



ABSTRACTS

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SPECIAL FOCUS COURSE *SHOULDER IMAGING*

Room Barbaros Paşa - Level 1

Friday, June 1st 2007

Shoulder Imaging Session 1

| | | |
|-------------|--|-------------------------|
| 08:30-08:45 | Shoulder Radiography | J. Hodler (Switzerland) |
| 08:45-09:05 | Shoulder Trauma: Mechanism of Injuries | A. Barile (Italy) |
| 09:05-09:25 | Imaging in Shoulder Trauma: Multislice CT vs MRI | I. Boric (Croatia) |
| 09:25-09:40 | Sternoclavicular Joint Diseases | A.G. Jurik (Denmark) |
| 09:40-09:55 | Congenital and Developmental Disorders | K. Johnson (UK) |
| 10:00-10:30 | Coffee Break | |

Shoulder Imaging Session 2

| | | |
|-------------|--|----------------------------|
| 10:30-10:50 | Normal MRI Anatomy of the Shoulder: Clinical Aspects for Imaging | H. Bloem (The Netherlands) |
| 10:50-11:10 | Normal Variants and Pitfalls in MRI of Shoulder Joint | W. Peh (Singapore) |
| 11:10-11:30 | MRI Protocols in the Shoulder | G. Astrom (Sweden) |
| 11:30-11:50 | MR Arthrography: Technique and Indications | C. Faletti (Italy) |

12:00-12:30 Opening Ceremony

12:30-13:30 Lunch

Shoulder Imaging Session 3

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| 13:30-13:50 | Impingement Syndrome: Pathology and Mechanism | A. Stabler (Germany) |
| 13:50-14:10 | MRI Findings in Rotator Cuff Lesions | C. Masciocchi (Italy) |
| 14:10-14:30 | MRI vs US Imaging in RC Pathologies: Clinical and Economical Aspects | E. Silvestri (Italy) |
| 14:30-14:50 | Interventional Procedures in the Shoulder | S. Ostlere (UK) |
| 15:00-15:30 | Coffee Break | |

Shoulder Imaging Session 4

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| 15:30-15:50 | Glenohumeral Joint Instability: Definition and Mechanism | J. Kramer (Austria) |
| 15:50-16:10 | MRI Findings in GHJ Instability | K. Wörtler (Germany) |
| 16:10-16:25 | SLAP Lesions | J. Beltran (USA) |
| 16:25-16:40 | Biceps Tendon Pathologies | E. Llopis (Spain) |
| 16:40-16:55 | Postoperative Imaging of the Shoulder | M. Zanetti (Switzerland) |

Saturday, June 2nd 2007

Shoulder Imaging Session 5

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|-------------|---|------------------------|
| 08:30-08:45 | Soft Tissue Tumors around Shoulder Joint | K. Vilanova (Spain) |
| 08:45-09:05 | Bone Tumors and TM like Lesions around Shoulder Joint | D. Vanel (France) |
| 09:05-09:20 | Synovial Disorders of Shoulder Joint | G. Allen (UK) |
| 09:20-09:35 | Bone Marrow Abnormalities | A. Karantanas (Greece) |
| 09:35-09:50 | Imaging of Brachial Plexus | A. Kassarjian (Spain) |
| 10:00-10:30 | Coffee Break | |

Shoulder Imaging Session 6

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|-------------|--|---|
| 10:30-12:00 | Shoulder US Anatomy Shoulder US Pathology Live Demonstration | C. Martinoli (Italy) A. Klausner (Austria) C. Martinoli (Italy) & A. Klausner (Austria) |
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Shoulder Imaging Session 1

Chairs: V. Pulicino (United Kingdom) and M. Reiser (Germany)

Shoulder Radiography

J. Hodler (Switzerland)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 08:30-08:45

Regardless of the increasing role of sonography and MR imaging, standard radiographs have maintained a key role in diagnosing shoulder abnormalities. Anteroposterior views in internal and/or neutral and/or external rotation and axial (cross-table), as well as supraspinatus outlet views are most commonly employed. Specialized projections such as Bernageau's or the Westpoint view may add information in glenohumeral instability. For assessing the damage in acromioclavicular joint trauma, bilateral radiographs are commonly obtained with weights in the patients' hands.

Arthrography is only rarely used unless combined with either CT or MR imaging.

Standard radiographs provide relevant information in rotator cuff disease. The acromiohumeral distance should be 7 mm or more on anteroposterior radiographs. Cranial migration of the humeral head occurs in the presence of a supraspinatus tear in combination with fatty degeneration of the rotator cuff muscles. Surgery may not be successful in severe fatty degeneration. Osteoarthritis of the glenohumeral and acromioclavicular joints are demonstrated by standard radiographs although they are not sensitive in degeneration of the glenohumeral joint. In calcific tendinitis, standard radiographs represent the easiest and most reliable means to demonstrate calcifications and to a certain degree the extend of activity. In instability, radiographs demonstrate Hill-Sachs lesions, bony Bankart lesions and the position of the humeral head in relation to the glenoid. In fractures, standard radiographs are the most important imaging method. The typical Neer's classification of proximal humeral fractures based on the number of dislocated parts may not be as reliable as desired but nevertheless are useful for predicting the prognosis including avascular necrosis. In frozen shoulder osteopenia may be seen on standard radiographs.

Postoperatively, standard radiographs provide information about the position and stability of implants.

Shoulder Trauma: Mechanism of Injuries

A. Barile (Italy)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 08:45-09:05

The shoulder is the most mobile joint in the human body. Shoulder trauma is common throughout life, but the site of injury varies with age. The mechanism of shoulder trauma are several; generally, it is possible to distinguish acute direct trauma and chronic repetitive one. Humeral fractures are most commonly caused by a direct blow or a fall onto an outstretched hand. Clavicular fractures usually occur during a fall onto an outstretched hand, although some result from a blow to the shoulder. Scapular fractures, which are uncommon, result from a direct blow to the scapular area or from extremely high-force impact elsewhere to the thorax. A common injury among athletes and active patients is acromioclavicular sprain. A direct blow to the superior aspect of the shoulder or a lateral blow to the deltoid area often produces this injury. Anterior sternoclavicular joint separation occurs when the medial end of the clavicle is displaced anteriorly or anterosuperiorly with respect to the anterior border of the sternum. This injury is most commonly the result of a motor vehicle crash. Tears of the rotator cuff during trauma are most common in persons older than 40 years. Because of its lack of bony stability, the glenohumeral joint is the most commonly dislocated major joint in the body. Glenohumeral stability is due to a combination of ligamentous and capsular constraints, surrounding musculature and the glenoid labrum. Static joint stability is provided by the joint surfaces and the capsulolabral complex, and dynamic stability by the rotator cuff muscles and the scapular rotators (trapezius, serratus anterior, rhomboids and levator scapulae). The humeral head can dislocate anteriorly, posteriorly or inferiorly in relation to the glenoid fossa. Most shoulder dislocations are anterior. Patients usually hold the affected arm in external rotation and abduction.

Imaging in Shoulder Trauma: Multislice CT vs MRI

I. Boric (Croatia)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 09:05-09:25

Shoulder traumatic injuries are common, and the glenohumeral joint is the most common joint dislocation treated in the emergency departments. The injury types vary with age and mechanism of injury. Regardless of injury types: acute direct traumatic injuries, acute indirect traumatic injuries or repetitive microtraumatic injuries, each injured shoulder requires sufficient radiological assessment.

Different radiological modalities are available and give answers on clinicians questions. But, two most powerful diagnostic tools are multidetector computed tomography (MDCT) and magnetic resonance imaging (MRI). Each of those diagnostic modalities has own advantages and disadvantages, but often are also complementary methods.

The main advantages of MDCT include extremely rapid scan times, excellent temporal, spatial, and contrast resolution, and the ability to produce high-quality two-dimensional reformats (multiplanar reconstruction, MPR) and three-dimensional surface renderings. Due to those facts, MDCT is method of choice in evaluation of bony trauma and MDCT with MPR increases the accuracy of fracture classification especially in complex or comminuted shoulder fractures, helping surgical planning and decision making.

MRI and MR arthrography are the imaging modalities of choice for the assessment of the many soft-tissue structures of the glenohumeral joint: rotator cuff, the glenoid labrum and the biceps tendon, as well as in detecting glenohumeral cartilage lesions. But, value of MDCT arthrography for studying the articular cartilage of the entire shoulder is promising with high sensitivity and specificity range.

Sternoclavicular Joint Diseases

A. G. Jurik (Denmark)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 09:25-09:40

The sternoclavicular joints (SCJs) are mechanically connected to the shoulder joints being the only synovial joints between the upper extremity and the trunk. Disorders of the joints encompass diseases occurring in other joints such as congenital and developmental abnormalities, traumatic disorders, arthritides, degenerative disorders and infections. The SCJ is often a diagnostic challenge to both the clinician and the radiologist. Disease involvement may cause referred pain in areas distant from the joints potentially leading to delayed diagnosis. The SCJ is moreover difficult to visualise by conventional radiography implying the need for more demanding examinations. Due to this the SCJ does not generally receive the attention it merits by radiologists.

Learning Objective: Normal anatomy: The SCJ is a true diarthrodial synovial-lined joint. When fully developed it contains fibrocartilaginous and not hyaline articular cartilage. It contains a fibrocartilaginous intraarticular disc and is in addition to surrounding ligaments stabilized by the costoclavicular ligament making the region rich of entheses.

Imaging modalities/strategy: The SCJs are often difficult to assess by conventional radiography, unless using tomography due to several over-projecting structures. Elimination of superimposed structures can be achieved by computed tomography (CT) and magnetic resonance imaging (MRI). CT often plays a significant role in the diagnosis and characterisation of SCJ disorders. It excellently demonstrates joint and bone lesions, especially when using the multidirectional potentials of multislice CT. MRI in addition visualises soft tissue structures, but can be difficult to perform due to respiratory movements of the SCJ region. Bone scintigraphy may be helpful in confirming the presence of active inflammation or infection, although the SCJs may be difficult to visualise accurately on routine bone scans. Ultrasonography can be used to diagnose arthritis, allowing differentiation between joint effusion, synovial hypertrophy and paraarticular soft tissue involvement.

Congenital and developmental variants of the sternocostoclavicular region are numerous [1]. Abnormalities influencing or impairing life are, however, relatively rare. They mainly consist of deformities and fusion abnormalities.

Traumatic disorders: SCJ dislocation is a relatively rare injury consisting of joint separation with capsular, ligament and disc lesion, and in severe cases also rupture of the costoclavicular ligament. It mostly occurs in young adults, adolescents and children, and there are often Salter type 1 or 2 medial clavicular epiphysiolysis. The diagnosis is usually missed at the initial clinical examination. Anterior dislocations are most frequent resulting from an anterior blow to the shoulder that forces the lateral part of the clavicle posterior. Posterior dislocations can be life threatening due to occasional associated aortic, brachio-cephalic vessel, tracheal, oesophageal and brachial plexus injuries [2]. CT is usually necessary for the evaluation of dislocation. Minor sports injuries can result in disc lesions only detectable by MRI.

Inflammatory disorders: Rheumatoid arthritis (RA) can involve the SCJ, but the frequency of involvement is low compared to that of seronegative spondylarthropathies (SpA). The SCJ and surrounding entheses and bones are often involved in SpA [3,4], but the involvement may not be diagnosed due to overshadowing spinal or sacroiliac joint symptoms. Knowledge is sparse about characteristic imaging features in the various well-known form of SpA [4]. Involvement of the SCJ often presents as joint erosion with subchondral sclerosis and surrounding new bone formation. There may be accompanying soft tissue calcification, including the costoclavicular ligament and resulting in a hyperostotic ossified plate. Such changes can usually be detected by conventional radiography, but CT or MRI is often needed for characterisation of SpA involvement. Signs indicating activity can only be visualised by MRI or scintigraphy.

Degenerative disorders of the sternoclavicular joint are commonly present radiologically but produce symptoms less frequently. When they do the presence of local swelling, tenderness and an abnormal radiograph can give rise to concern. In these patients MRI or CT should be used to exclude malignant or infective conditions while simultaneously differentiating the various degenerative processes [4].

Infectious arthritis of the SCJ is a rare finding mainly occurring in patients with low resistance to infection. Early diagnosis is important for a good outcome, and it is therefore important to be aware of the diagnostic possibility. Cross-sectional imaging, either CT or MRI, is important for achieving the diagnosis and delineating the extent of the disease [4].

Conclusion: The SCJs are often forgotten in trauma patients and in patients with known arthritides or degenerative disorders. The joints generally deserve more attention both clinically and radiologically.

References

1. Schmidt H, Freyschmidt J (1993) Kohler/Zimmer. Borderlands of normal and early pathologic findings in skeletal radiography. Thieme Medical, New York
2. Thomas DP, Davies A, Hoddinott HC (1999) Posterior sternoclavicular dislocations: a diagnosis easily missed. *Ann R Coll Surg Engl* 81: 201-4
3. Fournie B et al. (1997) Prospective study of anterior chest wall involvement in ankylosing spondylitis and psoriatic arthritis. *Rev Rhum Engl Ed* 64: 22-25
4. Imaging of the sterno-costo-clavicular region (2006) ed. by Jurik AG, Springer-Verlag, Berlin Heidelberg



Congenital and Developmental Disorders

K. Johnson (UK)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 09:40-09:55

The development of the upper limb and shoulder depends not only upon normal skeletal maturation but also on normal neural, vascular, muscular and cartilaginous development, much of which proceeds in early childhood. Consequently, abnormalities of any one of these structures or processes can severely affect normal shoulder. In particular shoulder development in the postnatal period may be severely affected by upper arm traction and nerve damage at birth.

It is important that the radiologist has an understanding of the normal development of the shoulder and the consequences of a disturbance within that development and how it may affect the remainder of the shoulder girdle.

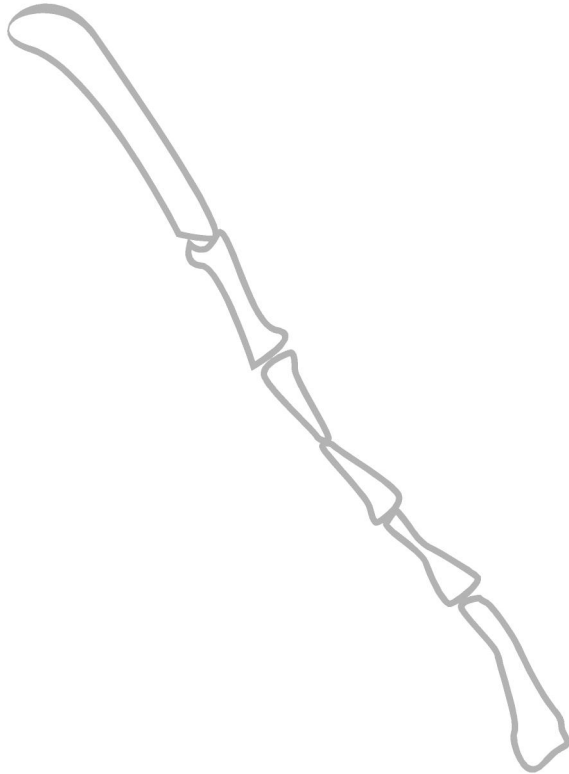
Additionally, disorders of the shoulder may be more than just a localised abnormality but form part of a wider spectrum disease, particularly the skeletal dysplasias and metabolic bone disorders. Radiology provides significant information in the understanding these systemic conditions and differentiating them from more focal localised pathologies.

This presentation will review the normal anatomy and embryology of the shoulder and discuss the common congenital abnormalities; in particular Sprengel's shoulder and pseudoarthrosis of the clavicle, congenital abnormalities of the glenoid fossa and scapula will also be discussed. Traumatic birth injuries, particularly brachial plexus (Erb's palsy) and birth fractures will be highlighted as will abnormalities of the muscles around the shoulder.

A limited review of the bone dysplasias which have classical features around the shoulder will be included.

The importance and use of different imaging modalities, particularly radiographs, ultrasound, CT and MR imaging, for different developmental anomalies will be discussed and the timing and approach to birth injuries will be highlighted. Those measurements which are relevant to clinical practice will be discussed.

NOTES



Shoulder Imaging Session 2

Chairs: J. Kramer (Austria) and E. Llopis (Spain)

Normal MRI Anatomy of the Shoulder: Clinical Aspects for Imaging

Hans Bloem (The Netherlands)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 10:30-10:50

Objective: To use functional anatomy in understanding pathophysiology, and features of common shoulder disorders.

Scylla and Charybdis of the shoulder are motion and stability. The glenohumeral joint allows extensive motion in 3D, consisting of rotational, and translational components, while maintaining stability. The shoulder is a functional unit, of which the glenohumeral joint is one component. Normal shoulder function requires coordinated motion between 4 joints (glenohumeral, scapulothoracic, sternoclavicular, acromioclavicular) using almost 30 muscles. In this lecture I will address, from a clinical-radiological perspective, the roles of osseous anatomy (retroversion of humeral head, glenoid, Bigliani types of acromion), non-muscular soft tissue structures, and muscles in achieving normal function, and in failure to do so. Most important passive stabilizers are glenohumeral ligaments, labrum, and periosteum. The inferior glenohumeral ligament is the most important of the glenohumeral ligaments. Biceps (superiorly) and triceps (inferiorly) contribute to stability. Active stability exercised by muscles depends on the compression vector aimed at the articular surface. Perpendicular to this is the shear vector producing motion. In a stable glenohumeral joint, the points of intersections of all axes on which motion occurs will be small. If, however, the stability is compromised because of disease of the rotator cuff, or capsuloligamentous complex (including labrum), the points of the intersections of axes will disperse resulting in unbalanced stress. Disproportional load shearing between components of the functional unit, secondary to structural or functional failure, will result in pathology of anatomical structures subjected to these excessive forces.

Normal Variants and Pitfalls in MR Imaging of the Shoulder Joint

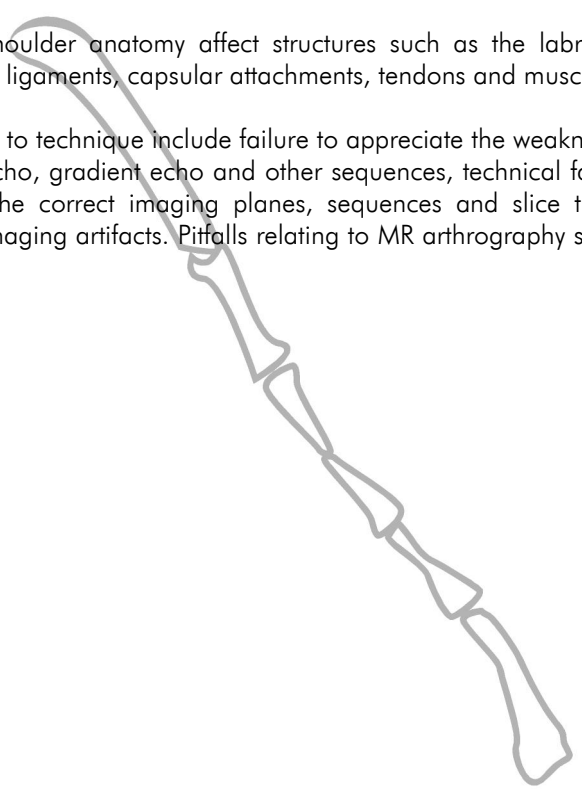
WCG Peh (Singapore)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 10:50-11:10

The shoulder is an increasingly imaged joint in current clinical MR imaging practice. Factors leading to misinterpretation of MR imaging of the shoulder may be classified as those due to anatomy and technique.

Variants in shoulder anatomy affect structures such as the labrum, recesses, glenohumeral ligaments, capsular attachments, tendons and muscles.

Pitfalls related to technique include failure to appreciate the weaknesses of turbo or fast spin echo, gradient echo and other sequences, technical factors such as selection of the correct imaging planes, sequences and slice thickness, and various MR imaging artifacts. Pitfalls relating to MR arthrography should also be recognized.



MRI Protocols in the Shoulder

G. Astrom (Sweden)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 11:10-11:30

MR imaging of the shoulder has become a common examination. However, with different magnet field strengths (0.2 – 3.0 T), better and better hardware and software solutions, many available coils, numerous techniques can be used to image the shoulder. In the end, the workload of the MR scanner, the know-how, and the clinical indications will determine the protocol. The role of 3.0 T imaging has not yet been determined – this field strength allows thinner sections, is faster, improves resolution but increases motion and metal artefacts.

A. Magnets

1. Closed circumferential magnets.
2. Open magnets have lower field strength. Usually composed of two parallel permanent magnet plates. Lower risk for claustrophobia. Enable placement of the shoulder in the physically optimal centre of the magnetic field. Low field strength – decreased S/N ratio – which gives longer acquisition times or lower spatial resolution. Longer acquisition times also increase the risk of motion artefacts.

B. Coils

1. Phased-array shoulder coils or quadrature coils offer high S/N ratio.
2. Flexible coils – single or in pairs.
3. To improve imaging of the brachial plexus we have used parallel imaging with use of a 5-channel cardiac coil with 3 coils encased in the base and 2 anterior flexible coils. Recently, a 16-channel Neurovascular coil also using parallel imaging is on the market.

C. Patient position

1. Supine with arm along the body.
 - a. Neutral positioning = Thumb pointing upwards is usually comfortable for the patients which minimizes motion artefacts. This position gives better distribution of contrast medium or joint effusion and does not distort the anatomy.
 - b. External rotation – can be uncomfortable/painful and causes therefore an increased risk of motion artefacts. It tends to tighten the anterior capsule of the shoulder and obscure the anterior labrum. It might be superior for SLAP lesions.

- c. Internal rotation – produces an overlap between the supraspinatus and infraspinatus tendon in oblique coronal position, which can cause misinterpretation. Internal rotation – slackens the anterior capsule and thus allows joint fluid to pool around the capsule and better define the local morphology. Often at the expense of the visibility of the posterior labrum.
 - d. Avoid placing the hand on the abdomen since respiratory motion could be transmitted to the shoulder and cause motion artefacts.
 - e. Placing the patient's palm under the buttock aids immobilization of the shoulder during imaging
 - f. When necessary use pre-medication due to pain.
2. ABER – Abduction and external rotation - Flexing the elbow and placing the patient's hand posterior to the contralateral aspect of the head or neck. It is superior for imaging of anterior instability and may also be useful in detection and characterization of tears of the rotator cuff. Imaging is performed in a transaxial oblique plane from a coronal localizer image parallel to the long axis of the humerus. About 20% of patients may have difficulties to stand the ABER position due to shoulder pain or apprehension. In order to reduce pain a wedge-shaped plastic pillow can be placed under the upper and lower arm. The ABER position require extra time (> 10 min) to the routine MR protocol for repeat patient positioning, coil placement and the ABER acquisition. Two passively coupled coils are used.
 3. Apprehensive test position – can only be performed in open magnets. Patient's arm is placed in 90° abduction and in 90° flexion of the elbow, then the maximum tolerable external rotation for motion-free imaging is performed. This position has been shown to be superior to the ABER position in demonstrating anterior capsulolabral lesions.
 4. Traction in combination of external rotation might increase the depiction of SLAP lesions.
 5. Kinematic imaging – various degrees of internal and external rotations with the arm beside the body or in abduction.

D. Imaging planes

1. Frontal oblique plane – for depicting the rotator cuff. The images are parallel with the course of the supraspinatus tendon.
2. Sagittal oblique plane – for displaying rotator cuff tendons, muscle atrophy, acromial anatomy, the coracoacromial and coracohumeral ligaments, and for showing the relationships of the capsulolabral

complex. The images are perpendicular to the long axis of the supraspinatus tendon or perpendicular to the long axis of the scapula.

3. Transaxial plane – for displaying capsular and labral anatomy and lesions. Most important for instability imaging. Should cover the acromion to the inferior margin of the glenoid cavity.

E. Sequences

The sequences that are used vary from one department to another. Typical protocols include conventional spin-echo, fast spin echo (FSE) or turbo spin echo (TSE), two-dimensional or three-dimensional gradient echo sequences. Furthermore, some investigators utilize fat-suppression combined with fast spin echo imaging. T1-weighted SE is used mainly for detection of fatty infiltration of muscles, muscle atrophy or bone marrow abnormalities. STIR for depicting bone marrow abnormalities or extraarticular fluid. Since extra-articular fat and gadolinium have similar signal intensity on T1-weighted images, T1WI with and without fat suppression can be used to differentiate between the two. T2* gradient echo imaging has advantages over spin echo imaging, e.g. high contrast around the cuff, shorter imaging times which can be used for to increase the number of signals averaged and thus improve the signal-to-noise ratio. This sequence is, however, more sensitive for magnetic susceptibilities. If fat suppression is not used with T2 TSE (FSE) images a long TE can be chosen (e.g. 140msek) to increase water contrast.

Protocol suggestion - Conventional MRI (1.5 T).

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| 1. Axial | PD TSE (FSE) Fat suppressed (or T2* GE) |
| 2. Oblique coronal | PD/T2 TSE (FSE) Fat suppressed |
| 3. (Oblique coronal) | (STIR and/or T1SE) |
| 4. Oblique sagittal | T1 SE |
| 5. Oblique sagittal | PD/T2 TSE (FSE) Fat suppressed |

Field of view (FOV): 10 to 18 cm; Matrix 256 x 192-(512); Slice thickness 3-4 mm.

How to minimize artefacts (e.g. metal artefacts) in the postoperative shoulder:

If possible, orient long axis of hardware parallel to direction of main magnetic field. Avoid the use of GE sequences. Selectively orient the frequency-encoding axis away from direction of clinical interest. Use widened or increased receiver bandwidth. Use STIR rather than frequency-selective techniques for fat-suppressed imaging. Observe, however, that gadolinium may be dark on STIR images.

Imaging at low field strength and with high image matrix size. Fast T1 SE sequences instead of SE sequence (keep echo train length low [eg, 2]).

F. Indirect arthrography

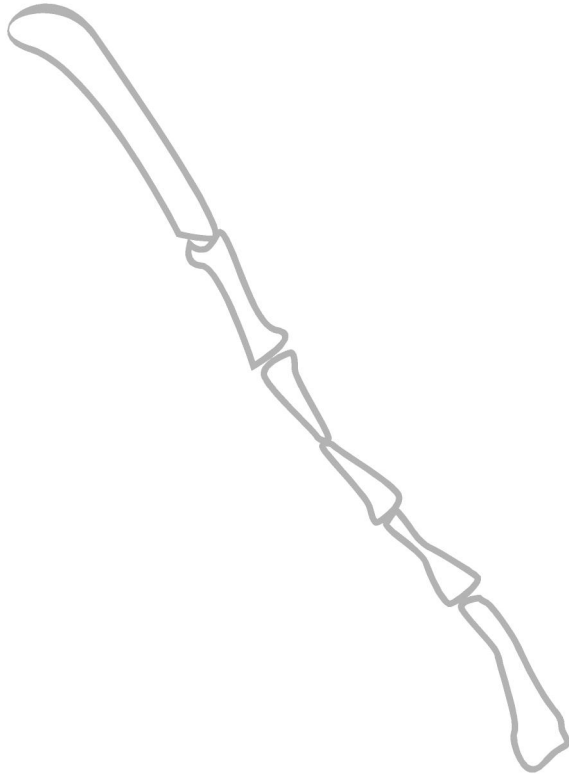
Intravenous contrast material (0.1 mmol/kg Gd-DTPA) will diffuse into the joint over time, producing an arthrographic effect. Diseases with joint effusion (i.e. different degrees of synovitis) will improve the arthrographic effect. Double- and triple dose i.v. injections have a limited positive effect. The increase in signal intensity of the joint fluid after injection could be up to 4 times greater after 10-15 minutes exercise before imaging. Due to low contrast agent concentration in the joint, fat suppression (with chemical shift selective techniques) is recommended. Indirect arthrography also provides improved delineation of soft-tissue lesions. Indirect MR arthrography with supplementary images obtained with patients in the ABER position improves the depicting of partial-thickness tears of the supraspinatous tendon. Disadvantages are, for example, the lack of capsule distension if there is no preexisting effusion, and that other structures such as an enhancing subacromial-subdeltoid bursa can be misinterpreted as an indirect sign of rotator cuff tear.

H. Direct arthrography

Mostly performed via an anterior approach by means of fluoroscopic or US-guidance. Needle size 20-22 gauges, 0.1 mL of Gd-DTPA in 20mL of saline. Most often 10-15 mL is injected and imaging should be performed within 90 minutes. Exercise after the intra-articular injection has no beneficial or detrimental effect on image quality or on the depiction of rotator cuff or labral tears. Since the most common indications are anterior capsulolabral lesions or instability, some radiologists favour a posterior approach in order to avoid extraarticular injection or leak of contrast material in anterior structures. Contrast enhancement with intraarticular Gd-DTPA using T1-weighted sequences improves the interpretation of internal joints derangements (e.g. labral, ligamentous, tendinous lesions, subchondral fractures or loose bodies). Care should be taken to prevent the injection of air to the joint, since air bubbles may simulate loose bodies. The leakage of contrast outside the joint should not be confused with capsular disruption. It also demonstrates pathologic communications between compartments of the joint or capsular tears. MR arthrography is considerably more sensitive for detection of partial-thickness supraspinatus tears and labral tears than conventional MRI. The prevalence of joint infection after arthrography is reported to be 0,003%.

Protocol suggestion for direct arthrography: All three conventional imaging planes and ABER position on request are examined using T1 SE with fat suppression. In

addition, a coronal oblique PD/T2 FSE (TSE) with fat suppression (alternatively STIR), and/or an axial PD FSE (TSE) with fat suppression (alternatively GE) can be performed.



MR Arthrography: Technique and Indications

C. Faletti (Italy)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 11:30-11:50

Premise: The term arthrography indicates the possibility to study endoarticular structures after injection of a contrast medium (c.m.), should the chosen investigative method give a poor or non-diagnostic result.

As even the basic MR examination is able to visualize encapsulated joints, the addition of a c.m. allows not only for their "true" representation but also that of any pathologies which might be present, thanks to the distension of the joint capsule and the "painting" of the various joint structures.

Technique: The intra-articular injection is carried out in the same way as that of an infiltration under careful aseptic conditions, to avoid infections at the puncture site, with either an posterior or anterior approach, using the coracoid process as a reference point.

This second approach seems to be the most adapt as it facilitates the pin-pointing of the anatomic sites and the patient is already supine on the MR table, ready for the examination to be started. There is usually no need for local anaesthesia and the uptake curve is extremely rapid.

More dexterity may be obtained with US guidance or the aid of fluoroscopy.

Nowadays, specific c.m. in low friction syringes is available. 18 or 20G epidural needles are the most commonly used. The amount of c.m. to be used varies depending on the articular volume, the maximum capacity is usually 20ml. The low resistance enables the operator to know when maximum distension has been achieved, so as not to force the injection.

The procedure is almost painless, except in the presence of an adhesive capsulitis, in which case the patient experiences a sharp pain and it is possible to inject a few ml.

High definition, T1 weighted spin echo sequences with specific coils are the most suitable so as to best take advantage of the qualities the contrast medium has to offer in enhancing the endo and periarticular structures. The c.m. designs the profile of the structure itself, evidencing even the smallest irregularities of the glenoid labrum and any discontinuity of the structures that make up the capsular

margins, such as the rotator cuff and the ligaments, as well as any alterations in the thickness of the cartilage lining profile.

The contrast medium may be further enhanced by the association of fat-sat sequences or a 3D GE fat-sat sequence may be useful should the need to reduce the thickness of the single slices to 1-2mm arise.

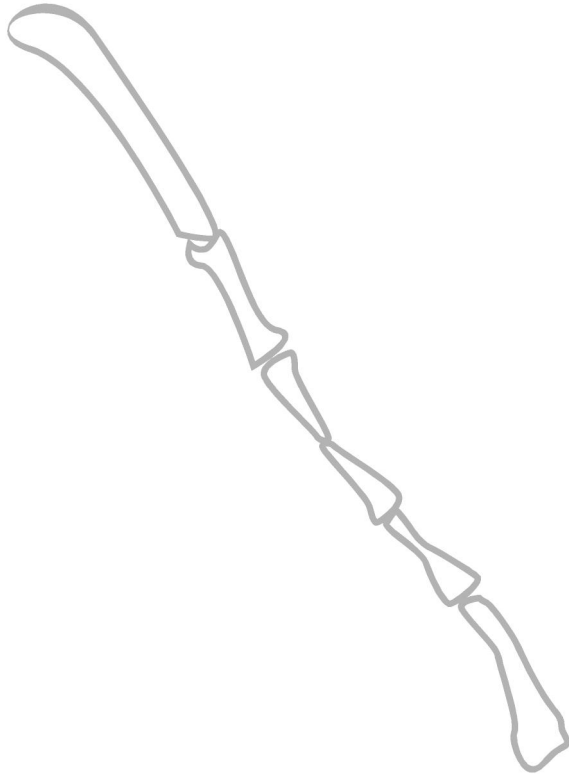
Indications: The use of intra-articular c.m. is indicated whenever information as to the precise entity and extent of the lesion/s is required, also as an aid to surgery planning, as in the case of shoulder instability where it is necessary to know to what extent the labrum is involved, if there is any capsule detachment and/or involvement of the supporting ligament structures.

Another indication is when a SLAP lesion or a lesion involving the rotator interval is to be investigated.

When dealing with rotator cuff and subscapular pathology, the use of c.m. allows for the identification of even the smallest alterations of the cuff on the articular side in partial thickness lesions, stage of a degenerated cuff, or the sub-scapular intersertional lesions at the foot-print level.

Lastly, c.m is useful in chondral and capsular pathology so as to evidence the precise site and extent of the osteochondral lesion/s, or to demonstrate the real presence and entity of a frozen shoulder.

NOTES



Shoulder Imaging Session 3

Chairs: J. Hodler (Switzerland) and C. Faletti (Italy)

Impingement Syndrome: Pathology and Mechanism

A. Stabler (Germany)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 13:30-13:50

Subacromial impingement syndrome is a painful compression of the supraspinatus tendon, the subacromial-subdeltoid bursa, and the long head of the biceps tendon between the humeral head and the anterior portion of the acromion occurring during abduction and forward elevation of the internally rotated arm. Impingement syndrome is present in a painful shoulder when subacromial infiltration with an anaesthetic agent results in pain relief, while provoking pain with the arm elevated

Coracoid impingement is a painful compression of the subscapularis tendon between the anterior portion of the humeral head at the level of the lesser tuberosity and the coracoid process. The glenoid rim impingement occurs from repetitive posterior and cranial subluxation of the humeral head in throwers or tennis players with compression and subsequent degeneration of the posterior superior labrum, frequently followed by ganglion cyst formation. This form of impingement is better classified as instability.

A dominant mechanism for rotator cuff disease is upward centering of the humeral head with a failure to stabilize the shoulder against this muscle action. Stiffness of the posterior capsule or increased muscle tension in the posterior located cuff muscles may aggravate the impingement process by forcing the humeral head upwards against the antero-inferior acromion as the arm is elevated. An increase of volume from mucoid tendon degeneration compromises the subacromial space. Anatomic variants in the shape of the acromion, degeneration of the rotator cuff tendons with or without calcifying deposits, repetitive or severe trauma, chronic overuse due to occupation or sports activities, contribute to the development of rotator cuff pathology by increasing friction and wear against the acromion and the coracoacromial arch.

The changes in the supraspinatus tendon from normal to complete rupture are classified according to Neer in three stages: edema and hemorrhage, fibrosis and thickening and progressive impairment due to degeneration and rupture of the supraspinatus tendon. With further impingement wear, incomplete or complete tears of the rotator cuff and biceps lesion occur.

MRI Findings in Rotator Cuff Lesions

C. Masciocchi (Italy)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 13:50-14:10

The rotator cuff is composed of four muscles: subscapularis, supraspinatus, infraspinatus and teres minor. There can be several conditions leading to impingement syndromes of the cuff components. Among these the most significant from the biomechanical point of view are the subacromial impingement syndrome, the postero-superior glenoid labrum impingement, and the coraco-humeral impingement. The subacromial impingement syndrome is caused by impingement between the cuff structures and the functional arc. The impingement syndrome can be the result of two conditions: the reduction of the subacromial space and functional overloading, which are concomitant or associated to the impingement syndrome with different incidence. The first phase of the impingement syndrome is characterised by acute bursitis, which can be associated to functional overload or morphological alteration of the arc. In the subsequent phase, the inflammatory process becomes chronic giving rise to fibrotic phenomena which cause stiffness of the bursa and cuff structures (calcifications), affecting in particular the less vascularised area of the supraspinatus. In the third phase the injury can become irreversible, giving rise to a degenerative tendinopathy of the supraspinatus (jaline, mucous or mucoid) associated to calcifications of the tendon. These three phases, becoming chronic, can lead to the rotator cuff tear (fourth phase).

We describe the MRI findings relative to each phase and compare plain MRI to arthro-MRI. MRI has proved to be a reliable tool in the evaluation of tendinosis, its extension and different degrees, allowing a distinction between partial and total tears. Moreover, it is possible with MRI to evaluate the extension of the total tears. MRI is also able to evaluate the muscular structures showing degenerative adipose and fibrous phenomena.

MRI vs US Imaging in RC Pathologies: Clinical and Economical Aspects

E. Silvestri (Italy)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 14:10-14:30

More and more the choice whether to use MRI or US as a diagnostic tool has become an arrangement between clinical question, economical aspects and system availability/waiting lists: among these, actually, clinical question seems to be the most relevant aspect.

Clinical aspects:

Anatomy: US is very useful in the depiction of RC normal anatomy, because of its high spatial resolution and definition that allow to study the very inner structure of tendons. MRI allows a more panoramic description of normal anatomy of the shoulder but it has a lower spatial resolution.

Acute lesions: US can easily detect RC acute lesions but it does not allow to see what happens in the rest of the shoulder (capsular effusion...). MRI can be effective in the detection of RC acute lesions but it seems to be less effective due to the acute edema that occurs in those situations.

Chronic lesions and degenerate tendon: US is extremely effective in the detection of chronic lesions and to depict the structure of degenerate tendon; moreover, it is the best diagnostic tool to assess the calcific tendonitis of RC and to treat it. MRI is effective in the detection of acute lesions but can have a low diagnostic outcome in degenerative pathologies; it has not a role in the detection of calcium deposits.

Concomitant pathologies: US is very limited in the detection of any concomitant pathologies, i.e. labial tears and bone involvement. On the contrary, MRI is extremely reliable in the detection of most of the collateral pathologies of the shoulder.

Preoperative staging: MRI is compulsory in the preoperative staging of RC pathologies.

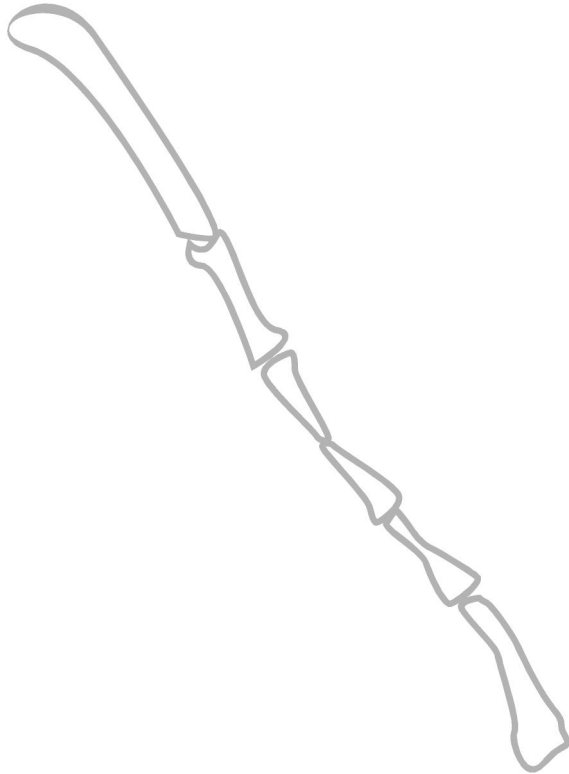
System availability/waiting list:

The different situation of each European country makes it difficult to describe which is the role of this parameter in the diagnostic course of RC pathologies. Opting by definition for one imaging method as the first modality just because of a long waiting list is not necessarily the right approach as any subsequent examination only raises costs.

Economical aspect:

Today's "toolbox" has an ample range from US to 3T MRI system with any solution in between.

Good healthcare is acquiring and using the right tool in the right occasion. When US is important but not enough, it is important not to forget the possible use of dedicated MRI systems as a right compromise on quality and diagnostic outcome and as an economical viable companion to ultrasound.



Interventional Procedures in the Shoulder

S. Ostlere (UK)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 14:30-14:50

This lecture will cover guided injections into the glenohumeral joint, acromioclavicular joint and the subacromial bursa, barbotage and extracorporeal shock wave treatment for calcific tendinitis, and radiofrequency ablation for benign tumours.

A common procedure performed by radiologists is injection of the subacromial space for patients with impingement syndrome. This is frequently performed "blind" by the clinicians in the clinic, but if you want to be sure that the needle tip is in the bursa then ultrasound guided injection is recommended. There is no evidence that ultrasound guided injection is any more or less effective than a blind injection and the choice is usually determined by the clinicians preference and access to ultrasound. If ultrasound is routinely used for assessing the rotator cuff then it is easy to perform an injection after the diagnostic scan. The trick is to ensure that the needle is parallel to the probe and that the tip enters the bursa at a tangent. If the tip is in the bursa then fluid will flow away from the needle tip.

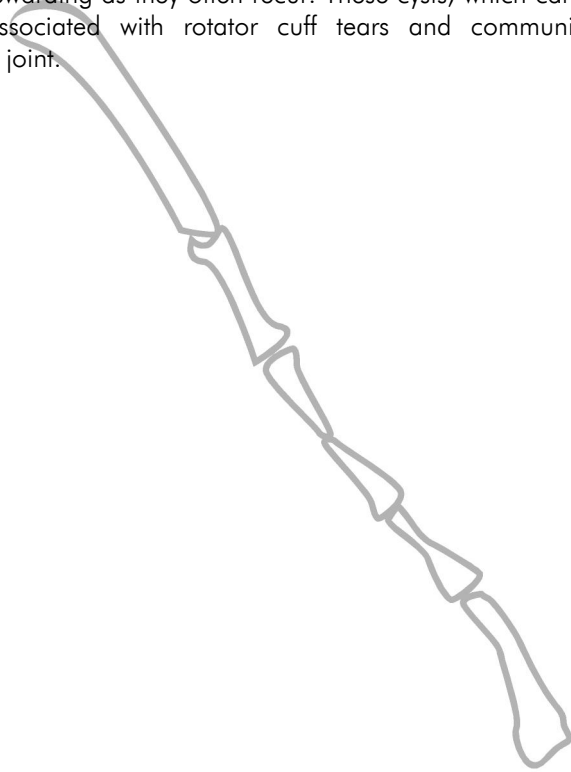
Guided placement of a needle into the glenohumeral joint may be required to inject gadolinium for MR arthrography, to aspirate the joint in suspected infection or to distend the joint in cases of frozen shoulder. The joint can be approached from the back or the front. The posterior approach is more commonly used if guiding the injection with ultrasound and the anterior approach if using fluoroscopy. On ultrasound the posterior joint margin is easy to demonstrate along with the posterior articular surface of the humeral head. If there is an effusion the procedure is even easier. A posterior "blind" approach has also been described and can this can be a time saving technique for injecting prior to MR arthrography.

Barbotage describes needling and irrigation of tendinous calcific deposits. It is an easy, effective technique performed under local anaesthesia and ultrasound guidance. Subacromial steroid injection is usually performed at the same time.

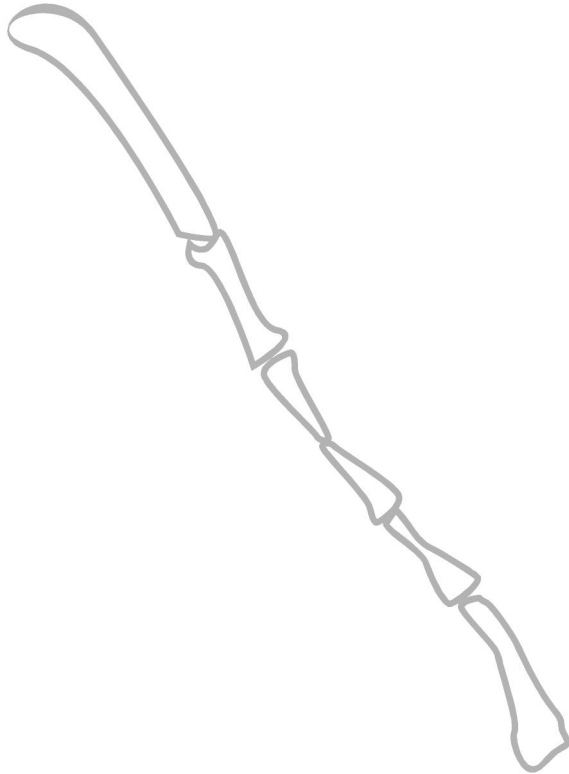
Extracorporeal shock wave treatment is an alternative technique. It is less invasive but more expensive. The evidence is a bit mixed but it does seem to be a reasonable alternative to surgery.

Radiofrequency ablation is an excellent treatment for osteoid osteoma and other benign painful lesions. In the shoulder the epiphysis is a typical site for chondroblastoma in the immature skeleton. As intraarticular surgery has a significant morbidity in these cases, radiofrequency ablation should be considered as an option.

Occasional the radiologist is asked to inject the acromioclavicular joint. This is easily done under ultrasound control. Aspiration of acromioclavicular joint cysts is usually unrewarding as they often recur. These cysts, which can become quite large, are associated with rotator cuff tears and communicate with the glenohumeral joint.



NOTES



Shoulder Imaging Session 4

Chairs: M. de Jonge (The Netherlands) and A. Chevrot (France)

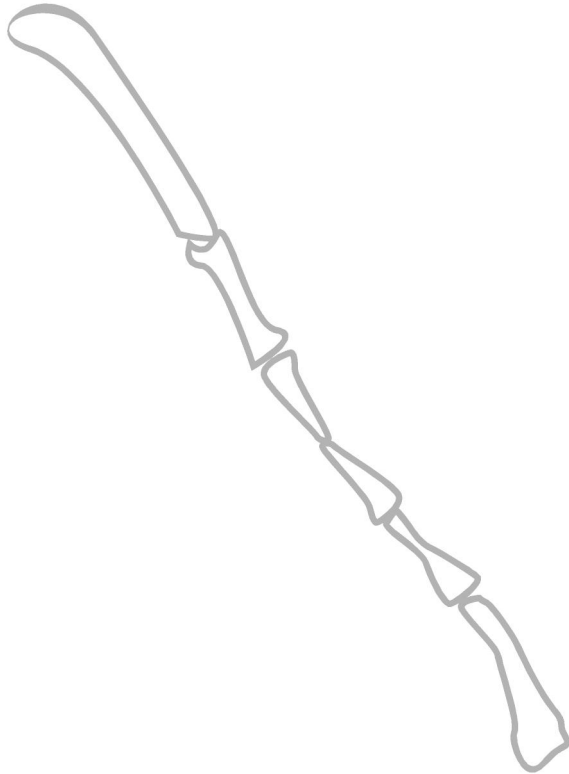
Glenohumeral Joint Instability: Definitions and Mechanism

J. Kramer (Austria)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 15:30-15:50

Instability is a clinical condition in which symptoms are produced by the unwanted translation of the humeral head, giving rise to pain or diminished shoulder function. In contrast to instability, laxity, found not rarely in younger female individuals, may be defined as the ability to passively translate the humeral head on the glenoid fossa. It has to be cautioned that passive glenohumeral translations in asymptomatic patients are often substantial and, in fact, nearly on a par with those of shoulders with established, symptomatic instability. This uncertainty can result in erroneous conclusions about a primary direction of instability, especially when drawn from examinations under anesthesia or clinical evaluation only. Therefore radiographic signs distinguishing between laxity and instability are not entirely clear. Several categorizations of instability have been reported in the literature taking into account the direction (uni/multidirectional, anterior/posterior, acquisition (atraumatic, traumatic) and the cause (congenital, acquired). It has been shown that a definite failure to maintain a limited joint volume is an important factor contributing to glenohumeral instability. A negative pressure within the joint provides resistance to glenohumeral translation, an effect that is dissipated when the volume of the capsule is expanded by avulsion, rupture, or stretching. A relative thick articular cartilage of the peripheral portions of the glenoid, in conjunction with its attached labrum, enhances the relative depth of the fossa and the translation compliance in the evaluation of disorders of the shoulder joint of the humeral head, an effect which is increased by an intact and tight capsular apparatus and ligamentous structures. MR imaging cannot confirm or deny the presence of instability directly, which is a clinical diagnosis. However, it allows detection and assessment of signs relatively specific for glenohumeral instability. Furthermore, there is a use for MR imaging other than simply to provide more specific information about capsule or labrum, since glenohumeral instabilities are commonly associated with rotator cuff tears or impingement, which are accompaniments to and sometimes a differential diagnosis of glenohumeral instability. Also several pathologic entities like SLAP lesions, lesions of the rotator interval structures (biceps and subscapularis tendon), and glenoid cysts may be detected in patients suspicious

for instability. Frequently, in patients suffering from glenohumeral instability conventional MR imaging does not provide the needed information. In those cases it should not be hesitated to perform MR- or CT- arthrography, techniques, which have reported higher sensitivity and specificity in the evaluation of disorders of the shoulder joint.



MRI Findings in GHJ Instability

K. Wörtler (Germany)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 15:50-16:10

Traumatic Glenohumeral Instability - TUBS (Traumatic, Unilateral, Bankart lesion, Surgery)

MR imaging findings in traumatic anterior instability include lesions of the antero-inferior labro-ligamentous complex (LLC), compression injuries of the humeral head (Hill-Sachs defect), and associated injuries of the superior labrum, rotator cuff, and rotator interval. MR arthrography provides high sensitivity and specificity for the detection of LLC lesions and has proved reliable in classification of these injuries. Whereas classic Bankart and Perthes lesions are most common in patients with acute instability, ALPSA (anterior labroligamentous periosteal sleeve avulsion) and 'non-classifiable' lesions of the LLC are more often depicted after multiple shoulder dislocations. The HAGL (humeral avulsion of glenohumeral ligaments) lesion is a relatively rare capsular injury that does not involve the LLC at the glenoid, but represents a tear of the IGHL at its humeral insertion. The Hill-Sachs defect is typically located at the posterolateral circumference of the humeral head. On transverse MR images it should be seen at or slightly above the level of the coracoid. MR findings that are of particular relevance for therapeutic decisions are the quality of the LLC, the presence of a HAGL lesion, the presence and size of a bony defect of the glenoid (bony Bankart lesion or chronic wear), the presence of a large Hill-Sachs defect, and associated pathology (e.g. SLAP lesions). A reverse pattern of injuries (posterior labral lesions, reverse Hill-Sachs defect) is seen in patients with traumatic posterior instability.

Atraumatic Glenohumeral Instability - AMBRII (Atraumatic, Multidirectional, Bilateral, Rehabilitation, Inferior capsular shift, Interval closure)

In atraumatic (multidirectional) instability, MR imaging does not reveal a specific pattern of findings. MR arthrography usually shows an increased capsular volume and a wide rotator interval, but no or little morphologic alterations of intraarticular structures. In athletes, laxity of the capsule is, however, often associated with development of labral or rotator cuff lesions.

Microtraumatic Glenohumeral Instability - AIOS (Acquired, Instability, Overstress, Surgery)

The concept of microtraumatic instability in throwers and overhead athletes is controversially discussed in the literature. MR arthrography appears to be best suited to depict structural alterations of the joint capsule, glenoid labrum, biceps anchor, and articular surface of the rotator cuff in these patients. In this context, posterosuperior glenoid impingement (PSI) represents the most common form of internal impingement which can be diagnosed by identification of the 'kissing lesions' pattern with corresponding lesions of the undersurface of the rotator cuff, posterosuperior labrum, greater tuberosity, and superior glenoid, often in association with tears of the superior labral-bicipital complex (SLAP lesions).

References:

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2. Waldt S, Burkart A, Imhoff AB, Bruegel M, Rummeny EJ, Woertler K. Anterior shoulder instability: performance of MR arthrography for classification of anteroinferior labroligamentous injuries. *Radiology* 2005; 237:578-583
3. Palmer WE, Caslowitz PL. Anterior shoulder instability: diagnostic criteria determined from prospective analysis of 121 MR arthrograms. *Radiology* 1995; 197:819-825
4. Chandnani VP, Yeager TD, Bencardino T, Christensen K, Galgiardi JA, Heitz DR, Baird DE, Hansen MF. Glenoid labral tears: prospective evaluation with MR imaging, MR arthrography, and CT arthrography. *AJR* 1993; 161:1229-1235
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SLAP Lesions: MRI Findings

J. Beltran (USA)

Room "Barbaros Paşa" – Friday June 1st, 2007 – 16:10-16:25

Mechanisms of Injury

- Compression: Fall in outstretched arm
- Traction: Sudden pull or repetitive overhead activity

Clinical Symptoms

- Clicking, popping, pain, limited range of motion
- Instability when the lesion extends to the upper half of the labrum

Throwing Mechanism

- Wind-up phase: Minimal internal rotation, slight abduction
- Early cocking: 90° of abduction and 150° of horizontal abduction. Early activation of the deltoid muscle and late activation of the rotator cuff muscles except the subscapularis muscle
- Late cocking: Maximum external rotation of 170° to 180° maintaining 90° to 100° of abduction. The 150° of horizontal abduction changes to 150° of horizontal adduction
- Acceleration: Abduction is maintained while the shoulder rotates to the ball release.
- Follow through: Shoulder rotation decreases to 30°, horizontal adduction increases to 60° and abduction is maintained at 100° while joint loads decrease, ending in adduction

Shoulder Pain in the Throwing Athlete

Kvitne RS and Jobe FW Clin Ortho 1993; 291: 107-123.
Meister K. Am J of Sports Med 2000; 2:265-275.

- I. Primary Disease. No instability, no acute trauma
 - Rotator cuff tendinosis
 - Subacromial impingement
 - Coracohumeral impingement
 - Biceps tendinosis
 - Posterior capsule lesion (Bennett lesion)
 - Some SLAP lesions
- II. Primary Instability. No acute trauma. Anterior capsular lesions leading to

secondary RC lesions (Secondary impingement, Tendinosis, Tears)

- Some SLAP lesions
- RC Interval tears
- SLAC
- POLPSA

• III. Acute Traumatic Instability. Following acute trauma.

- Bankart
- Perthes
- ALPSA
- HAGL, BAGHL, Floating AIGHL
- GLAD, OCD, GARD

• IV Posterior Superior GHI. No acute trauma, anterior instability.

- Harryman DT et al. J Bone joint Surg 1992; 74A: 53-66.

SLAP Lesions: Classifications

- Snyder, 1990: 4 types
- Moffet, 1995: 7 types
- RSNA, 1999: 9 types
- RSNA, 2000: 10 types
- RSNA, 2001: 11 types
- Today, 2003: 12 types

Type I: Tear of the superior part of the labrum with intact LHBT

Type II: Avulsion of the LHBT with tear of the anterior and posterior labrum

Type III: Bucket-handle tear of the labrum

Type IV: Bucket-handle tear of the labrum with longitudinal tear to the LHBT

Type V: Same as type II, but extends to the anterior inferior labrum

Type VI: Flap tear of the superior labrum

Type VII: Same as type II, but extends to the MGHL

Type VIII: Same as type II but extends mostly posteriorly

Type IX: Involves circumferentially the entire labrum

Type X: Same as type VII, but associated with RC interval tear

Type XI: Same as type II but extends to the SGHL

Type XII: Any type, associated with partial RCT of the articular surface (SLAC lesion: Superior Labrum Anterior Cuff) (Savoie FL et al. Ortho Clin of N Am. 2001; 3:457-461)

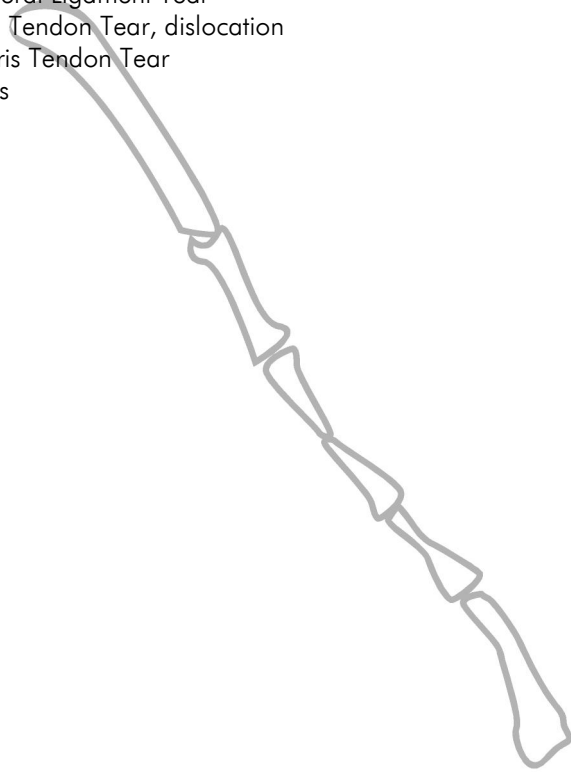
SLAP Lesions: MR Arthrography

Bencardino et al. Radiology 1999

- Sensitivity 89%
- Specificity 90%
- Accuracy 90%

Rotator Cuff Interval
Associated Injuries

- Coracohumeral Ligament Tear
- Long Biceps Tendon Tear, dislocation
- Subscapularis Tendon Tear
- SLAP Lesions



Biceps Tendon Pathologies

E. Llopis (Spain), L.Cerezal

Room "Barbaros Paşa" – Friday June 1st, 2007 – 16:25-16:40

Introduction: There is a growing evidence of the importance of the short and especially the long head of the biceps tendon as stabilizers of the anterosuperior aspect of the shoulder, especially with the arm in abduction and external rotation.

Learning Objectives:

1. To describe anatomy and relationship of the biceps tendon and the rotator interval in different imaging modalities, US, MR and special emphasis on MR Arthrography.
2. To review complex stabilizing system of the anterior glenohumeral and the key function of the biceps tendon
3. To illustrate spectrum of abnormalities of the biceps tendon and rotator interval.

Conclusions: Biceps tendon is a well known common source of shoulder pain in combination with labral or rotator cuff abnormalities. However, isolated injuries of the biceps tendon and rotator interval are more frequent than previously thought and its evaluation might be difficult and subtle clinically, radiological and arthroscopically. Understanding of anatomy and biomechanics is essential to achieve an accurate diagnosis and plan adequate treatment.

Postoperative Imaging of the Shoulder

M. Zanetti (Switzerland)

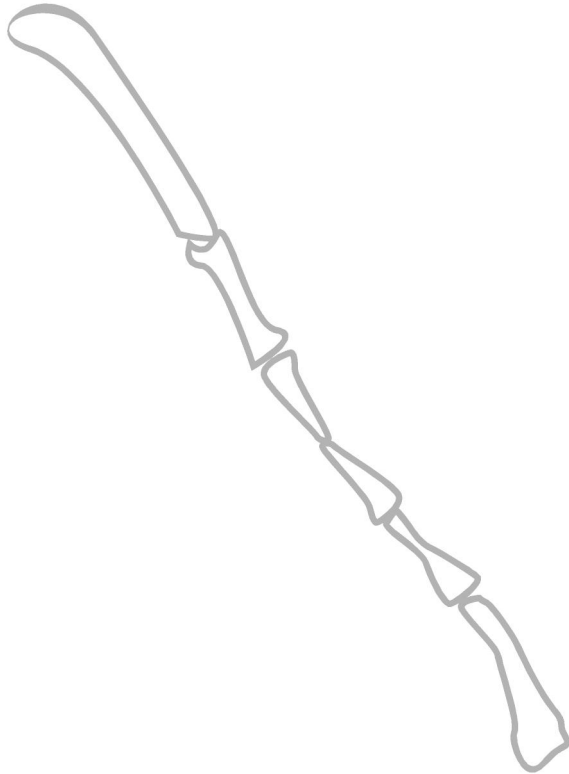
Room "Barbaros Paşa" – Friday June 1st, 2007 – 16:40-16:55

Postoperative imaging of the shoulder is challenging. Many MR imaging "abnormalities", such as irregular supraspinatus tendons, minor contrast leakage through the rotator cuff, rounded labrum and fluid-like signal in the subacromial bursa may be clinically irrelevant. In this lecture, postoperative MR findings relating to surgery in shoulder impingement syndrome including rotator cuff lesions, to shoulder instability, and to arthroplasty will be shown. Potentially misleading post-operative findings will be emphasized. Because standard MR imaging may not always be the method of choice for postoperative imaging alternative imaging techniques have been included (MR arthrography, CT arthrography and sonography).

References:

1. Haygood TM, Oxner KG, Kneeland JB, Dalinka MK. Magnetic resonance imaging of the postoperative shoulder. *Magn Reson Imaging Clin N Am* 1993; 1:143-155.
2. Zanetti M, Hodler J. MR imaging of the shoulder after surgery. *Magn Reson Imaging Clin N Am* 2004; 12:169-183, viii.
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NOTES



Shoulder Imaging Session 5

Chairs: C.van Reijswijk (The Netherlands) and I. Boric (Croatia)

Soft Tissue Tumors around Shoulder Joint

K. Vilanova (Spain)

Room "Barbaros Paşa" – Saturday June 2nd, 2007 – 08:30-08:45

Radiologist has different imaging modalities, including radiography, computed tomography, ultrasound and MRI to achieve a correct diagnosis whether a soft tissue mass is present in the shoulder region. It is necessary a knowledge of the radiologic features of the common masses in the shoulder region at different ages, and the best image modality available to characterise the tumors; in order to narrow the differential diagnosis. It will be illustrated the radiological approach for soft-tissue tumors in the shoulder region, explaining the more reasonable use of the different radiological techniques. The presentation will focus on the radiological findings of the more common soft tissue lesions around the shoulder joint.

Bone Tumors and TM like Lesions around Shoulder Joint

D. Vanel (France)

Room "Barbaros Paşa" – Saturday June 2nd, 2007 – 08:45-09:05

Imaging musculoskeletal tumours of the shoulder.

The shoulder includes all possible musculoskeletal structures: long, short and flat bones, a large joint, neurovascular structures, muscles.

Thus, the classic diagnostic rules for a bone tumour apply, and almost every diagnosis is possible.

Age, location and size, are used as usual and axis, calcifications, cortical destruction, periosteal bone formations are first analysed on plain films. CT is used to measure density, identify small calcifications, specify periosteal bone formations, and cortical involvement. MRI is the best technique for staging, evaluating preoperative chemotherapy and detecting recurrences.

Soft tissue sarcomas must be suggested when faced with a mass exceeding 5 cm in diameter, and/or which is either deep-seated, or paediatric.

Diagnostic needle biopsy must be discussed with the surgeon and the pathologist.

The radiologist should be aware of surgical reconstructions, especially multiple possible bone grafts, so that imaging can help the surgeon plan the procedures.

Synovial Disorders of Shoulder Joint

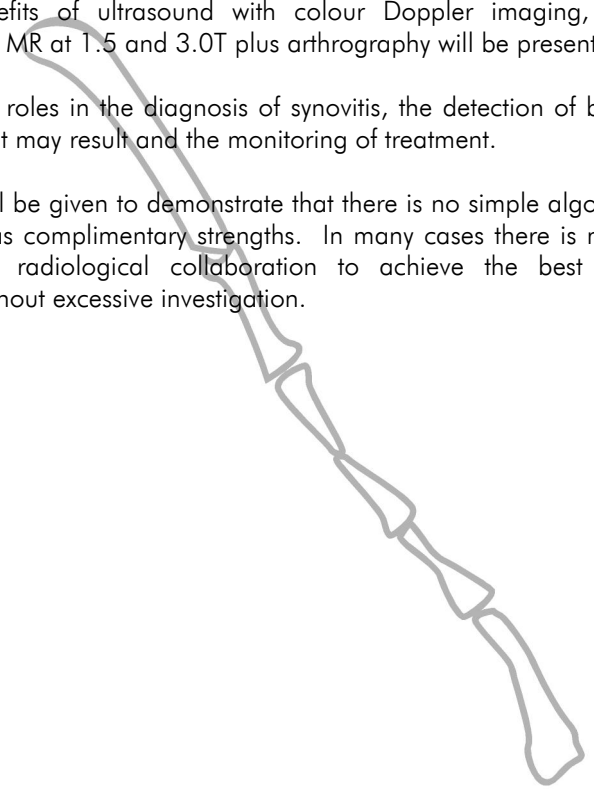
G. Allen (UK)

Room "Barbaros Paşa" – Saturday June 2nd, 2007 – 09:05-09:20

In this talk I will discuss the imaging of inflammatory arthropathies including rheumatoid arthritis, seronegative arthropathy and focal disease such as pigmented villonodular synovitis and synovial osteochondromatosis. The relative benefits of ultrasound with colour Doppler imaging, conventional radiographs, MR at 1.5 and 3.0T plus arthrography will be presented.

Imaging has roles in the diagnosis of synovitis, the detection of biomechanical instability that may result and the monitoring of treatment.

Examples will be given to demonstrate that there is no simple algorithm as each technique has complimentary strengths. In many cases there is need for close clinical and radiological collaboration to achieve the best management decisions without excessive investigation.



Bone Marrow Abnormalities

A. Karantanas (Greece)

Room "Barbaros Paşa" – Saturday June 2nd, 2007 – 09:20-09:35

Magnetic resonance imaging (MRI) allows direct visualization of the bone marrow in the shoulder area. Although MRI exhibits high sensitivity, we need an adequate understanding and careful choice of acquisition sequences to improve specificity. For imaging the bone marrow we use a combination of pulse sequences, including T1-w spin echo, T2-w turbo spin echo with fat suppression and turbo-short T1 inversion recovery. In selected cases contrast enhanced T1-w spin echo with fat suppression is applied. Radiological interpretation of the marrow space requires an understanding of normal maturation and recognition that red and yellow marrow co-exist with variable amounts depending upon the age and location. With MRI this variability yields normal patterns ranging from very uniform and homogeneous signal intensity to patchy and heterogeneous signal intensity. Signal changes also depend on the pulse sequence applied. The marrow reflects patient health and may herald developing anemia with marrow re-conversion from inactive to active.

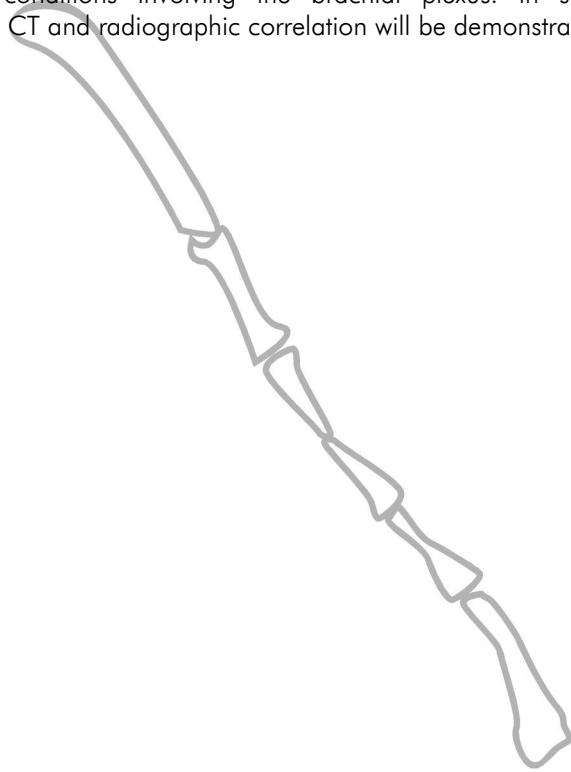
Disease processes involving the marrow in the shoulder - such as trauma, osteonecrosis, arthritis and infection - can induce a variety of imaging findings. The conditions mentioned above are frequently not detected by conventional radiographic techniques until they have reached an advanced clinical stage. Neoplastic disorders usually require contrast administration for better depiction of soft tissue involvement. The excellent spatial and contrast resolution provided by MRI facilitates early detection and evaluation of various disorders allowing thus prompt treatment. Imaging findings may alter or guide the correct treatment. Disorders to be considered include: a) marrow edema-like lesions secondary to trauma, arthritis, tendon pathology, synovial osteochondromatosis, posterosuperior impingement syndrome, b) marrow ischemia and infarction, c) infection, and d) marrow infiltration resulting from tumors, hemoglobinopathies and rare disorders such as Gaucher's and Erdheim-Chester disease.

MR Imaging of the Brachial Plexus

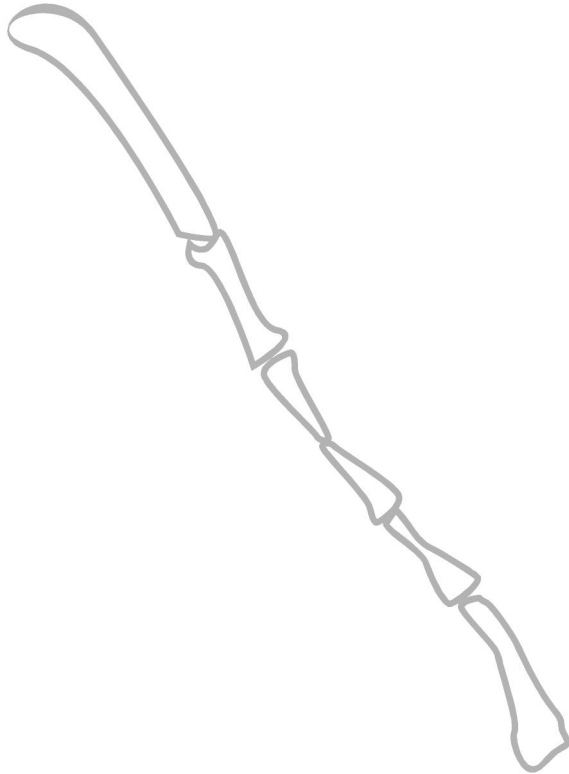
A. Kassirjian (Spain)

Room "Barbaros Paşa" – Saturday June 2nd, 2007 – 09:35-09:50

Imaging of the brachial plexus is best performed using MRI. This presentation will review the relevant anatomy of the brachial plexus, discuss imaging techniques with a focus on MRI, and demonstrate MR imaging findings of pathological conditions involving the brachial plexus. In selected cases, angiographic, CT and radiographic correlation will be demonstrated.



NOTES



Shoulder Imaging Session 6

Shoulder US Anatomy / Shoulder US Pathology / Live demonstration

C. Martinoli (Italy) & A. Klauser (Austria) & Stefano Bianchi (Switzerland)

Room "Barbaros Paşa" – Saturday June 2nd, 2007 – 10:30-12:00

Shoulder US Anatomy

C. Martinoli (Italy) & A. Klauser (Austria) & Stefano Bianchi (Switzerland)

The rotator cuff is one of the most common fields of application of ultrasonography (US) in the musculoskeletal system. In the last years, many changes have occurred that have had a positive impact on the practice of shoulder US, including standardization of the examination technique, improved visualization of shoulder structures by high-resolution transducers and refinement of the criteria for diagnosing rotator cuff tears. To investigate the rotator cuff with US, the patient is examined in a sitting position with the examiner located behind or in front. The shoulder is placed in a series of positions to allow adequate assessment of each tendon of the rotator cuff (i.e. the subscapularis, the supraspinatus, the infraspinatus and the teres minor), the long head of the biceps tendon, the subacromial-subdeltoid bursa and the acromioclavicular joint. Each tendon must be systematically assessed in its long- and short-axes: the subscapularis tendon is examined with the patient's arm externally rotated to move the tendon anteriorly (this manoeuvre helps to reposition it from underneath the coracoid); the supraspinatus by extending the patient's arm posteriorly and placing the palmar side of the hand on the superior aspect of the iliac wing with the elbow flexed, directed posteriorly and towards midline (this manoeuvre helps to reposition the tendon from under the acromion); the infraspinatus and teres minor tendons require transducer positioning on the posterior glenohumeral joint with the patient's hand placed in a supinated position on the ipsilateral thigh. Then, the rotator cuff interval structures, including the biceps tendon, the coracohumeral ligament and the superior glenohumeral ligament should be evaluated. The biceps tendon must be always examined from its intraarticular portion down to its myotendinous junction by means of short-axis planes. Although US of the rotator cuff requires a particularly long learning curve, even compared to other musculoskeletal applications, US represents an accurate and less expensive alternative to MR imaging in this field.

Shoulder US Pathology

A. S. Klauser (Austria)

Rotator cuff pathology is the commonest cause of shoulder pain. Cuff tendinopathy as an early result of impingement first affects the supraspinatus and the subacromial bursa.

Partial thickness tears should be diagnosed, when a true cleft within the tendon substance is delineated as a hypoechoic area, located at the bursal or articular surface. Full thickness tears extend from bursal to articular surface and can present complete or incomplete. The most important indirect sign of supraspinatus tear is focal herniation of deltoid muscle and peribursal fat into the tear. Long axis scans allow measuring the amount of tendon retraction in complete tears.

US further allows for differentiation of intramuscular cysts as hypoechoic masses, located within the muscle bellies.

Rotator cuff calcifications appear as intratendinous hyperechoic foci. They can present well defined with acoustic shadowing (Type I) especially in the formative phase, or as hyperechoic foci with (Type II) or without (Type III) shadowing in the resorptive phase. Calcifying tendonitis can be assessed in a dynamic examination, proving for a cause of impingement.

For the biceps tendon a differentiation of tendinopathy, splitting, rupture and instability can be achieved by scanning the extra- and part of the intraarticular portion. When a subscapularis tear becomes complete, the biceps slips medially within the glenohumeral joint. Dislocation can even be evident without subscapularis tears, when a tear of the lateral portion of the reflexion pulley and the transverse ligament occur.

Beyond the rotator cuff following pathology can be seen by using US: fractures of the greater and lesser tuberosity, degenerative arthropathies with loose bodies, or inflammatory arthropathies with delineation of erosions, osteophytes, effusion and synovitis.

Acromioclavicular joint subluxation or dislocation can be a further source of shoulder pain. US are more sensitive than standard radiography in low-grade sprains, showing widening of the joint capsule (> 6 mm), effusion, and bulging of the superior capsule and ligament. Acromioclavicular cysts can be found in rotator cuff pathology.

Neuropathies of the shoulder include the Quadrilateral space Syndrome and Suprascapular nerve Syndrome.

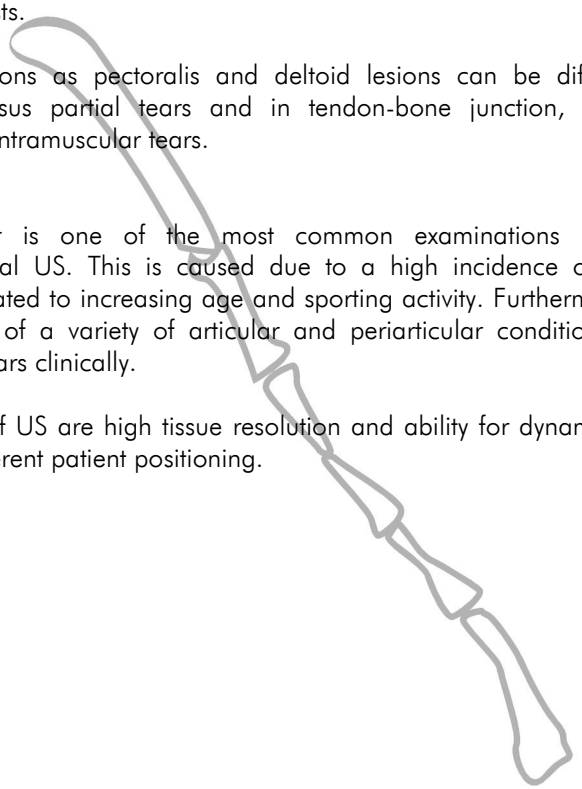
In the Quadrilateral space Syndrome stretching injuries (anterior dislocation) or extrinsic compression as paraglenoid cysts can cause axillary neuropathy, presenting with volume loss and hyperechogenic changes of the teres minor muscle. The Suprascapular nerve Syndrome can be secondary to constriction at the suprascapular notch or at the spinoglenoid notch, mainly caused due to paralabral cysts.

Muscular lesions as pectoralis and deltoid lesions can be differentiated in complete versus partial tears and in tendon-bone junction, myotendinous junction and intramuscular tears.

Summary:

The shoulder is one of the most common examinations performed in musculoskeletal US. This is caused due to a high incidence of rotator cuff pathology related to increasing age and sporting activity. Furthermore US allow for detection of a variety of articular and periarticular conditions mimicking rotator cuff tears clinically.

Advantages of US are high tissue resolution and ability for dynamic evaluation including different patient positioning.



HONORARY MEMBERSHIP

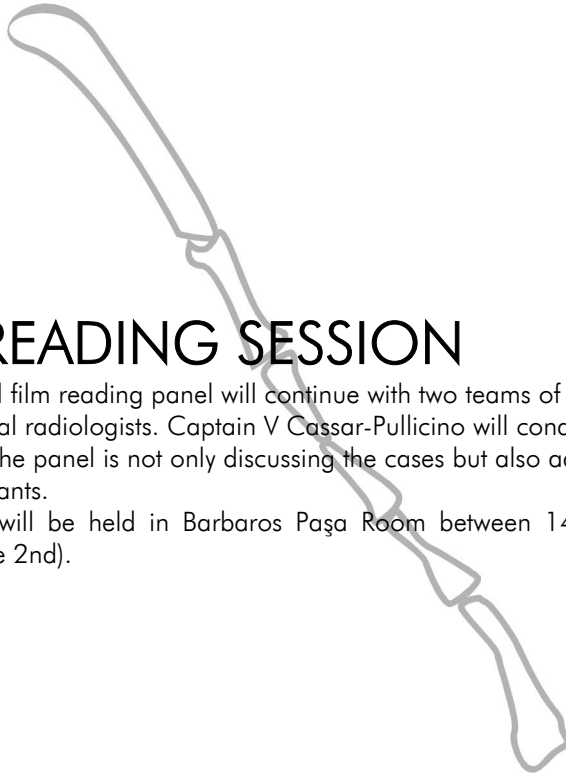
The ESSR Honorary Membership 2007 will be awarded to Professor Herwig IMHOF for his outstanding contributions to Musculoskeletal Radiology. His conference is about **“The mystery of the last kingdom of the Chachapoya-Inca people”**.

(This session will be held in Barbaros Paşa Room between 14:00-14:40 on Saturday, June 2nd).

FILM READING SESSION

The traditional film reading panel will continue with two teams of experienced musculoskeletal radiologists. Captain V Cassar-Pullicino will conduct this panel. The target of the panel is not only discussing the cases but also adding some joy to the participants.

(This session will be held in Barbaros Paşa Room between 14:45-16:15 on Saturday, June 2nd).



ABSTRACTS

SPECIAL FOCUS SESSIONS

Room Turgut Reis I - Level 7

Friday, June 1st 2007

Special Focus Session: Rheumatoid Diseases

| | |
|---------------|--|
| 08:30 - 09:00 | Plain Film Diagnosis of Appendicular Arthritis |
| 09:00 - 09:30 | Crystal Deposition Arthritides |
| 09:30 - 10:00 | Plain Film Diagnosis of Axial Arthritis |
| 10:00 - 10:30 | Coffee Break |

J. Teh (UK)
A. Cotten (France)
A. Oktay (Turkey)

Special Focus Session: Bone and Soft Tissue Tumors

| | |
|---------------|---|
| 10:30 - 11:00 | Tumor Mimicing Lesions of Musculoskeletal System |
| 11:00 - 11:30 | Musculoskeletal Tumors: Monitoring Therapy And Detecting Recurrence |
| 11:30 - 12:00 | Musculoskeletal Tumors: MRI vs PET-CT |

S. Anderson (Switzerland)
C. S. P. van Rijswijk (The Netherlands)
M. Reiser (Germany)

12:00 - 12:30 Opening Ceremony

12:30 - 13:30 Lunch

Special Focus Session: Osteoporosis

| | |
|---------------|--|
| 13:30 - 13:55 | Vertebral Fractures, Definition, Classification and Significance |
| 13:55 - 14:20 | MRI of Insufficiency Fractures in Osteoporosis, What the Radiologist Needs to Know |
| 14:20 - 14:40 | Bone Densitometry – the Essentials (including the New Fracture WHO Risk Criteria) |
| 14:40 - 15:00 | Verebroplasty and Kyphoplasty to Treat Osteoporotic Fractures |

J. Adams (UK)
T. Link (USA)
G. Guglielmi (Italy)
F. Aparisi (Spain)

15:00 - 15:30 Coffee Break

Special Focus Session: Musculoskeletal Imaging Biomarkers and Translational Research

| | | |
|---------------|---|--------------------------|
| 15:30 - 15:50 | Imaging Biomarkers in Translational Research of Bone and Joint Diseases | F. Kainberger (Austria) |
| 15:50 - 16:10 | Semiautomated Assessment of Vertebral Morphometry in Osteoporosis | G. Guglielmi (Italy) |
| 16:10 - 16:30 | Computer-Assisted Diagnosis of Arthritis | P. Peloschek (Austria) |
| 16:30 - 16:50 | Molecular Imaging of Arthritis | P. Lang (USA) |
| 16:50 - 17:10 | Digital Image Analysis of MRI of the Bone | L. Marti-Bonmati (Spain) |

Room Turgut Reis I - Level 7

Saturday, June 2nd 2007

Special Focus Session: Rheumatoid Diseases

| | | |
|---------------|--|------------------------|
| 08:30 - 08:50 | Update on Scoring Systems in Osteoarthritis and Quantitative MR Imaging Techniques | P. Lang (USA) |
| 08:50 - 09:10 | Pathogenesis and Pain, the Role of Imaging in Osteoarthritis | A. Grainger (UK) |
| 09:10 - 09:30 | Early Rheumatoid Disease Detection | P. Peloschek (Austria) |
| 09:30 - 09:50 | Early Spondyloarthropathy Disease Detection | N. Boutry (France) |
| 10:00 - 10:30 | Coffee Break | |

Special Focus Session: Cartilage and Sports Imaging

| | | |
|---------------|---|-------------------------------|
| 10:30 - 10:45 | MRI of Articular Cartilage: Basic Concepts and Current State | D. Wilson (UK) |
| 10:45 - 11:00 | Osteochondral Injuries to the Knee | M. Padron (Spain) |
| 11:00 - 11:15 | MRI of Femoroacetabular Impingement and Acetabular Labrum | A. Karantanas (Greece) |
| 11:15 - 11:30 | Osteochondral Lesions of the Talus and Osseous Impingement of the Ankle | M. de Jonge (The Netherlands) |
| 11:30 - 11:45 | MRI of the Postoperative Cartilage | J. Kramer (Austria) |
| 11:45 - 12:00 | MRI of Upper Extremity Lesions at 3T | G. Allen (UK) |

Plain Film Diagnosis of Appendicular Arthritis

J. Teh (UK)

Room "Turgot Reis 1" – Friday June 1st, 2007 – 08:30-09:00

Principles

1. Although more than 150 arthropathies have been described, there are only a handful of common diagnoses to consider in practice

Common: OA, rheumatoid arthritis, psoriatic arthritis, CPPD

Less common: gout, septic arthritis

2. Look for key radiographic features

Osteophytes: the key feature of OA

Erosions: indicative of inflammatory disease

Chondrocalcinosis: hallmark of CPPD

3. Which part of the joint is involved?

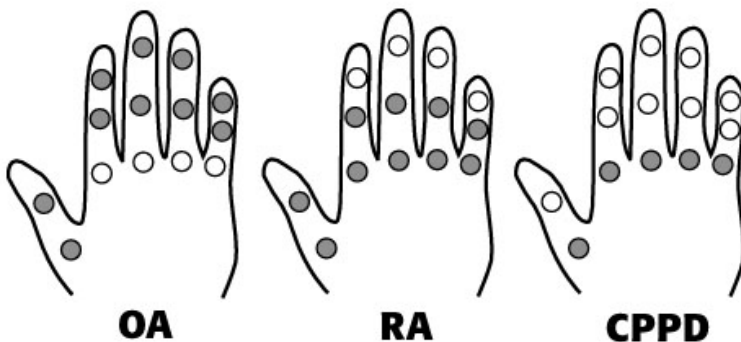
Synovium involved – Are there erosions in the bare areas not covered by cartilage = RA, gout

Articular cartilage primarily involved = OA

Enthesis involved = seronegative arthropathy

4. Use the target approach (Resnick)

Pay attention to the pattern of joint involvement



OA – tends to affect STTJ and 1st CMCJ

RA – tends to be pan-carpal

CPPD – tends to affect radio-carpal joint and knee

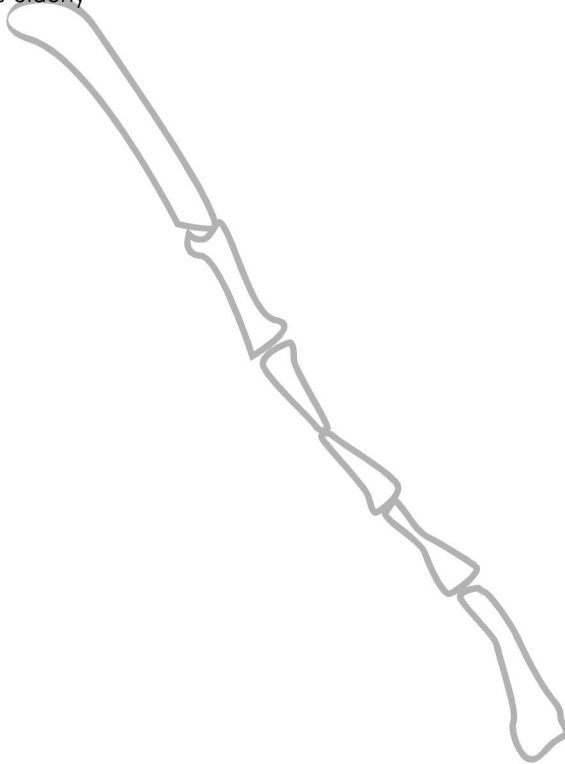
5. Consider the age and sex of the patient

Children – septic arthritis and JIA are common

Gout – more common in men

RA – more common in women, older adults

CPPD – affects elderly



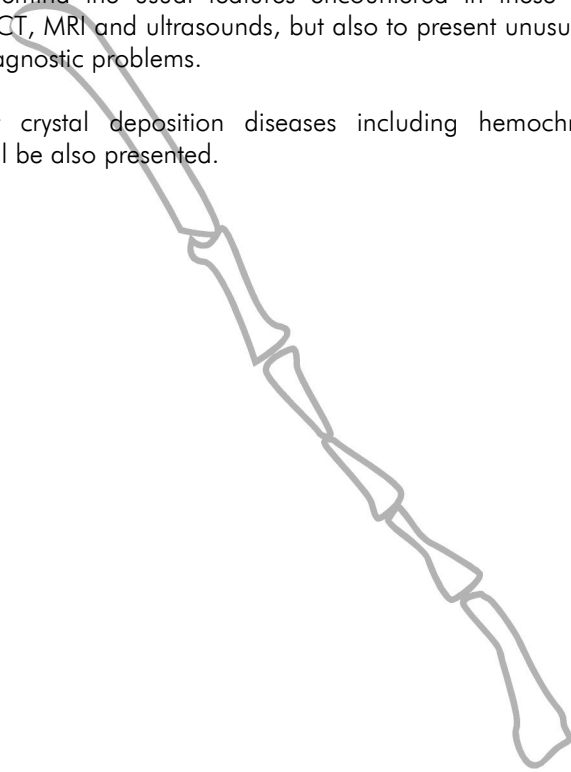
Crystal Deposition Arthritides

A. Cotten (France)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 09:00-09:30

Gouty arthritis, calcium pyrophosphate dihydrate crystal disease and calcium hydroxyapatite crystal deposition disease represent the main crystals deposition disorders. They are frequent and usually correctly diagnosed. The aim of this paper is to remind the usual features encountered in these diseases using radiographs, CT, MRI and ultrasounds, but also to present unusual features that may cause diagnostic problems.

Less frequent crystal deposition diseases including hemochromatosis and ochronosis will be also presented.



Plain Film Diagnosis of Axial Arthritis

A. Oktay (Turkey)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 09:30-10:00

Axial skeleton is one of the involvement sites of in the inflammatory arthritis. Both seronegative spondylarthropathies and rheumatoid arthritis affect synovial and cartilaginous joints, ligaments, tendons and entheses. However the distribution and extent of the changes differ among the diseases.

In rheumatoid arthritis inflammatory changes usually are seen around the odontoid process in the cervical spine. Plain film of the cervical vertebra may show bony erosions of the joint surfaces and atlantoaxial subluxation due to the erosion of transverse ligament. Facet joint arthritis may cause stepladder deformity or subluxation in the cervical spine.

Seronegative spondylarthropathies (SpA) are heterogeneous group of inflammatory rheumatic disorders with predominant involvement of axial joints. The pathological hallmark of the SpA is inflammation of the enthesis. The main clinical symptoms and criteria for the classification and diagnosis of SpA are inflammatory back pain and asymmetrical peripheral arthritis of the lower limbs. There is a high incidence of HLA-B27 but negative rheumatoid factor tests. Seronegative spondyloarthropathies comprise the disorders of ankylosing spondylitis (AS), reactive arthritis (ReA), psoriatic arthritis (PA), arthritis of chronic inflammatory bowel disease (AIBD), undifferentiated spondylarthropathy (uSpA) and juvenile-onset ankylosing spondylitis.

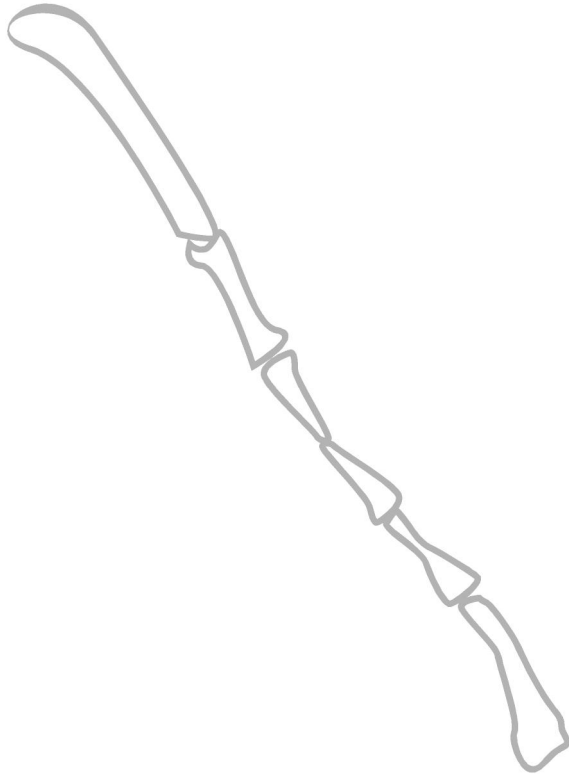
Inflammation of sacroiliac (SI) joints is a characteristic feature of seronegative spondylarthropathies (SpA). The sacroiliac joints are either unilaterally or bilaterally affected ranging from mild to very severe degree. The involvement pattern of SI joints differs between AS and the other SpA subgroups. Symmetrical sacroiliitis is found in more than 90% of AS, although in ReA, PA, AIBD and uSpA it is more often unilateral and asymmetrical. Plain films are still being widely used for diagnosis and follow-up of the disease. In the early stages of sacroiliitis conventional radiographs may be normal. The findings in the advanced stages are erosions, sclerosis and ankylosis. The early findings of erosions starts on the iliac side followed with bony proliferation and sclerosis. The complicated anatomy of the joint causes superimposition of the ilium with the sacrum in AP pelvis projection, therefore special sacroiliac joint radiograph with the tube angled by 25-30 degrees in prone position or oblique projections are preferred in most situations. The findings on spinal plain radiographs

include erosions, squaring, sclerosis, syndesmophytes, spondylodiscitis and fractures. In ankylosing spondylitis, the spinal changes are generally seen in ascendant fashion from lumbar to dorsal and cervical spine. In the early stages of the spondylitis vertebral corner erosions surrounded by bony sclerosis is referred as Romanus osteitis or shiny corners. Ossification of the outer annular fibers and adjacent connective tissue fibres form marginal syndesmophytes. The complete fusion of the vertebral bodies by syndesmophytes produces bamboo spine appearance. Pseudarthrosis with discovertebral erosions and bone destruction is referred to as the Andersson lesion. Apophyseal joints and costovertebral joints may also be involved. Patients with ankylosing spondylitis are at increased risk for spinal fractures even after only minor trauma. CT is the preferred imaging modality for patients with suspected fracture. In psoriatic arthritis and Reiter's disease, the involvement pattern differs from that of AS in the spine.

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- 2- Klecker RJ, Weissman BN. Imaging features of psoriatic arthritis and Reiter's syndrome. Semin Musculoskeletal Radiol 2003; 7: 115-126
- 3- Braun J, Sieper J, Bollow M. Imaging of sacroiliitis. Clin Rheumatol 2000; 19: 51-57
- 4- Van der Heijde D, Landewe R. Imaging in spondylitis. Curr Opin Rheumatol 2005; 17: 413-417
- 5- Brandt J, Bollow M, Haberle J, et al. Studying patients with inflammatory back pain and arthritis of the lower limbs clinically and by magnetic resonance imaging: many, but not all patients with sacroiliitis have spondylarthropathy. Rheumatology 1999; 38: 831-836

NOTES



Special Focus Session: Bone and Soft Tissue Tumors
Chairs: G. Allen (United Kingdom) and D. Vanel (France)

Tumor Mimicing Lesions of Musculoskeletal System

S. Anderson (Switzerland)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 10:30-11:00

The educational objective is to be able to distinguish some patterns of benign lesions that can be mistaken for neoplastic lesions on MRI.

Musculoskeletal pseudotumors on MRI are not infrequent due increased availability of MRI and expanding clinical referral basis. A forgotten past major or minor injury, not immediately perceived as being related to the current clinical problem, may be the cause. Secondary infection, normal variants with overuse, body habitus, inappropriate training and use of equipment may complicate appearances. In other cases, characteristic locations and type of sporting activity may be characteristic. Correlation with radiographs and with an appropriate clinical history the MRI diagnosis may be quite specific [1,2], eg, stress fracture of bone.

Pseudotumors may involve fat necrosis after minor trauma [3]. Localized myositis ossificans is a common MRI pseudotumor [1, 3, 4]. In acute and subacute stages, adjacent soft tissues edema may be prominent, which is unusual in primary malignant tumors that have not been previously biopsied or undergone intratumoral hemorrhage [1].

Tears and overuse of ligaments and muscles may cause MRI pseudotumors, eg. partial avulsion of the adductor muscles of the thigh [5]. Proximal adductor avulsions and intramuscular strains have been described.

Stress reactions and fractures may cause MRI pseudotumors. Specific sites and patterns are associated with specific sports activities eg. spinal pars defects of the thoracic and lower lumbar spine are characteristic in cricketers.

Muscle abnormalities are common MRI pseudotumors. MRI appearances of hematoma depends on the state of the hemoglobin molecule [2, 6]. It may sometimes be difficult to distinguish simple hematoma from hemorrhage into a malignant mass [2]. Abscess features include thickened peripheral increased signal intensity rim on T1.

Normal variants and their overuse, calcium deposition disorders [7] and foreign body reactions, hand pseudoaneurysms [8], may present as pseudotumors.

Pitfalls: Real tumors. Ensure correlation with radiographs. Review all anatomical areas depicted on MRI for apparent incidental findings.

References:

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5. Anderson SE, Johnston JO, ODonnell R, Steinbach LS. MR imaging of Sports related pseudotumor in Children: mid femoral diaphyseal periosteitis at insertion site of adductor musculature. *Am J Roentgenol* 2001; 176:1227-1231
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7. Anderson SE, Bosshard C, Steinbach LS, Ballmer FT. Calcification of the lateral collateral ligament of the knee: a rare pathology and cause of lateral knee pain shown by MR imaging. *Am J Roentgenol* 2003; 181(1):199-202
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Musculoskeletal tumors; Monitoring Therapy and Detecting Recurrence

Carla S.P. van Rijswijk

Room "Turgut Reis 1" – Friday June 1st, 2007 – 11:00-11:30

Information on effectiveness of treatment plays an important role. Monitoring the response to local or systemic chemotherapy comprises accurate identification and quantification of the proportion of therapy-induced necrosis and residual viable tumor. This may have an impact on prognosis, modification of neoadjuvant (pre-surgical) treatment protocols, timing and planning of surgery, planning of radiation therapy and selection of postoperative radiation therapy and/or chemotherapy regimens. Secondly, imaging modalities strongly influence the therapeutic strategies by revealing absence, or presence and location of recurrent local, regional or distant tumor after initial treatment. In this presentation will histopathologic changes occurring after chemo- and radiotherapy be addressed as they pertain to imaging response to treatment and identification of recurrent tumor, as well as the corresponding imaging findings and required imaging strategies.

Musculoskeletal Tumors: MRI vs PET-CT

M. Reiser (Germany)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 11:30-12:00

Diagnosis, staging and follow up of musculoskeletal tumours are very important for selection of adequate therapeutic measures and prognosis of patients. Modern imaging technologies have greatly contributed to improvement.

With modern MRI systems high contrast of neoplastic tissue vs. normal uninvolved structures is achieved. This allows for adequate delineation of intraosseous and soft tissue extension and thereby facilitating high precision in staging. Compartmental infiltration is readily detected. Dynamic, contrast enhanced studies allow for assessment of vascularity and perfusion, which provides valuable information concerning malignancy and benign character of a particular tumour. With diffusion weighted imaging and diffusion tensor imaging, microstructural information can be obtained, which correlates with response to chemotherapy and viability of the tissue.

Malignant bone tumours may spread within the bone or to distant organs. Therefore, whole body imaging modalities hold great potential for comprehensive assessment. Whole body MRI incorporating multiple channels and receiver coil elements allow for large anatomical coverage and enable to detect spread of the tumour within various parts of the body.

In computer tomography major advances have been achieved recently. The combination of CT and PET in hybrid systems allows to assess function and morphology within one session. With FDG-PET the metabolic activity of a particular lesion can be analyzed. The standard uptake value (SUV) can be utilized for differentiation of benign malignant lesions. However, there are various benign lesions, which result in false positive findings, such as NOF, fibrous dysplasia, eosinophilic granuloma and aneuysmal bone cysts as well as inflammation and infection. False negative results in FDG-PET may be found in low grade chondrosarcoma, multiple myeloma, low grade osteosarcoma, Ewing's sarcoma and low grade soft tissue sarcomas. Therefore correlation with other imaging findings such as plain radiographs and MRI are required in order to avoid misdiagnoses.

Another new application of CT in diagnosis of musculoskeletal tumours may be dual energy CT. This method enables to differentiate iodine from calcium. Enhancement within a particular lesion can be differentiated from other reasons of high tissue attenuation. The potential of dual energy in CT has to be explored in further studies.

Special Focus Session: Osteoporosis

Chairs: T. Link (United States of America) and D. Ozaksoy (Turkey)

Vertebral Fractures, Definition, Classification and Significance

J. Adams (UK)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 13:30-13:55

Osteoporosis is the most common metabolic bone disease, affecting 1 in 2 women and 1 in 5 men over the age of 50 years. The disease is characterized by reduced bone mass and deterioration in trabecular bone structure which results in fractures with little, or no, trauma, particularly in sites rich in trabecular bone (hip, spine and wrist). Vertebral fractures are the most common osteoporotic fracture and are associated with significant morbidity and reduced quality of life, although 30 % may be asymptomatic. Their presence is a powerful predictor of future fracture (X2 hip fracture; X5 vertebral fracture) and if associated with low bone density the fracture risk is even higher (X25). The accurate identification and reporting of vertebral fractures by radiologists is vital to the appropriate diagnosis and management of patients with osteoporosis, since now there are effective therapeutic interventions (bisphosphonates, selective oestrogen receptor modulators [SERMs], strontium ranelate) which result in fairly modest increases in bone mineral density (BMD) but much more impressive reductions in future fracture risk (40% to 70%). However, while BMD by dual energy X-ray absorptiometry (DXA) is widely used in patient evaluation, radiological assessment of vertebral fractures is commonly not performed, or if performed, is inadequately standardized and interpreted. There is considerable evidence that vertebral fractures are under-reported and to address this issue there has been an initiative between the International Osteoporosis Foundation (IOF) and the European Society of Musculoskeletal Radiology (ESSR) over 5 years to raise the profile of osteoporosis and stress the importance of reporting the presence of vertebral fractures to radiologists; an educational document and slides can be downloaded from www.osteofound.org.

Spinal radiographs are the most common imaging modality used for the identification of vertebral fractures. Good and consistent radiographic technique needs to be used to avoid artefactual biconcavity of the vertebral endplates (divergent X-ray beam causing "bean-can effect"). Fractures change the shape of vertebrae (deformity) and are generally described as endplate, wedge or crush fractures; it is relevant to grade the degree of deformity (Grade 1 = mild; Grade 2 = moderate and Grade 3 = severe) as the more the severe the grade

the higher the risk of future fracture. In research studies assessing the efficacy of new therapeutic agents the effect on vertebral fractures is often used as a principal outcome measure, and a semi-quantitative assessment or a quantitative measurement of vertebral dimensions (e.g., vertebral morphometry) is used. Other pathologies (Scheuermann's disease, spondylosis, Schmorl's nodes, infection, metastases, myeloma, trauma and congenital disorders) can also deform the vertebra and there are radiographic and other imaging features which help to differentiate the aetiologies. Other complementary examinations (e.g. radionuclide imaging [RNI], computed tomography [CT], or magnetic resonance imaging [MRI]) may be helpful in this differentiation. With the introduction of multi-detector spiral CT providing rapid 3D volume imaging a midline sagittal reformation of the spine may be particularly useful in identifying vertebral fractures, as it is the middle of the endplate which is most vulnerable to fracture. With the introduction of fan beam DXA scanners it is now possible to obtain a lateral image of the spine on a single image at 1/100th of the radiation dose of conventional radiographs, and is a reliable method for excluding vertebral fractures if image quality is adequate and is being increasingly applied for this purpose.

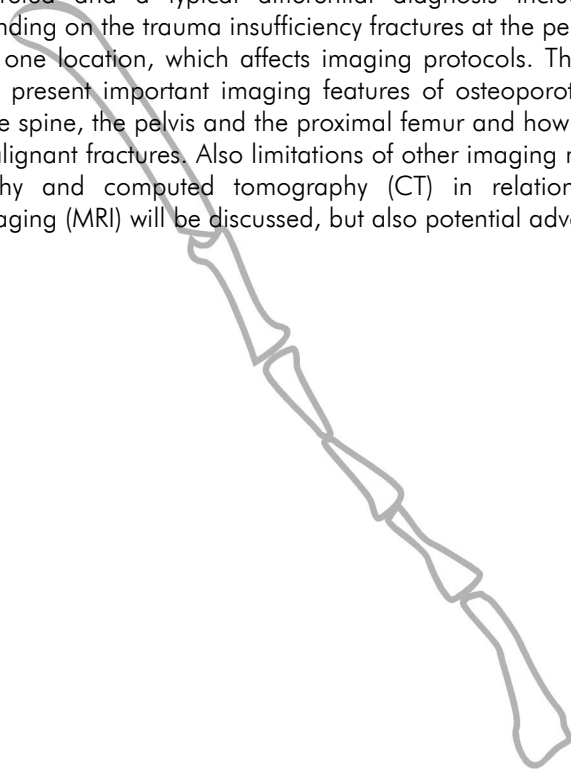
By understanding the clinical principles of osteoporosis diagnosis and management and always reporting vertebral fractures clearly radiologists and clinicians can contribute significantly to reducing the consequences of the important disease of osteoporosis for which there are now effective therapies for treatment and prevention.

MRI of Insufficiency Fractures in Osteoporosis, What the Radiologist Needs to Know

T. Link (USA)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 13:55-14:20

Insufficiency fractures are commonly observed in patients with osteoporosis. Typical locations are the pelvis and the spine. Not infrequently these fractures are misinterpreted and a typical differential diagnosis includes neoplastic lesions. Depending on the trauma insufficiency fractures at the pelvis are located in more than one location, which affects imaging protocols. The goals of this lecture are to present important imaging features of osteoporotic insufficiency fractures at the spine, the pelvis and the proximal femur and how to differentiate them from malignant fractures. Also limitations of other imaging modalities such as radiography and computed tomography (CT) in relation to magnetic resonance imaging (MRI) will be discussed, but also potential advantages of CT versus MRI.



Bone Densitometry - The Essentials (including the New Fracture WHO Risk Criteria)

G. Guglielmi (Italy)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 14:20-14:40

Osteoporosis is a healthcare-social problem of increasing relevance in developed countries especially because of the rapid increase of the incidence of fragility fractures in postmenopausal women.

More than 10 years ago the diagnosis of osteoporosis has been defined by WHO on the basis of the assessment of bone mineral density (BMD). Osteoporosis is defined as a BMD 2,5 SD or more below the average value for premenopausal women (T-score $< -2,5$ SD). Severe osteoporosis denotes osteoporosis in the presence of one or more fragility fractures.

Even if in the first years all measurable sites were equally considered valid for diagnosis, recently it was recognised that the most effective site for diagnosis is the proximal femur with dual energy X-ray absorptiometry (DXA). Several other skeletal sites (axial and appendicular) could also be evaluated by other validated densitometric techniques (QCT, QUS) for fracture prediction.

Other clinical risk factors contribute to fracture risk independently of densitometric techniques: these include age, previous fragility fracture, premature menopause, a family history of hip fracture, and the use of oral corticosteroids.

Because of the many techniques available for fracture risk assessment, the T-score approach to determine the risk of fracture appears to be lacking because of discrepancies among sites and techniques. The 10-year probability of fracture is the most effective approach to determine intervention thresholds. Many treatments can be provided cost-effectively to women if on the basis of 10 years probability of fracture. Up to now the values of 10 years probability of fracture have been published for DXA and for phalangeal QUS techniques in the European population.

Vertebroplasty and Kyphoplasty to Treat Osteoporotic Fractures

F. Aparisi (Spain)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 14:40-15:00

The vertebral fracture is the most frequent osteoporosis complication. Usually these fractures are mechanically stable, whose main clinical symptom is the pain. In order to determine the type of injury and to exclude the instability they must be considered like potentially complicated and therefore treated with precaution quickly. In case of unstable fracture, well suitable surgical procedures are established. Nevertheless in the case of stable fractures, the criteria still are controverted.

On the part of some schools the recommendation is immobilization by means of corset and motion rest. This procedure is able to control the pain control, but the risk of demineralization increase that would favor the appearance of new fractures. Vertebroplasty treatment reduce the motion rest period and in addition give us a remedy to the pain faster than the rest.

Of general form vertebroplasty is called to a procedure that allow us the percutaneous injection in the vertebra, of materials that persecute to increase its resistance and in some cases recover its morphology. The used materials acrylic are very well tolerated by the organism, but recently compatible resins and calcium derivates biologically compatibles also can be injected.

Once established the stability of the fracture, the main criterion for the recommendation of vertebroplasty is the pain. Correlation between image and pain does not exist, nevertheless exists an almost absolute correlation between inflammation and pain. If we consider that a fracture gives rise to inflammation we will consider the fracture, potentially symptomatic while it maintains inflammation. At the moment it is possible to determine the degree of inflammation by means of the MRI because this procedure is able to discover variations in the proportions of water of means.

Once diagnosed the fracture by means of RX or CT, we will select the symptomatic levels, based on edema that we find in the MRI examination. It is very rare that the symptoms come from a fractured vertebra already healed and without edema, nevertheless is possible to find vertebrae with edema without symptoms. The selection of the level must be made always according the clinical information.

In order to make vertebroplasty we needed to have a procedure of precise location. This it can be the fluroscopy or the CT. Both procedures are valid and with different advantages. The final mission is to place the needle in the vertebral body, preferably in center of the front third and to do it, by a safe route without risk of injury of the crossed structures. The safer access road is to transpedicular, but this not always is possible, reason why also the oblique paravertebral is used. In the dorsal region this direct route is the cost-vertebral one.

The injection of the material must be able to be controlled to avoid flights, that are the main complication of this procedure. The new dedicated cements usualle include barium in the composition that allow us the direct vision under X ray examination. Unamimity does not exist about if to use the flebography, like aid procedure, to determine the possibility of flights and the probable distribution of the material. Its use or no, will depend on the criterion of the radiologist. In any case the amount and material to inject will be always smaller than the one of lost volume after the fracture.

Two great groups of vertebroplasty exist, those that try to treat the pain without modifying the morphology, to which flame of generic form vertebroplasty and those that try to modify the form of the vertebra by means of insufflation of a ball (kyphoplastia) or the directed distribution of the cement (acuplasty). Unamimity of criteria does not exist about the precise indications of each one of these.

Vertebroplasty can be made with needles of smaller caliber, are cheaper, but the material is injected with high pressure with which, the flight of the material is easier. Kyphoplasty, needs needles greater caliber, are more expensive and the material is injected with low pressure, but fat emboli are detected from the computed bone originated in the insufflation.

Nowadays the number of accidents after vertebroplasty and kyphoplasty are very low thanks to the new specific cements, that can be injected like a semi liquid product decreasing the leakage probability and producing less temperature increase when become solids with low risk of burning.

The number of levels that must be treated not are defined. The lost of complete elasticity must be avoided. If we have an important rigid segment a hammer effect can be obtained, and secondary fractures can be unchained. The limits will be established by the clinic of the patient and the good judgment of the radiologist.

New procedures like acuplasty, vertebroplasty by means of resin injection or the use of biological agents are attractive, but at the moment it is lacked great series that allow their valuation.

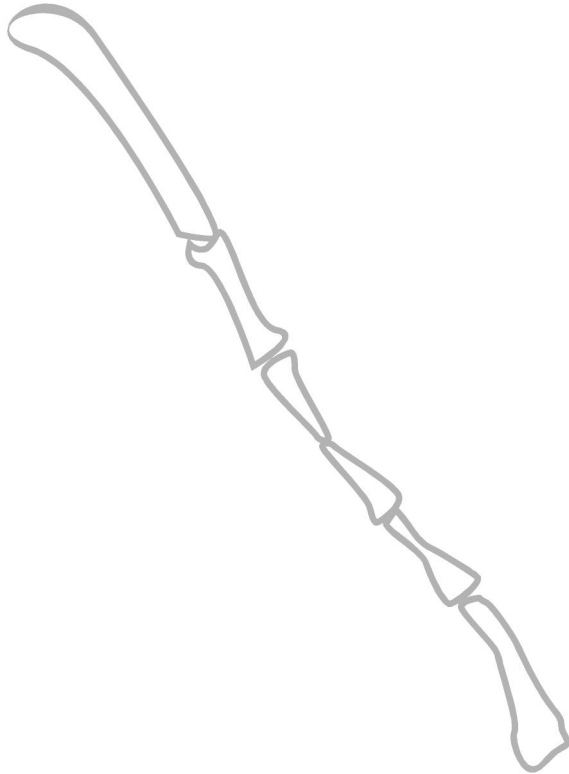
The diagnosis and precocious treatment of the osteoporosis are the key of the success, but it is not necessary to forget that vertebroplasty represents a fast and very effective procedure nowadays as solution of the vertebral fracture.

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NOTES



Special Focus Session: Musculoskeletal Imaging Biomarkers and Translational Research

Chairs: F. Kainberger (Austria) and I. McCall (United Kingdom)

Imaging Biomarkers in Translational Research of Bone and Joint Diseases

F. Kainberger (Austria)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 15:30-15:50

The concept of using biomarkers from mainly non-invasive tests as surrogate standards for translational research is an important milestone for medical science. It was recognised by regulatory bodies, including the U.S. Food and drug administration and National Institutes of Health, in 1999.

Anatomic changes have traditionally served as biomarkers in the Response Evaluation Criteria in Solid Tumors (RECIST). Another important biomarker is the T-score, which is calculated from bone densitometry. Conventional x-rays offer a superior imaging biomarker for fractures, especially vertebral fragility fractures from osteoporosis. Radiological depiction of the slowing of arthritis progression has been accepted as a surrogate biomarker when examining the effect of antirheumatic drugs on synovial inflammation to hand and finger joints. Ultrasound and MRI have been used to assess arthritis and provide scores based on the extent of inflammation in and around erosions and thickened synovial tissue. Imaging from these modalities, however, are not yet acceptable as surrogate biomarkers in arthritis research.

Computer-aided diagnosis schemes (CAD) based on new forms of artificial neural networks may help replace the cumbersome visual assessment of scoring and recent results show a high potential of improving the precision of measurements.

Implementation of quantitative imaging techniques needs a sophisticated quality management with extension of the system borders by including all active partners in a research network.

Semiautomated Assessment of Vertebral Morphometry in Osteoporosis

G. Guglielmi (Italy)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 15:50-16:10

Aspects of efficacy of a workflow improvement software tool to aid the clinician when using a 6-point morphometry protocol for vertebral deformity analysis for osteoporosis were determined. The underlying technology uses a statistical modelling approach. Experiments were performed on a set of 92 previously unseen digitised radiographs. Institutional review board approval and patient informed consent were obtained for all subjects. The mean reproducibility error for semi-automatic 6-point placement was $\sim 2.6\%$ in terms of vertebral width. The technique is highly reproducible but not time intensive in routine clinical use and can therefore be recommended in large epidemiological studies and pharmaceutical trials for reporting of osteoporotic vertebral fractures.

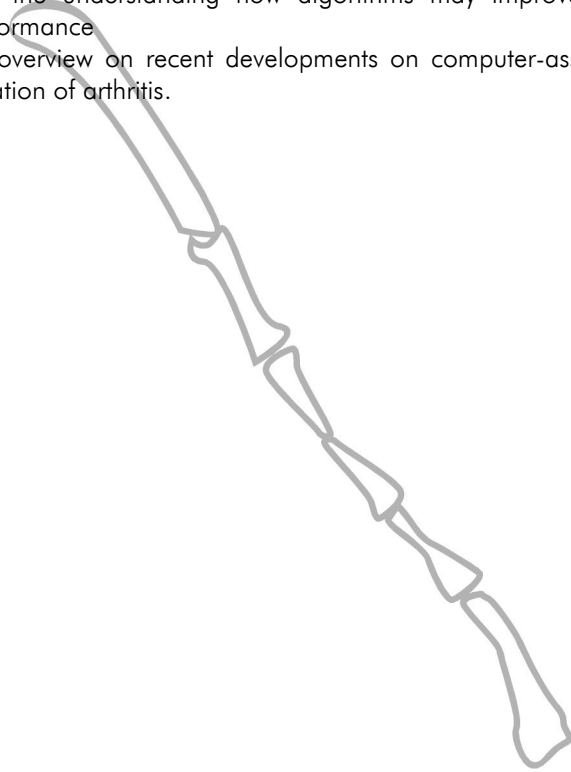
Computer-Assisted Diagnosis of Arthritis

P. Peloschek (Austria)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 16:10-16:30

Aims of this lecture are

- to explain the nomenclature and pre-requisites of computer-assisted diagnosis in radiology
- to improve the understanding how algorithms may improve radiologists' reporting performance
- to give an overview on recent developments on computer-assisted diagnosis and quantification of arthritis.



Molecular Imaging of Arthritis

P. Lang (USA)

Room "Turgut Reis 1" – Friday June 1st, 2007 – 16:30-16:50

The visualization of specific molecular events holds great promise for both clinical and basic sciences applications in musculoskeletal radiology. Molecular imaging can be defined as the imaging of specific biological processes at the molecular and cellular level in living organisms.¹ Numerous applications exist for a molecular imaging approach in the musculoskeletal system and general categories include arthritis, bone and joint healing, bone marrow abnormalities, osteogenesis regulation, bone remodeling, osteoporosis, tumor imaging, and therapy assessment.

In recent years there has been intense interest in molecular imaging due in large part to the rapid advances in our understanding of specific molecular pathways related to the musculoskeletal system. Contributions in fields such as biochemistry, molecular biology, cellular biology and genetics have lead to a greater fundamental understanding of the molecular and cellular processes both normal and disease states. However, much of the fundamental basic science work relies on in vitro study or examination of large populations of animals at single points in time. What is needed are imaging tools to examine molecular events at multiple points in time in living systems. The goal for molecular imaging is to reveal the early underlying biochemical and genetic events responsible for disease rather than late changes (e.g. tumor size or altered blood flow) as seen with most current clinical diagnostic imaging modalities.

A few examples exist in the literature or are in active development for musculoskeletal application. Beckmann et al. have shown that the macrophage phagocytosis of super-paramagnetic iron oxide particles produce MRI signal changes that correlate with arthritis severity and the response to treatment in an antigen-induced arthritis rat model.² ¹⁸F-FDG PET imaging shows potential for monitoring disease activity in rheumatoid arthritis (RA)³ and novel molecular probes have been tested and are under development using radiolabeled antibodies specific to markers of inflammation⁴, ⁵ or pannus formation in RA. Tracking of hematopoietic stem cell engraftment with a molecular imaging approach may provide an alternative/adjunct to invasive bone marrow aspiration.⁶ The disease progression of multiple myeloma can be visualized in a mouse model with in vivo whole body mouse fluorescent imaging.⁷ Fluorescence imaging can visualize events in tumors located close to the skin

surface8 and one potential application might be therapy monitoring of soft tissue tumors.9, 10

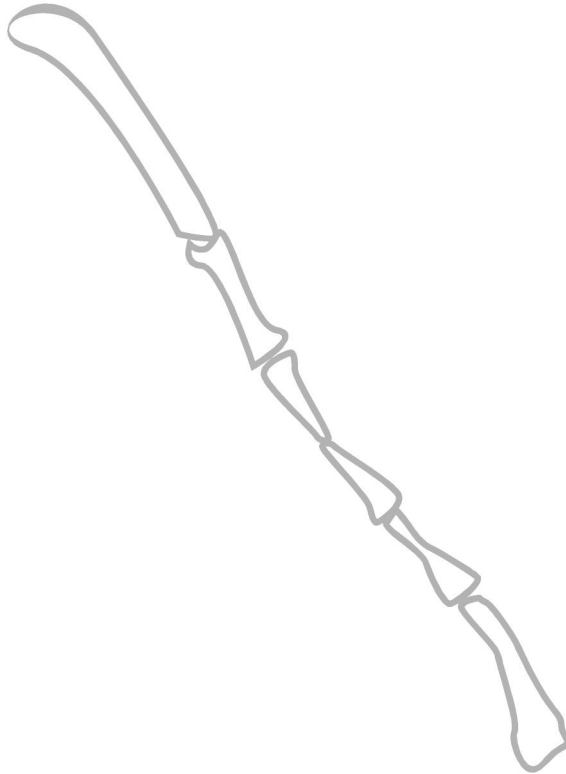
Molecular imaging promises non-invasive in vivo monitoring of specific molecular targets with the exciting prospect of translation to clinical application. While molecular imaging clearly dovetails with research into the fundamental molecular and cellular processes, concurrent efforts are needed into the development of novel imaging contrast agents that are specific for molecular processes. Furthermore, the imaging devices need to be tailored to optimize visualization and localization of specific molecular events. Ultimately, direct visualization of events fundamental to disease processes with molecular imaging will translate into better patient care through earlier and more specific detection and intervention.

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Digital Image Analysis of MRI of the Bone

L. Marti-Bonmati (Spain), D.Moratal-Perez, A. Alberich-Bayarri, L. Nieto-Charques

Room "Turgut Reis 1" – Friday June 1st, 2007 – 16:50-17:10

Dual X-ray absorptiometry (DXA) techniques used in the quantitation of bone mineral density (BMD) have been demonstrated to be not sufficiently accurate for the correct diagnose of trabecular bone diseases. Fracture risk in patients with osteoporosis and grading of the in vivo microarchitecture of the trabecular bone structure have been evaluated using advanced image processing algorithms applied to high resolution MR images.

In our institution, we have been working with the integration of the different parameters that can be evaluated from the MR axial images acquired from the distal radius and ulna. The application may help in the complete clinical assessment of patients with osteoporosis.

We will present a preliminary series of 45 patients evaluated with high resolution MR axial images, acquired with a 3 Tesla MR scanner (Philips Medical Systems, Best, The Netherlands). These images were obtained with a good contrast between trabeculae and bone marrow, a clear difference between cortical and trabecular bone, a satisfactory signal-to-noise ratio (SNR) and also with a high spatial resolution.

MR images were pre-processed before the trabecular structure analysis. The pre-processing procedure started with an automated image segmentation to discriminate the trabecular bone region from the cortex in each scan. A first depiction of an initial trabecular bone contour was developed applying different image filters. Once this initial contour is detected, a snakes method was used to adjust the edges to the rest of the images.

After the segmentation of the MR series, voxels were processed and divided into subvoxels in order to increment the apparent resolution and generate images with a considerably better sharpness. The last step in pre-processing consisted of a complete discrimination of the voxels in bone or marrow obtaining a binarized structure.

Taking the resulting 3D binarized reconstruction of the pre-processing step, a structural analysis was performed from three different viewpoints.

First, a morphological evaluation was developed by calculating some main parameters as the mean trabecular thickness (Tb.Th), mean trabecular separation (Tb.Sp), trabecular number (Tb.N) and bone volume to total volume fraction (BV/TV).

Afterwards, to study the complexity, porosity and connectivity of the calculated 3D trabecular reconstruction, a fractal analysis was also developed by calculating the fractal dimension (D) parameter of the whole trabecular reconstructed structure, which directly correlates with porosity and connectivity.

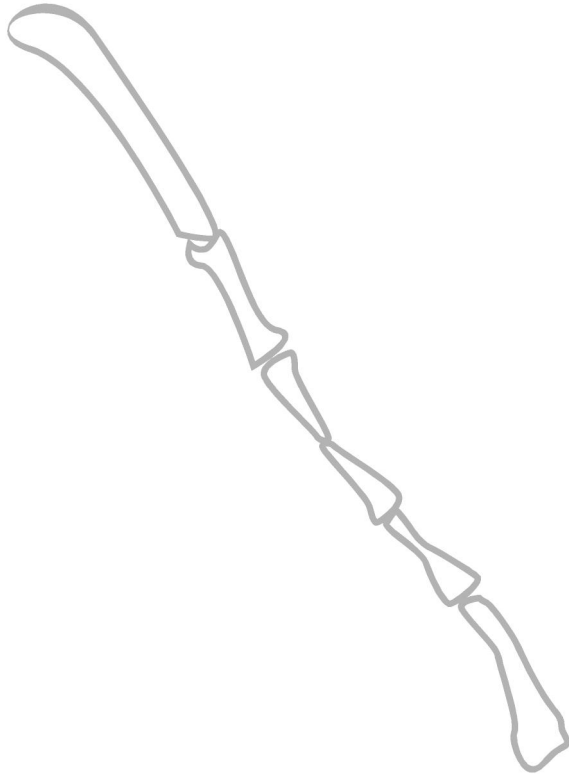
Topology of the trabecular structure is also important to determine the relative situation of voxels. To achieve this analysis, a skeletonization algorithm was applied in order to maintain the shapes and classify the voxels of the structure by their situation (9 possible situations; e.g., joint of two surfaces, surface with curve or interior of surface). Once the topological classification was done, the surface-to-curve ratio (SCR) and the total erosion index (TEI) parameters were calculated to complete the estimation of the principal structural parameters.

After the structural analysis, a mechanical simulation of the trabecular bone structure behavior was developed to find weak points in the structure and also to determine the general performance under different simulated loads and physical conditions. This mechanical study was carried out by the application of the finite element method (FEM), which is widely considered among mechanical simulations in engineering. In order to accomplish this, the binarized 3D reconstruction resulting from the pre-processing step was converted into a FEM model, which contains the trabecular bone structure as a collection of hexahedron "brick" elements. The model was also pre-processed by defining the published density and the elastic properties of the compact bone. To obtain a general mechanical behavior, a compression test was defined. A pressure was applied on one face of the trabecular structure while boundary conditions of null displacement were applied to the opposite face. The solution was then calculated by solving the FEM equations.

Finally, displacements, stresses and strains at the different elements were obtained. Applying the homogenization theory to the results of the mechanical simulation, an apparent Young modulus of the whole structure can be obtained, determining its elastic behavior.

Bone trabecular micro-architectural analysis results in a new clinical method. The computational simulation of in vivo MR obtained trabecular bone structures and its mechanical and elastical characterization may advance our knowledge of the cancellous bone quality in patients with osteoporosis.

NOTES



Update on Scoring Systems in Osteoarthritis and Quantitative MR Imaging Techniques

P. Lang (USA)

Room "Turgut Reis 1" – Saturday June 2nd, 2007 – 08:30-08:50

Osteoarthritis (OA) is the most common type of arthritis and a frequent cause of pain and disability. A number of exciting surgical treatment modalities have been introduced recently, including autologous chondrocyte transplantation and osteochondral allo- or autografting. There is, however, no proven pharmacologic treatment that affects the progression of OA. A major problem in the development of a pharmacologic treatment for OA is the lack of a validated non-invasive method that is both accurate and reproducible at measuring articular cartilage repeatedly over time to determine disease progression.

Conventional radiography is widely used in evaluating the long-term progression of OA and is able to clearly depict the established hallmarks of OA, namely, joint space narrowing, subchondral sclerosis, subchondral cyst formation and osteophytosis. Conventional radiography is limited, however, by its inability to directly visualize articular cartilage - the tissue in which the earliest insults of osteoarthritis are thought to occur.

Magnetic resonance imaging (MRI) offers the distinct advantage of visualizing the articular cartilage directly. MRI can detect signal and morphological changes in the cartilage and has been used to detect cartilage surface fraying and varying degrees of cartilage thinning.

The standard techniques broadly used in clinical practice and scientific studies are the 2D fast spin-echo and the 3D spoiled gradient-echo sequence. Both sequences are available on most MRI systems.

2D Fast Spin-Echo Imaging: Fast spin-echo (FSE) imaging affords high contrast for evaluating articular disorders and cartilage. Incidental magnetization transfer contrast contributes to the signal characteristics of articular cartilage on FSE images and can enhance the contrast between cartilage and joint fluid. 2D FSE sequences have excellent signal to noise ratios, which help to achieve short scan times in clinical practice. The sequence has fewer artifacts than 3D SPGR 1.

Image blurring can be a problem in 2D FSE. Strategies to decrease or avoid image blurring include the use of ultrashort echo times and short echo trains.

3D Spoiled Gradient Echo Imaging (SPGR): SPGR sequences have been employed because of their ability to provide high resolution 3D images 2-5. Fat suppression is typically used to increase the dynamic range of signal intensities in cartilage. The hyaline cartilage appears as a high signal intensity structure compared with adjacent tissues which demonstrate lower signal intensities with this sequence. The 3D imaging capability of this sequence has helped transform it into the standard acquisition technique for quantitative cartilage assessment such as 3D volume or thickness measurements. Recent studies indicate, however, that this sequence is hampered by significant image artifacts that can result in over- or underestimation of cartilage disease 1 and failure of automated cartilage segmentation for 3D analysis due to poor contrast between cartilage and surrounding tissue 6.

Many other MRI sequences have been proposed for cartilage imaging, but have not found wide-spread acceptance. These include T1-weighted, proton density-weighted and T2-weighted spin-echo (SE) sequences, inversion recovery (IR) sequences, 2D and 3D magnetization transfer contrast (MTC) sequences, projection reconstruction spectroscopic imaging (PRSI), and 2D and 3D driven equilibrium Fourier transform (DEFT). Poor cartilage signal-to-noise (SNR) and contrast-to-noise ratios CNR (SE, IR sequences), limited SNR efficiency (SE, IR), need for offline reconstruction (PRSI) or for image subtraction (MTC), and unstable sequence performance (DEFT) are among the factors that have prevented the broad dissemination and acceptance of these techniques for cartilage MRI.

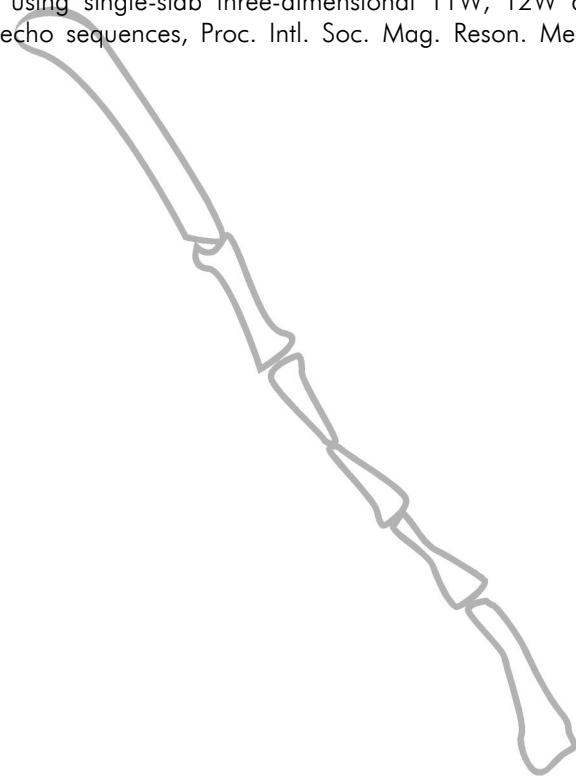
The most promising novel MRI pulse sequences for cartilage imaging are water-selective excitation techniques such as 3D spoiled gradient echo with spectral spatial pulses (3D SS-SPGR) 7-9, 3D steady state free precession (3D SSFP) 10, 11, 3D dual echo steady state (3D DESS) and 3D fast spin-echo (3D FSE) techniques 12-14. These fast sequences hold the promise of providing 3D coverage (unlike 2DFSE) while yielding superior contrast-to-noise ratio between cartilage and surrounding tissues and are likely to improve the accuracy and reproducibility of cartilage MRI.

When combined with novel arthritis scoring systems, these techniques are ideally suited for longitudinal monitoring of therapeutic response in OA trials.

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Pathogenesis and Pain, the Role of Imaging in Osteoarthritis

A. Grainger (UK)

Room "Turgut Reis 1" – Saturday June 2nd, 2007 – 08:50-09:10

For many years osteoarthritis was thought of as a 'wear and tear' disease primarily affecting cartilage. This meant that a great deal of effort was concentrated on assessing cartilage loss on conventional radiographs (by measuring joint space) and using MRI. However osteoarthritis is fundamentally a disease of pain, and cartilage loss is not a reliable predictor of morbidity or outcome in osteoarthritis. Indeed it has been known for many years that the conventional radiographic appearances of osteoarthritis, which include joint space loss, osteophyte formation and subchondral bone change, correlate poorly with the patient's symptoms.

Using advanced imaging techniques such as ultrasound and MRI we can identify changes in osteoarthritic joints involving the soft tissues that cannot be appreciated using conventional radiology. Changes are also seen on MRI before conventional radiographic features are evident. Features seen in osteoarthritis on MR imaging include synovitis, bone marrow edema, and alteration in the appearances of fibrocartilage and ligaments. Although it is important not to disregard the role of cartilage change in the pathogenesis of osteoarthritis, these other changes also need to be considered, and the trend now is to consider osteoarthritis as a 'whole organ' disease.

The pathogenesis of joint pain in osteoarthritis remains controversial. Studies of the knee joint have shown an association between pain and both synovitis and bone marrow edema although other studies have failed to show an association with bone marrow edema.

A further area of interest is in identifying changes important in the pathogenesis of osteoarthritis. While there is little doubt that biomechanical factors are fundamental to the development of osteoarthritis as evidenced by the association between obesity and osteoarthritis of the knee, this cannot be the whole story. Interestingly obesity also has a significant, but less strong, association with hip and hand osteoarthritis. There is also good evidence for a genetic susceptibility to osteoarthritis. Attention has recently focussed on ligament changes seen early in the osteoarthritis process and alteration in ligament structure or function may also provide a mechanism by which osteoarthritis may develop through altered joint biomechanics.

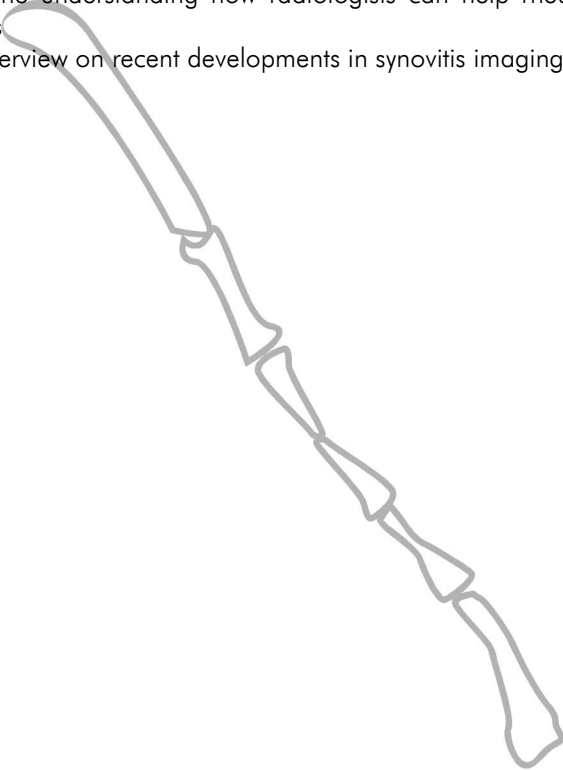
Early Rheumatoid Disease Detection

P. Peloschek (Austria)

Room "Turgut Reis 1" – Saturday June 2nd, 2007 – 09:10-09:30

Aims of this lecture are

- to recall knowledge about the pathophysiological sequence of joint destruction in rheumatic diseases
- to improve the understanding how radiologists can help rheumatologists in early diagnosis
- to give an overview on recent developments in synovitis imaging .



Early Spondyloarthropathy Disease Detection

N. Boutry (France)

Room "Turgut Reis 1" – Saturday June 2nd, 2007 – 09:30-09:50

Modified New York diagnostic criteria for ankylosing spondylitis (AS) take into account the axial involvement, and include clinical and radiographic (ie, uni- or bilateral sacroiliitis) findings. Conventional radiography of the pelvis and the spine has been the mainstay for diagnosis of axial involvement, but this modality is insensitive to early bone and joint damage. Until recently however, the absence of effective treatment to preserve structural integrity limited the need for more sensitive imaging modalities. This situation changed following the introduction of the anti-TNF- α agents that have shown great promise for alleviating inflammatory symptoms of AS, and possibly preventing structural changes in the spine. Therefore, new imaging modalities such as magnetic resonance (MR) imaging and ultrasound have developed during the past few years. This presentation illustrates the interest of imaging modalities (including MR imaging and ultrasound) in diagnostic management of patients with early AS.

Special Focus Session: Cartilage and Sports Imaging

Chairs: C. Masciocchi (Italy)

Cartilage, Basic Imaging and Innovations

D. Wilson (UK)

Room "Turgut Reis 1" – Saturday June 2nd, 2007 – 10:30-10:45

There reasons why we may be asked to image cartilage are:-

To exclude cartilage defects as a cause of symptoms.

To decide whether to perform surgery

To decide what sort of surgery

To follow up surgical procedures.

MR is the best means of imaging joint surfaces.

Conventional MR is poor at detecting cartilage lesions so that any abnormality detected is highly significant.

To optimize MR to detect small defects we need to improve the resolution and the contrast.

Strategies are:-

Resolution: Higher field strength
 Dedicated surface coils
 Steeper gradients
 Higher matrix

The trade off is usually signal to noise ratio, increased imaging time and problems with dielectric effects at high field.

Contrast: Lower field strength
 New sequences
 Intravenous contrast agent
 Intra-articular contrast agent

The trade offs are the need for intervention, reduced resolution and imaging time.

There are a variety of sequences that may be used and the selection will depend on all the above parameters, the type of equipment available and the clinical needs.

In this lecture I will demonstrate a practical approach based on conventional and high field MR using protocols that are commercially available.

I will discuss the role of contrast agents and present a strategy for management of the common clinical problems.

The approach will be pragmatic and practical rather than technical.

Osteochondral Injuries of the Knee

M. Padron (Spain)

Room "Turgut Reis 1" – Saturday June 2nd, 2007 – 10:45-11:00

In the athletic population, reproducible imaging of cartilage lesions is extremely important in order to decide the optimal therapeutic decision. The normal appearance of articular cartilage on MR imaging remains somewhat controversial and is dependent on the performed technique. We review the most widely accepted pulse sequences and the novel ones to give the basic knowledge of how to perform an acceptable study of the knee cartilage. Normal variants, magic angle effect and MR Arthrography are also reviewed. Many scoring systems have been described to evaluate hyalin cartilage. The ICRS arthroscopic scores have been validated for the assessment of cartilage repair and seems to be reliable and repeatable. Acute or repetitive trauma can cause a variety of articular cartilage injuries including fissures, chondral flaps and loss of a fragment of articular cartilage. These injuries may be associated with other structures of the knee joint such as menisci and/or ligaments. Most osteochondral lesions are caused by shear forces and osteochondritis dissecans may be due to a separation or fragmentation of a subchondral bone fragment due to repetitive trauma. We review the most frequent cartilage lesions in the athlete, cartilage delamination, cartilage shear injury, osteochondral and transchondral fracture and osteochondritis dissecans as well as their therapeutic considerations.

MRI of Femoroacetabular Impingement and Acetabular Labrum

A. Karantanas (Greece)

Room "Turgut Reis 1" – Saturday June 2nd, 2007 – 11:00-11:15

The acetabular articular surface is peripherally deepened by a rim of fibrocartilage-the acetabular labrum-which encloses the femoral head beyond its equator, increasing thus the stability of the joint. Normal variants such as labral sulcus, absence or thickening of the labrum, emphasize the need to know the MRI appearance of the asymptomatic acetabular labrum. The classification of Czerny and Hofmann can be used for assessment of the acetabular labrum, differentiating post-traumatic and degenerative lesions. Tears of the acetabular labrum have been recognized as a cause of mechanical pain of the hip. Such tears are known to occur in association with a twisting injury during sporting activities. Underlying dysplasia of any type might contribute to labral involvement. Femoroacetabular impingement (FAI) is a relatively recently appreciated cause of hip pain and degenerative change. In FAI, excessive acetabular coverage (Pincer type) and/or an insufficient femoral head-neck offset (Cam type) reduces the joint clearance causing impingement, which has been related to early osteoarthritis. Cam impingement is most common in young athletic males. During flexion of the hip, repetitive peak contact pressures occur when the prominent femoral head-neck junction abuts against the acetabular rim. This abnormal contact results in damage predominately to the acetabular cartilage along the anterosuperior acetabular rim. Chondral abrasion or avulsion in turn leads to a tear of the acetabular labrum. Radiological recognition of this entity will help in the selection of the appropriate treatment aiming at decreasing the likelihood of early degenerative osteoarthritis of the hip. MR arthrography appears more sensitive than conventional MRI in the depiction of labral lesions.

Osteochonral Lesions of the Talus and Osseous Impingement of the Ankle

M.C. de Jonge, M. Maas (The Netherlands)

Room "Turgut Reis 1" – Saturday June 2nd, 2007 – 11:15-11:30

Osteochondral lesions (OCL): Osteochondral lesions of the talus are presumed to be the consequence of inversion sprain injuries which are very common injuries in all different kinds of sports at all levels. Most of these inversion injuries will go on to complete recovery. A small portion however will keep on complaining of deep ankle pain which becomes chronic and it is this population which has to be screened for the presence of an OCL. The incidence of OCL's after ankle sprain injuries has been reported to be as high as 6,5 %.

OCL's occur predominantly in either the anterolateral or posteromedial aspect of the talar dome. There appears to be a difference in appearance between the two. The anterolateral lesions are shallow and wafer shaped in contrast with the posteromedial lesions which are deeper and cup shaped. This is due to (in theory) the mechanism which causes them which is thought to be a shearing injury in the anterolateral lesions and torsion impact injury in the posteromedial lesions.

The imaging modalities most usefull for the detection of OCL's are conventional radiography (CR), Computed Tomography (CT) and Magnetic Resonance Imaging (MRI). Standard AP and lateral mortise views of the ankle should be the first imaging study although it does not exclude a lesion in case it is normal. Additional heel rise AP view (plantar flexion) can be beneficial in selected cases particularly for the detection of a posterior OCL. MRI or CT is the next investigating modality which has to be used in cases with strong clinical suspicion and negative CR. A recent study published showed no significant statistical difference between CT and MRI in the detection of OCL's. In MRI the edema which will be present at the site of the lesion can obscure the true extent of the lesion, making it bigger than in reality. CT is better in delineating the true size of the lesion. Taking this into account, CT is more certain in making the diagnosis if an OCL is actually present (higher positive predictive value) whereas in cases without an OCL the MRI was more certain (higher negative predictive value). The role of CT or MR arthrography is debated; with the high sensitivity and specificity of 'conventional' CT and MRI one has to ask oneself if a non-invasive investigation modality has to be turned into an invasive one.

Regarding staging OCL's, the classification system by Berndt and Hardy is the most frequently used. Different grading systems are however developed for not

only the imaging techniques but also for arthroscopy. The role of staging is uncertain and debated and it is very questionable whether or not it is helpful in daily clinical practice.

Osseous impingement of the ankle: The osseous impingement syndromes of the ankle can be classified according to the anatomical location. There is anterior and posterior impingement, the anterior impingement syndrome can be further subdivided in anterolateral and anteromedial impingement syndromes, the former being predominantly a form of soft tissue impingement. Osseous posterior impingement is for the most part posterolateral, the posteromedial impingement is predominantly a soft tissue impingement without osseous abnormalities.

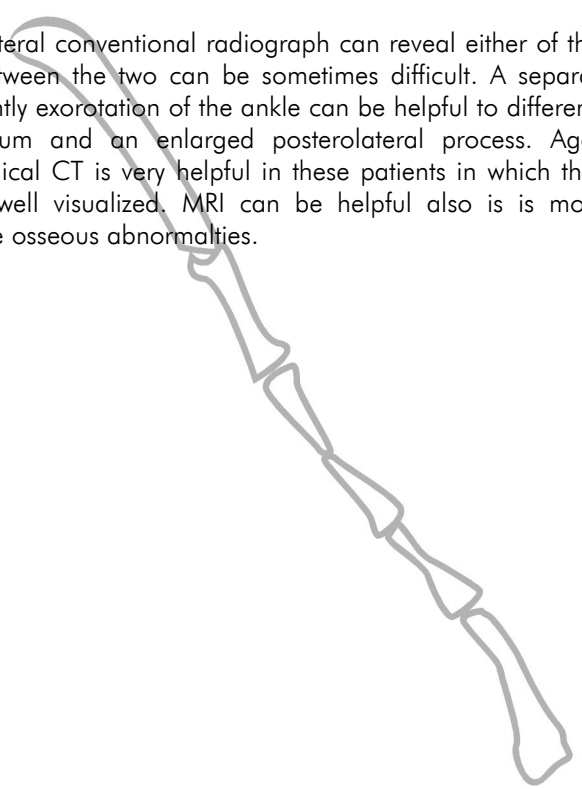
Anterior impingement: The anterior impingement syndromes are characterized clinically by pain and limited range of motion on dorsiflexion. Stiffness and irritability can accompany the spectrum of complaints. Anteromedial impingement is a relatively common complaint in sports with kicking actions like soccer. The syndrome is characterized by the formation of an osseous spur at the anteromedial tibia and the opposite part of the talus. There is controversy in the literature about the mechanism of origin of these spurs. Some studies state that the repeated forceful plantar flexion of the foot in kicking actions predispose for the formation of the osteophytes at the level of the attachment of the ankle joint capsule. Other recent studies have found that the majority of the osteophytes are however located within the joint, not at the attachment of the capsule and that they could not therefore arise due to traction. Therefore another theory was postulated that holds the direct impact of the ball against the anterior ankle responsible for the osteophyte formation. The repetitive high impact force would lead to damage of the anterior cartilage rim and subsequently osteophyte formation.

Visualizing the anteromedial osteophyte is the hallmark together with clinical findings of the diagnosis. Normal conventional films fail to show these anteromedial osteophytes properly. An additional so-called Anteromedial Impingement View can be very helpful in these cases. Also particularly CT and to a lesser extent MRI can show these osteophytes.

Posterior impingement: Posterior osseous impingement syndrome is characterized clinically by posterior (heel) pain especially on plantar flexion. It is not uncommon in athletes and high performing ballet dancer's (hence also the name 'dancer's heel'). To understand the etiology one must know the anatomy and development of the talus since the causative mechanism for the syndrome is

caused by a developmental anomaly or variant. The lateral posterior tubercle of the talus can develop as a separate ossification center. In case this osseous structure fuses with the rest of the talus the structure will be known in case of excess growth as the posterolateral process of the talus. In case this osseous structure does not fuse with the talus it remains there as an os trigonum (hence also the name 'os trigonum syndrome'). Either the hypertrophic posterolateral process or the os trigonum can impinge the soft tissues posterior with repeated forceful plantar flexion.

A standard lateral conventional radiograph can reveal either of the two but the distinction between the two can be sometimes difficult. A separate additional view with slight external rotation of the ankle can be helpful to differentiate between an os trigonum and an enlarged posterolateral process. Again the High resolution Helical CT is very helpful in these patients in which the abnormality will be very well visualized. MRI can be helpful also it is more difficult to appreciate the osseous abnormalities.



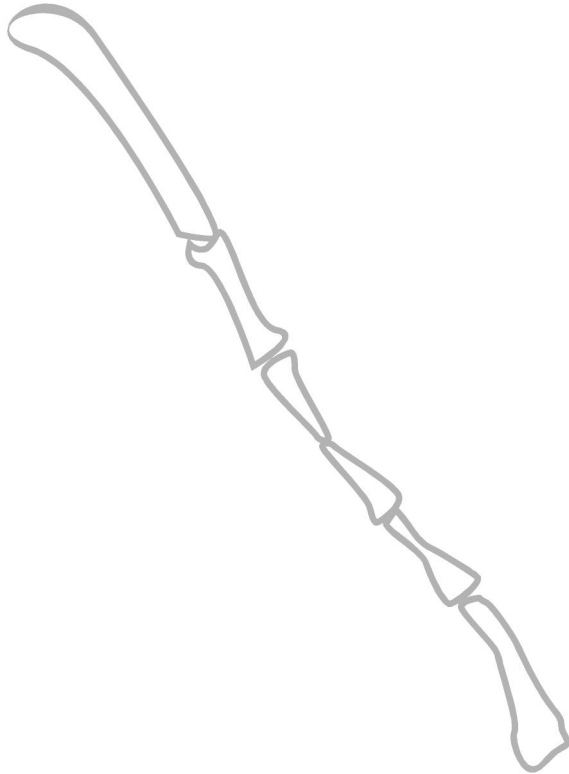
MRI of the Postoperative Cartilage

J. Kramer (Austria)

Room "Turgut Reis 1" – Saturday June 2nd, 2007 – 11:30-11:45

Articular cartilage is a uniquely adapted, highly differentiated tissue that acts as a buffer to transmitted forces across the joint, protecting the underlying bone. Unlike other tissues such as muscles and tendons, cartilage has a very limited repair capacity. However, chondral lesions are a common and important orthopedic problem in both young and old patients. Because of the excellent soft-tissue contrast, the ability to visualize directly hyaline cartilage, and the multiplanar capabilities, MR imaging has been shown to be an excellent imaging technique for the evaluation of hyaline cartilage and especially for non-invasive follow-up in patients after cartilage repair procedures have been performed. Nowadays, also multi-slice CT-arthrography with its capability of excellent reformatted images has demonstrated to be of high value after operative procedures have been performed, since there is no image degradation due to metallic artifacts commonly seen in MR imaging. There are several techniques used to treat cartilage: local stimulation, transplantation of osteochondral grafts, and autologous transplantation of cartilage. The three most commonly used surgical procedures for local stimulation are abrasion arthroplasty, microfracture, and subchondral drilling. All the techniques rely on bleeding from the penetration of the subchondral bone to form a fibrin clot containing pluripotent stem cells, which can differentiate and remodel into the formation of fibrocartilaginous repair tissue. Autologous osteochondral transplantation procedures are based on the principle that osteochondral plugs are harvested from a relative non-weightbearing area of the joint and reimplanted to repair chondral defects. Histologic evaluation of autologous osteochondral transplants has shown viable graft hyaline cartilage with the interstices between graft plugs filled with fibrocartilage-like repair tissue. The number of plugs that can be used however is limited by the availability of donor sites and the need to limit morbidity at the donor sites. Autologous chondrocyte is a two stage procedure primarily indicated for repair of symptomatic medium to large chondral lesions. In the first stage, cartilage is harvested from the intercondylar notch or trochlear border. This cartilage is cultured and grown "ex-vivo" to produce a cell suspension. In the second stage, in an open arthrotomy, the chondral defect is debrided to subchondral bone and all unstable margins are removed. A periosteal flap is taken from the ipsilateral femur or tibia and used to cover the cartilage defect. The periosteal patch is sewn to the margins of the defect and made water tight with fibrin glue. Then the cartilage suspension is injected. Alternatively, a flap enriched with a hyaline cells suspension can be

implanted. Advantages to ACT are the limited disruption to the joint and the potential to reform hyaline or hyaline-like cartilage. Potential disadvantages are the need for a two step procedure and the expense of the procedure. Because the healing process is not ideal in all patients after cartilage repair procedures have been performed, there is definitely a need for radiological imaging techniques for further evaluation to avoid an invasive arthroscopy for diagnostic purposes.



MRI of Upper Extremity Lesions at 3T

G. Allen (UK)

Room "Turgut Reis 1" – Saturday June 2nd, 2007 – 11:45-12:00

3 Tesla MRI is becoming a preferred method of imaging for the upper limb. This is principally due to its high resolution for small areas, for example the wrist and elbow joints. Subtle ligament, tendon, articular surface and bone abnormalities can be detected. This precision of diagnosis is both a challenge to the interpreter who will have access to more detailed findings and the clinician who must put the findings in context.

At the same time much shorter scanning time may be achieved without loss of resolution compared to 1.5T imaging. This means that a patient who may not be able to stay motionless for longer periods can be examined in a reasonably effective manner.

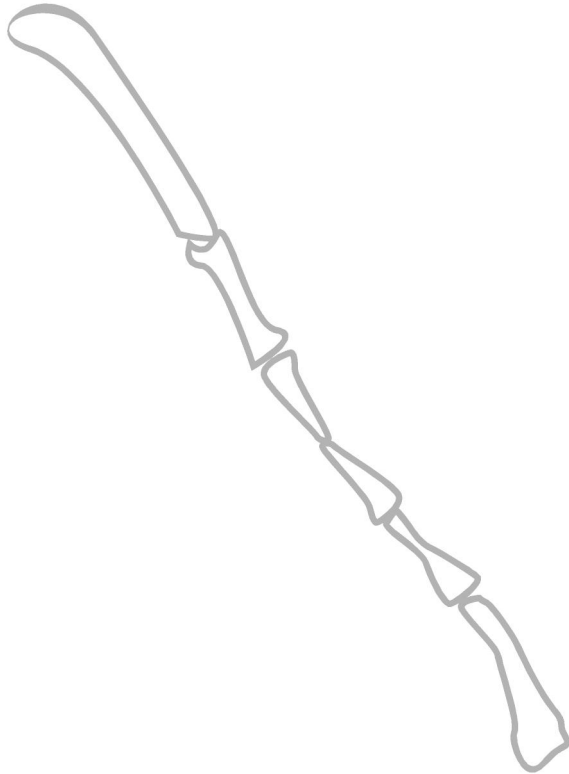
There are a number of draw backs. Metal when the artefact may be more apparent and new contraindications such as an intrauterine coil have to be considered. The extent of artefact depends on the relationship of the objects size to the Larmor frequency. Not all artefacts are worse at 3T.

Induction of electromagnetic effects with cardiac and neurological effects have not proved to be a significant problem.

Field homogeneity is likely to be worse at higher field strengths and this is associated with artefact from dielectric effects which may cause problems with imaging larger volumes of tissue.

In general 3T MR is currently the best MR field strength for imaging small regions of the upper limbs.

NOTES



INTERACTIVE TEACHING SESSIONS

Room Turgut Reis II - III - Level 7

The interactive teaching sessions have been developed to allow you not only to expand your knowledge but also to draw attention in certain fields of diagnostic radiology. These sessions are always fun besides being educational.

Friday, June 1st: 10:30-12:00 Mistakes you should avoid in Musculoskeletal Radiology

Prof. Dr. K. Bohndorf (Germany)

(Turgut Reis II & III) – Level 7

Imaging findings are rather commonly overlooked or misinterpreted. The number of errors can be reduced by training, experience, concentration and work organisation. Most of the remaining errors are caused by one or several of the following problems:

- 1) Insufficient consideration of history, symptoms and other clinical information
- 2) Jumping to conclusions, uncritical acceptance of previously made diagnoses
- 3) Interpretation without previously obtained or complementary imaging methods
- 4) Interpretation solely based on necessarily limited own experience
- 5) Interpretation without systematic approach to findings
- 6) Insufficient knowledge of rare but typical diagnoses
- 7) Clinical relevance of imaging abnormalities not known or not taken into consideration
- 8) Influence of technical factors on imaging findings not sufficiently known.

What is the result? Typical examples of errors include:

- Missed or underestimated fractures
- Infection mistaken as neoplasm, enchondroma as an infarct
- Missed changes of the diagnosis over time (such as malignant degeneration of Paget's disease or bone infarct or dedifferentiation of relatively benign neoplasms)
- Incorrect diagnosis instead of characteristic image appearance (such as osteoid osteoma, osteochondroma, non-ossifying fibroma, bone infarct, myositis ossificans)

- Potentially meaningless imaging abnormalities overemphasized, leading to overtreatment (disk protrusion, small amounts of fluid in tendon sheaths, increase signal within tendons and fibrocartilaginous structures)
- Missed diagnoses at the borders of the image
- Artifacts mistaken as relevant findings

Saturday, June 2nd: 08:30-10:00 Spinal Disorders

Prof. Dr. K. Verstraete & Dr. F. Vanhoenacker (Belgium)
(Turgut Reis II & III) – Level 7

Experts will interactively review selected cases of spinal disease with the audience. The attendant will learn about special manifestations of frequent and infrequent diseases of the spine.

FUTURE ESSR MEETINGS

| | |
|------------------|------|
| Galway / Ireland | 2008 |
| Genova / Italy | 2009 |
| France | 2010 |



founded 1993

For more information about ESSR membership and the upcoming meetings, please consult the ESSR website at <http://www.essr.org>.

ABSTRACTS

SCIENTIFIC SESSIONS

Rooms: Turgut Reis II - III – Level 7 & Çaka Bey - Level 2

Session 1- Friday June 1st – Room “Çaka Bey” – Level 2

- 10.30 Antibodies against citrullinated vimentin in rheumatoid arthritis: Higher sensitivity and extended prognostic value concerning future radiological progression as compared to antibodies against CCP
Marius C Wick*, Linda Mathsson**, Mohammed Mullazehi**, Olaf Sjøvberg**, Ronal F vonVollenhoven***, Lars Klareskog***, Johan Rvanelid**(*Innsbruck, Austria, **Upsala, ***Stockholm, Sweden)
- 10.40 Dynamic contrast enhanced MRI of rheumatoid arthritis shows early changes due to anti-TNF alpha therapy
R.S.D. Campbell, R Hodgson, S Connolly*, T Barnes, B Eyes, V Adams, R Moots (Liverpool, UK, *St.Helens, UK)
- 10.50 Impact of Sonography in Gouty Arthritis: Comparison with Conventional Radiography, Clinical Examination, and Laboratory Findings
C Schueller-Weidekamm, M Aringer, G Schueller, F M Kainberger (Vienna, Austria)
- 11.00 Whole body MRI in psoriatic arthritis – development of an imaging protocol and evaluation in 25 patients
S Weckbach, H Michaely, S Schewe, M Reiser, C Glaser (Munich, Germany)
- 11.10 Evaluation of Infliximab induced therapeutic response in rheumatoid synovitis: correlation between US contrast medium quantification and histology
*O Bottinelli, A de Marchi, P Clerico, C Faletti (Torino, Italy, * Pavia, Italy)

- 11.20 Contrast Enhanced grey- scale Sonography: Assessment of Joint Vascularity in therapy follow up of Rheumatoid Arthritis
A S Klauser, E Mur, S Mlekusch, R Arora, M Gabl, J Gruber, G Feuchtnr, D ZurNedden (Innsbruck, Austria)
- 11.30 Enteropathic osteoarthropathy: HRCT and MDCT imaging
A Mester, G Toth, P N Kaposi, S Forgacs (Budapest, Hungary)
- 11.40 A new spondylarthropathy scoring system based on MRI
A G Jurik, K B Madsen, B Schiøttz-Christensen, N Egund (Aarhus, Denmark)

Session 2 - Friday June 1st – Room “Turgut Reis II – III ” – Level 7

- 13.30 The role of ultrasonography in patients with radial nerve pathology. Comparison with Magnetic Resonance and Surgery
C Bertocchi, S Colopi, R Adani, E Gallo, P Toricelli (Modena, Italy)
- 13.40 High Resolution Ultrasound In The Dynamic Assessment Of Plantar Plate
F Lacelli, N Prato, L Alessandri, G Grillo, E Sivestri, G Garlaschi (Genova, Italy)
- 13.50 Epicondylitis Lateralis Humeri: Value Of Contrast-Enhanced Sonography
A Loizides, S Ennemoser, W Judmaier, M Herold, E Mur, J Gruber, T Rettenbacher (Innsbruck, Austria)
- 14.00 Value of an additional cross sectional area measurement of the Median nerve in Carpal Tunnel Syndrome patients compared to healthy volunteers assessed by Ultrasound
A S Klauser, E Mur, S Mlekusch, R Arora, M Gabl, J Gruber, M Schirmer, W Löscher (Innsbruck, Austria)
- 14.10 A pilot study on nerve ultrasound in acromegaly
A Tagliafico, E Resmini, R Nizzo, F Bianchi, C Martinoli, D Ferone (Genova, Italy)
- 14.20 Occult Dorsal Carpal Ganglia: Spectrum of Ultrasound Features
N Stagnaro, A Tagliafico, C Martinoli, E Capaccio, *S Bianchi (Genova, Italy, * Chene-Bougries, Switzerland)

- 14.30 Ultrasound and MR imaging of the Musculocutaneous Nerve
A Tagliafico, E Capaccio, N Pignataro, N Stagnaro, *S Bianchi, C Martinoli, (Genova, Italy, * Chene-Bougries, Switzerland)
- 14.40 3D-Ultrasound of Congenital Clubfoot: preliminary results
E Capaccio, A Tagliafico, N Pignataro, B Damasio, * S Bianchi, C Martinoli, (Genova, Italy, * Chene-Bougries, Switzerland)

Session 3 - Friday June 1st – Room “Çaka Bey” – Level 2

- 13.30 Treatment of Osteoid Osteoma Using Percutaneous Radiofrequency Ablation and Alcohol Injection
M Fatehi, S Akhlaghpour, A Tomasian, AA Shabestari, M Ebrahimi, MR Alinaghizadeh (Tehran, Islamic republic of Iran)
- 13.40 Fluid/fluid levels in bone neoplasms: Relative signal intensity of the superior and inferior layer of fluid- diagnostic significance
F Alyas, A Saifuddin (London, UK)
- 13.50 Synovial sarcoma: detection of neoadjuvant therapy response with dynamic MR imaging
G Duygulu, R Arkun, M Argin, T Akalin, Y Anacak, D Sabah (Izmir, Turkey)
- 14.00 Surveillance imaging of soft tissue sarcoma and aggressive fibromatosis
C S P van Rijswijk, M Geirmaerd, A Taminiou, F van Coevorden, P C W Hogendoorn, JL Bloem (Leiden, Netherlands)
- 14.10 The soft tissues masses : US, specific contrast medium software and comparative histology. Last 2 year's experience
A de Marchi, S. Pozza, *O Bottinelli, P de Petro, A Linari, C Faletti, (Torino, Italy, *Pavia, Italy)
- 14.20 The spectrum and prevalence of MRI findings in groin injury as detected by focused groin MRI
F Alyas, *S L J James, D Connell, J Gilmore, S Marsh (London, UK, * Birmingham, UK)

- 14.30 Imaging Evaluation Criteria for Muscles at Lower Limb Lengthening
G V Diachkova, M F Korabelnikov, K A Diachkov (Kurgan, Russian Federation)
- 14.40 In Vivo MR Tractography of thigh muscles using diffusion imaging: preliminary results
C Khalil, J F Budzik , V Le Thuc, *D Chechin , A F Cotten, (Lille, France, * Suresnes, France)

Session 4- Friday June 1st – Room "Turgut Reis II – III " - Level 7

- 15.30 Intra-articular treatment with Hyaluronic Ac. under US- guidance in hip osteoarthritis. Personal experience in 41 patients with a medium-term follow-up
A Bini, C Fugazzola, L Callegari, G Sturniolo, A Spanò, E Genovese, G Angeretti, P Nicotera (Varese, Italy)
- 15.40 US-guided hip viscosupplementation and rehabilitative therapy of coxarthrosis
LM Sconfienza, E Silvestri, G Garlaschi, M Falchi, A Muda (Genova, Italy)
- 15.50 US-guided arthro MRI of the hip: a new technique
F Lacelli, E Silvestri, G Garlaschi, LM Sconfienza, L Saitta, D Schettini (Genova, Italy)
- 16.00 US-guided percutaneous 'washing' treatment of rotator cuff calcifications
F Lacelli, E Silvestri, G Garlaschi, M Falchi, *G Serafini, A Muda (Genova, Italy, *Pietra Ligure, Italy)
- 16.10 US-guided percutaneous steroid treatment of subacromial-subdeltoid bursitis
LM Sconfienza, E Silvestri, G Garlaschi, D Schettini, A Muda, M Chiara (Genova, Italy)
- 16.20 Double-blind trial of ultrasound-guided steroid injections for Morton's neuroma
I Beggs; (Edinburgh, UK)

- 16.30 US-guided Percutaneous Treatment Of Plantar Fasciitis
LM Sconfienza, E Silvestri, G Garlaschi, MFalchi, S Pucci, G Minetti (Genova, Italy)
- 16.40 US - Guided removal of soft tissues foreign bodies: personal experience
A Leonardi, A Bini, C Sabato, C Fugazzola, D Mariani, L Callegari, E Genovese, P Nicotera (Varese, Italy)
- 16.50 Chronic post-traumatic osteomyelitis of the appendicular skeleton in adults: Imaging on gray-scale and color Doppler ultrasonography.
O Papakonstantinou, A Gouliamos, N Kelekis, A Balanika, C Kontopoulou, A Kelekis, M Mademli, E Brountzos (Athens, Greece)

Session 5 - Friday June 1st – Room “Çaka Bey” – Level 2

- 15.30 Evaluation of the Anterior Cruciate Ligament of the Knee: Comparison between flexed and extended Knee Position during MR Imaging
*C Muhle, C Diecke (Kiel, Germany, * Vechta, Germany)
- 15.40 Transient osteoporosis of the knee: Can MRI predict outcome?
N I Skoulikaris, A H Karantanos, I Nikolakopoulos, E Apostolaki, *T Karachalios, N Gourtsoyiannis (Iraklion, Greece, * Larissa, Greece)
- 15.50 Revisiting Semimembranosus Tendinopathy: common but overlooked cause of medial knee pain
*S P Suresh , J Bell, D Connell (London, UK, * Plymouth, UK)
- 16.00 Osteoarthritis of the knee: inflammatory signs in cartilage, entheses and ligaments at MR imaging
N Egund, A Joergensen, K Stengaard-Pedersen (Aarhus, Denmark)
- 16.10 Insertional tendinopathy: a comparison between conventional power Doppler, new technologies (e-flow) and MR
*O Bottinelli, G Regis, S Pozza, A de Marchi, C Faletti (Torino, Italy, * Pavia, Italy)
- 16.20 Value of Real-time sonoelastography in patients with painful Achilles tendons and healthy volunteers
A S Klauser, S Mlekusch, T de Zordo, V Smekal, C Dejacco, C Hoser, C Fink, M Reindl (Innsbruck, Austria)

- 16.30 Ultrasound screening of professional basketball players, preliminary results
J Gielen, J Stappers, **A van der Stappen, P Viroux, K Mertens, *F M Vanhoenacker (Antwerp, Belgium, *Duffel-Antwerp, Belgium, **Brussels, Belgium)

Session 6 - Saturday June 2nd – Room “Çaka Bey” – Level 2

- 08.30 16-Slice MDCT Arthrography of the Shoulder: Diagnostic Accuracy for Detection of Glenoid Labral and Rotator Cuff Tears
S K Juhng, G D Kim, H W Kim, *S Lee, H J Kim (Wonkwang, Republic of Korea, * Seoul, Republic of Korea)
- 08.40 Lateral Acromial Angle Measurement and Low Angles coincidence on Shoulder Impingement
M Bankaoglu, E Derin Cicek, C Edrisi, M Ertürk, M Basak (Istanbul, Turkey)
- 08.50 Clinical and MRI evaluation of open rotator cuff repairs
N Tarhan, E Cerci, H Demirors, A M Agildere, R Tandogan (Ankara, Turkey)
- 09.00 Risk factors of hip dislocation after primary total hip replacement (THR) – clinical and radiological analysis.
P Likums, P Studers, K Krastins, M Zambrans (Riga, Latvia)
- 09.10 Diffusion tensor imaging and tractography of the median nerve in carpal tunnel syndrome
C Khalil, C Hancart, V Le Thuc, J F Budzik, *D Chechin, A F Cotten (Lille, France, * Suresnes, France)
- 09.20 MR Imaging of Achilles Tendon Repair
A Heuck, B Sommer, J Scheidler (Munich, Germany)

Session 7 - Saturday June 2nd – Room “Turgut Reis II -III” – Level 7

- 10.30 Whole Body MRI: a potential role in the detection of multicentric osteonecrosis?
JM Elliott, *S Eustace, H Cairns, D H.J. Mawhinney, D G.R. Gracey (Belfast, UK, * Dublin, Ireland)

- 10.40 Whole-body-MRI versus Whole-body-MDCT for the staging of patients with multiple myeloma
A Baur-Melnyk, S Buhmann, R Duerr, C Becker, M Reiser (Munich, Germany)
- 10.50 PET CT in the staging of multiple myeloma: Correlation with disease activity and treatment response
C Shortt, K Breen, P O'Gorman, M O'Connell, S Eustace (Dublin, Ireland)
- 11.00 Different reconstruction modalities of multidetector-row CT in the evaluation of fractures in orthopedic patients
C R Krestan, S Nemeč, M Gruber, C Czerny (Vienna, Austria)
- 11.10 Biomarkers as predictors for MRI abnormalities?
R Sharma, P R Kornaat, M Kloppenburg, I Watt (Leiden, Netherlands)
- 11.20 Navigation system for interventional CT-guided procedures: First phantom and clinical experience
P Amarteifio, M Meier-Meitinger, U Baum, N Markus, K Willi, B Werner (Erlangen, Germany)
- 11.30 Is percutaneous perineural steroid injection effective in the palliation of persistent rhizitic pain?
A Kozadinos, V Souftas, T Birbilis, P Prassopoulos (Alexandroupolis, Greece)
- 11.40 Cervical Clearance Radiation Doses & Cancer Induction
P Richards, R Summerfield (Stoke on Trent, UK)

Session 8 - Saturday June 2nd – Room “Çaka Bey” – Level 2

- 10.30 The Significance of Epidural Varicose Veins Detected on MRI Scan in Patients with Spinal Stenosis
H Obaid, D Finlay, Z Husamaldin (Leicester, UK)

- 10.40 Degenerative Lumbar Spinal Stenosis: Correlation of Oswestry Disability Index and MRI
M Sirvanci, M Bhatia, K A Ganiyusufoglu, C Duran, M Tezer, C Ozturk, M Aydogan, A Hamzaoglu (Istanbul, Turkey)
- 10.50 Degenerative changes of posterior stabilizing elements in individuals complaining of Low Back Pain visualized using STIR Sequence
H Lakadamyali , N C Tarhan, T Ergun, B Cakir, *M Karatas, A M Agildere (Alanya, Ankara, Turkey)
- 11.00 MRI findings in the lumbar spine of asymptomatic adolescent/ young tennis players
F Alyas, M Turner, D Connell (London, UK)
- 11.10 Iron overload of vertebral bone marrow in beta-thalassemia major: imaging findings and correlation of R2 relaxation rate values with iron stores
O Papakonstantinou, E Alexopoulou, K Foufa, A Gouliamos, N Kelekis, N Economopoulos (Athens, Greece)
- 11.20 Quantitative detection of vertebral fracture on DXA images using Active Shape (ASM) and Appearance Models (AAM)
JE Adams, MG Roberts, E M.B. Pacheco, TF Cootes (Manchester, UK)
- 11.30 Potential MRI-pitfalls when reporting cervical trauma patients
E J Ulbrich, M Sturzenegger, A Busato, C Boesch, B Saar, H M Bonel, H Zimmermann, *J Hodler, S E Anderson (Bern, Switzerland, * Zurich, Switzerland)
- 11.40 CT guided transforaminal cervical nerve root block: Is an injection of steroid alone as effective as a combination of local anaesthetic and steroid?
*S P Suresh ,**S L J James, ***H Jones, ****David Connell (*Plymouth, UK, ** Birmingham, UK, *** Surrey, UK, **** London, UK)

Scientific Session 1

Chairs: A.G. Jurik (Denmark) and M. Manisalı (Turkey)

Antibodies against citrullinated vimentin in rheumatoid arthritis: Higher sensitivity and extended prognostic value concerning future radiological progression as compared to antibodies against CCP

M C Wick*, L Mathsson**, M Mullazehi**, O Sjöberg**, R F vonVollenhoven***, L Klareskog**, J Rvanelid**(*Innsbruck, Austria, **Upsala, ***Stockholm, Sweden)

Room "Çaka Bey" – Level 2 – Friday June 1st – 10:30-10:40

Purpose / Introduction: The Sa autoantigen can be found in inflamed rheumatoid arthritis (RA) synovium, and at least part of the humoral RA-specific anti-Sa response is directed against citrullinated vimentin. We have evaluated the sensitivity, specificity and prognostic value of determination of antibodies against citrullinated vimentin (anti-MCV) as compared to antibodies against cyclic citrullinated peptides (anti-CCP) in an early RA inception cohort.

Materials and Methods: 273 early RA patients were followed with clinical investigations, radiographs and measurement of anti-MCV and anti-CCP antibodies at baseline and after three months, 1, 2, 3 and 5 years. Autoantibodies were also analyzed in 100 healthy controls.

Results: 70.7% (193/273) of the patients were anti-MCV positive and 57.9% (158/273) were anti-CCP positive at the time of diagnosis, with equal specificities (95% and 96%, respectively). 14.7% (40/273) were anti-MCV positive only and 1.8 % (5/273) were anti-CCP positive only. Anti-MCV positive and negative patients had similar disease activities at baseline, but presence of anti-MCV was predictive of subsequent high disease activity and continued radiological progression. Changes in anti-MCV showed stronger correlation to changes in clinical parameters than changes in anti-CCP. The anti-MCV-positive, anti-CCP-negative subgroup showed a higher rate of radiological destruction as compared to patients negative for both anti-MCV and anti-CCP.

Discussion / Conclusion: When comparing early RA patients and healthy controls, analysis of anti-MCV yields a greater sensitivity together with unchanged specificity as compared to anti-CCP. As compared to anti-CCP, anti-MCV also defines an extended group of early RA patients with poor radiological prognosis.

Dynamic contrast enhanced MRI of rheumatoid arthritis shows early changes due to anti-TNFalpha therapy *

R.S.D. Campbell, R Hodgson, S Connolly*, T Barnes, B Eyes, V Adams, R Moots (Liverpool, UK, *St. Helens, UK)

Room "Çaka Bey" – Level 2 - Friday June 1st – 10:40-10:50

Purpose / Introduction: Dynamic contrast enhanced (DCE) MRI allows assessment of the inflamed synovium in rheumatoid arthritis. The relative early enhancement rate (RER) is sensitive to synovial vascularity and capillary permeability and is therefore expected to be a good marker of inflammatory activity. Anti-TNFalpha drugs have a rapid effect on rheumatoid arthritis clinically, but long-term benefit can only be assessed after 3 months. The aim of this work was to determine whether DCE-MRI can detect an early response in the synovial enhancement after treatment, and how this related to clinical outcome.

Materials and Methods: 10 patients with active, longstanding rheumatoid arthritis were imaged twice before and at 1,2,4, and 13 weeks after anti-TNFalpha treatment. Imaging was performed at 3T using a close-fitting radiofrequency coil to cover the wrist and mcp joints of one side. A 3D FLASH 4.5/2.0/30 sequence was used for the dynamic imaging giving a voxel size of 1.0x0.8x0.8mm in 13 seconds. 24 sequential images were acquired before, during and after bolus administration of 0.1 mmol/kg Gd-DOTA. The inflamed synovium was outlined manually and the RER calculated over the first 26 seconds after contrast administration. Significant reductions from pre-treatment values were tested using the Wilcoxon matched-pairs, signed-rank test with Bonferroni correction. Clinical outcome was assessed at 13 weeks using the Disease Activity Score. Significant correlations between RER and clinical outcome were tested for.

Results: There was a significant decrease in RER at all times from 1 - 13 weeks after treatment. However while the RER reduction at 13 weeks correlated with the clinical outcome, the RER at earlier time points did not. Some patients showed a good initial response to anti-TNFalpha therapy but the RER relapsed later.

Discussion / Conclusion: DCE-MRI can detect a response in the RER after just 1 week of anti-TNFalpha therapy. However this does not reliably predict clinical outcome at 3 months.

Impact of Sonography in Gouty Arthritis: Comparison with Conventional Radiography, Clinical Examination, and Laboratory Findings

C Schueller-Weidekamm, M Aringer, G Schueller, F M Kainberger (Vienna, Austria)

Room "Çaka Bey" – Level 2 – Friday June 1st – 10:50-11:00

Purpose / Introduction: To explore the typical sonographic features of gray-scale and Power Doppler of acute and chronic gouty arthritis in conjunction with radiographic, clinical, and laboratory findings.

Materials and Methods: All hand, finger, and toe joints of 19 patients with acute and chronic gout were examined with gray-scale and Power Doppler sonography. The number and size of bone changes detected with sonography was compared to radiographic findings. Vascularization of the synovial tissue was scored on Power Doppler (grades 0-3), and was compared with clinical appearance, including swelling, tenderness, and redness (grades 0-3).

Results: In acute gout, mild to moderate echogenic periarticular nodules with sonotransmission and hypervascularization of the edematous surrounding soft tissue were found. In chronic gout, tophaceous nodules completely blocked transmission of US wave, leading to strong reflexion and dorsal shadowing in a minority of cases. No significant difference in the detection of large bone changes (>2mm) was found between sonography and radiography. However, gray-scale sonography was significantly more sensitive in the detection of small bone changes ($p < 0.001$). Power Doppler scores were statistically significantly higher than clinical examination scores ($p < 0.001$).

Discussion / Conclusion: Sonography is superior to radiographs in evaluating small bone changes. The inflammatory process in joints can be better detected with Power Doppler sonography than with clinical examination. Typical sonographic appearance of acute and in particular of chronic gout might provide clues on gouty arthritis that adds to the information available from conventional radiography, clinical, and laboratory findings.

Whole body MRI in psoriatic arthritis – development of an imaging protocol and evaluation in 25 patients

S Weckbach, H Michaely, S Schewe, M Reiser, C Glaser (Munich, Germany)

Room "Çaka Bey" – Level 2 - Friday June 1st – 11:00-11:10

Purpose / Introduction: In psoriatic arthritis multiple locations of the body may show inflammatory changes. However, clinical exam is very difficult. Since it is very important to have an accurate tool to monitor disease extent and activity as well as therapy success, especially considering cost-intensive TNF-alpha-inhibitors, the purpose of the study was to implement an MRI protocol for whole body imaging of psoriatic arthritis, test it for feasibility and assess the additional value compared to clinical examinations as initial results.

Materials and Methods: An imaging protocol was developed on a 1.5 T whole body scanner (Magnetom Avanto, Siemens Medical Solution) using coronal STIR-sequences of the shoulders, ribs, the sternum, pelvis, hips, SI-joints, knees, ankles, feet and hands. The hands were positioned lying upon the pelvis and covered by an additional coil. Sagittal STIR-images of the whole spine were acquired. Secondly, native VIBE-sequences of the same anatomical regions were performed. After that, a contrast enhanced time-resolved sequence of the most painful area ('signal area') was acquired. Finally, contrast enhanced VIBE-sequences were performed and the native data sets were subtracted from these images (Imaging matrix 384 x 384, slice thickness 3mm, total imaging time 60 min). 25 patients with diffuse pain at multiple sites and elevated inflammation parameters under standard basic therapy were examined. The MR images were evaluated by two experienced readers in a consensus reading assessing image quality and pathological findings (bone marrow edema, effusion, synovitis, enthesitis, bursitis and osseous destructions). Clinical exam was performed by an experienced rheumatologist. Clinician and radiologists were blinded for their respective findings.

Results: Imaging quality was rated excellent in 22 of 25 patients. In 3 patients the hands and feet were assigned poor image quality with major artifacts. By MRI, significantly more joints with synovitis and regions with enthesitis were detected than by clinical exam except for the hands and feet.

Discussion / Conclusion: By a specific imaging protocol, an examination of almost all major joints / affected regions in psoriatic arthritis could be achieved with very good image quality and reasonable imaging time. MRI was more sensitive in assessing synovitis and enthesitis than clinical exam except for the

hands and feet, which in some patients showed an impaired image quality. Whole body MRI with contrast media may become a valuable tool for the diagnostic process in psoriatic arthritis as well as for initiation and monitoring of therapy.

Evaluation of Infliximab induced therapeutic response in rheumatoid synovitis: correlation between US contrast medium quantification and histology

*O Bottinelli, A de Marchi, P Clerico, C Faletti (Torino, Italy, * Pavia, Italy)

Room "Çaka Bey" – Level 2 - Friday June 1st – 11:10-11:20

Purpose / Introduction: The aim of the study is to assess the value of a parametric software, compared to the histological findings, in the evaluation of Infliximab induced therapeutic response in patients affected by rheumatoid synovitis. New pharmacological therapies, based on TNF-alpha-blocker infusion, require the use of a functional imaging able to quantify any micro-vascularity changes; US contrast, as a true blood pool, is the better choice imaging technique in the evaluation not only of the vascular volume changes, but also of the synovial therapy response.

Materials and Methods: For this purpose we enroll for the study a group of 36 patients with rheumatoid synovitis involving medium-large joints; all patients were preliminary imaged using US contrast medium (Sonovue, Bracco, Italy) with small part linear probe associated with contrast specific mode. After contrast infusion at baseline, at 4 and 72 hours post-treatment, quantification studies were performed using an off-line software that provides mapping of the microvascular blood volume. A controlled group of this patients was also submitted to MRI , in the same session of the US examination, before and after Infliximab infusion.

Results: All subjects improved after treatment, as confirmed both by clinical and histological findings. Indeed a significant reduction in vascular volume and perfusion was observed as early as 4 hours after the administration of Infliximab single dose.

Discussion / Conclusion: US contrast associated with parametric imaging is a promising technique for early evaluation of the therapeutical response in subjects affected by rheumatoid synovitis involving large joints, because it is able in both detect and monitor Infliximab therapy induced responses and flow modulation.

Contrast Enhanced grey- scale Sonography: Assessment of Joint Vascularity in therapy follow up of Rheumatoid Arthritis

A S Klauser, E Mur, S Mlekusch, R Arora, M Gabl, J Gruber, G Feuchtner, D ZurNedden (Innsbruck,Austria)

Room "Çaka Bey" – Level 2 - Friday June 1st – 11:20-11:30

Purpose / Introduction: To assess the value of contrast enhanced grey- scale ultrasound (CEUS) in detection of vascularity in joints of patients with rheumatoid arthritis (RA) before and after intraarticular corticosteroid injection.

Materials and Methods: We assessed 35 clinically active joints in 35 patients (14 men, 21 women; mean age 45 ± 12 years) with the diagnosis of RA. CEUS, using a low mechanical index US equipment (MPX Technos, LA532E, Esaote, Genova, Italy), was performed by a bolus administration of the contrast agent SonoVue® (Bracco, Milan, Italy). Quantitative estimation of joint vascularity was performed by calculation of time-intensity curves. Follow up examinations were carried out 3 weeks after treatment.

Results: High peak enhancement was found before therapy in 35/35 joints, whereas after therapy a decreased enhancement with low plateau enhancement characteristics could be seen in 9/35 joints and no enhancement at all in 26/35 joints. Enhancement of the calculated time-intensity curves differed significantly before and after therapy at follow up ($p < 0.001$).

Discussion / Conclusion: CEUS is sensitive to the presence of joint vascularity associated with RA, and useful in determination of vascularity decrease after therapy. Therefore this technique seems to have the potential of a sensitive monitoring of therapeutic response in patient with RA on the microvascular level. This could be further helpful for therapeutic follow up of new treatment regimes in RA pts.

Enteropathic osteoarthropathy: HRCT and MDCT imaging

A Mester, G Toth, P N Kaposi, S Forgacs (Budapest, Hungary)

Room "Çaka Bey" – Level 2 - Friday June 1st – 11:30-11:40

Purpose / Introduction: Enteropathic arthritis related erosive and/or calcifying sacroiliitis and vertebral facet joint arthritis can earlier and safer be detected if using high resolution CT (HRCT) versus plain film radiography. While radiation exposure is increased in case of CT a dose reduction requirement is actual field

of clinical research. Purpose of the study was to develop dose reducing enteropathic arthritis HRCT imaging.

Materials and Methods: Patients with a suspicion of inflammatory bowel diseases (IBD) were investigated using nasogastric tube insertion based jejunal filling CT-enteroklysis. The multidetector CT (MDCT) thin slice raw data were used for workstation based post-processing with edge enhanced "bone-algorithm" image reconstruction. Additional multiplanar (MPR) reconstructions were used as well.

Results: Detection rate of sacroiliac and of vertebral facet joint erosions, sacroiliac and facet joint subchondral and ligamental-capsular calcifications were compared with earlier detection rate using single slice crosssectional HRCT. In 34% of IBD patients one or more lesions were detected using MDCT versus 33% of single slice crosssectional HRCT.

Discussion / Conclusion: Radiation dose in bone scan has acceptable radiation dose (3.6 mSv), smaller than lumbar spine X-ray films (2,4mSv) plus pelvic (1,4mSv) plus thoracic plus cervical X-ray. Abdominal CT (7,5mSv) is required in general to confirm IBD. Detection rate of enteropathic arthritis by thin slice volume acquisition MDCT was not significantly higher versus crosssectional HRCT, but the similar diagnostic value without additional radiation - using the enteroklysis raw data - were dose saving.

A new spondylarthropathy scoring system based on MRI

A G Jurik, K B Madsen, B Schiøttz-Christensen, N Egdud (Aarhus, Denmark)
Room "Çaka Bey" – Level 2 - Friday June 1st – 11:40-11:50

Purpose / Introduction: Classifications for spondylarthropathies are still based on clinical findings established by the European Spondylarthropathy Study Group in 1991(ESSG criteria) and signs of sacroiliitis at conventional radiography. When changes are detected at radiographs there is permanent bone or joint damage. At Magnetic Resonance Imaging (MRI) early reversible changes can be detected as well as chronic and irreversible changes. MRI shows signs of active inflammation not visualized by other methods. It is necessary to establish a valid grading system to monitor inflammatory as well as chronic changes.

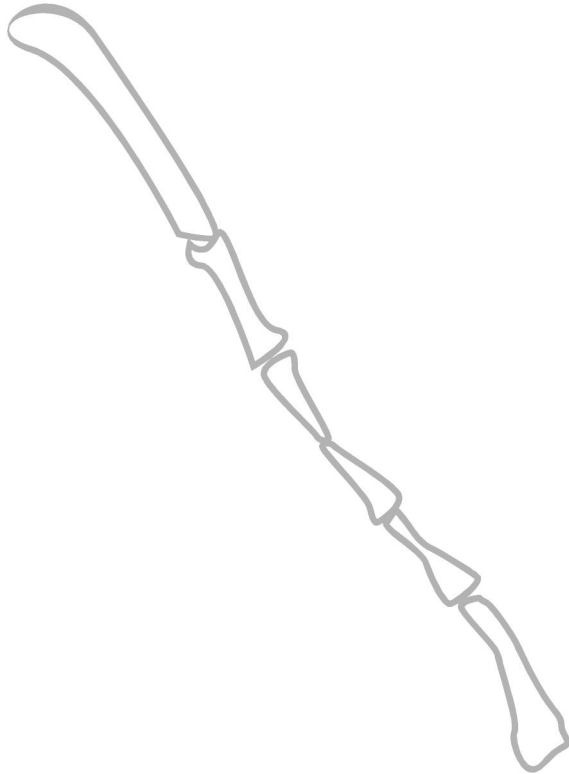
Materials and Methods: The authors have developed a new MRI scoring system for sacroiliitis including assessment of osseous changes in 4 positions at each

joint (iliac and sacral site of both the cartilaginous and ligamentous portion of joints). The assessed abnormalities comprise signs of activity in the form of oedema at STIR and contrast enhancement, and chronic changes consisting of erosion and fatty bone marrow changes. All abnormalities were graded and assembled to a final total score value. The maximal total activity and chronic score for a patient was 56 and 88, respectively. The validity of the scoring system was tested on 40 patients fulfilling the ESSG criteria. The following MRI sequences were used: Semi-axial short tau inversion recovery (STIR), semi-coronal T1 and T1 with fat saturation (FS), and after intravenous administration of Gadolinium, semi-coronal and semi-axial T1 FS. One senior and one junior radiologist assessed the MR examinations of the sacroiliac joints independently.

Results: The mean activity scores were 6.63 (with a 95% confident interval (CI) of 4.57-8.68) and 6.29 (CI: 3.95-8.63) for the senior and junior evaluator, respectively, with an agreement corresponding to a kappa value of 0.77. The two mean scores comprise 11.84% and 11.23% of the maximal activity score. The ranges for activity scores were 0-20.5 and 0-23 for the senior and junior evaluator, respectively. The mean chronic scores were 13.47 (CI: 9.87-17.08) and 16.9 (CI: 13.01-20.79) with a kappa value of 0.75. These scores comprise 15.31% and 19.20% of the total chronic score. The ranges for chronic scores were 0-44 and 0-56 for the senior and junior evaluator, respectively.

Discussion / Conclusion: The new scoring system was found reliable for grading signs of activity and chronic changes of the sacroiliac joints. It has to be tested for sensitivity to change to confirm that it is usable for monitoring the disease during treatment, e.g. with anti-TNF agents.

NOTES



Scientific Session 2

Chairs: A. Klauser (Austria)

The role of ultrasonography in patients with radial nerve pathology. Comparison with Magnetic Resonance and Surgery *

C Bertocchi, S Colopi, R Adani, E Gallo, P Toricelli (Modena, Italy)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 13:30-13:40

Purpose / Introduction: To evaluate Ultrasonography (US) accuracy in identifying radial nerve(RN) morphology and related pathologies compared to Magnetic Resonance (MR).

Materials and Methods: 15 patients with NR paralysis (6 had expansive and 9 traumatic pathology) were examined with radiography, electromyography, US (Siemens-Sequoia; linear probe 10-15 MHz) and MR (Philips Intera 1,5 Tesla). Surgical evaluation was performed in 10 patients. US and MR parameters evaluated were: identification, thickness, integrity and structure of the RN.

Results: 5 patients had a spontaneous recovery of RN paralysis. In the remaining 10, US identified correctly RN morphology, thickness, structure and anatomical relationship, compared to surgical evaluation. RM was unable to identify the RN in 5 cases because of metallic material artefacts. In traumatic and expansive pathologies, mean RN thickness was 4,4 mm and 1,4 mm respectively; ecographic structure was ipoechoic with loss of the fasciculated normal pattern in traumatic lesions while normal in expansive ones.

Discussion / Conclusion: US and MR are both useful for the diagnosis of RN pathologies. US is a dynamic, comparative and brief examination, useful when metallic material obstacles MR evaluation. US, therefore, is also useful in planning surgery and in the follow up.

High Resolution Ultrasound In The Dynamic Assessment Of Plantar Plate *

F Lacelli, N Prato, L Alessandri, G Grillo, E Sivestri, G Garlaschi (Genova, Italy)

Room "Turgut Reis II-III" – Friday June 1st – 13:40-13:50

Purpose / Introduction: To describe the normal and pathologic appearance of the plantar plate, assessed with dynamic high resolution ultrasound (D-HRUS).

Materials and Methods: We used D-HRUS to study 18 patients (age range 38-71, mean age 56, 12 females, 6 males) presenting with a previous orthopaedic diagnosis of plantar plate tear. A MRI control was performed in all cases. Moreover, we performed D-HRUS on 5 healthy volunteers to determine the correct scanning technique of the plantar plate and to determine the correct dynamic manoeuvres that allow to depict the normal ultrasound anatomy of this structure .

Results: On ultrasound, the normal plantar plate is a triangular structure, with homogeneous echogenic appearance; it can be easily assessed with plantar longitudinal scan on the metatarsophalangeal joint (MTPJ) and passive flexion/extension of foot fingers. The dynamic scan allows to depict the relations among the plantar plate and the flexor tendons and the articular cartilage. In our study, D-HRUS has detected a plantar plate tear in 17/18 patients (12 on MTPJ II, 3 on MTPJ III, 2 on MTPJ II and III). They appear as small hypoechoic defects of the distal insertional fibres and can be divided into partial thickness (6 patients) and full thickness tears (11 patients) according to an incomplete or complete extension from articular to plantar side. In all patients, MRI confirmed the diagnosis of plantar plate rupture but in 8 cases we could not differentiate a partial from a full thickness tear.

Discussion / Conclusion: HR US allows to assess the plantar plate in detail and to detect its lesions. In particular, the dynamic analysis is able to differentiate partial from a full thickness tears.

Epicondylitis Lateralis Humeri: Value Of Contrast-Enhanced Sonography

A Loizides, S Ennemoser, W Judmaier, M Herold, E Mur, J Gruber, Rettenbacher (Innsbruck, Austria)

Room "Turgut Reis II-III" – Friday June 1st, 2007 – 13:50-14:00

Purpose / Introduction: To determine the value of contrast-enhanced ultrasound and to describe sonographic findings in diagnosis lateral epicondylitis of the elbow. Reference standards were clinical evaluation and MRI.

Materials and Methods: In a prospective study 17 patients (age: 32-76 years, mean of 52 years) with clinical suspicion of lateral epicondylitis underwent gray-scale ultrasound, color-Doppler and contrast-enhanced ultrasound on both elbows. Gray-scale ultrasound was performed at 14 MHz (8-14 MHz linear transducer), color-Doppler at 12 MHz (PRF:750Hz) and contrast ultrasound with a second generation contrast agent (Sonovue®) at a low mechanical index. 14

patients additionally underwent MR-imaging. The following ultrasound-criteria were examined: tendon-thickening, focal hypoechoic regions, diffuse heterogeneity, intratendinous calcification, adjacent bone irregularity, enthesophytes. The blood flow in the tendon and its surrounding area was examined with color-Doppler and contrast-enhanced ultrasound.

Results: When referring to clinical evaluation as goldstandard the sensitivity (95% CI) of grey-scale ultrasound was 82% (63-94), of color-Doppler 54% (34-72), of contrast ultrasound 84% (64-95) and of all ultrasound-modalities in combination 96% (80-100). When referring to MRI as goldstandard, the sensitivity of ultrasound was 100% (63-100). Comparing the 14 patients that had undergone both ultrasound and MRI examinations, ultrasound had a sensitivity of 90% and MRI 77% (reference standard: clinical evaluation).

Discussion / Conclusion: In our study contrast-enhanced ultrasound increased the sensitivity of sonography in diagnosing lateral epicondylitis. Sonography showed a higher sensitivity than MRI. In our opinion ultrasound can replace MRI in most patients. MRI should only be performed when ultrasound-results are inconclusive.

Value of an additional cross sectional area measurement of the Median nerve in Carpal Tunnel Syndrome patients compared to healthy volunteers assessed by Ultrasound

A S Klauser, E Mur, S Mlekusch, R Arora, M Gabl, J Gruber, M Schirmer, W Löscher (Innsbruck, Austria)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 14:00-14:10

Purpose / Introduction: The aim of the study is to compare 2 different cross-sectional area (CSA) measurements of the median nerve at the level of carpal tunnel and more proximal to assess individual nerve thickness in order to resolve the problem of different cut off values discussed in the literature.

Materials and Methods: Ninety wrists in 75 consecutive CTS pts and 40 wrists of 20 healthy volunteers underwent US examination (Siemens Acuson Sequoia, 15L8w). Difference between maximal CSA value obtained at the carpal tunnel (CSAc) minus CSA value obtained at the level of the pronator quadratus muscle at the distal forearm (CSAp) was calculated.

Results: Mean CSAc in pts was 13.83 mm² (\pm 3.58, range 9.0-34.1) compared

to healthy volunteers with $8.90 \text{ mm}^2 (\pm 1.12, \text{ range } 7.3\text{-}10.8)$ ($P < 0.01$). 18% of patients presented CSAc values in the range of healthy volunteers, but showed increased thickness of the median nerve at the carpal tunnel when compared to CSAp. Calculated difference of CSAc minus CSAp measurement in pts compared to healthy volunteers was statistically significant ($P < 0.0001$).

Discussion / Conclusion: Controversies on CSA cut-off values for CTS diagnosis exist. Median nerve thickness might be influenced due to hand physiognomies and body mass index. Based on our preliminary results, an additional CSA measurement at the distal forearm is helpful to diagnose nerve thickening at the carpal tunnel on an individual basis. This was especially helpful in 18 % of patients, presenting with values overlapping with them of healthy volunteers, which would have led therefore to a negative ultrasound result for the diagnosis of CTS.

A pilot study on nerve ultrasound in acromegaly

A Tagliafico, E Resmini, R Nizzo, F Bianchi, C Martinoli, D Ferone (Genova, Italy)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 14:10-14:20

Purpose / Introduction: Acromegalic patients may complain of sensory disturbances in their hands. The aim of this study was to examine nerves of acromegalic patients with ultrasound (US) and to determine whether nerve abnormalities in these patients correlate with clinical parameters and nerve conduction studies (NCS).

Materials and Methods: We prospectively examined the median and ulnar nerves in $n=34$ non-diabetic, acromegalic patients and $n=34$ age-matched controls with 17-5MHz US. The median nerve was examined at the carpal tunnel (MN-Ct) and at the mid-forearm (MN-f) level; the ulnar nerve at the mid-forearm (UN-f) and at distal arm (UN-a). A total of 272 nerve cross-sectional areas (CSA) were recorded from both patients and C. In addition, 22 patients underwent NCS of median and ulnar nerves.

Results: Nerves of acromegalic patients (MN-Ct = $16.5 \pm 4.4 \text{ mm}^2$; MN-f = $10.5 \pm 2.4 \text{ mm}^2$; UN-f = $9.5 \pm 3.0 \text{ mm}^2$; UN-a = $13.1 \pm 3.7 \text{ mm}^2$) had significantly ($p < 0.0001$) greater CSA compared to C (MN-Ct = $7.4 \pm 1.7 \text{ mm}^2$; MN-f = $5.5 \pm 1.4 \text{ mm}^2$; UN-f = $5.3 \pm 1.4 \text{ mm}^2$; UN-a = $6.6 \pm 1.7 \text{ mm}^2$). NCS displayed at least one abnormality in 13/22 (59%) patients. Acromegalic patients were grouped according to disease activity (13 controlled;

8 partially controlled; 13 uncontrolled) and medical therapy with somatostatin analogs (18 treated; 16 untreated). All these groups had significantly ($p < 0,0001$) greater CSA compared with C. Nerve CSA were significantly greater in uncontrolled patients compared to controlled, both at MN-Ct ($15.46 \pm 4.17 \text{ mm}^2$ vs. $18.41 \pm 4.14 \text{ mm}^2$; $p < 0.01$) and at UN-f ($12.34 \pm 2.77 \text{ mm}^2$ vs. $14.95 \pm 3.98 \text{ mm}^2$; $p < 0.01$) level. Abnormal NCS were observed in 5/7 uncontrolled patients and 4/9 controlled patients. No significant CSA difference was found between treated and untreated patients, although NCS abnormalities were more common in treated (10/12) than in untreated (3/9). A positive correlation between IGF-I values and CSA ($r = 0.34$) was present, no correlation with GH levels was present ($r = 0.03$). A positive correlation was found between disease duration and both nerve CSA and NCS ($r = 0.33$ and $r = 0.31$ respectively).

Discussion / Conclusion: US identified a significantly increased volume of median and ulnar nerves in acromegalic patients. This peripheral nerve enlargement in acromegaly seems to be an intrinsic feature of the disease and nerve swelling seems to be related to clinical control, disease duration and IGF-I levels.

Occult Dorsal Carpal Ganglia: Spectrum of Ultrasound Features

N Stagnaro, A Tagliafico, C Martinoli, E Capaccio, *S Bianchi (Genova, Italy, *Chene-Bougries, Switzerland)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 14:20-14:30

Purpose / Introduction: As cause of chronic wrist pain and functional disability, an occult dorsal carpal ganglion is a challenging clinical condition in which imaging may play an important role. The aim of this study is to describe the spectrum of US appearances in patients with occult dorsal carpal ganglia.

Materials and Methods: We prospectively examined $n=23$ wrists in $n=21$ consecutive patients with dorsal wrist pain suspected of having an occult dorsal carpal ganglion. MR imaging was performed in $n=5$ cases. Six patients underwent surgery.

Results: Eighteen ganglia were identified with US. All appeared as small-sized anechoic masses (mean size, 5,5mm) arising at the attachment of the dorsal wrist capsule to the dorsal aspect of the scapholunate ligament. Ganglia were located within the dorsal capsuloligamentous structures (6/18) or grew outside the ligaments (12/18) assuming a tadpole or lobulated appearance between

the II and IV compartments of the extensor tendons or deep to them. Ganglia confined within the dorsal ligaments were smaller and correlated with a higher pain score. In n=5 cases, ganglia emerged outside the ligaments in close apposition to the terminal branch of the posterior interosseous nerve. These ganglia had a higher pain score than those emerging from the ligaments far from the nerve.

Discussion / Conclusion: Given their small-size, occult dorsal carpal ganglia may be missed with MR imaging unless using volume acquisition or very thin contiguous slices. Conversely, US makes identification of the smallest ganglia confident and reliable. Because of its resolution capabilities and its lower cost, we believe that US should be the initial imaging procedure for suspected occult dorsal carpal ganglia.

Ultrasound and MR imaging of the Musculocutaneous Nerve

A Tagliafico, E Capaccio, N Pignataro, N Stagnaro, *S Bianchi, C Martinoli,
(Genova, Italy, * Chene-Bougries, Switzerland)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 14:30-14:40

Purpose / Introduction: To describe the potential use of US for evaluation of musculocutaneous nerve.

Materials and Methods: The anatomy of the musculocutaneous nerve and perineural structures was evaluated on 3 cadaveric limbs and correlated with the US images obtained in n=15 healthy subjects. Then, n=5 consecutive patients with loss of normal arm contour and inability to flex the supinated elbow suggesting dysfunction of the musculocutaneous nerve were evaluated using 17-5MHz and 12-5MHz broadband linear-array transducers. All patients had abnormal nerve conduction studies and underwent MR imaging on a 1.5T unit.

Results: One-to-one comparison between cadaveric specimens and US scans showed that the musculocutaneous nerve and its terminal branch (lateral cutaneous nerve of the forearm) can be reliably identified with US from the axilla through the forearm. US allowed detection of a wide spectrum of nerve abnormalities. Patients had a history of trauma (n=3), heavy exercise (n=1) and anesthetic block (n=1). In 3/5 cases, US demonstrated a fusiform stretching neuroma located between the long and short heads of the biceps or between the biceps and the coracobrachialis muscle. Another case showed focal swelling of some cords of the brachial plexus in the axillary region without detectable abnormalities in the musculocutaneous nerve. No nerve abnormality was

detected in one patient. Atrophy of the biceps and brachialis muscles was associated. Due to the small-size of the nerve and its out-of-plane course, US was superior to MR imaging to demonstrate musculocutaneous nerve abnormalities.

Discussion / Conclusion: US is promising for evaluating traumatic lesions of the musculocutaneous nerve. By providing unique information on the entire course of the musculocutaneous nerve, US has potential for major impact on treatment planning.

3D-Ultrasound of Congenital Clubfoot: preliminary results

E Capaccio, A Tagliafico, N Pignataro, B Damasio, * S Bianchi, C Martinoli,
(Genova, Italy, * Chene-Bougries, Switzerland)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 14:40-14:50

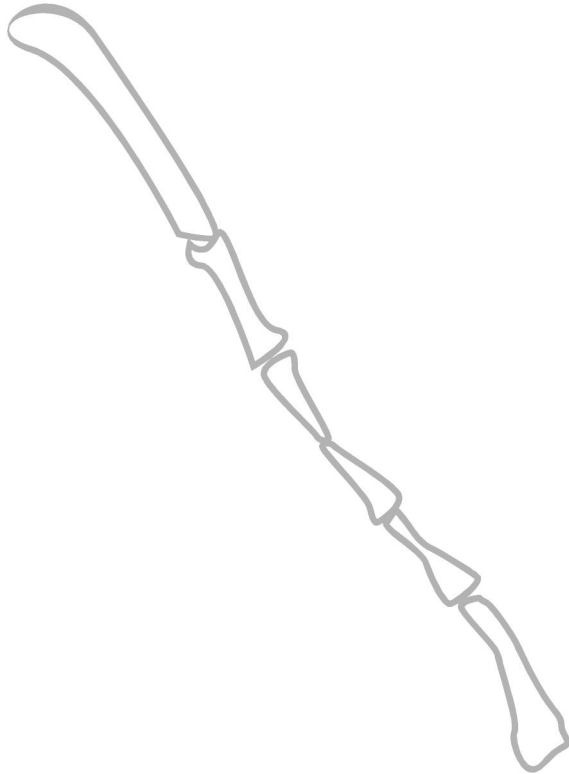
Purpose / Introduction: The aim of this study was to describe the potential use of high-frequency three-dimensional (3D) US for assessment of congenital clubfoot at birth and at the early phases of treatment.

Materials and Methods: A series of n=15 normal neonates and n=10 patients with congenital clubfoot were examined with high-frequency (16-6.8MHz) Volume Ultrasound to assess the talocalcaneal angle. Coronal MPR reconstructions of the long-axis of the calcaneus and talus were obtained with the probe placed in a water bath on the plantar aspect of the foot. The talocalcaneal angle was measured by the lines representing the estimated longitudinal axes of the two bones. The talus-first metatarsal angle was measured as well.

Results: Volume Ultrasound was reliable to reconstruct the talus and calcaneus on coronal planes parallel to the sole according to their long-axis. Both were characterized by a well-defined cartilaginous part and an ossification nucleus. The talocalcaneal angle was reliably measured in normal feet and clubfeet. It resulted significantly lower ($p<0.01$) in patients with clubfoot due to a higher degree of parallelism between the talus and calcaneus.

Discussion / Conclusion: In addition to the measurements and projections obtained with conventional US, Volume Ultrasound makes it possible to simply calculate the talocalcaneal angle as an additional parameter to evaluate bone misalignment in congenital clubfoot.

NOTES



Scientific Session 3

Chairs: S. Anderson (Australia) and S. Khan (UK)

Treatment of Osteoid Osteoma Using Percutaneous Radiofrequency Ablation and Alcohol Injection

M Fatehi, S Akhlaghpour, A Tomasian, AA Shabestari, M Ebrahimi, MR Alinaghizadeh (Tehran, Islamic republic of Iran)

Room "Çaka Bey" – Level 2 - Friday June 1st – 13:30-13:40

Purpose / Introduction: Treatment of osteoid osteoma using CT guided procedures including drill resection (with or without ethanol injection), laser photocoagulation and radiofrequency ablation have gradually become the preferred methods to manage this relatively common benign but disabling disease. We tried two methods for percutaneous treatment of osteoid osteoma one using only RF ablation and the other combining RF ablation with alcohol injection. The purpose of the study is to assess final outcome of these two methods and compare the results to find out added value of alcohol injection.

Materials and Methods: 99 patients diagnosed as typical osteoid osteoma cases by plain x-ray, CT and clinical findings were selected for percutaneous CT guided treatment. Spiral CT images were obtained for all patients using thin 2 mm sections in order to find the best entry point and course of the needles. The nidus was accessed through RF compatible 11 G coaxial needle where 2mm drill system made the tract through cortical bone. One centimeter active tip non-cooled RF needle was inserted into the nidus to cook it by 90 degrees heat for 6 minutes. For those patients being treated by combined method i.e. RF ablation followed by alcohol injection, 0.5-1 ml of 99.8% ethanol was injected into the nidus using 20 G needle after removal of RF needle. 54 patients were treated using combined method and 45 patients were treated by just RFA.

Results: The treatment was successful in 100% of cases in both methods. The follow up period ranged from 13 to 60 months. Minor complications were observed only in two patients including mild local cellulitis in the entry site and small zone paresthesia on anterior aspect of leg. The patients became pain free within one week after treatment in 77.8% of cases treated by combined method and in 93% of those treated by RF alone. Long-term follow up of the patients revealed recurrence of pain in three cases (2 in combined method and 1 in RF alone method). Thin section CT and radionuclide study demonstrated persistence of lesion at the site of treatment. Second attempt resulted in 100% success rate in treatment.

Discussion / Conclusion: Treatment of osteoid osteoma using percutaneous treatment methods have high primary and secondary success rates both in RFA alone and combined method using RFA and alcohol injection. Alcohol injection does not have any added value to treatment success, and even may cause longer period of post-operative pain.

Fluid/fluid levels in bone neoplasms: Relative signal intensity of the superior and inferior layer of fluid- diagnostic significance

F Alyas, A Saifuddin (London, UK)

Room "Çaka Bey" – Level 2 - Friday June 1st – 13:40-13:50

Purpose / Introduction: To describe the diagnostic relevance of relative signal intensity of the superior to inferior layer found in FFLs of bone tumours on MRI.

Materials and Methods: A retrospective analysis was performed in 2658 patients (1057 females, mean age 43.6 years \pm 20.1[S.D.]) presenting with a suspected bone tumour over an 8-year period. All underwent MRI and diagnosis by biopsy/surgical resection or on the basis of clinical/characteristic imaging findings. The patients were divided according to presence of FFLs (absent/present) and histology (benign/malignant). Cases with FFLs were sub-categorized by the relative signal intensity of the superior-to-inferior layer as high/low or low/high on T1W and T2W/STIR imaging, respectively.

Results: 207/2658 (7.8%) cases had FFLs and of these 148 had images available for review. 133 had T2W/STIR sequences available for review. All tumours showed high/low signal on this sequence. 91/133 (64.4%) were benign and 42/133 (35.6%) were malignant. 67 patients had T1W available for review. 41 showed low/high signal. 5/41 (12.2%) were malignant tumours and 36/41 (87.8%) were benign ($p < 0.05$ chi-squared). 26 showed high/low signal. 11/26 (42.3%) were malignant tumours (9 Osteosarcomas, 1 Malignant Fibrosis Histiocytoma, 1 Pleomorphic Sarcoma) and were 15/26 (57.7%) benign tumours (7 Aneurysmal bone Cysts (ABC), 3 Chondroblastomas, 3 Giant Cell Tumours, 1 Lipoma, 1 Fibrosis Dysplasia).

Discussion / Conclusion: All FFLs showed non-specifically high/low signal on T2/STIR. A significant proportion of benign tumours showed low/high signal on T1W compared to malignant. Conversely, high/low signal on T1W imaging occurred in both benign and malignant diseases most frequently in ABC and osteosarcomas.

Synovial sarcoma: detection of neoadjuvant therapy response with dynamic MR imaging *

G Duygulu, R Arkun, M Argin, T Akalin, Y Anacak, D Sabah (Izmir, Turkey)
Room "Çaka Bey" – Level 2 - Friday June 1st – 13:50-14:00

Purpose / Introduction: Synovial sarcoma accounts for 2.5-10.5% of all primary soft-tissue malignancies. Radiological findings which are seen either on plain film or MRI, are not enough to make correlation with histologic response to preoperative neoadjuvant therapy. In this study our aim was to discuss the MRI findings of synovial sarcoma and to show the value of dynamic MRI in detecting viable tumor and effect of neoadjuvant therapy before surgery in these patients.

Materials and Methods: Ten patients with histological evidence of synovial sarcoma and treated with neoadjuvant therapy and followed by limb sparing surgery were examined retrospectively with routine and dynamic MRI. MR studies were performed both before and after neoadjuvant therapy on a 1.5 T superconductive system. Regarding to conventional MRI findings of tumor, signal pattern, shape, size, borders, relationship with neurovascular bundles and bone invasion were evaluated. After i.v rapid administration of Gd-DTPA dynamic enhancement patterns were noted before and after neoadjuvant therapy. On dynamic subtraction images, the interval between arrival of the bolus of the contrast agent in an artery and start of the tumoral enhancement was used to distinguish residual viable tumor. MRI findings were compared with corresponding areas on histologic sections of the resected specimens.

Results: The median patient age was 27.9 years; the most common primary tumor site was lower extremity; and monophasic fibrous type was the predominant histology. Six of the ten tumors were 10 cm or greater at their largest diameters. Regarding to signal pattern, heterogenous appearance were seen on T1W and T2W images in 8 patients, cystic appearance in 2 patients and triple sign in 7 patients. Multilobulated appearance with intervening septa was observed in 6 patients in T2W images. There were neurovascular invasion in 2 patients and bone invasion in 1 patient. In dynamic MRI using with subtraction technique and time-signal intensity curve, eight patients were correctly classified as poor responders. In remaining two patients, as good responders with histopathology, could not be evaluated by dynamic MRI because of cystic nature of tumors. These tumors had no contrast enhancement and showed reduction in volume after neoadjuvant therapy.

Discussion / Conclusion: Dynamic MRI findings in patients with synovial sarcoma is helpful to choose surgery type and make planning for operation. However, final treatment protocols are still based on histopathological findings after surgery

Surveillance imaging of soft tissue sarcoma and aggressive fibromatosis

C S P van Rijswijk, M Geirnaerd, A Taminiau, F van Coevorden, P C W

Hogendoorn, JL Bloem (Leiden, Netherlands)

Room "Çaka Bey" – Level 2 - Friday June 1st – 14:00-14:10

Purpose / Introduction: To evaluate the effectiveness of magnetic resonance (MR) imaging and chest radiographs or computed tomography (CT) at standardized intervals in detecting local recurrence and metastases in patients with primary soft tissue sarcoma or aggressive fibromatosis.

Materials and Methods: Between March 1999 and March 2001, we prospectively included 69 patients (62 soft tissue sarcomas and 7 aggressive fibromatoses). Follow-up consisting of clinical assessment, chest radiographs or CT, and MR imaging was scheduled at 3 weeks, 3, 6, 12, 18 and 24 months after treatment. After two years, annual clinical assessment was scheduled. Minimal follow-up was at least five years in all patients. Excluded were 14 patients with locally irresectable tumors and 12 patients with diffuse metastatic disease at presentation. Two patients were lost from follow-up.

Results: Local and/or distant recurrence occurred in 18 of 41 (44%) patients. Twelve (29%) local recurrences (with synchronous pulmonary metastases in one patient) were detected at median time of 12 months after resection. Seven of the eight (88%) sarcoma recurrences were clinically apparent. One sarcoma recurrence and all four aggressive fibromatosis recurrences were clinically silent recurrences, and were only detected with MR. In seven of 36 (19%) patients with sarcoma, metastases were detected at median time of 3 months after resection. The one soft tissue metastasis was clinically symptomatic 5 months after resection of the primary tumor. The six patients with pulmonary metastases were asymptomatic and metastases were detected at scheduled chest radiograph or CT.

Discussion / Conclusion: Intensive follow-up MR imaging in patients with soft tissue sarcoma seems not to add to clinical assessment in detecting local recurrence. Routinely scheduled MR imaging, however, is essential in detecting local recurrence of aggressive fibromatosis. Pulmonary metastases of soft tissue

sarcoma are initially clinically silent and detected effectively with routine chest radiographs in a one to three months interval during the first year of follow-up.

The soft tissues masses: US, specific contrast medium software and comparative histology. Last 2 year's experience

A de Marchi, S. Pozza, *O Bottinelli, P de Petro, A Linari, C Faletti, (Torino, Italy, *Pavia, Italy)

Room "Çaka Bey" – Level 2 - Friday June 1st – 14:10-14:20

Purpose / Introduction: The aim of this study is to compare the results of US examinations carried out in combination with a second generation contrast medium and contrast specific mode, to the histological results, (considered "The Gold Standard").

Materials and Methods: After having given informed consent a total of 382 subjects with soft-tissue masses were enrolled into the study. The masses showed clinical signs and fundamental US patterns typical of both benign or malignant lesions and were located in various anatomical sites. The age of the patients ranged between 6y and 85y; 132 were male and 250 female. All subjects were examined by US and contrast medium with linear probe array equipped with contrast-specific mode (CnTI). US guided biopsies were taken for all subjects.

Results: Despite the heterogeneity of the sample population, which differed for age, anatomical site of the lesion and clinical history, it was observed that the diagnosis indicated by the evaluation with US and contrast medium, corresponded well to that of the histological results. Moreover, it was noted that the presence of the contrast medium was an essential element so as to be able to identify those zones, which were not to be considered suitable biopsy sites, due to the absence of vascularity, or when there was doubt as to the presence of necrosis.

Discussion / Conclusion: The particular characteristics of the II generation US contrast medium (true "blood pool"agents), used in association with contrast-specific mode, allow for the identification of the neo-angiogenesis that is associated with tumoural growth. Moreover, it has made for a positive modification in the role the US plays in this field, enhancing its properties, making it possible, not only to allow for a precise detection of the mass itself, but often also to depict its characteristics.

The spectrum and prevalence of MRI findings in groin injury as detected by focused groin MRI

F Alyas, *S L J James, D Connell, J Gilmore, S Marsh (London, UK, * Birmingham, UK)

Room "Çaka Bey" – Level 2 - Friday June 1st – 14:20-14:30

Purpose / Introduction: Groin pain is a common clinical presentation of the amateur and professional athlete. The spectrum of disease causing these symptoms can relate to degeneration of the symphysis pubis and injuries to the surrounding muscles, fascia and tendons, and these injuries include- Osteitis pubis, muscle strain, superficial inguinal insufficiency/ hernias. Such injuries are difficult to distinguish clinically, and radiological findings can be found in the asymptomatic and may commonly co-exist. This probably reflects the common pathophysiology, the density and complexity of the anatomy at this location, and overlap with normal age-related or physical-activity related changes. Our aim was to look at the prevalence and spectrum these findings using focused groin MRI in a large group of patients presenting to a single groin sports injury practice.

Materials and Methods: Prospective analysis was performed of MRI scans through the groin of 113 patients who presented with groin pain (37.8 +/- 11.1 years, 110 males, 3 females). Focused coronal oblique and axial oblique STIR and proton density images through the groin were performed. Images were reviewed by two radiologists for the presence and degree of: symphysis pubis joint degeneration (cortical irregularity, sclerosis, cyst formation), acruate complex thickening, symphyseal disc degeneration and extrusion, adductor longus and brevis origin thickening/undermining/partial tearing, pubic bone oedema, fatigue fractures of the pubic bones, and the presence of a hernia.

Results: 10/113 (8.4%) patients had no abnormality. 84/113 (74.3%) had symphyseal disc degeneration (49-mild, 24-moderate, 11-severe) and degeneration of the symphysis pubis (cortical irregularity-18, sclerosis-9, cyst formation-19). Of these, 43 had extrusion of the disc of which 19 caused undermining and 24 resulted in partial tear of the adductor longus origin. Additionally we found 19 patients with thickening of the acruate ligament. 91/113 (80.5%) had thickening of the adductor longus origin. Whereas 19/113 (16.8%) had inflammatory changes around the adductor brevis origin. 44/113 (38.9%) patients had pubic bone oedema (18-moderate grade, 26-mild grade, 20-unilateral, 24-bilateral). Of these 13 had fatigue fracture of the anterior inferior pubic body. 3/113 (2.7%) had hernias (2 sportsman, 1

inguinal).

Discussion / Conclusion: Patients presenting with groin pain commonly have associated changes identified on MRI, related to degeneration of the symphysis pubis and the complex of adjacent muscle attachments. The changes related to superficial inguinal ring insufficiency are less frequently identified. As these findings can be non-specific and their significance needs to be correlated with the clinical scenario.

Imaging Evaluation Criteria for Muscles at Lower Limb Lengthening

G V Diachkova, M F Korabelnikov, K A Diachkov (Kurgan, Russian Federation)
Room "Çaka Bey" – Level 2 - Friday June 1st – 14:30-14:40

Purpose / Introduction: Life-time morphological study of the muscles can currently be produced only with diagnostic imaging techniques.

Materials and Methods: Muscle changes were studied at limb lengthening of 75 patients with achondroplasia and short limbs of different aetiology using with magnetic resonance imaging (MRI), computed tomography (CT), radio-contrast imaging (RC), and ultrasonound (US).

Results: Evaluation criteria of muscles according to US. Continuous and well-defined differentiation of muscle bundles, preserved contraction reaction with C no less that 60% showed moderate changes in muscles. The absence (or minimal manifestations) of contraction reaction ($CT \leq 10\%$), discontinuity of muscle bundles, dedifferentiated structure appeared to be frank changes in muscles. Appearance of «matte» effect indicated to considerable muscular changes. Evaluation criteria of muscles according to contrast radiography Preserved sliding function of the muscle belly and differentiated muscular tissue indicated to moderate changes in muscles that failed to prevent surgical procedures on the limb and required no adjustments during lengthening. The absence of sliding function of the muscle belly, dedifferentiated structure and appearance of translucent portions in the muscle at the level of distractional regenerate bone indicated to frank changes in muscles that would require additional examinations when planning surgical procedure or making adjustments during lengthening. Increased contrast to the point of lost contexture and appearance of «sand glass» in muscle belly at the level of distractional regenerate bone indicated to considerable changes in muscles. The changes found at examination would result either in termination of lengthening procedure or a failure of the next stage of limb elongation. Evaluation criteria of

muscles according to computed tomography. Decrease of the muscle cross-section by 25% of the original area and muscular tissue density in the range of 68 ± 4 HU for anterior tibial muscle and at the limit of 50 ± 4 HU for the posterior group of tibial and femoral muscles indicated moderate changes in the muscles that made no contraindications to further lengthening or beginning the next stage of treatment. Decrease of the cross-section by 40% of the original area indicated considerable changes in muscles that prevented further lengthening procedure or the next stage of treatment.

Discussion / Conclusion: A variety of techniques used to examine muscles and the analysis of dynamic radiological and sonographic findings allowed us to develop evaluation criteria for muscles, their morphological and functional «availability» for lengthening, spare capacities of muscles for limb lengthening prior to the next stage of increasing a segment length.

In Vivo MR Tractography of thigh muscles using diffusion imaging: preliminary results

C Khalil, J F Budzik, V Le Thuc, *D Chechin, A F Cotton, (Lille, France, * Suresnes, France)

Room "Çaka Bey" – Level 2 - Friday June 1st – 14:40-14:50

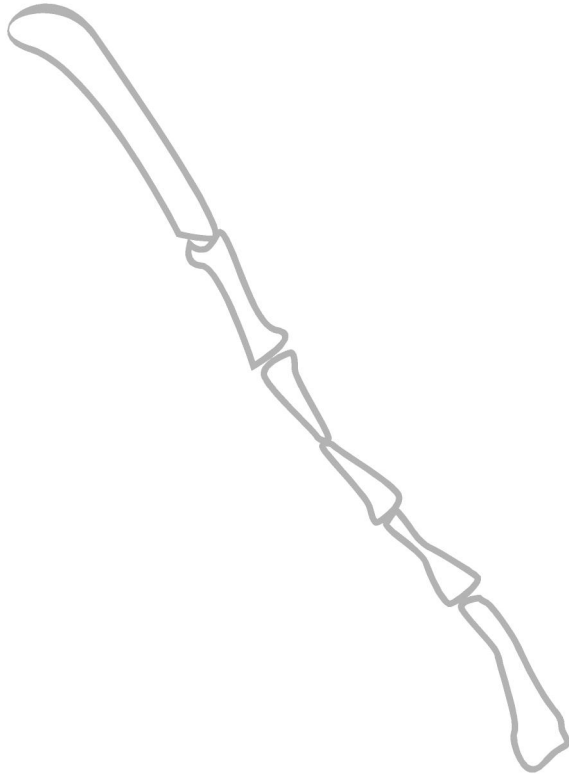
Purpose / Introduction: The aims of this preliminary study were (1) to demonstrate the feasibility of providing in vivo 3D architecture of human thigh muscles using tractography on a 1.5T magnet, and (2) to provide an easy way of obtaining microstructural parameters, Fractional Anisotropy (FA) and Apparent Diffusion Coefficient (ADC) of thigh muscles from tractography images.

Materials and Methods: Five healthy volunteers were included in this study. Their right thigh was imaged using diffusion tensor imaging and gradient echo T2 sequences. Muscular tractography was performed on each muscle.

Results: MR tractography provided a good approach of the muscle shape and of the orientation of the muscle fibers. FA values ranged from 0.27 to 0.38. ADC values ranged from 0.76 to $0.96 \times 10^{-3} \text{mm}^2/\text{second}$.

Discussion / Conclusion: Our study demonstrated the feasibility of providing in vivo 3D architecture of human thigh muscles using tractography on a 1.5T magnet, and muscular microstructural parameters (FA and ADC). Musculoskeletal radiologists should be aware of these new developments that may provide complementary information on muscles to the usual sequences.

NOTES



Scientific Session 4

Chairs: S. Ostlere (UK) and M. Reijnen (Netherlands)

Intra-articular treatment with Hyaluronic Ac. under US- guidance in hip osteoarthritis. Personal experience in 41 patients with a medium-term follow-up

A. Bini, C Fugazzola, L Callegari, G Sturniolo, A Spanò, E Genovese, G Angeretti, P Nicotera (Varese, Italy)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st - 15:30-15:40

Purpose / Introduction: Hyaluronic acid (HA) is widely used for intra-articular treatment of knee osteoarthritis (OA). We examined the effects of HA in intra-articular treatment of hip OA.

Materials and Methods: We enrolled 41 patients ranged 35-70 years affected by symptomatic Hip OA including "young" patients with congenital displasia and femoral valgism. All patients were clinically and radiologically evaluated and treated with a cycle of 3-5 intraarticular injections, one injection a week, of local anesthetic and Hyaluronic Ac.(medium-low molecular weight). The injection was performed under ultrasound guidance with an antero-inferior approach using a 22G spinal needle previous superficial skin anesthesia. Treatment efficacy was assessed through Harris Hip Score, visual analogue scale (VAS) pain quantification, and radiological Kellgren-Lawrence Scale at the timepoint zero (baseline) and after 12 months.

Results: We observed a significant improvement of all considered parameters at 12 months and a significant delay in undergoing surgical treatment. No side effects were observed, nor systemic complications.

Discussion / Conclusion: Viscosupplementation is a conservative, well tolerated, easy managing and safe treatment for hip OA. There aren't many publications on hip treatment but referring to knee literature and our experience we can expect: therapeutic effects in onsetting arthritis with partial regression of the pathology; a delay in surgical intervention ("young" patients) in advanced pathology; an improvement of life quality in non surgical candidate old patients and in those on waiting list.

US-guided hip viscosupplementation and rehabilitative therapy of coxarthrosis
LM Sconfienza, E Silvestri, G Garlaschi, M Falchi, A Muda (Genova, Italy)
Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 15:40-15:50

Purpose / Introduction: To describe our experience on US-guided viscosupplementation treatment of the hip associated with the rehabilitation.

Materials and Methods: In co-operation with the Physical Therapy Department, we have treated 49 patients suffering from coxarthrosis and selected according both to clinical and radiologic criteria (more than 40 years-old, grade II-III Kellgren-Lawrence, Lequesne index, VAS and frequent NSAIDs consumption). We have excluded patient treated with anticoagulant therapy, with a previous intrarticular steroid injection, with a complete disappearance of intrarticular space, and suffering from any other rheumatic pathologies or allergic to any bird proteins. The injection is performed by two operators with a 20G spinal needle, through a bioptic guide on a convex 3.5 MHz transducer. The patient is supine and the injection is performed with an anterosuperior access. We used a high molecular weight hyaluronic acid only in patients presenting with a severe arthrosis (grade III).

Results: After 3 months, in 30/49 patients we observed a consistent reduction of symptoms and an increase of their articular mobility; in 10/49 patients we observed a partial decrease of symptoms but a reduction of NSAIDs consumption; in 9/49 patients we did not observe any improvement of the clinical condition. All patients have been followed-up by the Physical Therapy Department where they could even undergo a rehabilitation and a new intrarticular injection, if needed.

Discussion / Conclusion: Thanks to the precision of US guidance, hip viscosupplementation in conjunction with the rehabilitation is effective to improve the functional and clinical outcome in patients suffering from coxarthrosis.

US-guided arthro MRI of the hip: a new technique
F Lacelli, E Silvestri, G Garlaschi, LM Sconfienza, L Saitta, D Schettini (Genova, Italy)
Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 15:50-16:00

Purpose / Introduction: To describe a new ultrasound-guided technique for the injection of paramagnetic contrast media in the hip joint.

Materials and Methods: We performed arthroMRI of the hip joint on 11 patients affected by different pathologies. The injection of paramagnetic contrast media was made using an ultrasound equipment with a linear transducer and without any guide for the needle. The injection was performed on an anterior parasagittal plane, lateral to the femoral vessels, with the transducer oriented along the major axis of the femoral neck. We used a 20 G spinal needle, with an anterosuperior approach, orienting the needle itself to the articular cavity in correspondence of the femoral head. A small amount of local anesthetic was injected when introducing the needle. The introduction of paramagnetic contrast media in the articular space was easily demonstrated by power Doppler.

Results: In all cases, ultrasound allowed to see the course of the needle in the soft tissues and to confirm its correct intrarticular positioning. No further complication occurred.

Discussion / Conclusion: The ultrasound guidance allows to perform arthroMRI with no need of fluoroscopic guidance and, therefore, avoiding ionizing radiations and iodate contrast agents.

US-guided percutaneous 'washing' treatment of rotator cuff calcifications

F Lacelli, E Silvestri, G Garlaschi, M Falchi, *G Serafini, A Muda (Genova, Italy, *Pietra Ligure, Italy)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 16:00-16:10

Purpose / Introduction: To describe US-guided percutaneous treatment (needle aspiration and 'washing') of rotator cuff calcifications and to evaluate the clinical response to this treatment.

Materials and Methods: 1850 symptomatic shoulders (1080 women, mean age 42, range 29-72) in patients with RX or US diagnosis of rotator cuff calcific tendonitis and with shoulder pain unresponsive to medical treatment were treated. The procedure is performed with a sterile technique by two expert radiologists. The calcification is pricked under US guidance with a 14-16 G needle after local injection of anaesthetic. Successive pressures and aspirations are performed with the syringe plunger to 'wash' the tendon with saline solution and retrieve calcified material, until the aspirate is completely free from calcium. The next step is the injection of steroid in the subacromion-subdeltoid bursa. 1557/1850 patients were followed-up clinically for one year after the treatment.

Results: It was possible to fully aspirate the calcification with a considerable reduction of symptoms and significant improvement of the mobility of the affected limb in 70% of patients. In 25% of patients a second treatment was performed because of the presence of more than one calcification. In 4% of patients the calcification had broken spontaneously before the treatment or had moved into the subacromial-subdeltoid bursa (and then successfully treated). In 1% of patients no resolution of symptoms has occurred because of the coexistence of a tendon tear.

Discussion / Conclusion: This US-guided technique for the therapy of tendon calcifications is a quick, non invasive, successful and cheap procedure in comparison with the fluoroscopic guidance. It allows to obtain significant and longlasting reduction of symptoms in shoulder calcific tendonitis.

US-guided percutaneous steroid treatment of subacromial-subdeltoid bursitis

LM Sconfienza, E Silvestri, G Garlaschi, D Schettini, A Muda, M Chiara
(Genova, Italy)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 16:10-16:20

Purpose / Introduction: To describe the results of our experience on percutaneous US-guided steroid treatment of subacromial-subdeltoid (SASD) bursitis.

Materials and Methods: In six months we have treated 21 patients with a clinically evident SASD bursitis (13 acute exudative bursitis, 3 acute calcific bursitis and 5 chronic bursitis) presenting with US or MR diagnosis (12 females, 9 males, age range from 46 to 68). We used a 'combined' free-hand technique, with one operator that keeps the transducer in the correct position and the other operator that performs the interventional procedure. A small amount of local anaesthetic is injected in the subcutaneous tissue and in the bursa; therefore, the content of the bursa is sucked out with a spinal needle (20/18 G) and the bursa itself is repeatedly washed with saline solution. In the end, a small amount of steroid (1ml of Triamcinolone acetonide 40 mg/ml) is injected. In those cases where a calcific bursitis is detected, washing is performed with two spinal needles to create a real in-out washing flow and to allow a more efficient aspiration of calcium.

Results: In 14/16 cases of acute exudative bursitis this treatment has determined an immediate decompression of the bursa with a quick and lasting disappearance of symptoms. In 2/16 cases we observed just a reduction of

symptoms because of the coexistence of a calcific tendonitis. In 3/5 cases of chronic bursitis, the bursal distension was just partial because of several inner bursal adhesions, partially cut with the movement of the needle; in 2/5 cases the bursal distension has been inefficient because of strong fibroid adhesions. In 3 cases of calcific bursitis, the continuous washing and the use of two needles has allowed an easy emptying of the bursal content and an immediate disappearance of symptoms. No complication has occurred.

Discussion / Conclusion: Percutaneous US-guided steroid injection of SASD bursitis is a safe, easy and complication-free technique that allows to be more precise when injecting the steroid within the bursa, avoiding the risk of injecting the drug in the tendon.

Double-blind trial of ultrasound-guided steroid injections for Morton's neuroma

I Beggs; (Edinburgh, UK)

Room "Turgut Reis II-III" – Level 7 – Friday June 1st – 16:20-16:30

Purpose / Introduction: To compare the effectiveness and cost-effectiveness of steroid injections with those of anaesthetic injections in treating Morton's neuroma.

Materials and Methods: 131 patients with a diagnosis of Morton's neuroma confirmed by ultrasound were randomly allocated to receive an injection of either 1ml of methylpredisolone and 1ml of 2% lignocaine or 2ml of 2% lignocaine. Patients completed follow-up questionnaires at 1,3 and 12 months.

Results: 64 patients were allocated to receive steroid injection and 67 patients were allocated to placebo. Patients randomised to steroid injection reported statistically significant improvements at 1 and 3 months but not at 12 months. There were no significant differences in patient utility between groups. The estimated cost per QALY (quality-adjusted life years) was £19500. The probability of steroid injections being cost-effective was little more than 50%.

Discussion / Conclusion: Steroid injections significantly improve patients' foot health, substantially after one month, less after three months, and not at all after 12 months. This treatment offers only temporary amelioration of the pain of Morton's neuroma. The gain in patient utility is so small that even amelioration may not be cost-effective.

US-guided Percutaneous Treatment Of Plantar Fasciitis

LM Sconfienza, E Silvestri, G Garlaschi, MFalchi, S Pucci, G Minetti (Genova, Italy)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 16:30-16:40

Purpose / Introduction: To describe the technical approach to US-guided percutaneous treatment of plantar fasciitis.

Materials and Methods: 26 patients with clinical and US diagnosis of plantar fasciitis unresponsive to medical therapy were treated. The procedure is performed by two expert radiologists. After injecting a small amount of local anaesthetic, we carry out a transverse scan of the plantar fascia and perform a dry-needling on its insertional portion and on periostium to produce local phenomena of hyperaemia. Then the needle is retracted to reach the perifascial soft tissues and a small amount of steroid (1ml of Triamcinolone acetonide 40 mg/ml) is injected. After the treatment, a orthotic soft arch support to relief the hind part of the foot is suggested. All the patients were followed-up clinically after the treatment for four-six months.

Results: In 91% of patients we have observed a complete disappearance of symptoms after 2/3 weeks from the treatment. In 7% of patients we have observed a relative worsening of symptoms in the first days after the treatment, followed by a progressive reduction and a disappearance of symptoms in about three weeks. In 2% of patients we have observed no significant response to the therapy; in these patients, MR showed a remarkable calcaneal bone edema at the fascial insertion.

Discussion / Conclusion: US-guided treatment of plantar fasciitis is a non invasive and successful technique that allows to be more precise when injecting the steroid, avoiding the fascia. The combined approach with two radiologists allows a better evaluation of anatomical structures. The dry-needling of plantar fascia and of periostium produces a local hyperemia that can be compared to a surgical debridement.

US - Guided removal of soft tissues foreign bodies: personal experience

A Leonardi, A Bini, C Sabato, C Fugazolla, D Mariani, L Callegari, E Genovese, P Nicotera (Varese, Italy)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 16:40-16:50

Purpose / Introduction: Soft tissues foreign bodies are a frequent cause of medical consult, they can cause pain and complications (allergic reaction, inflammation and infection). The surgical removal of foreign bodies is not always successful, is invasive, expensive and burdened by complications. In our study we evaluated the advantages of US-guided removal of soft tissue foreign bodies versus surgery.

Materials and Methods: 16 patients (14 male 2 female, age range 13-65) came to our attention for clinical suspect and/or RX evidence of foreign bodies in soft tissues. All patients were primary evaluated with US examination (performed with ATL 5000 and PHILIPS IU-22, with linear high frequency probe) that confirmed the presence and location of 35 foreign bodies. 2 Patients with organic foreign bodies (1 agave fragment, 1 wood splinter); 11 Patients with metallic foreign bodies (8 fragments, 1 nail, 1 needle, 1 bullet); 3 Patients with glass foreign bodies (22 fragments). The average dimension of the foreign bodies changed from less than 1 mm of some glass fragments up to 3 cm of the agave fragment. All the patients underwent to US-guided procedure of foreign bodies removal.

Results: In 35/35 cases US-guided removal was successful. No complications related to procedure compared. 23 cutaneous incisions were performed, in 21/23 cases incision was repaired with Steri-Strip. In all the cases antibiotic therapy was established for 7 days after procedures.

Discussion / Conclusion: In contrast with other invasive technique the US-guided removal of foreign bodies in soft tissue is a procedure with high rate of success, has a low cost and is minimally invasive with evident advantages. The results of our study allow us to propose the US-guided removal as the primary therapeutic option.

Chronic post-traumatic osteomyelitis of the appendicular skeleton in adults: Imaging on gray-scale and color Doppler ultrasonography

○ Papakonstantinou, A Gouliamos, N Kelekis, A Balanika, C Kontopoulou, A Kelekis, M Mademli, E Brountzos (Athens, Greece)

Room "Turgut Reis II-III" – Level 7 - Friday June 1st – 16:50-17:00

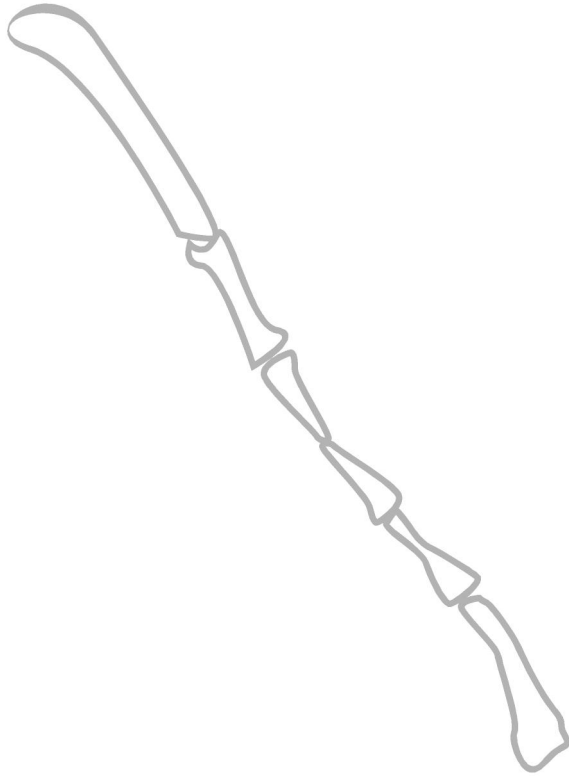
Purpose / Introduction: Chronic post-traumatic osteomyelitis is a continuing chronic low-grade infection. Because delay in the treatment increases the rate of complications and morbidity several imaging modalities have been used for early detection of the disease. Our objective is to evaluate the role of gray-scale (B-mode) and color Doppler ultrasonography (CDUS) in the detection of chronic post-traumatic osteomyelitis of the appendicular skeleton in adults.

Materials and Methods: 53 patients (30 male and 23 female, age 32-70 years), with clinical suspicion of relapse of chronic osteomyelitis in the appendicular skeleton, secondary to trauma and orthopedic surgery, were examined with B-mode and CDUS. The following US criteria were assessed: soft tissue oedema, abscesses, sinus tract, periosteal thickening, discontinuity of the cortex/sequestrum and juxtacortical fluid. In addition CDUS was employed to detect vascularity in the adjacent soft tissues and within or around the underlying periosteum. The final diagnosis was based on the clinical course in combination with aspiration-cytologic examination and MR imaging.

Results: Final diagnosis revealed 32 patients with osteomyelitis. For the detection of osseous involvement B-mode and CDUS sensitivity, specificity, positive predictive value (PPV) and negative predictive value were 90,6%, 80%, 82,8% and 94,4% respectively.

Discussion / Conclusion: Gray-scale in combination with CDUS is a reliable non-invasive imaging modality for the diagnosis of chronic post-traumatic osteomyelitis of appendicular skeleton in adults.

NOTES



Scientific Session 5

Chairs: C. R. Krestan (Austria) and N. Sabır (Turkey)

Evaluation of the Anterior Cruciate Ligament of the Knee: Comparison between flexed and extended Knee Position during MR Imaging

*C Muhle, C Diecke (Kiel, Germany, * Vechta, Germany)

Room "Çaka Bey" – Level 2 - Friday June 1st – 15:30-15:40

Purpose / Introduction: The aim of our study was to compare partial flexion sagittal magnetic resonance imaging (MR) images at 30° and 55° of knee flexion with extension MR images with regard to delineation of torn anterior cruciate ligaments (ACL) in clinical practise.

Materials and Methods: Within a mobile positioning device and a flexible surface coil, the knee joint was examined at extension, at 30° of knee flexion and at 55° of knee flexion within a 1.5 tesla superconducting magnet. Sets of sagittal MR images were obtained for the extended and flexed-knee positions. To define and to describe the normal delineation of the ACL at extension, 30° of knee flexion and 60° of knee flexion, 10 healthy subjects were evaluated. In addition, 40 patients with diagnosed ACL tears on MRI examinations were evaluated. In 27 patients the records of the arthroscopical examinations could be compared to the MR images. Two observers interpreted each MR image of the extended and two flexed positions independently without knowledge of the arthroscopic results.

Results: The MR images of flexed knees in healthy subjects were more useful than of extended knees in 60 % of the case reviews of femoral attachments and 40 % reviews of midportions of normal ACLs. 40 patients with on MRI diagnosed ACL tears were evaluated in this study. Full ACL tears were diagnosed in 16 out of 20 arthroscopic proven cases in knee extension and at 30° of flexion (80%). At 60° of knee flexion, 95% of patients with full ACL tears were diagnosed true positive. MR images both at 30° and 60° flexion, revealed 5 of 7 (71%) partial torn ACL, whereas at extension only 3 of 7 partial torn ACL (42%) were diagnosed as partial ruptures. Statistically significant difference was found between inbetween extended and flexed knee positions ($p < 0.05$).

Discussion / Conclusion: Compared with MR images of knee extension, MR images of knees at knee flexion more clearly delineate the femoral side of the ligament with wider space under the intercondylar roof and with decreased

volume-averaging artifacts, providing superior visualization of normal and torn ACLs in clinical settings.

Transient osteoporosis of the knee: Can MRI predict outcome?

N I Skoulikaris, A H Karantanas, I Nikolakopoulos, E Apostolaki, *T Karachalios, N Gourtsoyiannis (Iraklion, Greece, * Larissa, Greece)

Room "Çaka Bey" – Level 2 - Friday June 1st – 15:40-15:50

Purpose / Introduction: To present the MRI findings in transient lesions around the knee and to identify any prognostic factors.

Materials and Methods: In a 9-year period, 25 patients (age range 34-73y/o, mean 53y/o, M/F: 13/12) presented with acute knee pain and bone marrow edema (BME) on MRI, were included in the study. All of them had no previous history of trauma or conditions associated with osteonecrosis. No patient had clinical or radiological indication of osteoarthritis. The MRI study was performed with a 1.5T scanner, synergy coils and STIR, T1-w, T2-w and fat suppressed T1-w after i.v. administration of contrast agent pulse sequences.

Results: Diffuse areas of decreased on T1-w and increased signal intensity on STIR and T2-w fat suppressed images consistent with BME were depicted at the epiphysis of the condyles medial femoral (n=17), lateral femoral (n=7), medial tibial (n=6), and lateral tibial (n=5). Joint effusion (n=15) and subchondral lesions (n=10) were also found. Nine patients showed two distinct lesions. MRI depicted no case with subchondral lesions thicker than 2.0 mm or articular collapse. Treatment included NSAID and weight bearing protection. Complete resolution of all imaging findings and knee pain was shown in imaging (6-9m) and clinical (2y) follow-up.

Discussion / Conclusion: The median age of 53 is higher than that observed in the transient osteoporosis of the hip and lower than in spontaneous osteonecrosis of the knee. The absence of significant subchondral lesions and of articular collapse, suggest the transient behaviour of the epiphyseal lesions around the knee, demonstrated as BME with MRI.

Revisiting Semimembranosus Tendinopathy: common but overlooked cause of medial knee pain

*S P Suresh, J Bell, D Connell (London, UK, * Plymouth, UK)

Room "Çaka Bey" – Level 2 - Friday June 1st – 15:50-16:00

Purpose / Introduction: To revisit the radiological anatomy and features of semimembranosus tendinopathy on ultrasound (US) and magnetic resonance imaging (MRI). We will also review the efficacy of ultrasound guided steroid and local anaesthetic injection in providing short term pain relief for semimembranosus tendinopathy

Materials and Methods: Thirty two (14 men, 18 women) patients, with medial knee pain had MRI of the knee followed by US evaluation and the diagnosis of semimembranosus tendinopathy was made. Mean age at presentation was 45 years, with a range of 27-69. Under US guidance the semimembranosus tendon was bathed with a combination of 40 mg of triamcinolone and 2 ml of Bupivacaine. Patients were reviewed, at 1 week, 1 month and 3 months and VAS scores were recorded pre-procedure and post procedure.

Results: On MRI, thickening of the tendon with high signal changes within the tendon and the adjacent bursa were noted on fat saturated images. Sonography demonstrated thickening of the tendon with varying degree of hypoechoic changes +/- inflammatory changes in the adjacent bursa. There was significant decrease in the median VAS score at pre-procedure (N = 32) from 7 (5-8) to 2 (1-4) at 1 week, and had further decreased to 1 (0-3) at 1 month (N = 32). The median VAS score at 3 months (N = 32), had also significantly decreased to 3 (1-4.75), from the pre-procedure VAS score.

Discussion / Conclusion: The diagnosis of semimembranosus tendinopathy should be actively sought when the MRI of the knee is reviewed, especially in patients presenting with medial knee pain as it is a frequent and easily treatable cause of knee pain. Ultrasound can be used to confirm the diagnosis, guide injections and to monitor changes.

Osteoarthritis of the knee: inflammatory signs in cartilage, entheses and ligaments at MR imaging

N Egund, A Joergensen, K Stengaard-Pedersen (Aarhus, Denmark)

Room "Çaka Bey" – Level 2 - Friday June 1st – 16:00-16:10

Purpose / Introduction: Osteoarthritis (OA) of the knee is generally considered a degenerative condition and is in most clinical randomized trials defined by the American College of Rheumatism (ACR) criteria. The ACR criteria are believed to separate OA from rheumatoid arthritis and the different forms of seronegative arthritis. Our purpose is to present the occurrence of inflammatory manifestations in patients fulfilling the ACR criteria of OA of the knee.

Materials and Methods: From a randomized placebo controlled multicenter study 90 patients were followed clinically and by MRI during one year. Female/male 57/33, 62 years (41-84). All fulfilled the ACR criteria for primary knee OA. Lequesne Algodysfunctional Index score 10 or more. Normal CRP. Standing weight-bearing radiographs of the femoro-tibial (FT) and patellofemoral (PF) joints: joint space narrowing in the medial FT compartment (59), lateral FT (15), medial PF (30) and lateral PF (22) grade 0.5 – 3.0 (modified Ahlbäck/Baltimore longitudinal). MR imaging, pre-contrast: Sagittal STIR, T1, PD-FS, axial T1. Post contrast: sagittal and axial T1 FS. Baseline MRI demonstrated synovitis medium grade 1 (0-3) in 85/90 and bone marrow edema = 8 (0-36) in 78/90. Cartilage morphology: 14 articular-surface regions were scored in a scale modified from WORMS. Regions of cartilage deterioration away from weightbearing areas were recorded separately. ACL, PCL and patellar tendon (PT) were assessed for tendinopathy and bone marrow lesions at sites of entheses.

Results: In OA of the medial FT and/or medial and lateral PF compartment partial thickness loss of cartilage < 50% (grade 3) or > 50% (grade 4) was observed in the posterior aspect of the lateral femoral condyle (FPL) in 14 knees. Diffuse total thickness loss of cartilage, (grade 4-6) in FPL in 9 knees; concomitant subcondral lesions in three. Smaller cartilaginous defects were observed in further 6 knees. Severe tendinopathy with contrast enhancement of ACL, PCL and or PT occurred in 6 knees and moderate changes in 8 knees. Enthesopathies occurred in 11 knees. There were no correlation between these findings and the grade of synovitis or bone marrow abnormalities.

Discussion / Conclusion: Synovitis is a common abnormality in OA of the knee, but is generally considered benign without concomitant destruction of cartilage. Our observation of the occurrence of "arthritis like" cartilage destructions,

tendinopathy and enthesopathy in OA of the knee may indicate that the ACR criteria of knee OA may not exclude seronegative arthritides. MRI may be useful to separate and define these conditions in the spectrum of inflammatory joint disorders.

Insertional tendinopathy: a comparison between conventional power Doppler, new technologies (e-flow) and MR

*O Bottinelli, G Regis, S Pozza, A de Marchi, C Faletti (Torino, Italy, * Pavia, Italy)

Room "Çaka Bey" – Level 2 - Friday June 1st – 16:10-16:20

Purpose / Introduction: The aim of this study is to evaluate the sensitivity of the US examination when combined with new technologies, such as that of the e-flow, in evidencing the hypoechoic and hyperemic areas, signs of active flogosis, with that of areas having a similar US appearance, but based rather on degenerative aspects, compared to that of the MR, which, to date, is considered the reference examination.

Materials and Methods: After obtaining accurate clinical history, a total of 10 subjects were enrolled into the study. All subjects had a clinical picture referable to that of inflammatory tendonitis, 7 had acute shoulder pain and 3 knee pain in the patella insertional area. All subjects had basic US in combination with conventional power Doppler, e-flow technique and MR examinations, which were carried out at one imaging sitting. The results obtained by the three different methods were compared to one another.

Results: When the US examination was combined with that of the e-flow technique, extremely useful and reliable data, offering the possibility to identify the inflammatory area, was obtained. Indeed, a rich hyperemic area was observed, making it possible to distinguish areas of flogosis from oedematous-degenerative avascular ones. When the results were compared to those of the MR, the examinations gave perfectly superimposable results. Although the data obtained from the MR and US examination offered the same diagnostic information, the US examination in combination with the e-flow technique, gave a higher degree of sensitivity with a more detailed image, allowing for the identification of the inflammatory areas.

Discussion / Conclusion: This new US technology is highly sensitive in the recognition of the vascular modifications associated with insertional tendinopathy, in particular in the acute phase.

Value of Real-time sonoelastography in patients with painful Achilles tendons and healthy volunteers

A S Klauser, S Mlekusch, T de Zordo, V Smekal, C Dejacco, C Hoser, C Fink, M Reindl (Innsbruck, Austria)

Room "Çaka Bey" – Level 2 - Friday June 1st – 16:20-16:30

Purpose / Introduction: To assess Achilles tendons, Paratenon and Bursae in healthy volunteers and to compare the findings with patients complaining of achillodynia with real-time sonoelastography.

Materials and Methods: 15 patients with 18 painful Achilles tendons and 18 tendons in healthy volunteers underwent real-time sonoelastography (Hitachi EUP-8500, L54M, 6-13 MHz) and compared it to findings in gray scale sonography (6-13 MHz). Tendon insertion, midportion and musculotendinous junction were examined and tendon thickening, focal intratendinous lesion, partial tears, paratenonitis and bursitis were evaluated by a semiquantitative score of different colors representing stiff tissue (blue) to more soft tissue (green, yellow, red).

Results: Tendons in healthy volunteers showed blue coloring consistent with stiff normal tendon tissue and normal findings at gray scale. Patients showed tendon thickening in 16 tendons, alteration of gray scale echotexture in 10 patients and in all patients a significant higher detection of intratendinous color alterations detected by sonoelastography (yellow, red) in comparison to gray scale US ($P < 0.001$). Comparison to healthy volunteers showed significant differences for tendon stiffness ($P < 0.0001$). Detection of tendon thickening, partial tears and peritendinous alterations showed a good correlation with gray scale US ($P < 0.01$).

Discussion / Conclusion: Sonoelastography seems to be a sensitive method for assessment of intratendinous alterations in achillodynia. Detection of tissue softening in achillodynia might predict progressive tendinosis at different stages. Follow up studies or histopathology is needed for further evaluation of internal alterations detected by sonoelastography in painful Achilles tendons.

Ultrasound screening of professional basketball players, preliminary results

J Gielen, J Stappers, **A van der Stappen, P Viroux, K Mertens, *F M Vanhoenacker (Antwerp, Belgium, *Duffel-Antwerp, Belgium, ** Brussels, Belgium)

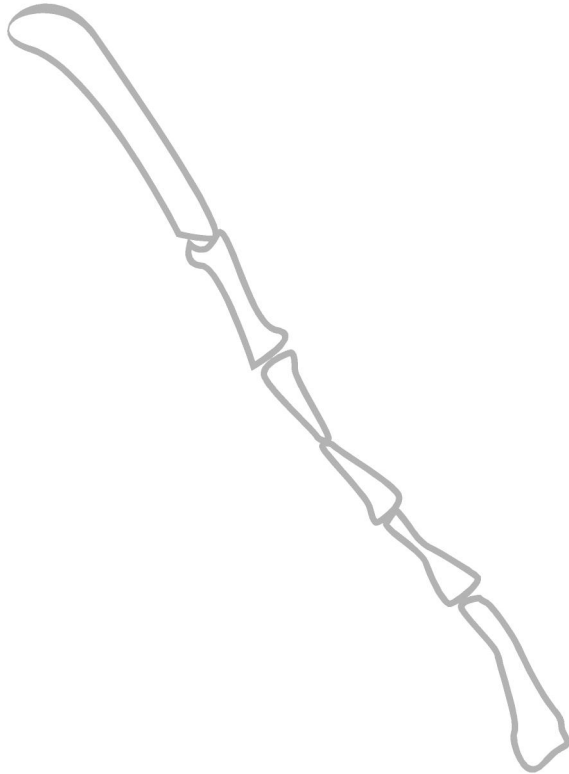
Room "Çaka Bey" – Level 2 - Friday June 1st – 16:30-16:40

Purpose / Introduction: Sportsmen with chronic clinical tendinosis frequently have a long revalidation, adapted training and suboptimal competition activity. Ultrasound (US) may detect tendon abnormalities in an early phase. US screening of professional basketball players showed abnormalities in clinical normal tendons. To determine the relative frequency of normal tendons and subclinical and clinical abnormalities in tendons of professional basketball players. To evaluate the value of US screening of subclinical tendon lesions by the effect of eccentric MTU training on US aspect of tendons and sports availability of the sporter.

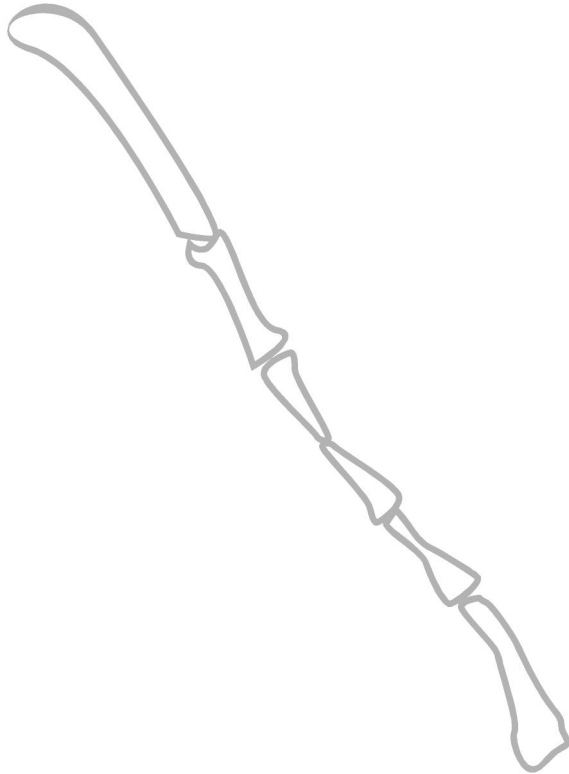
Materials and Methods: The female national basketball team was screened in 2003 and 2004. In 2003 13 (N=78 tendons), in 2004 23 players were examined (N=184). A first and second class male team were US screened in 2006. Seven of the first (N=42 tendons) and fifteen of the second team (N=120) were examined. Tendons were divided into four groups. Group A: no symptoms and no US abnormalities. Group B: symptoms and US abnormalities. Group C: no symptoms with US abnormalities. Group D: symptoms without US abnormalities. The trainers were blinded for the results of a randomized half of the players in the second male team. An eccentric training program is followed by the players with US abnormalities. The control group in the second team will receive no therapy.

Results: 1) Female team. 2003: group A 85% (65/78), group B 2% (2/78), group C 13% (11/78), group D: none. 2004: group A 91% (167/184), group B 2% (4/184), group C 6.5% (12/184), group D: 0.5% (1/184). The follow up of group C was possible for nine players. Five players stayed in the same group. Three showed an US improvement. One player developed a clinical quadriceps tendon injury. All the players were able to play the European championship without tendon injuries. 2) First male team 2006: group A 50% (21/42), group B 14% (6/42), group C 29% (12/42), group D: 7% (3/42). Results second team 2006: group A 76% (91/120), group B 2.5% (3/120), group C 20% (24/120), group D: 1.7% (2/120).

Discussion / Conclusion: (Sub) clinical US tendon abnormalities are frequent in professional basket players, they are more frequent in the male compared to female population. In women the individual eccentric training program of the involved tendons was able to include all players at the European championship.



NOTES



Scientific Session 6

Chairs: M. Epermane (Latvia) and C. Muhle (Germany)

16-Slice MDCT Arthrography of the Shoulder: Diagnostic Accuracy for Detection of Glenoid Labral and Rotator Cuff Tears

S K Juhng, G D Kim, H W Kim, *S Lee, H J Kim (Wonkwang, Republic of Korea, * Seoul, Republic of Korea)

Room "Çaka Bey" – Level 2 - Saturday June 2nd – 08:30 -08:40

Purpose / Introduction: To determine the diagnostic accuracy of 16-slice MDCT arthrography (CTA) in the glenoid labral and rotator cuff tears of shoulder.

Materials and Methods: We enrolled forty-five patients who underwent arthroscopy after CTA for pain or instability of shoulder joint. CTA images were analyzed by three musculoskeletal radiologists under consensus about existence, sites and types of glenoid labral tears and existences and severity of rotator cuff tears. We determined the sensitivity, specificity and accuracy of CTA for detecting glenoid labral and rotator cuff tears on the basis of findings of arthroscopy.

Results: At arthroscopy, there were 33 SLAP lesions (9 type I, 23 type II, 1 type III), 6 Bankart lesions and 31 rotator cuff lesions (21 supraspinatus, 9 infraspinatus and 1 subscapularis). On CTA, sensitivity, specificity and accuracy in detection of SLAP lesions were 83%, 100% and 91%, in depicting total rotator cuff tears were 90%, 100%, 98%, and in depicting full thickness supraspinatus tendon tears were 100%, 94% and 96%, in depicting partial thickness supraspinatus tendon tears were 29%, 100% and 89%, respectively.

Discussion / Conclusion: 16-slice MDCT arthrography has high accuracy in the diagnosis of abnormality of glenoid labrum or rotator cuff tears except for partial thickness bursal surface tear of rotator cuff and can be a useful alternative to MRI or ultrasonography if it is difficult for them to be performed.

Lateral Acromial Angle Measurement and Low Angles coincidence on Shoulder Impingement

M Bankaoglu, E Derin Cicek, C Edrisi, M Ertürk, M Basak (Istanbul, Turkey)
Room "Çaka Bey" – Level 2 - Saturday June 2nd – 08:40 -08:50

Purpose / Introduction: To define quantitative, comparable and reproducible angle values-Acromioglennoidal angle (AGA)- rather than morphological determination, for lateral downsloping of acromion, which is an important predisposing extrinsic factor of shoulder impingement, and to evaluate coincidence rotator cuff supraspinatus tendon pathology .

Materials and Methods: In two different imaging centers, prospectively, 101 symptomatic patients, were evaluated with routine shoulder protocols, relevant tendon pathologies with regard to severity of finding divided to 4 groups - tendinosis, bursal or articular sided partial thickness tear, incomplete and complete full-thickness tears – with increasing severity respectively. From coronal series angle between inferolateral contour of the acromion and glenoid articular surface were measured with the aid of goniometer. Also anterior downsloping and morphological types of the acromion were qualitatively evaluated from sagittal series.

Results: AGA uppermost value was 95 degrees and lowermost 60 degrees. 94 patients had tendinopathy, from which 36 had tendinosis, 29 partial thickness tears, 18 incomplete full-thickness tears and 11 complete ruptures. We could not find meaningful correlation between acromion and tendinopathy. Also severity of tendinopathy did not revealed correlation with AGA values. But those with tendinopathy had lower AGA values(76.4 ± 0.70) than those without tendinopathy who had higher AGA values(81.9 ± 2.1)($p < 0.05$).

Discussion / Conclusion: So quantitative measurement of AGA is important for definition of lateral downsloping which is an important contributor to the shoulder impingement syndrome.

Clinical and MRI evaluation of open rotator cuff repairs

N Tarhan, E Circi, H Demirors, A M Agildere, R Tandogan (Ankara, Turkey)
Room "Çaka Bey" – Level 2 - Saturday June 2nd – 08:50 -09:00

Purpose / Introduction: Tears of the rotator cuff are a common cause of shoulder pain and disability. MRI is important to evaluate tendon integrity and

degree of fatty infiltration after rotator cuff tear repair. In this study, we investigated the tendon integrity and the degree of fatty infiltration after open repair of rotator cuff tears and compared the results with clinical and functional changes.

Materials and Methods: Twenty-six shoulders of 25 patients (20 women, 5 male, age range 39-82 years) who had open rotator cuff repair within 5-year period were included. All patients had clinical, functional, isokinetic assessment and MRI. MRI was obtained preoperatively and postoperatively. The imaging protocol included oblique coronal PD-W with fat saturation, oblique coronal t-STIR, oblique sagittal T2-W with fat saturation for cuff integrity and oblique sagittal T1-W for fatty infiltration. Rotator cuff integrity was classified into five types; I, sufficient thickness with low intensity; II, sufficient thickness with partial high intensity; III, intact with decreased thickness; IV-A, partial thickness discontinuity, IV-B, full thickness focal discontinuity; V, major discontinuity with retraction. When postoperative MRI was evaluated, type I, II, III accepted as intact repair and type IV, V as failed repair. Muscle fatty infiltration was evaluated in five stages; stage 0, muscle with no fat; stage 4, with more fat than muscle. Chi-square and Mann-Whitney U tests were used to evaluate the significance between two variables.

Results: According to postoperative MRI evaluation, sixteen repairs (53.8%) were intact or thinned and twelve repairs (46.2%) were ruptured at follow-up. A statistical difference was observed between the Constant scores ($p < 0.05$). MRI results revealed that preoperative and postoperative fatty infiltration stages were affected by cuff integrity. There was statistically significant correlation between postoperative fatty infiltration stage and cuff integrity ($p < 0.001$). In addition, there was strong degree of correlation between preoperative and postoperative MRI stages of fatty infiltration ($p < 0.001$; $r = 0.637$).

Discussion / Conclusion: Although the failed repair percentage was high (46.2%) on MRI, functional results and clinical outcome was successful. Intact repair group had better muscle strength and less fatty infiltration than the other group. MRI as a non-invasive imaging technique can be used to detect the anatomic changes such as cuff integrity and fatty infiltration in these patients.

Risk factors of hip dislocation after primary total hip replacement (THR) – clinical and radiological analysis

P Likums, P Studers, K Krastins, M Zambrans (Riga, Latvia)

Room "Čaka Bey" – Level 2 - Saturday June 2nd – 09:00 -09:10

Purpose / Introduction: According to literature data hip dislocation occurs in 2-

9% patients after primary THR. Most commonly it is caused by component malposition, soft tissue disbalance etc. The purpose of our study was clinical and radiological analysis of the risk factors determining hip dislocation after THR.

Materials and Methods: We retrospectively analyzed 2626 THR cases treated at the Hospital of Traumatology and Orthopaedics (HTO) in the period of 2000-2003. We found 59 hip dislocations (20 in male and 39 in female patients). In the clinical analysis we included surgical diagnosis, patient condition, leg length, surgery data, cause of dislocation. Radiological analysis included: plain x-ray of pelvis; hip AP, LL (before surgery, after surgery, dislocation, reposition, revision surgery); lumbar spine AP, LL; CT scan according to evaluation protocol. For data evaluation SPSS were used.

Results: In our hospital (2000-2003) hip dislocation had occurred in 2,2% of primary THR cases. Clinical results. Early postoperative dislocations (up to 6 weeks) – 28,8%; Late and recurrent dislocations – 86,4%; Untoward risk factors: alcohol – 35,6%; mental disorders – 8,5%; previous surgery – 16,9% of dislocation cases. Radiological results. Acetabular component malposition was found in 35,6% of dislocation cases.

Discussion / Conclusion: 1. Dislocation rate. In our clinical and radiological analysis we found it 2,2%. This result corresponds with the data of literature. 2. The main risk factors were found to be - previous surgery of hip, alcohol abuse, mental diseases and implant malposition.

Diffusion tensor imaging and tractography of the median nerve in carpal tunnel syndrome

C Khalil, C Hancart, V Le Thuc, J F Budzik, *D Chechin, A F Cotten (Lille, France, * Suresnes, France)

Room "Çaka Bey" – Level 2 - Saturday June 2nd – 09:10 -09:20

Purpose / Introduction: To prove the feasibility of in vivo diffusion tensor imaging (DTI) and tractography of the human median nerve with a 1.5 T MR scanner and to assess potential differences in diffusion within the median nerve between healthy volunteers and patients suffering from carpal tunnel syndrome.

Materials and Methods: The median nerve was examined at the wrist level in 13 patients and 13 healthy volunteers with MR DTI combined with tractography using a 1.5T MRI scanner with a dedicated 4-channel phased array wrist coil. T1-weighted turbo spin echo imaging in the axial plane was performed for

anatomical correlation. Fractional anisotropy and mean ADC values were quantified in the examined median nerves on tractography images.

Results: In all subjects, orientation and course of the median nerve could be detected with tractography and correlated well to T1-weighted images. FA values were significantly lower ($p=0.03$) in patients compared to healthy volunteers. However, no statistically significant differences were found in ADC values.

Discussion / Conclusion: In vivo assessment of the median nerve in the carpal tunnel using DTI with tractography on a 1.5 T MRI scanner is possible. Microstructural parameters (FA and ADC values) can be easily obtained from tractography images. A significant decrease of FA values was found in patients suffering from chronic compression of the median nerve. Further investigations are necessary to determine if FA values may be correlated with the severity of nerve entrapment.

MR Imaging of Achilles Tendon Repair

A Heuck, B Sommer, J Scheidler (Munich, Germany)

Room "Çaka Bey" – Level 2 - Saturday June 2nd – 09:20 -09:30

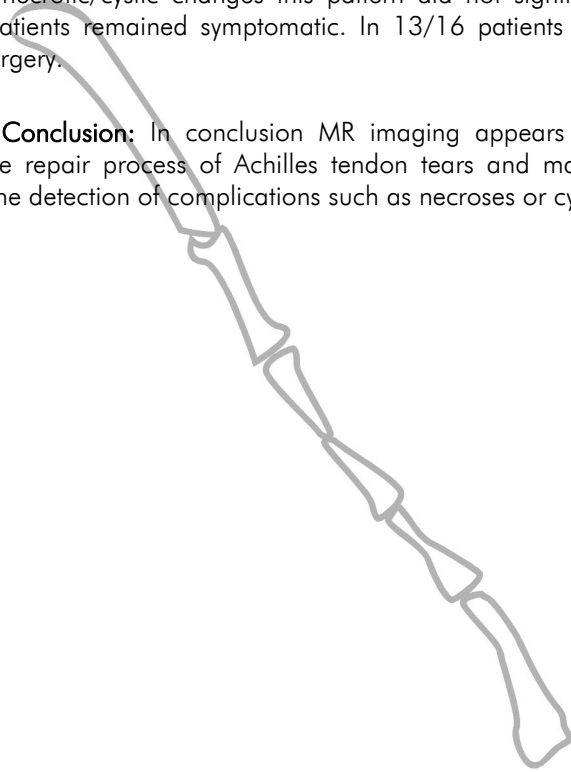
Purpose / Introduction: Achilles tendon tears may be either the result of chronic overuse, direct contusion, or a combination of preexisting alterations and trauma. In up to 97 % the underlying pathology is tendon degeneration. The healing process of Achilles tendon tears involves three phases: The early and short inflammatory phase, the intermediate fibroblastic and collagen-producing phase, and the late remodeling phase. The purpose of the study was to determine the value of MR imaging in monitoring Achilles tendon repair and in the detection of healing complications.

Materials and Methods: 68 patients with partial or full thickness tears of the Achilles tendon were studied. 47 patients underwent surgical repair and 21 had non-surgical treatment. MR imaging was performed before therapy and at three intervals after the onset of therapy (4 to 6 weeks, 8 to 10 weeks, and 16 to 18 weeks). The imaging protocol included T2 weighted sagittal FSE fat sat sequences, as well as axial T1 weighted SE, T2 weighted FSE fat sat, and T1 weighted SE fat sat post gadolinium sequences.

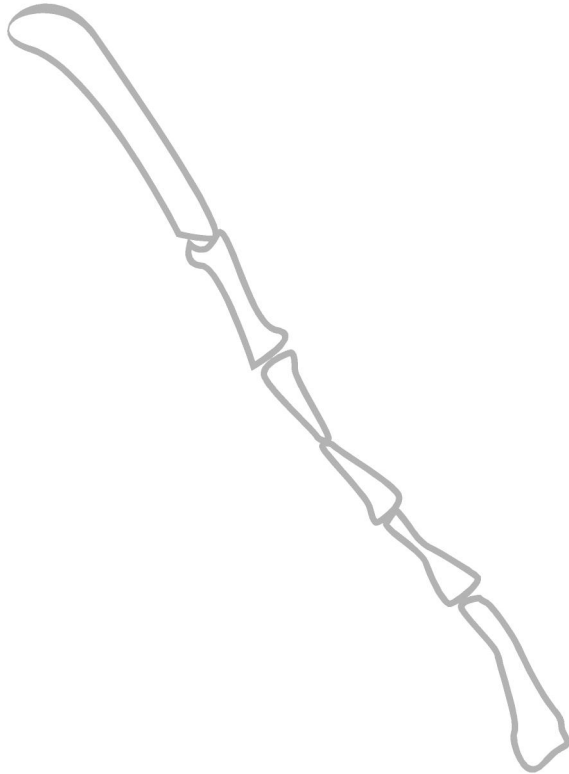
Results: After 4 to 6 weeks 52/68 Achilles tendons revealed intermediate to low signal intensity (SI) in T1 and T2 weighted sequences, and areas of contrast enhancement after IV gadolinium; this pattern was considered as a normal healing process. In 16/68 tendons (23 %) a pattern with areas with low SI in T1

weighted, high SI in T2 weighted sequences and lack of contrast enhancement were found, consistent with necroses/cysts. After 8 to 10 weeks 51/52 tendons with so far normal healing process displayed decreasing SI and contrast enhancement, the patients were asymptomatic. In one patient a traumatic re-tear occurred. In 16/16 tendons with previous pattern of necroses/cysts, this pattern did not significantly change and patients were symptomatic. After 16 to 18 weeks 51/51 tendons with normal healing process displayed regular low SI without contrast enhancement; patients remained asymptomatic. In all 16/16 tendons with necrotic/cystic changes this pattern did not significantly change further and patients remained symptomatic. In 13/16 patients necroses were found at re-surgery.

Discussion / Conclusion: In conclusion MR imaging appears very useful in monitoring the repair process of Achilles tendon tears and may be an early indicator for the detection of complications such as necroses or cysts.



NOTES



Scientific Session 7

Chairs: A. Baur-Melynk (Germany) and A. Yücel (Turkey)

Whole Body MRI: a potential role in the detection of multicentric osteonecrosis?

JM Elliott, *S Eustace, H Cairns, D H.J. Mawhinney, D G.R. Gracey (Belfast, UK, * Dublin, Ireland)

Room "Turgut Reis II-III" – Level 7 - Saturday June 2nd – 10:30 -10:40

Purpose / Introduction: Whole body MR imaging is now an established means of assessing the extent and distribution of bone metastases and multiple myeloma. Osteonecrosis is a recognised complication in the treatment of patients with childhood leukaemia and lymphoma and such patients may require arthroplasty at an early age due to subsequent collapse of the articular surfaces. Dedicated MR imaging of the symptomatic joint is the imaging modality of choice in the confirmation of this diagnosis. Our purpose is to determine the presence of osteonecrosis at multiple sites on whole body MR imaging in a group of patients with a history of treated childhood leukaemia or lymphoma referred to the orthopaedic service.

Materials and Methods: Five patients (4 female, 1 male) aged 18 – 32 years (mean age 25.2 years) with a known history of treated childhood malignancy and symptomatic osteonecrosis of at least 1 joint were referred for orthopaedic assessment. Three patients had prior hip arthroplasty. MRI scanning was performed in all patients using 1.5T magnets with whole body scanning capabilities. Combinations of local coils were positioned to cover the entire body and scans were obtained at 5 or 6 table positions. Coronal imaging using STIR (TR 9240ms, TE 90ms, TI 130 degrees, FOV 450mm) and SE T1W (TR 598ms, TE 11ms, FOV 450mm) sequences was performed. Total acquisition time was approximately 30 minutes.

Results: Geographic areas of signal abnormality consistent with osteonecrosis were demonstrated at multiple sites in all patients. The femora were affected in all patients and in those with femoral condylar involvement, the lesions were located posteriorly. Osteonecrosis was noted in the humeri in 4 patients and in the tibiae in 4 patients. Foci were distributed in the diaphyseal and epiphyseal regions of the long bones.

Discussion / Conclusion: Multicentric osteonecrosis may occur in patients with treated childhood leukaemia or lymphoma. In addition to confirming the diagnosis at the symptomatic site, whole body MRI allows identification of other

currently 'silent' sites. This may aid the orthopaedic surgeon in long-term management of the associated joint disease.

Whole-body-MRI versus Whole-body-MDCT for the staging of patients with multiple myeloma

A Baur-Melnyk, S Buhmann, R Duerr, C Becker, M Reiser (Munich, Germany)
Room "Turgut Reis II-III" – Level 7 - Saturday June 2nd – 10:40 -10:50

Purpose / Introduction: To compare the detection rate of bony manifestations of multiple myeloma in whole-body MRI compared to MDCT and to assess accuracy in staging.

Materials and Methods: 41 patients with histologically confirmed myeloma were prospectively examined with a whole-body MDCT-protocol and whole-body MRI on a 1.5 Tesla system. The MRI protocol consisted of T1-weighted SE and STIR sequences. For data analysis, the entire skeleton was divided into 61 regions per patient. Image evaluation was performed in a consensus reading by two radiologists, blinded to the patients' history, with separate evaluation of each modality. The patients were staged by MRI- and MDCT-data separately according to the Durie and Salmon PLUS staging system.

Results: In MRI 15 patients showed no involvement. 975 regions in 26 patients were affected in MRI. According to MRI 21 patients were stage I, 2 were stage II and 18 were stage III. In MDCT 19 patients showed no involvement. 462 regions in 22 patients were affected. According to MDCT 25 patients were stage I, 7 were stage II and 9 were stage III. In 21 patients with involvement detected in both methods, MRI showed more extensive disease than MDCT. 7 patients were understaged with MDCT (stage II) compared to MRI (stage III). However, only 4 patients (10%) were understaged concerning stage I (no treatment) versus stage II or III (treatment indication).

Discussion / Conclusion: Whole body MDCT is a feasible and alternative imaging method in patients with multiple myeloma. In 10% it leads to understaging concerning with the indication of systemic treatment.

PET CT in the staging of multiple myeloma: Correlation with disease activity and treatment response

C Shortt, K Breen, P O'Gorman, M O'Connell, S Eustace (Dublin, Ireland)
Room "Turgut Reis II-III" – Level 7 - Saturday June 2nd – 10:50 -11:00

Purpose / Introduction: We evaluated the role of FDG PET CT in the staging of multiple myeloma. Our main purpose was to correlate the imaging findings with clinical and laboratory markers of disease activity and treatment response.

Materials and Methods: Twenty-six patients with bone marrow biopsy proven multiple myeloma were included in the study. Mean age 67 years(44-83), M:F 1:1. All patients underwent PET CT scanning post IV FDG. Ten patients had a follow up PET CT with an overall total of 36 scans. In each case, the PET CT results were correlated with serum parameters of disease, bone marrow aspirate results and clinical status. The results of PET CTs were ultimately correlated with response to therapy.

Results: In 21/36 (58%) of scans, PET CT imaging demonstrated either focal or diffuse increased uptake of FDG consistent with multiple myeloma. In 15/36 (42%), no increased uptake of FDG was demonstrated. Patients with increased uptake included 3 with non-secretory myeloma. Paraprotein levels and clinical status correlated with PET CT findings in 28/36 (78%) of cases. PET CT findings lead to a change management in 8/36 (22%) of cases.

Discussion / Conclusion: PET CT characterised the extent of disease and disease activity better than CT alone. Increased FDG uptake in multiple myeloma occurs in approximately 58% of patients. PET CT correlates well with clinical and laboratory markers of disease activity and may be used effectively to stage disease both at diagnosis and at follow up, in the assessment of response to therapy.

Different reconstruction modalities of multidetector-row CT in the evaluation of fractures in orthopedic patients

C R Krestan, S Nemeč, M Gruber, C Czerny (Vienna, Austria)
Room "Turgut Reis II-III" – Level 7 - Saturday June 2nd – 11:00 -11:10

Purpose / Introduction: Assessment of fractures in orthopedic patients is usually monitored by radiographs in two views. In complex cases MDCT is the preferred modality of fracture diagnosis. The purpose of our study was to compare the

efficiency of different reconstruction modalities from multidetector-row computed tomography datasets in the diagnosis of fractures or fissures in orthopaedic patients.

Materials and Methods: There were 12 orthopedic patients (6 female, 6 male) who underwent a multidetector-row computed tomography exam for suspected fracture or non-union in our study. Multidetector-row computed tomography studies were performed on an Philips Brilliance 64 MDCT (Philips Medical Systems, Best, The Netherlands) The technical parameters were adapted to the anatomic region. Collimation was 64x0.625 mm with a reconstructed slice thickness between 0.67-1.4 mm and 50% overlap. A bone algorithm for reconstruction was used (3000/600 HU). Multiplanar reconstructions (MPR), MIP, VIP and minIP were calculated in three orthogonal planes, and were analyzed by two musculoskeletal radiologists in a consensus reading to determine the ability of fracture diagnosis using a semiquantitative approach.

Results: In 9(75%) patients minIP was better for fracture diagnosis than the other reconstruction modalities. In one of these 9 patients the fracture could only be detected on minIP. In 2(16.6%) minIP was equal to the other reconstruction modalities. In one patient the fracture was not seen on coronal minIP, but diagnosed with MPR, MIP and VIP. In this case the fracture was visible on axial minIP.

Discussion / Conclusion: Multidetector-row computed tomography using minIP is recommended as the primary reconstruction modality for the evaluation of fractures in orthopedic patients, however all three planes have to be analyzed.

Biomarkers as predictors for MRI abnormalities?

R Sharma, P R Kornaat, M Kloppenburg, I Watt (Leiden, Netherlands)
Room "Turgot Reis II-III" – Level 7 - Saturday June 2nd – 11:10 -11:20

Purpose / Introduction: OA affects many of the ageing western population. Recently serum CTX-II levels have been associated with radiographic progression. This study investigated the relation between biomarkers and MRI abnormalities assessed at baseline and the structural progression of knee osteoarthritis (kOA) 2 years later.

Materials and Methods: MRI of the knee at baseline and 2 years later was obtained in 205 patients with symptomatic OA at multiple joint sites. MRIs were scored using a qualitative scoring system (0-3) for cartilage abnormalities,

osteophyte formation, bone marrow oedema (BME) and cysts in all the compartments of the knee, as well as meniscal pathology, Baker's cysts and effusion. At baseline eight biochemical markers, representing tissue turnover of cartilage (UCTX-II, PIIANP, SCOMP, UTIINE), bone (total OC and UCTX-I), synovium (Glc-Gal-PYD) and inflammation (HsCRP) were measured. Each was then subdivided into 4 categories based on the quartiles (Q1-Q4). Odds ratios and 95%CI were then calculated to assess the presence of any type of abnormality versus a specific biomarker and adjusted for age, sex, BMI and family effect.

Results: 195 patients had successful MRI and biomarkers measured (80% women; mean age, 60 years, range, 43-76; mean BMI, 26.5, range 20.0-40.0). At baseline it was seen that in the presence of UCTX-I (Q2: 3.36; 1.54-7.32; Q3: 2.71; 1.19-6.19; Q4: 3.8; 1.61-9.07), PIIANP (Q2: 2.43; 1.11-5.34; Q3: 2.51; 1.05-6.02) and total OC (Q4: 2.36; 1.02-5.59) there was a higher risk of BME formation anywhere in the knee. In the presence of UTIINE (Q3: 3.05; 1.37-6.81; Q4:3.41; 1.43-8.12) and total OC (Q4: 2.63; 1.00-6.98) there was a higher risk of subchondral cyst formation anywhere in the knee. In the presence of PIIANP (Q3: 13.80; 1.90-100.01) there was a higher risk of cartilage defects anywhere in the knee. However there was very little progression on MRI 2 years later and no predictive significance of these biomarkers was demonstrated.

Discussion / Conclusion: Whilst PIIANP correlates with cartilage turnover, the presence of cartilage defects, BME and cyst formation, as does UCTX-I, and higher levels of total OC affect BME formation, no 2 year predictive significance could be found. Hence, there is an apparent disparity in the role of CTX-II in radiographic as opposed to MRI progression in kOA.

Navigation system for interventional CT-guided procedures: First phantom and clinical experience

P Amarteifio, M Meier-Meitingner, U Baum, N Markus, K Willi, B Werner
(Erlangen, Germany)

Room "Turgut Reis II-III" – Saturday June 2nd – 11:20 -11:30

Purpose / Introduction: Evaluation of practicability and accuracy of a novel navigation system for interventional CT-guided procedures. Investigations were in phantom and in patient.

Materials and Methods: The navigation system (CAPPa IRAD, CAS innovations

AG, Erlangen, Germany) was applied in CT-guided biopsies in phantom and patients. The system consists of a PC, navigation software, an optical tracking system and a patient frame. For the phantom study we used a spine phantom in wax. First of all the patient or the phantom is fixed with a double vacuum fixation device (BodyFix™, Medical Intelligence, Schwab-Munich, Germany) on CT table, the patient frame with optical and CT markers is positioned above and the region of interest is scanned. All data are transferred instantly to the navigation system inside scanning room. The target approach is planned with the navigation software which offers MPRs in four orientations. After this the needle holder is orientated towards the trajectory. Finally a coaxial biopsy needle is pushed to the planned target. The accuracy of the procedures was evaluated using navigation software to measure the distance between target and needle tip.

Results: In the phantom study (n=15) the average deviation between planned and documented needle tip position was 0.9 mm. In the clinical study (n=15) we performed biopsies of the lung, the mediastinal area, of clavicle and acetabulum, of spine and one nerve root infiltration. In 12 out of 15 cases the needle feed was done in an angulated 3D approach. In 11 cases only one planning and one control scan was carried out before taking biopsy. In spite of an additional safety scan performed in 3 procedures, only once a marginal correction of planned needle feed was done. During the nerve root infiltration three corrections were necessary because of needle bending by using a very thin needle. In all cases the needle tip was within the lesion and histological diagnoses could be defined. The length of procedure was about 30 minutes.

Discussion / Conclusion: The navigation system allows interventions even of smallest lesions in an angulated approach with a high accuracy. The navigation system facilitates CT-guided procedures, makes them less traumatic and reduces the radiation exposure.

Is percutaneous perineural steroid injection effective in the palliation of persistent rhizitic pain?

A Kozadinos, V Souftas, T Birbilis, P Prassopoulos (Alexandroupolis, Greece)
Room "Turgut Reis II-III" – Level 7 - Saturday June 2nd – 11:30 - 11:40

Purpose / Introduction: To evaluate the efficacy of perineural steroid injection, under CT guidance, as a treatment for lumbar radiculopathy (LR).

Materials and Methods: Seventeen consecutive patients (13 males and 4

females, age range 37-65y, mean 55,8y) with LR, not related to malignancy, enrolled in this study. The level of pain was evaluated using the visual analogue pain intensity scale (VAS), where 0 = no pain and 10 = worst pain. Patients eligible for the study have been treated conservatively with minor or no response and had a VAS score over 6. Under CT guidance a 22-G needle was advanced adjacent or into the intervertebral foramen via a posterolateral approach and a solution of 1ml Betamethasone, 2ml Lidocaine and 0,5ml Iopromide was injected. The distribution of the dilution was examined by CT. Pain levels were reevaluated at the 1st , 3rd and 9th month follow-up. Outcome was concluded as satisfactory with a decrease of at least 4 grades in VAS.

Results: Fifteen patients (88,3%) experienced satisfactory remission of pain. Seven after the first, 5 after the second and 3 after the third session. Two patients (11,7%) presented no improvement (pain decrease <4). No major complications were observed. Three patients complaint of pain during the procedure, one with nerve root puncture and two with needle insertion into the facet joint.

Discussion / Conclusion: Percutaneous perineural injection is a simple, effective and low-risk procedure for the treatment of rhizitic pain in patients not responded to conservative treatment.

Cervical Clearance Radiation Doses & Cancer Induction

P Richards, R Summerfield (Stoke on Trent, UK)

Room "Turgut Reis II-III" – Level 7 - Saturday June 2nd – 11:40 -11:50

Purpose / Introduction: To compare the radiation dose of cervical spine clearance in a cohort of unconscious, major trauma patients for three different protocols, comparing spiral to multi-slice CT. To quantify the radiation exposure effect of the protocols on the lifetime cancer risk.

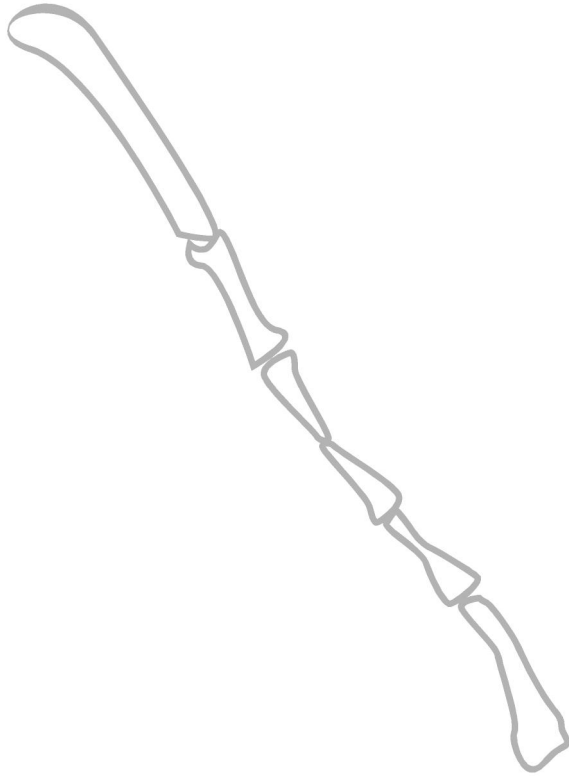
Materials and Methods: Using our trauma database, unconscious (GCS<9), severely injured (Injury Severity Score >15) patients were identified from 1.1.01 to 21.12.03, excluding isolated head injuries. The protocols used for imaging the brain and cervical spine were: 1) Lateral, antero-posterior and peg radiographs. CT brain and cranio-cervical junction. 2) Lateral and antero-posterior radiographs. CT brain, cranio-cervical and cervico-dorsal junctions 3) A lateral radiograph. CT brain and cervical spine. The Toshiba Xpress GX CT scanner (spiral) was used. The Monte Carlo software was used to estimate the x-ray doses to the whole body and to the thyroid. The associated nominal

additional lifetime cancer risk was assessed. Equivalent doses were estimated for Siemens Sensation 16 multi-slice scanner.

Results: There were 33 cases for evaluation. Results as follow: Spiral CT Total effective doses (mSv) were 4.4, 1 and 8.2 for protocols 1, 2 and 3 respectively. Mean thyroid doses (mGy) were 8.5, 48.9, 66.5 Nominal lifetime cancer risks were 1:4500, 1:2800, 1:2400. Multi-slice CT scanner, Total effective doses (mSv) were 2.3, 4.3, 5.4. Mean thyroid doses (mGy) were 5.9, 36.1, 52.4. The lifetime cancer risks were 1:8700, 1:4600, 1:3700. The total dose and additional lifetime nominal cancer risk associated with CT of the chest, abdomen and pelvis (CAP) were 11.8 mSv and 1:1700. When combined with a CT CAP the cancer risks for each protocol were 1)1:1500, 2)1:1200, 3)1:1200

Discussion / Conclusion: CT CAP is associated with the greatest risk of inducing a fatal cancer in the severely injured patient with a GCS less than 9. In our institution the multi-slice CT protocols expose the patient to less radiation than single slice CT, which is contrary to much of the published work to date. CT scanning the thyroid (or whole cervical spine) still has a marked effect on the cancer risk in cervical clearance. Many centres will relax cervical spinal precautions in unconscious trauma patients if the cervical spine CT with reconstructions is normal. CT of the whole cervical spine may be justified in these patients. Concerns about inducing thyroid tumours are relatively minor given that their prognosis is poor. In conscious trauma patients, the additional lifetime risk may not justify CT of the whole cervical spine as a routine practice.

NOTES



Scientific Session 8

Chairs: J. Garcia (Switzerland) and A. Mester (Hungary)

The Significance of Epidural Varicose Veins Detected on MRI Scan in Patients with Spinal Stenosis

H Obaid, D Finlay, Z Husamaldin (Leicester, UK)

Room "Çaka Bey" – Level 2 - Saturday June 2nd – 10:30 -10:40

Purpose / Introduction: To determine the incidence rate of epidural varicose veins in patients with spinal stenosis on MRI scan. To explore the relationship between epidural varicose veins and radiculopathy. To assess the impact of epidural varicose veins on patient management.

Materials and Methods: A retrospective review of 200 MRI scans performed during the period 01/01/06 and 01/01/07. All the patients had radiological diagnosis of spinal stenosis. Routine MRI protocol was performed. Images were reviewed on PACS by Musculoskeletal Radiology resident and experienced Musculoskeletal Radiologist. Radiology reports were reviewed on Computerised Radiology Information System. Patients' medical notes were checked when necessary.

Results: The incidence rate of epidural varicos veins is 2% (n=4) in all the MRI scans of patients with spinal stenosis. All of these patients have had radiculopathy symptoms. Further results are under analysis and will be submitted at a later stage.

Discussion / Conclusion: The association between epidural varicose veins and spinal stenosis well documented surgically. However, the presence of this phenomenon had not been confirmed Radiologically. In Our study, we presented radiological evidence to support this association. These patients are more likely to have radiculopathy symptoms which have significant impact on patient management.

Degenerative Lumbar Spinal Stenosis: Correlation with Oswestry Disability Index and MRI

M Sirvanci, M Bhatia, K A Ganiyusufoglu, C Duran, M Tezer, C Ozturk, M Aydogan, A Hamzaoglu (Istanbul, Turkey)

Room "Çaka Bey" – Level 2 - Saturday June 2nd – 10:40 -10:50

Purpose / Introduction: The aim of the study was to establish a relationship

between the degree of radiologically established anatomic stenosis and the severity of self assessed Oswestry Disability Index (ODI) in patients undergoing surgery for multilevel degenerative lumbar spinal stenosis (LSS). Degenerative lumbar spinal stenosis is defined as narrowing of the spinal canal, the lateral nerve root canal or the intervertebral neural foramina, at a single or multiple levels.

Materials and Methods: 63 patients with multilevel degenerative LSS scheduled for elective surgery were enrolled in the study. All patients underwent a preoperative MRI and completed the patient self assessment ODI questionnaire. Quantitative image evaluation for LSS included dural sac cross sectional area, lateral recess and foraminal evaluations for stenosis, conducted independently by two experienced radiologists. Each patient subsequently answered the Turkish translation of the ODI questionnaire, and percentage disability was calculated. Statistical analysis of the data was performed to correlate quantitative radiological stenosis and percentage disability recorded by the ODI.

Results: On quantitative radiological assessment, of the 63 patients evaluated, 27 had severe dural sac stenosis; 11 had grade 3 nerve root compromise in the lateral recess; and 22 had grade 3 foraminal stenosis. On the basis of the percentage disability score (ODI), of the 63 patients, 10 patients demonstrated mild disability, 13 patients moderate disability, 25 patients severe disability, 12 patients were crippled and 3 patients bed ridden. Radiologically, 8 patients with severe central stenosis and 9 patients with moderate lateral stenosis demonstrated only minimal disability on percentage ODI scores. On statistical evaluation of central and lateral radiological stenosis versus ODI percentage scores, no significant correlation was established.

Discussion / Conclusion: LSS is one of the most common reasons for decompressive spinal surgery to relieve pressure on the neurovascular structures. Accurate radiological diagnosis is thus crucial to treatment selection. The ODI is a simple, condition specific, and reliable tool covering a wide domain of function, pain and limitation in health status. The relationship between the disability index and the degree of radiologically verified constriction could not be established. Hence, LSS remains a clinico-radiological syndrome and therapy must be targeted at the most distressing symptoms and not on the degree of narrowing.

Degenerative changes of posterior stabilizing elements in individuals complaining of Low Back Pain visualized using STIR Sequence

H Lakadamyali, N C Tarhan, T Ergun, B Cakir, M Karatas, A M Agildere

(Antalya, Turkey)

Room "Çaka Bey" – Level 2 - Saturday June 2nd – 10:50 -11:00

Purpose / Introduction: The goal of the present study was to investigate the relationship of posterior elements' degenerative changes, which cannot be usually visualized with routine MRI techniques, and low back pain. In addition, based on the big size of the study population, age and sex distribution of the posterior elements' degenerative changes visualized with STIR sequences were attempted.

Materials and Methods: The lumbar MRI findings of 372 (150 males, 222 females) patients referred to our radiology department within a 4-year time period complaining of low back pain, with no radicular pain, were analyzed. Mean age was 47 years. Patients with recent trauma or surgical history and those with well-known reason for low back pain (spondylolisthesis, spondylolysis, extruded or sequestered discs, infection, tumor) were not included. In addition to routine MRI sequences, sagittal STIR sequence was obtained from all patients. Images were evaluated by two radiology specialists in consensus. Presence of interspinous ligament edema (ISL), facet joint effusion and neocyst formation, degeneration of intrinsic spinal muscles, presence of subcutaneous edema and intervertebral disc degeneration were considered on STIR sequences and incidence for each finding was determined. All findings were also grouped based on age, gender and affected disc level. Pearson Chi-Square test was used for statistical analysis.

Results: Intervertebral disc degeneration was found in 78% of the patients. ISL edema was detected mostly at L4-5 level. The changes in the posterior elements were as follows: facet joint effusion (85.5%), ISL edema at L4-5 (80.6%), at L5-S1 (79.8%), facet joint neocysts (62.4%), subcutaneous edema (27.2%) and intrinsic spinal muscle degeneration (24.7%). Most of the pathologies were observed among age Group III (41-50 years) and female patients. Statistically significant difference was found in subcutaneous edema and intrinsic spinal muscle degeneration between age groups.

Discussion / Conclusion: Degenerative changes of the posterior spinal elements are found in a high percentage of patients with low back pain. STIR sequence

with homogenous fat suppression allows visualization of those changes in addition to routine MRI technique.

MRI findings in the lumbar spine of asymptomatic adolescent/ young tennis players

F Alyas, M Turner, D Connell (London, UK)

Room "Çaka Bey" – Level 2 - Saturday June 2nd – 11:00 -11:10

Purpose / Introduction: Injuries to the lumbar spine are common in tennis players due the increased twisting and rotation movement of the spine and include facet joint disease, pars injuries and disc herniation. Recognition of those young/adolescent tennis players at risk of developing lumbar spine injury could aid appropriate training/technique modification and /or physiotherapy to prevent these injuries- "prehab". We aim to describe the prevalence of these early changes on the MRI of the lumbar spine in a of group asymptomatic elite young/adolescent tennis players.

Materials and Methods: Prospective analysis was performed of the Lumbar MRI scans of 33 asymptomatic adolescent/ young tennis players (17.3 +/- 1.7 years, 18 males, 15 females) as part of an on going screening programme and longitudinal study. Sagittal T1, T2, STIR and axial T2 weighted images were reviewed for the presence of: disc desiccation, disc herination, pars lesions (fracture or stress reaction) and facet joint arthrosis by two radiologists in consensus.

Results: 5/33 players showed no abnormality. 9/33 players showed pars lesions (one at two levels) almost exclusively at the L5 level (9/10-L5, 1/10-L4). 3/10 lesions were complete fractures, 2 demonstrating grade 1 and 1 grade 2 spondylolithesis. Both of which resulted in moderate narrowing of the L5 exit foramen. 2/10 had acute and 5/10 chronic stress reactions in the pars. 23/33 patients showed signs of facet arthrosis occurring at the L5/S1 (15/29 joints) and L4/5 (12/29 joints) levels. 20/29 joints showed mild degeneration and 9/29 joints moderate degeneration. 20/29 showed sclerosis and 24/29 hypertrophy of the facet joint. Synovial cysts were identified in 14/29 and these were all confined to the para-spinal side of the joint. Constitutional narrowing of the central canal was identified in 3/33 players. 1 player had moderate central canal stenosis due to a combination of facet degeneration, constitutional narrowing and a broad disc bulge. 15/33 players showed disc desiccation and a disc bulge (14/16 discs-mild, 2/16-moderate) most frequently at the L4/5 and L5/S1 levels (13/16 discs). 2 discs showed high intensity zones and 1 appeared

as a Schmorl's node.

Discussion / Conclusion: Abnormalities in the lumbar spine of asymptomatic young/adolescent tennis players occur in 28/33 (84.8%) of all cases, and almost exclusively at the L4/5 and L5/S1 levels. Potentially symptomatic findings of Pars defects and facet joint arthrosis are relatively common occurring in 27.3% and 69.7% respectively.

Iron overload of vertebral bone marrow in beta-thalassemia major: imaging findings and correlation of R2 relaxation rate values with iron stores

○ Papakonstantinou, E Alexopoulou, K Foufa, A Gouliamos, N Kelekis, N Economopoulos (Athens, Greece)

Room "Çaka Bey" – Level 2 - Saturday June 2nd – 11:10 -11:20

Purpose / Introduction: To describe the MR imaging features of vertebral bone marrow and explore the relation between R2 values of vertebral bone marrow, liver, spleen and serum ferritin in transfusion-dependent patients with beta-thalassemia major.

Materials and Methods: R2 relaxation rate values of vertebral bone marrow, liver and spleen were retrospectively calculated in 72 consecutive patients and 10 healthy controls. All patients were under systematic red-blood cell transfusions and chelation therapy with desferoxamine and had undergone MR imaging, at 1.5T, at a single institution, in a four-year period, for quantification of hepatic and myocardial iron overload. The imaging sequence used was a respiratory triggered 16-echo Carr-Purcell-Meiboom-Gill (CPMG) spin-echo sequence (TR: 2000 msec, TE_{min}: 5 msec, in 16 symmetrically repeatable echoes). The medical records of the patients were reviewed and serum ferritin values close to the MR studies were recorded.

Results: R2 values of bone marrow: a) were reduced in 69/73 patients and were normal in 4/73 patients, respectively b) correlated with hepatic, splenic R2 values and serum ferritin levels (pearsons correlation, $r=0,45$ $p < 0,0001$, $r=0,54$ $p < 0,0008$ and $r=0,47$ $p < 0,001$ respectively). Sites of extramedullary hematopoiesis were seen in two patients.

Discussion / Conclusion: Hemosiderosis of vertebral bone marrow is common in transfusion-dependent thalassemic patients. However, occasionally, iron distribution may follow an unpredictable pattern compromising normal bone marrow in the presence of siderotic liver, such as seen in primary

hemochromatosis. MR imaging can be valuable in the follow-up of thalassemic patients and in elucidating iron kinetics.

Quantitative detection of vertebral fracture on DXA images using Active Shape (ASM) and Appearance Models (AAM)

JE Adams, MG Roberts, E M.B. Pacheco, TF Cootes (Manchester, UK)
Room "Çaka Bey" – Level 2 - Saturday June 2nd – 11:20 -11:30

Purpose / Introduction: Current quantitative morphometric methods of vertebral fracture identification lack specificity, particularly with mild (grade 1) fractures. We have used more detailed shape and texture information to develop quantitative classifiers of vertebral fractures.

Materials and Methods: The detailed shape and appearance of vertebrae on 250 lateral dual energy X-ray absorptiometry (DXA) images were modelled statistically, using Principal Components Analysis. The vertebrae were given a "gold standard" classification using a consensus reading by two radiologists. Relevant shape and appearance parameters were then selected using stepwise regression, and linear discriminants were trained on these shape and appearance parameters.

Results: The appearance-based classifiers gave better specificity than shape-based methods in the lumbar and mid-thoracic spine. The specificity was 94% at a sensitivity of 95%, representing a sensitivity of 84% on grade 1 fractures (vs 71% for height ratio classifier), and 100% on grade 2 or 3 fractures. Using the full shape parameters improved specificity in the upper thoracic spine compared to using three standard height ratios when operating at high sensitivity (>95%). The main improvement was in the detection of mild fractures. In the thoracic spine, a linear discriminant classifier trained using three height ratios also outperformed a more standard morphometric approach in which height ratios were thresholded individually (90% specificity vs 83% specificity at 95% sensitivity).

Discussion / Conclusion: The shape and appearance parameters of statistical models of vertebrae could provide more powerful quantitative classifiers of osteoporotic vertebral fracture. A standard morphometric approach using three height ratios could also be improved by using a linear discriminant classifier instead of the currently favoured method of thresholding each ratio individually.

Potential MRI-pitfalls when reporting cervical trauma patients

E J Ulbrich, M Sturzenegger, A Busato, C Boesch, B Saar, H M Bonel, H Zimmermann, *J Hodler, S E Anderson (Bern, Switzerland, * Zurich, Switzerland)
Room "Çaka Bey" – Level 2 - Saturday June 2nd – 11:30 -11:40

Purpose / Introduction: MR abnormalities in whiplash injury may be very subtle and may include minimal bone marrow abnormalities of facet joints or minimal fluid collections within or along cervical muscles. Such findings may also be present in healthy controls. To differentiate normal anatomical variations from acute posttraumatic findings in MR examinations of the cervical spine.

Materials and Methods: MR examinations of 29 controls (12 females, 17 males, mean age 36.7, range 20 to 81 years) were reviewed. The study protocol included: sagittal T2, STIR and T1 images, axial STIR images as well as sagittal pre- and post contrast 3D VIBE images which were also subtracted. Image evaluation was performed in consensus a senior musculoskeletal radiologist and a resident. Features reviewed were: 1) presence of any fluid in atlantodental joint and facet joints ; 2a) focal signal abnormalities of facet joints and 2b) vessels around facet joints potentially causing partial volume artefacts and thus mimicking facet contusion/fracture; 3) vessels potentially mimicking subtle muscle strain or hematoma of muscles and subcutaneous fat.

Results: 55,2 % of the controls showed a small amount of fluid in the atlantodental joint and 20,7 % in the facet joints (C2/3 right side, n = 4). In 17,2 % of the controls facet joint contusion/fracture were suspected on single sagittal STIR/T2 images, but were attributed to joint degeneration when the entire sequence was evaluated. In 31,0 % of the controls, a facet contusion was suspected on sagittal VIBE post-contrast images but considered to represent synovial/epidural vessels near the anterior portion of the facet joint when the entire sequence was evaluated. 55,2 % of the controls appeared to have a subtle hematoma in the deep dorsal cervical muscles (especially lower cervical spine) in the sagittal STIR or pre-contrast VIBE images, confirmed to represent prominent vessels on axial STIR and sagittal post-contrast VIBE images. In 69,0 % of the volunteers tortuous vessels were potentially misinterpreted as muscle strain on axial STIR images, and in 6,9 % prominent subcutaneous vessels could be misinterpreted as a hematoma on STIR images.

Discussion / Conclusion: In up to 69 % of an asymptomatic control population tortuous or dilated vessels as well as degenerative joint disease may mimic the subtle abnormalities which may occur in patients with whiplash injury. This project was supported by the National Research Programme NRP 53

CT guided transforaminal cervical nerve root block: Is an injection of steroid alone as effective as a combination of local anaesthetic and steroid?

*S P Suresh, **S L J James, ***H Jones, ****David Connell (*Plymouth, UK, ** Birmingham, UK, *** Surrey, UK, **** London, UK)

Room “Çaka Bey” – Level 2 - Saturday June 2nd – 11:40 -11:50

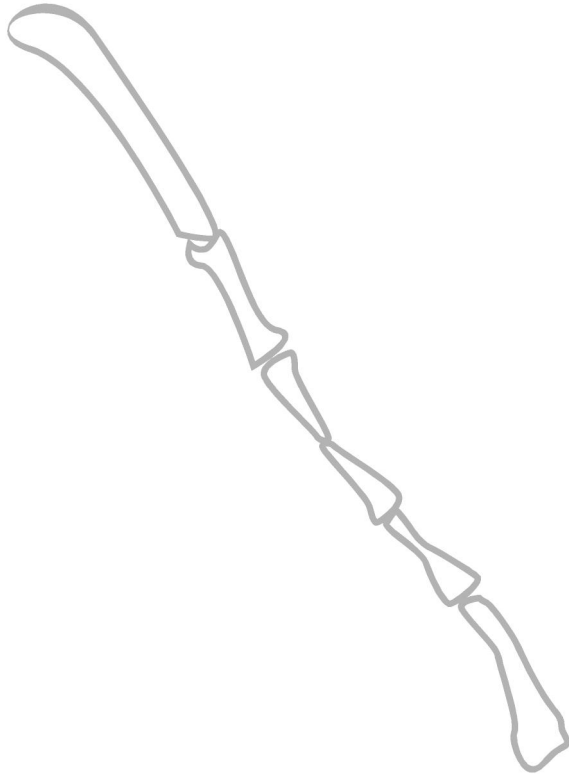
Purpose / Introduction: The aim of the study was to demonstrate whether the injection of steroid in isolation into the neural foramen would achieve a similar outcome to a combination of steroid and local anaesthetic. We therefore prospectively analysed the outcome in two randomised groups, one receiving steroid alone and the other receiving a combination of steroid and local anaesthetic as a treatment for cervical radiculopathy.

Materials and Methods: Review board approval and patient informed consent was obtained for the study and fifty three patients with refractory neck pain and radicular symptoms were recruited. Patients were asked to rate their symptoms on a visual analogue score (VAS) of 0-10. This data was collected both before and after the procedure at 15 minutes, 24 hours, 1 week, 1 month and 3 months.

Results: The median (IQR) VAS score for arm pain pre-procedure (N = 53) was 8 (7-9) which significantly decreased at 3 months to a median of 4 (2-8) ($z = 5.281, p < 0.001$). The median VAS score for neck pain (N = 53) pre-procedure was 8 (8-9), which significantly decreased to a median of 4.5 (3-8) ($z = 5.343, p < 0.001$) at 3 months. Sub-division of patients (N = 52) into those who received steroid alone (n = 26) and those who received lignocaine and steroid combined (n = 26) demonstrated no significant difference in pre-procedure VAS pain score for the neck and arm and the scores taken at 24 hours and at 3 months ($p = 0.607$).

Discussion / Conclusion: Our study has demonstrated no significant difference in pain outcome in the 2 randomized patient groups. Injection of steroid in isolation should suffice in providing pain relief.

NOTES



EPOS™

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The organising committee thanks the members of the scientific committee for reviewing and rating the abstract submissions and awarding certificates of Merit, Cum Laude, Magna Cum Laude and Organizing Committee Special Award for Case Reports.

EPOS™ Jury

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US-Guided removal of soft tissues foreign bodies: personal experience

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Awarded with “Cum Laude”

Ultrasound of plantar plates: Normal and pathological findings

E. Capaccio¹, A. Tagliafico¹, N. Pignataro¹, S. Bianchi², C. Martinoli¹; ¹Genova/IT, ²Geneva/CH

Anomalous muscles: Imaging findings with anatomical correlation

M. Miguel-Pérez¹, E. Capaccio², A. Tagliafico², J. Calzada³, S. Bianchi⁴, C. Martinoli²; ¹Barcelona/ES, ²Genova/IT, ³Barcelona/IT, ⁴Geneva/CH

The role of ultrasonography in patients with radial nerve pathology. Comparison with Magnetic Resonance and surgery

C. Bertocchi, S. Colopi, R. Adani, E. Gallo, P. Torricelli; Modena/IT

The significance of epidural varicose veins detected on MRI scan in patients with spinal stenosis.

H. Obaid, D. Finlay, Z. Husamaldin; Leicester/GB

Imaging of craniocervical junction injuries

A. Leone; Rome/IT

Awarded with "Certificate of Merit"

Radiofrequency ablation of painful postamputation neuromas

J. Brtkova; Hradec Kralove/CZ

Radiation dose considerations in the preoperative planning of hip replacement surgery

C.P. Mullan, R.B. Mooney, D.E. Beverland, H.A.P. Archbold, J.M. Elliott; Belfast/GB

Skeletal manifestations of sarcoidosis

G. Stasinou¹, C. Arriagada², S. Kattapuram³; ¹Athens/GR, ²Valparaiso/CL, ³Boston/US

The value of ultrasound in acute ankle injury-comparison with MR

P. Margetic, D. Miklic, V. Rakic-Ersek, M. Salaj, Z. Doko, I.Z. Lubina; Zagreb/HR

Pain at the popliteal fossa and calf. The role of musculoskeletal ultrasound

A. Foteinos¹, S. Nikolaos², P. Nasia², A. Michaelides², S. Chalkias²; ¹Rodos/GR, ²Chios/GR

Myelographic magnetic resonance imaging of the cervical spine with coherent oscillatory state acquisition for the manipulation of image contrast (COSMIC) : Initial experience

T.L. Huang¹, A.T. Vu², B. Bittersohl¹, M.A. Duran-Mendicuti¹, T. Sung¹, L. Alparslan¹, P.K. Lang¹, H. Yoshioka³; ¹Boston, Ma/US, ²Waukesha, Wi/US, ³Boston/US

The intravertebral vacuum phenom as specific sign of osteonecrosis in vertebral fractures

M. Libicher¹, I. Berger², M. Baier², A. Appelt², I. Grafe², C. Kasperk²;
1Cologne/DE, 2Heidelberg/DE

Intramedullary 'cortical' bone formation after intramedullary nailing

V. Katsiva¹, S. Papadakis², A. Balanika², D. Segkos², V. Stavrianos², I. Balia²,
S. Ispanopoulou¹, O. Papakonstadinou³; 1Piraeus/GR, 2Athens/GR,
3Athens/IS

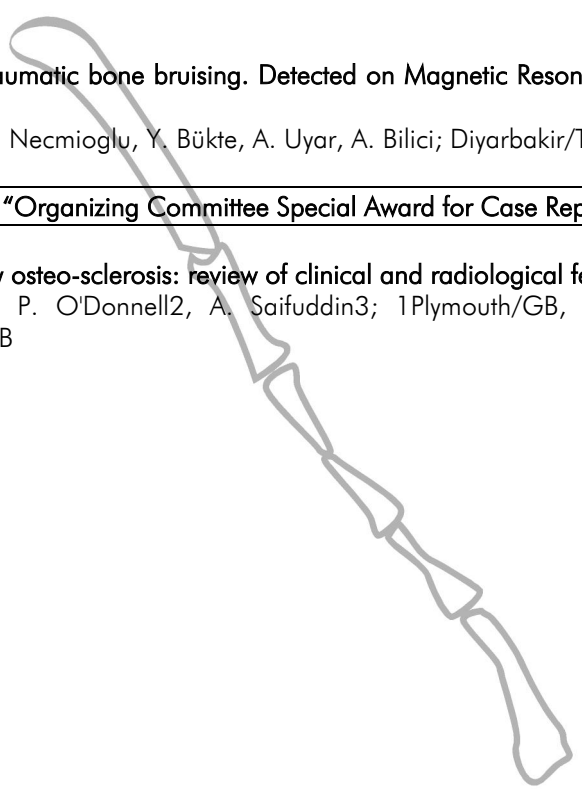
Occult posttraumatic bone bruising. Detected on Magnetic Resonance Imaging in knees

K. Meric, N.S. Necmioglu, Y. Bükte, A. Uyar, A. Bilici; Diyarbakir/TR

Awarded with "Organizing Committee Special Award for Case Reports"

Intramedullary osteo-sclerosis: review of clinical and radiological features

S.P. Suresh¹, P. O'Donnell², A. Saifuddin³; 1Plymouth/GB, 2London/GB,
3Stanmore/GB



Other Submitted Scientific Posters

The value of ultrasound in acute ankle injury-comparison with MR

P. Margetic, D. Miklic, V. Rakic-Ersek, M. Salaj, Z. Doko, I.Z. Lubina;
Zagreb/HR

Skeletal manifestations of sarcoidosis

G. Stasinou¹, C. Arriagada², S. Kattapuram³; ¹Athens/GR, ²Valparaiso/CL,
³Boston/US

Diffusion Weighted Magnetic Resonance (DWMR) Imaging of knee injuries

P.D. Corr; Al Ain/AE

Antibodies against citrullinated vimentin in rheumatoid arthritis: Higher sensitivity and extended prognostic value concerning future radiological progression as compared to antibodies against CCP

M.C. Wick¹, L. Mathsson², M. Mullazehi², O. Sjöberg², R.F. van Vollenhoven³, L. Klareskog³, J. Rönnelid²; ¹Innsbruck/AT, ²Uppsala/SE,
³Stockholm/SE

Power-Doppler- ultrasonography in the identification of early synovitis in patients with cutaneous psoriasis: a new radiological screening test

N. Magarelli¹, A.M. Ierardi¹, A. Leone¹, G. Guglielmi², L. Bonomo¹;
¹Rome/IT, ²San Giovanni Rotondo (fg)/IT

Extraaxial neurogenic tumors- Discrimination with Magnetic Resonance

H. Rodrigues, P. Belo-Oliveira, P.J. Donato, C. Marques; Coimbra/PT

The role of ultrasonography in patients with radial nerve pathology. Comparison with Magnetic Resonance and surgery

C. Bertocchi, S. Colopi, R. Adani, E. Gallo, P. Torricelli; Modena/IT

MR evaluation for the histologic components of soft-tissue tumors: Comparison of MEDIC and conventional T2-weighted Imaging

I.S. Lee, T.Y. Moon; Busan/KR

MRI findings of synovial chondromatosis of a rare joint: Shoulder

H.T. Sanal, N. Bulakbasi, M. Kocaoglu, C. Tayfun, I. Somuncu; Ankara/TR

Impact of Whole-Body MR in the assesment of extension and follow-up of hemophilic artropathy. Preliminary study
R.O. Dominguez Oronoz; Barcelona/ES

The evaluation of distal radioulnar joint with 3-D CT
F. Demirkan¹, N. Sabir¹, M. Üçdal²; ¹Denizli/TR, ²Kahramanmaraş/TR

Swellings secondary to specific infections
H.T. Sanal, M. Kocaoglu, N. Bulakbasi, T. Ucoz, I. Somuncu; Ankara/TR

Contrast enhanced ultrasound (CEUS) with second generation contrast agent (sonovue) in professional athletes insertional tendinopathy
E.A. Genovese, C. Recaldini, F. Fontana, A. Leonardi, L. Callegari, C. Fugazzola; Varese/IT

Radiological and clinical evaluation of bio-absorbable pin fixation in Mitchell's Osteotomies
I. Alcelik, M. Alnaib, C.J. Tulloch; Stockton On Tees/GB

Radiofrequency ablation of painful postamputation neuromas
J. Brtkova; Hradec Kralove/CZ

The effect of severity of athrosis on bone mineral density in women
A. Hayirlioglu, H. Gökaslan, N. Andaç Baltacioglu; İstanbul/TR

The incidence of skip metastases in high-grade osteosarcoma as detected by MRI
F. Alyas¹, M. Rehman¹, A. Saifuddin²; ¹London/GB, ²Stanmore/GB

Bone structure and volumetric bone mineral density in young oligomenorrhoeic/hyperandrogenic women with polycystic ovary synrome: A peripheral quantitative computed tomography (pQCT) study
A. Balanika, C. Baltas, T. Spyridopoulos, O. Papakonstantinou, V. Bizimi, E. Trakakis, G. Skarantavos, A. Gouliamos; Athens/GR

Utility of ultrasonography for hemiplegic shoulder pain after stroke
I.S. Lee, T.Y. Moon, Y.B. Shin, J.W. Song; Busan/KR

US-Guided removal of soft tissues foreign bodies: personal experience
L. Callegari, A. Leonardi, A. Bini, P. Nicotera, D. Mariani, E. Genovese, C. Sabato, C. Fugazzola; Varese/IT

MRI of the knee in osteoarthritis (OA): Is it effective?

R. Sharma, P.R. Kornaat, M. Kloppenburg, I. Watt; Leiden/NL

Percutaneous US-guided treatment of calcific tendinitis: personal experience in 70 patients

P. Nicotera, L. Callegari, M.G. Angeretti, A. Leonardi, A. Spanò, D. Mariani, E. Genovese, C. Fugazzola; Varese/IT

Proposal of US-infiltration and orthotic device combined treatment of metatarsalgia non-morton neuroma linked.

D. Mariani, L. Callegari, A. Bini, C. Sabato, A. Leonardi, G. Sturniolo, E. Genovese, C. Fugazzola; Varese/IT

Synovial sarcoma: detection of neoadjuvant therapy response with dynamic MR imaging

G. Duygulu, R. Arkun, M. Argin, T. Akalin, Y. Anacak, D. Sabah; İzmir/TR

Painful bones metastases of lung cancer: CT guided Radiofrequency Ablation

S. Velitsista, N. Sidiropoulou, P. Filippousis, S. Apostolopoulou, L. Poulou, A. Manataki, L. Thanos; Athens/GR

MRI manifestations of soft tissue hemangiomas and accompanying reactive bone changes

A. Pourbagher, G. Ozkoc, N. Bal, M.A. Pourbagher; Adana/TR

Measurement of trunk muscles area in patients with chronic low pain by CT

D. Kiresi, D. Emlik, M. Kamaz, H. Oguz, K. Odev; Konya/TR

Magnetic resonance imaging with low-field strength extremity-only magnet of collateral ankle ligaments reconstruction in young athletes

P. Cardello¹, M. Russo¹, C. Selvaggini²; ¹Viterbo/IT, ²Tarquinia (vt)/IT

Changes in bone strength, muscle mass and subcutaneous fat mass, measured by peripheral quantitative computed tomography (pQCT), in men treated with androgen deprivation therapy (ADT) for prostate carcinoma

A. Balanika, C. Baltas, T. Spyridopoulos, O. Papakonstantinou, M. Tsouroulas, A. Grigorakis, G. Skarantavos, A. Gouliamos; Athens/GR

Morphological and Radiological study of the rotator cuff interval of the shoulder

R.A. El-Beshbishy; Cairo/EG

Anatomical and radiographic study of egyptian calcaneal angle in relation to other populations

O.M. Osman; Cairo/EG

Cortical and trabecular bone density of the forearm in tetraparetic patients

S.K. Stathopoulou¹, O. Lazoura¹, M. Vlychou², E. Antoniadou¹, C. Tsilikas¹, E. Drakonaki¹, P.J. Papadaki¹, A.N. Dimitrakopoulos¹; ¹Athens/GR, ²Larissa/GR

Predictors of ultrasonographic achilles tendon dimensions

S. Yildiz¹, S. Koparal², N. Ertug², N. Ozcan², O. Turksoy², L. Araz², E. Yuksel²; ¹Sanliurfa/TR, ²Ankara/TR

Evaluation of the anterior cruciate ligament of the knee: Comparison between flexed and extended knee position during MR Imaging

C. Muhle¹, C. Diecke²; ¹Vechta/DE, ²Kiel/DE

Patellar tendon length after ACL reconstruction. A comparative MRI study between patellar and hamstring tendon autografts

N.I. Skaulikaris¹, A.H. Karantanas¹, M. Hantes², K. Malizos²; ¹Iraklion/GR, ²Larissa/GR

Sonographic findings of the Median Nerve and prevalence of Carpal Tunnel Syndrome in patients with Parkinson's Disease

A. Yucel, O. Yilmaz, S. Babaoglu, M. Acar; Afyonkarahisar/TR

Intra-articular treatment with Hyaluronic Ac. under US- guidance in hip osteoarthritis. Personal experience in 41 patients with a medium-term follow-up

A. Spanò, L. Callegari, A. Bini, G. Sturniolo, P. Nicotera, C. Sabato, E. Genovese, C. Fugazzola; Varese/IT

Image Guided Hip Aspiration, a useful diagnostic test?

R.A. Beable, K. Jeyapalan; Leicester/GB

Dynamic contrast enhanced MRI of rheumatoid arthritis shows early changes due to anti-TNFalpha therapy

R. Hodgson¹, S. Connolly², T. Barnes¹, R.S.D. Campbell¹, B. Eyes¹, V. Adams¹, R. Moots¹; ¹Liverpool/GB, ²St Helens/GB

Proposal of a treatment technique with hyaluronic acid (low-medium molecular weight) in knee osteoarthritis

C. Sabato, L. Callegari, A. Bini, A. Leonardi, P. Nicotera, G. Sturniolo, E. Genovese, C. Fugazzola; Varese/IT

Degenerative changes of posterior stabilizing elements in individuals complaining of Low Back Pain visualized using STIR Sequence

H. Lakadamyali, N.C. Tarhan, T. Ergun, B. Cakir, M. Karatas, A.M. Agildere; Antalya/TR

Tuberculosis spondylitis vs pyogenic spondylitis: MRI findings

A. Athanassopoulou¹, İ. Kalogeropoulos¹, D. Passomenos², V. Psychoyios¹, S. Loti¹, O. Papakonstantinou¹, A.D. Gouliamos¹; ¹Athens/GR, ²Pireus/GR

The role of ultrasound examination in shoulder trauma diagnostics

M. Kečkovski, A. prláková - Puková, J. Neubauer, T. Uher, P. Vojtáník; Brno/CZ

Musculoskeletal hydatidosis

V.J. Vasilevska, G. Zafirovski, N. Kirjas, M. Samargiski, S.K. Kostadinova, K. Lozance, V.B. Tolevska; Skopje/MK

Pelvis and acetabular fractures detected with multislice CT images

E. Mine Karagöz¹, Y. Bükte¹, A. Uyar¹, A. Bilici²; ¹Diyarbakir/TR, ²Diyarbakir/TR

Limited MRI protocol (coronal stir) in the evaluation of hip pain

C. Çevikol, S. Gül, U. Senol, K. Karaali, A. Apaydin; Antalya/TR

Femoral Osteoid Osteoma: Our experience in percutaneous RF ablation treatment

C. Çevikol, K. Çeken, E. Dinçer, A. Kabaalioglu, A. Apaydin; Antalya/TR

Detection of the lipotrophy of lumbar paraspinal muscles semiquantitatively in patients with nonspecific low back pain by conventional MR sequences

B. Alicioglu, D. Demirbag Karayel, N. Sut, S. Emen; Edirne/TR

Synovial cysts of the lumbar facet joints: Magnetic resonance imaging features

B. Alicioglu; Edirne/TR

Axial loading CT-myelography versus MRI in degenerative stenosis with lumbar spine

M. Sirvanci, K.A. Ganiyusufoglu, M. Bhatia, C. Duran, C. Ozturk, S. Karaca, N. Aksu, A. Hamzaoglu; İstanbul/TR

Benign lipomatous tumors of the hand: Correlation of histopathological and MRI findings in 6 Patients

T. Ergun, H. Lakadamyali, A. Derincek; Antalya/TR

Haemophilic arthropathy: MR imaging findings in asymptomatic patients and correlation between MR and clinical score

O. Papakonstantinou, H. Pergantou, D. Logitsi, A. Balanika, N. Economopoulos, A. Papadopoulos, S. Aronis, N. Kelekis, A. Gouliamos; Athens/GR

Spinal hydatid disease: spectrum of MR imaging findings

O. Papakonstantinou¹, A. Athanassopoulou², D. Passomenos³, I. Kalogeropoulos¹, V. Psychoyios², A. Balanika¹, A. Gouliamos¹; ¹Athens/GR, ²Voula/GR, ³Pireus/GR

Musculoskeletal results in Neurofibromatosis 1 by sonography

N. Karabul, R. Brzezinska, R. Schumacher, P. Gutjahr; Mainz/DE

Image-guided radiosynoviorthesis with Yttrium-90 in knee joints for the treatment of chronic synovitis: technique and clinical outcome

B.J.A.M. Gonçalves, P. Abreu, M.A. Oliveira, A. Gil-Agostinho, F. Alves, G. Costa, A. Malcata, J.P. Lima, F. Caseiro-Alves; Coimbra/PT

Imaging of knee joint space inhomogeneity in children arthritis syndrome

A.K. Karpenko; St. Petersburg/RU

Diagnosing of rheumatoid arthritis of hand using magnetic resonance imaging

O.V. Mazurenko, Y.S. Babij, V.V. Udovichenko; Kiev/UA

Radiation dose considerations in the preoperative planning of hip replacement surgery

C.P. Mullan, R.B. Mooney, D.E. Beverland, H.A.P. Archbold, J.M. Elliott; Belfast/GB

Diagnostic impact of ultrasonography in musculoskeletal tumors

K. Köllő, K. Karlinger, Á. Mester; Budapest/HU

A pQCT evaluation of bone mass in Greek population: preliminary study

S.K. Stathopoulou¹, O. Lazoura¹, M. Vlychou², E. Drakonaki¹, P.J. Papadaki¹, A.N. Dimitrakopoulos¹, V. Antoniou¹, K. Kalokerinou¹, N. Tasiopoulos¹; ¹Athens/GR, ²Larissa/GR

Soft tissue composition and bone mass in Greek population

S.K. Stathopoulou¹, O. Lazoura¹, M. Vlychou², E. Drakonaki¹, P.J. Papadaki¹, A.N. Dimitrakopoulos¹, V. Antoniou¹, D. Voltea¹; ¹Athens/GR, ²Larissa/GR

Cortical and trabecular bone density and SSI of the forearm in hemiparesis by pQCT

S.K. Stathopoulou¹, O. Lazoura¹, M. Vlychou², E. Antoniadou¹, C. Tsilikas¹, E. Drakonaki¹, P.J. Papadaki¹, A.N. Dimitrakopoulos¹; ¹Athens/GR, ²Larissa/GR

Ultrasound diagnosis of sternum fractures

M. Vlychou¹, S.K. Stathopoulou², I. Gakidis², A. Larda², N. Makris², P.T. Mihos²; ¹Larissa/GR, ²Athens/GR

Trephine Bone Biopsies under CT-guidance in 275 lesions. Accuracy, Specificity, sensitivity and complications

S. Mylona, N. Giannoulakos, D. Kyriakoulis, E. Stroumpouli, N. Lepida, L. Thanos; Athens/GR

The significance of epidural varicose veins detected on MRI scan in patients with spinal stenosis.

H. Obaid, D. Finlay, Z. Husamaldin; Leicester/GB

T2*-weighted first pass perfusion MRI in evaluation of benign and malignant musculoskeletal lesions

H.T. Sanal, D. Yildirim, N. Bulakbasi, M. Kocaoglu; Ankara/TR

Myelographic magnetic resonance imaging of the cervical spine with coherent oscillatory state acquisition for the manipulation of image contrast (COSMIC) : Initial experience

T.L. Huang¹, A.T. Vu², B. Bittersohl¹, M.A. Duran-Mendicuti¹, T. Sung¹, L. Alparslan¹, P.K. Lang¹, H. Yoshioka³; ¹Boston, Ma/US, ²Waukesha, Wi/US, ³Boston/US

US-guided percutaneous treatment of plantar fasciitis

E. Silvestri, G. Garlaschi, L.M. Sconfienza, M. Falchi, S. Pucci, G. Minetti; Genova/IT

Occult posttraumatic bone bruising. Detected on Magnetic Resonance Imaging in knees

K. Meric, N.S. Necmioglu, Y. Bükte, A. Uyar, A. Bilici; Diyarbakir/TR

Single voxel proton MR spectroscopic imaging for characterization of musculoskeletal tumors

H.T. Sanal, D. Yildirim, N. Bulakbasi, M. Kocaoglu; Ankara/TR

Role of open 0,2T MRI in the condylomeniscal incoordination of the temporomandibular joint (TMJ)

E. Silvestri, G. Garlaschi, D. Schettini, F. Paparo, E. Guglieri, L. Dardano; Genova/IT

US-guided percutaneous 'washing' treatment of rotator cuff calcifications

E. Silvestri¹, G. Garlaschi¹, M. Falchi¹, F. Lacelli¹, G. Serafini², A. Muda¹; ¹Genova/IT, ²Pietra Ligure (SV)/IT

US-guided percutaneous steroid treatment of subacromial-subdeltoid bursitis

E. Silvestri, G. Garlaschi, L.M. Sconfienza, D. Schettini, A. Muda, M.C. D'Auria; Genova/IT

US-guided hip viscosupplementation and rehabilitative therapy of coxarthrosis

E. Silvestri, G. Garlaschi, L.M. Sconfienza, M. Falchi, A. Muda, Maggi; Genova/IT

The effect of low field (0.5 TESLA) and high (1.5 TESLA) field MR units in detecting meniscal tears

A. Ocguder, O. Tosun, T. Kalkan, M. Bozkurt, M.E. Sakarya; Ankara/TR

Ultrasound of plantar plates: Normal and pathological findings

E. Capaccio¹, A. Tagliafico¹, N. Pignataro¹, S. Bianchi², C. Martinoli¹; ¹Genova/IT, ²Geneva/CH

Quantitative detection of vertebral fracture on DXA images using Active Shape (ASM) and Appearance Models (AAM)

M.G. Roberts, E.M.B. Pacheco, T.F. Cootes, J.E. Adams; Manchester/GB

Cervical brachalgia: Assessment by cervical CT epidurography (CCTE) post transforaminal injection (TFI)

S.P. Tan; Kuala Lumpur/MY

Assessment of inter-observer variability of MRI in detecting meniscal and ligamentous lesions in the post traumatic knees

M. Bankooglu, E.D. Çiçek, T. Eren, R. Armagan, N. Cam, M. Basak; Istanbul/TR

Complete dislocation of the knee: A pictorial sample

P. Aparisi¹, P.R. Ferrer², E. Llopis¹, V. Higuera¹; ¹Valencia/ES, ²Alzira-Valencia/ES

Intramedullary 'cortical' bone formation after intramedullary nailing

V. Katsiva¹, S. Papadakis², A. Balanika², D. Segkos², V. Stavrianos², I. Balia², S. Ispanopoulou¹, O. Papakonstadinou³; ¹Piraeus/GR, ²Athens/GR, ³Athens/IS

Chronic compartment syndrome of the forearm in motocross racers: Diagnostic value of MRI

J.L.M.A. Gielen¹, B. Peersman¹, G. Peersman¹, P. Van Dyck¹, F.M. Vanhoenacker²; ¹Antwerp/BE, ²Duffel-Antwerp/BE

Imaging of idiopathic synovial osteochondromatosis of the elbow

M. Vlychou¹, S.K. Stathopoulou², A. Larda², N. Makris², C. Kokkinis², A. Peteinelli², L. Fragopoulou², G.M. Zavras²; ¹Larissa/GR, ²Athens/GR

Diagnosis of cervical spine chordomas by CT-guided biopsy

M. Vlychou¹, S.K. Stathopoulou², N. Makris², C. Kokkinis², A. Peteinelli², L. Fragopoulou², G.M. Zavras², O. Lazoura²; ¹Larissa/GR, ²Athens/GR

Bone marrow oedema in the distal radius in association with de Quervain's tenosynovitis

J.M. Elliott, I.N. Mawhinney, M.B. Finch; Belfast/GB

Disorders involving the reflection pulley and long head of biceps

M. Natsika¹, D. Schizas¹, C. Kalamara¹, E. Panourgias¹, D. Alexakis¹, C. Skordis¹, A.H. Karantanas²; ¹Athens/GR, ²Iraklion/GR

Whole Body MRI: A potential role in the detection of multicentric osteonecrosis?
J.M. Elliott¹, S. Eustace², H. Cairns¹, D.H.J. Mawhinney¹, D.G.R. Gracey¹;
1Belfast/GB, 2Dublin/IL

The frequency of middle glenohumeral ligament involvement in traumatic and non-traumatic shoulder joint instability-MR Arthrography findings
M. Natsika¹, E. Panourgias¹, I. Katsimilis¹, C. Iliadis¹, G. Bouchlis¹, A.H. Karantanas²; 1Athens/GR, 2Iraklion/GR

The potential of U.S contrast medium in the follow up of elite athletes' tendinopathies compared with PD
A. De Marchi¹, S. Pozza¹, P. De Petro¹, C. Faletti¹, L. Verga²; 1Torino/IT, 2Turin/IT

US guided synovial's biopsy in unknown knee's monoarthritis to avoid arthroscopy
A. De Marchi¹, S. Pozza¹, P. De Petro¹, C. Faletti¹, L. Verga²; 1Torino/IT, 2Turin/IT

Pain at the popliteal fossa and calf. The role of musculoskeletal ultrasound
A. Foteinos¹, S. Nikolaos², P. Nasia², A. Michaelides², S. Chalkias²;
1Rodos/GR, 2Chios/GR

The intravertebral vacuum phenomenon as specific sign of osteonecrosis in vertebral fractures
M. Libicher¹, I. Berger², M. Baier², A. Appelt², I. Grafe², C. Kasperk²;
1Cologne/DE, 2Heidelberg/DE

Proposal for a standardized mininvasive US-guided technique in athletes wrist gangliar cyst
A. Leonardi, L. Callegari, A. Bini, A. Spanò, P. Nicotera, E. Genovese, D. Mariani, C. Fugazzola; Varese/IT

Other Submitted Educational Posters

MR imaging of the forefoot: Bone, ligament, tendon, nerve and soft-tissue abnormalities
P. Melloni¹, M. Veintemillas², R. Valls², E. Ballesteros², A. Valera², A. Alguersuari²; 1Sabadell/ES, 2Sabadell (Barcelona)/ES

MR imaging of transient patellar lateral dislocation: Pictorial review

J. Arnaiz¹, T. Piedra¹, R. Garcia-Barredo², E. Gallardo¹, A. Garcia-Bolado¹, M.A. Fernandez-Echevarria¹; ¹Santander/ES, ²Lienres/ES

Imaging of craniocervical junction injuries

A. Leone; Rome/IT

Injuries of the distal tendon of biceps brachii: A pictorial review

S. Choudhary, W.J. Rennie; Leicester/GB

MRI evaluation of ganglion cysts of the anterior cruciate ligament (ACL) of the knee

I. Tsifountoudis, I. Kalaitzoglou, A.S. Dimitriadis; Thessaloniki/GR

A pictorial essay of subcutaneous lesions in musculoskeletal system; MR imaging

I.S. Lee, T.Y. Moon, J.W. Song; Busan/KR

Bone tumor of mid and hindfoot

Y. Kobashi¹, H. Okazaki¹, K. Kitsukawa¹, Y. Nakajima², H. Nakajima¹, M. Takagi¹; ¹Kawasaki/JP, ²Kawasaki, Kanagawa/JP

The role of scout image of lumbar spinal MRI for detection of hip pathology; Reports in 25 cases experience

H.S. Kim, S.B. Kim, S. Lee, D. Chung; Seoul/KR

Bone-forming tumours: From common to rare presentations

E.M.B. Pacheco¹, J.E. Adams¹, M. Etchebehere², C.E. Hanasilo², D.M. Ferreira², E.M.I. Amstalden², N.M.G. Caserta²; ¹Manchester/GB, ²Campinas/BR

Contribution of high resolution ultrasound in the assessment of bone tumors

M. Chelli Bouaziz, S. Chaabane, M.F. Ladeb; Ksar Said/TN

Osteosclerotic lesions in myeloma: An update

X. Tomas¹, I. Perez², C. Nieto³, M. Rovira¹, J. Pomes¹, A.I. Garcia¹, J. Blade¹; ¹Barcelona/ES, ²Huelva/ES, ³Mallorca/ES

MRI in acute hip pain. A pictorial review of diverse pathology encountered

M.G. Prentice, J.M. Searle, J. Green, M. Shaw, R. Hopkins, I.D. Lyburn; Cheltenham/GB

Its all in the Hand: A review of radiological changes in arthritis of the hand

R. Dharmadhikari, I. Curzon; Middlesborough/GB

Determination of ratio of avascular necrosis of femoral head with MRI in renal transplant recipients

N.C. Tarhan, B. Cevik, H. Demirors, S. Beyaz, A.M. Agildere, E.A. Niron; Ankara/TR

MRI for hip fractures - a pictorial review of alternative diagnoses

J.L. Bates; Hull/GB

Surface lesions of bone

S. Chaabane, M. Chelli Bouaziz, M.F. Ladeb; Ksar Said/TN

The contribution of CT-Imaging in the management of pelvic trauma

S. Mylona, N. Giannoulakos, D. Kyriakoulis, S. Ntai, N. Batakis, N. Lepida; Athens/GR

Imaging of sports-related muscle and tendon injuries in children and adolescents

E.J.M. Vandervliet¹, F.M. Vanhoenacker¹, A. Snoeckx¹, P.M. Parizel², J.L.M.A. Gielen², P. Van Dyck²; ¹Duffel-Antwerp/BE, ²Antwerp/BE

Anomalous muscles: Imaging findings with anatomical correlation

M. Miguel-Pérez¹, E. Capaccio², A. Tagliafico², J. Calzada³, S. Bianchi⁴, C. Martinoli²; ¹Barcelona/ES, ²Genova/IT, ³Barcelona/IT, ⁴Geneva/CH

Top 10 Soft Tissue Tumours

M.G. Prentice¹, C. Collins², M. Bradley²; ¹Cheltenham/GB, ²Bristol/GB

Sonography in the diagnostic investigation of pediatric extremity trauma

M. Vakaki, A. Simopoulos, G. Pitsoulakis, C. Koumanidou; Athens/GR

Imaging of neuropathic (Charcot's) arthropathy of the spine

A. Chevrot¹, A. Feydy², C. Vallée¹, R. Carlier¹, H. Guerini¹, R. Campagna¹, F. Thevenin¹, D. Richarme¹, J. Drapé¹; ¹Paris/FR, ²/FR

RFA in bone lesions as alternative therapy

S. Mylona, N. Giannoulakos, D. Kyriakoulis, E. Stroumpouli, N. Lepida, L. Thanos; Athens/GR

Ultrasonography of wrist: Presentation of ultrasonographic anatomy, the techniques, landmarks and also the major pathology

A. Foteinos¹, A. Michaelides², A. papachristodoulou², E. Michaelidou², C. Kalamara², N. Stroumbakis², S. Chalkias²; ¹Rodos/GR, ²Chios/GR

MRI and ultrasound findings in abdominal and extraabdominal desmoids

G. Bodner, M. Felfernig, M. Bernathova; Gibraltar/GI

Top ten bone tumours

M.G. Prentice¹, C. Collins², M. Bradley²; ¹Cheltenham/GB, ²Bristol/GB

MR arthrography of shoulder, what do we need to know?

J. Kandathil Chacko, G. Robinson; Bath/GB

Other Submitted Case Report Posters

Initially unrecognized asymptomatic thoracic spinal fracture and vertebral body luxation without neurological sequelae - Diagnosed by dynamic fluoroscopy due to delayed dysphagia

M.C. Wick, M. Rieger; Innsbruck/AT

Orbital involvement in cherubism: computed tomographic and three-dimensional imaging findings

M.H. Atalar, H. Egilmez, O. Solak; Sivas/TR

Imaging characteristics in two cases with different patterns in primary hydatid cyst of the thigh

M.H. Atalar, G. Koyluoglu, L. Cankorkmaz; Sivas/TR

Radiological Features of Finger Megadactylia: Report of two different types

I.S. Lee, T.Y. Moon; Busan/KR

Osteitis fibrosa cystica vs giant cell tumour: Should PTH level be evaluated first?

H.T. Sanal, D. Yildirim, B. Demiralp, E.I. Cicek; Ankara/TR

A chordoma originating in the sclerosing L1 vertebra

T. Nishiguchi, K. Mochizuki, T. Nakayama, T. Tsujio, K. Wakasa, Y. Inoue; Osaka/JP

Bone marrow metastasis of cutaneous angiosarcoma: MRI findings of a case

H.T. Sanal, G. Husmen, N. Bulakbasi, M. Kocaoglu, T. Ucoz, C. Tayfun;
Ankara/TR

An unusual complication of single lung transplantation

G. Hide; Newcastle Upon Tyne/GB

Gorham-Stout Disease

E. Yalniz, B. Alicioglu, E. Benlier; Edirne/TR

Multilevel cervical disconnection syndrome

B. Alicioglu, K. Demir, Y. Durmus; Edirne/TR

Bilateral transient osteoporosis of the hip and pregnancy: MRI findings in 3 cases

A. Xyda¹, I. Mountanos¹, M. Natsika¹, N.I. Skoulikaris², A.H. Karantanas²;
¹Heraklion/GR, ²Iraklion/GR

Ancient Schwannoma of the Foot Mimicking a Hemangioma: Radiologic - Pathologic Correlation

M. Fahrni, U. Schneider, R.P. Meyer, D.W. Crook, P. Komminoth, R. Kubik;
Baden/CH

Eosinophilic Fasciitis: MRI Findings

A. Yesildag¹, M. Argin², E. Tunç¹, A. Oktay², R. Arkun²; ¹Isparta/TR,
²Izmir/TR

Secondary Lymphoedema with a rare probable cause or a coincidence

N.H. Nasir; Ipoh/MY

Pisiform Dislocation with Associated Carpal Fractures

D.W. Crook¹, R. Kubik¹, C. Hort²; ¹Baden/CH, ²Dättwil/CH

Functional paratiroid adenoma diagnosed after stress fractures

N. Haliloglu, E. Ozkavukcu, G. Sahin; Ankara/TR

Osteochondroma of the Coronoid Process and Joint Formation with Zygomatic Arch (Jacob Disease)

A. Yesildag, F. Döner, M. Yarıktas, G. Aydin, Ü. Topal, M. Munduz; Isparta/TR

Hemangiopericytoma? Diagnostic procedures and preoperative embolization- a case report

B. Hadzihanovic¹, S. Jaganjac², I. Gavrankapetanovic¹; ¹Sarajevo/BA, ²Hamburg/DE

Subcoracoid dislocation of the distal end of the clavicle

M.K.D. Canbora, H.M.D. Bombaci, S.M.D. Yanik, M.M.D. Gorgec, B.M.D. Baysal; Istanbul/TR

Infected primary hydatidosis of paraspinal muscles with water lily sign eroding c6 vertebra

S. Yildiz, E. Komur, Z. Akti, H. Karabag Z. Ziylan; Sanliurfa/TR

Synovial Hemangioma of the Knee Extending to the Prepatellar Bursa: Report of Five Cases with MRI Findings

M. Bankaoglu, E.D. Çiçek, M. Basak; Istanbul/TR

Vertebral artery rupture after fracture of the cervical spine: a case report

A. Athanassopoulou¹, I. Kalogeropoulos¹, D. Passomenos², V. Psychoyios¹, M. Domazou¹, S. Loti¹; ¹Athens/GR, ²Pireus/GR

Periosteal chondrosarcomas. Report of two cases

S. Chaabane, M. Chelli Bouaziz, M.F. Ladeb, M.H. Jaafoura; Ksar Said/TN

A rare cause of knee pain and swelling

E. Mine Karagöz, Y. Bükte, A. Uyar, A. Bilici, K. Meric; Diyarbakir/TR

Embolization of Extremity Arteriovenous Malformation: a case report

G. Demirpolat¹, A. Memis², C. Cınar²; ¹Kahramanmaraş/TR, ²Izmir/TR

Chondrosarcoma of the shoulder joint with atypical imaging findings

A. Hayirlioglu, B. Pekar, B. Kalayci, I. Kuru; Istanbul/TR

Surface osteosarcoma

G. Zafiroski, M. Samardziski, V. Vasilevska, S. Konstadinova; Skopje/MK

Management of patients with schwannomatosis

E. Mine Karagöz, Y. Bükte, A. Uyar, A. Güzel, K.A. Uzunlar; Diyarbakir/TR

Post-traumatic metacarpal synostosis

A. Uyar¹, E. Mine Karagöz¹, Y. Bükte¹, A. Bilici²; ¹Diyarbakir/TR, ²Diyarbakir/TR

Spinal epidural extraskelatal ewing sarcoma in an adolescent girl: a case report

E. Mine Karagöz, Y. Bükte, A. Uyar, A. Bilici, K.A. Uzunlar; Diyarbakir/TR

Intercostal pulmonary herniation diagnosed basing on inspiratory and expiratory ct imaging: Case presentation and literature review

T. Ergun, H. Lakadamyali, H. Lakadamyali; Antalya/TR

Multiple joints pigmented villonodular synovitis in a child: an extremely rare occurrence

E.M.B. Pacheco¹, J.E. Adams¹, E.M.I. Amstalden², N.M.G. Caserta², C. Hutchinson¹; ¹Manchester/GB, ²Campinas/BR

Mazabraud syndrome: recent relapses

K. Karlinger, Á. Mester, K. Köllő; Budapest/HU

Bilateral hernia of the superior lumbar space combined with right ureter hernia: Helical CT and CT urography demonstration.

M. Vlychou¹, S.K. Stathopoulou², N. Makris², C. Kokkinis², G.M. Zavras², O. Lazoura²; ¹Larissa/GR, ²Athens/GR

Rotator cuff deficiency in subacute/chronic recurring gleno-humeral osteomyelitis

C. Dell'Atti; Rome/IT

MR findings of dysplastic hips in Saldino-Mainzer syndrome: a new observation

F.M. Vanhoenacker¹, K. Van Hoeck²; ¹Duffel-antwerp/BE, ²Antwerp/BE

Multiple muscle metastases from primary head and neck SCC identified by FDG PET/ CT

M.G. Prentice¹, J. Searle¹, J. Green¹, M. Shaw¹, R. Hopkins¹, B. Wittkop², I.D. Lyburn¹; ¹Cheltenham/GB, ²Worcestershire/GB

Iliopsoas abscess in a neonate: Sonographic diagnosis

M. Vakaki, M. Tsiarta, M. Leodis, G. Pitsoulakis, C. Koumanidou; Athens/GR

Idiopathic calcinosis cutis in two infants: Imaging findings

M. Vakaki, G. Pitsoulakis, A. Hountala, C. Koumanidou; Athens/GR

Radiologic Diagnosis of Elastofibroma Dorsi in Five Patients

E. Ustuner, N.K. Altınbas, K. Ceyhan, E. Dusunceli, E. Ozyurek; Ankara/TR

Mycobacterium tuberculosis infection of the lumbar facet joints

J.M. Elliott, D.G.R. Gracey; Belfast/GB

Rare case of heterotopic ossification in multiple sclerosis

S.K. Stathopoulou¹, O. Lazoura¹, M. Vlychou², E. Drakonaki¹, N. Tasiopoulos¹, P. Alevizos¹; ¹Athens/GR, ²Larissa/GR

Bilateral, non traumatic, osteochondritis dissecans of the lateral tibial plateau: a case report

M. Natsika, S. Anthimou, S. Benakis, P. Christopoulos, X. Horomidou, D. Triantafillou; Athens/GR

Intramedullary osteo-sclerosis: review of clinical and radiological features

S.P. Suresh¹, P. O'Donnell², A. Saifuddin³; ¹Plymouth/GB, ²London/GB, ³Stanmore/GB

