



# Final Programme

property of Marbella City Council

*Sport Injuries*  
**ESSR 2013**  
**MUSCULOSKELETAL  
RADIOLOGY**  
JUNE 13–15, MARBELLA/SPAIN



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*Welcome*

**from the ESSR 2013 Congress President**

On behalf of the ESSR it is a pleasure to invite you to participate in the 20<sup>th</sup> Annual Scientific Meeting of the European Skeletal Society to be held in Marbella, Spain, on June 13-15, 2013, at the Palacio de Congresos located in the center of the city.

The scientific programme will focus on "Sports Lesions"; with a refresher course lasting two days dedicated to actualised topics. The programme will include focus sessions and hot topics, as well as different sessions of the subcommittees of the society. There will be a special session on Interventional Strategies in Sports Injuries. The popular "hands on" ultrasound workshops in MSK ultrasound will be held on Thursday 13, 2013, during the afternoon, with the topic of Sports Lesions. Basic and advanced levels will be offered.

A state-of-the-art technical exhibition will display the most advanced technical developments in the area of musculoskeletal pathology. The main lobby will be available for workstations for the EPOS as well as technical exhibits.

Marbella is located in the south of Spain, full of life and with plenty of cultural and tourist interest, with architectural treasures of the traditional and popular Andalusian culture.

The participants will be welcomed at the reception on Friday and an Andalusian Night shall round off the 20<sup>th</sup> Congress of the ESSR.

The congress is open to all radiologists, clinicians and surgeons involved in MSK imaging and is targeted to all members and non-members of the society. Young radiologists are cordially invited to participate and present their scientific work.

I would like to express my gratitude to all the colleagues of the Committees and Sub-Committees of the ESSR as well as to the local members for their hard work preparing the scientific programme.

I want to invite you to participate actively in one of the most significant scientific events in this exciting field of Musculoskeletal Imaging.

A handwritten signature in black ink, appearing to read 'Mario Padron', written in a cursive style.

**Mario Padron**  
ESSR 2013 Congress President



## Committees

### Congress President Marbella 2013

M. Padron, Madrid/ES

### Local Organising Committee Marbella 2013

F. Amores, Malaga/ES

F. Aparisi, Valencia/ES

A. Bueno, Madrid/ES

M.J. Ereño, Bilbao/ES

E. Galvan, Marbella/ES

E. Llopis, Alzira/ES

J. Martel, Madrid/ES

S. Martin, Palma de Mallorca/ES

E. Sanchez, Madrid/ES

J.C. Vilanova, Girona/ES

### ESSR Executive Committee

President: M. Padron, Madrid/ES

Past President: K. Verstraete, Ghent/BE

President Elect: I. Beggs, Edinburgh/UK

Vice President: M. Zanetti, Zurich/CH

Treasurer: M. Zanetti, Zurich/CH

Secretary: F. Vanhoenacker, Antwerp/BE

Councilors: M. Reijnierse, Leiden/NL

L.M. Sconfienza, Genoa/IT

### ESSR Committees

Education: C. Martinoli, Genoa/IT

Research: D. Wilson, Oxford/UK

### ESSR Subcommittees

Arthritis: C. Schueller-Weidekamm, Vienna/AT

Sports: J. Kramer, Linz/AT

Tumour: I.M. Noebauer-Huhmann, Vienna/AT

Ultrasound: R. Campbell, Liverpool/UK

Osteoporosis: G. Guglielmi, Foggia/IT

## Invited Speakers

- J. Adams, Manchester/UK  
G. Allen, Oxford/UK  
F. Amores Ramirez, Malaga/ES  
N. Amoretti, Nice/FR  
S. Anderson, Melbourne/AU  
P. Aparisi Gomez, Valencia/ES  
F. Aparisi Rodriguez, Valencia/ES  
R. Arkun, Izmir/TR  
G. Astrom, Uppsala/SE  
L. Bancroft, Orlando/US  
A. Barile, L'Aquila/IT  
J. Bauer, Munich/DE  
A. Baur-Melnyk, Munich/DE  
I. Beggs, Edinburgh/UK  
J. Beltran, Brooklyn/US  
A. Blum, Nancy/FR  
K. Bohndorf, Augsburg/DE  
I. Boric, Zagreb/HR  
N. Boutry, Lille/FR  
A. Bueno, Alcorcon/ES  
R. Campbell, Liverpool/UK  
V. Cassar-Pullicino, Shropshire/UK  
L. Cerezal, Santander/ES  
A. Cotten, Lille/FR  
M. Court-Payen, Frederiksberg/DK  
J. Damilakis, Heraklion/GR  
M. de Jonge, Amsterdam/NL  
Ch. Dejaco, Graz/AT  
X. Demondion, Lille/FR  
E. Drakonaki, Heraklion/GR  
J.-L. Drape, Paris/FR  
I. Engele, Riga/LV  
M. Epermane, Riga/LV  
M. J. Ereño Ealo, Bilbao/ES  
I. Eshed, Ramat Gan/IL  
C. Faletti, Turin/IT  
D. Fessell, Ann Arbor/US  
E. Galvan Sanchez, Marbella/ES  
J. Gielen, Edegem/BE  
Ch. Glaser, Munich/DE  
A. Grainger, Leeds/UK  
H. Guerini, Paris/FR  
G. Guglielmi, Foggia/IT  
F. Idoate, Pamplona/ES  
J. Jacobson, Ann Arbor/US  
A.-G. Jurik, Aarhus/DK  
F. Kainberger, Vienna/AT  
A. Karantanas, Heraklion/GR  
A. Kassarian, Madrid/ES  
E. Kavanagh, Dublin/IE  
J. Kramer, Linz/AT  
Ch. Krestan, Vienna/AT  
A. Leone, Rome/IT  
E. Llopis, Alzira/ES  
M. Maas, Amsterdam/NL  
J. Martel, Alcorcon/ES  
S. Martin, Palma de Mallorca/ES  
C. Martinoli, Genoa/IT  
V. Mascarenhas, Lisbon/PT  
C. Maschiocchi, L'Aquila/IT  
E. McNally, Oxford/UK  
J.M. Morales Perez, Seville/ES  
J.A. Narvaez Garcia, Barcelona/ES  
A. Navas Canete, Leiden/NL  
I.M. Nöbauer-Huhmann, Vienna/AT  
M. Obradov, Nijmegen/NL  
Ph. O'Connor, Leeds/UK  
A. Oktay, Izmir/TR  
S. Ostlere, Oxford/UK  
M. Padron, Madrid/ES  
V. Pansini, Lille/FR  
Ph. Peetrons, Brussels/BE  
W. Peh, Singapore/SG  
Ch. Pfirrmann, Zurich/CH  
A. Plagou, Athens/GR  
Ph. Robinson, Leeds/UK  
R.M. Rodrigo del Solar, Bilbao/ES  
E. Sanchez, Madrid/ES  
C. Schüller-Weidekamm, Vienna/AT  
L. Sconfienza, Genoa/IT  
M. Shahabpour, Brussels/BE  
E. Silvestri, Genoa/IT  
A. Tagliafico, Genoa/IT  
M. Taljanovic, Tucson/US  
J. Teh, Oxford/UK  
N. Theumann, Lausanne/CH  
X. Tomas Battle, Barcelona/ES  
S. Tormenta, Rome/IT  
M. Tzalonikou, Athens/GR  
H. Umans, New York/US  
C. van Rijswijk, Leiden/NL  
F. Vanhoenacker, Antwerp, Gent/BE  
V. Vasilevska Nikodinovska, Skopje/MK  
A. Silva Vieira, Porto/PT  
J.C. Vilanova, Girona/ES  
S. Waldt, Munich/DE  
M.A. Weber, Heidelberg/DE  
D. Wilson, Oxford/UK  
K. Wörtler, Munich/DE  
M. Zanetti, Zurich/CH



## General Information

### Certificate of Attendance / CME Accreditation

The Certificate of Attendance/CME Accreditation can be viewed and printed after the congress upon entering your ESSR MyUserArea at the ESSR website ([www.essr.org/myuserarea](http://www.essr.org/myuserarea)). To enter the MyUserArea, please use your last name in combination with your Personal ID from your congress badge.

The ESSR Ultrasound Workshop (June 13, 2013) is designated for a maximum of, or up to 3 European CME credits (ECMEC).

The ESSR Annual Scientific Meeting (June 14-15, 2013) is designated for a maximum of, or up to 11 European CME credits (ECMEC).

Continuing Medical Education (CME) is a programme of educational activities to guarantee the maintenance and upgrading of knowledge, skills and competence following completion of postgraduate training. CME is an ethical and moral obligation for each radiologist throughout his/her professional career, in order to maintain the highest possible professional standards.

### Conference Language

The meeting will be held in English. No simultaneous translation will be offered.

### Onsite Registration Fees

ESSR Non-Member	€ 650.00
ESSR Member*	€ 490.00
Resident** ESSR Non Member	€ 280.00
Resident** ESSR Member	€ 200.00
Student ***	€ 75.00

*\* Reduced congress registration fees for ESSR Members are available only if the ESSR membership fee has been paid.*

*\*\* Registrations categorized as "Resident" are limited to residents under the age of 35. A proof of your resident status has to be shown to the ESSR Office.*

*\*\*\* Registrations categorized as "Student" are limited to students under the age of 30.*

### Congress Venue

Palacio de Congresos de Marbella  
Calle José Meliá 2  
29602 Marbella, Málaga

### Coffee Breaks

Complimentary coffee, tea and refreshments will be served during the official coffee breaks to all congress delegates.

### Disclaimer / Liability

The ESSR cannot accept any liability for the acts of the suppliers to this meeting or the attendees' safety while travelling to or from the congress. All participants are strongly advised to carry adequate travel and health insurance, as ESSR cannot accept liability for accidents or injuries that may occur. ESSR is not liable for loss or damage of private property.

### EPOS™

ESSR 2013 is using EPOS™, the Electronic Presentation Online System, the electronic format of the scientific exhibition developed by the European Congress of Radiology (ECR). Several workstations are available in the EPOS™ Area at which the current electronic exhibits can be viewed by the congress participants during the congress.

### Name changes

Name changes will be treated like the cancellation of the registration and a new registration of the other participant.



### Payment

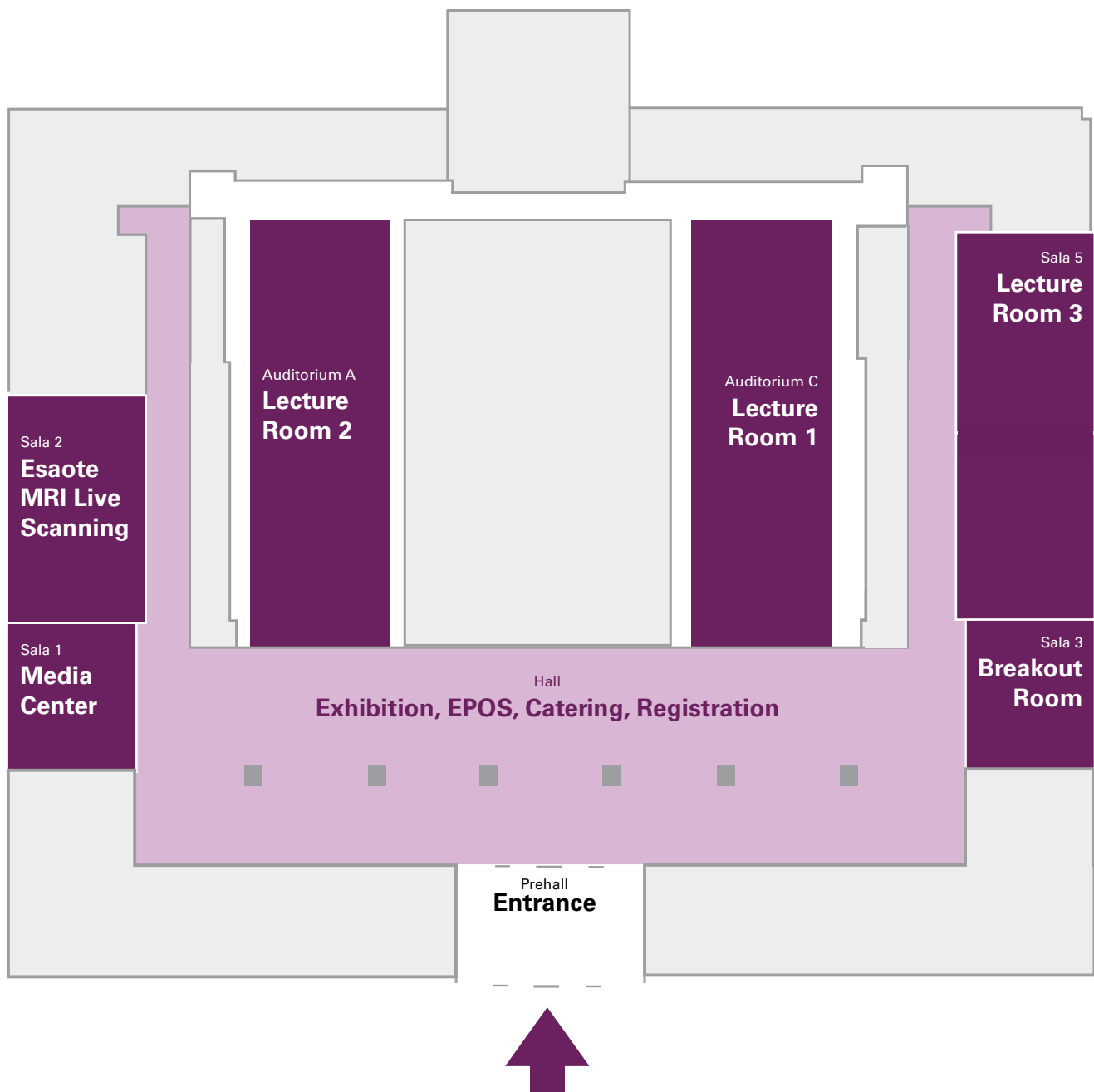
Onsite payment can only be made by credit card (Visa or Euro/Mastercard) or in cash (Euro). Please understand that no other payment facilities like cheques, etc. will be accepted.

### Media Centre

The media centre is located near the registration area. Trained staff will be available to assist you with the equipment. The Media Centre should only be used for a test run of the presentations. Please note that the Media Centre should not be used to prepare your entire presentation and that due to the large number of speakers the workstations are only available for minor editing.

### Registration Opening Hours

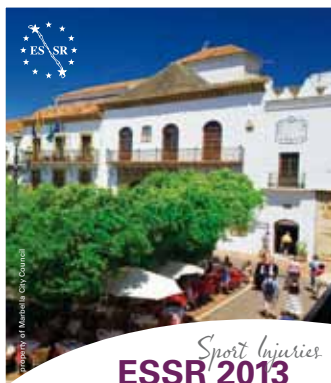
Thursday, June 13	10:00 – 18:00
Friday, June 14	07:30 – 18:00
Saturday, June 15	07:30 – 18:00





## Marbella Information

Marbella is a city and municipality in southern Spain, belonging to the province of Málaga in the autonomous community of Andalusia. It is part of the region of the Costa del Sol and is situated on the Mediterranean Sea, between Málaga and the Gibraltar Strait, in the foothills of the Sierra Blanca. The city is full of life with plenty of cultural and tourist interests and architectural treasures of the traditional and popular Andalusian culture.



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## Exhibition

Marbella Congress, Fairs and Exhibitions has been specially designed to hold congresses, conventions, conferences, exhibitions and all kind of meetings at a national and international level. Its principal attractions are the multipurpose and functional facilities for any type of event and its privileged situation in the city center.

The exhibition area will be located in the hall at the ground floor, with easy access to the main auditorium rooms and diverse meeting rooms.

<b>Thursday, June 13</b>	<b>13:00 – 18:00</b>
<b>Friday, June 14</b>	<b>08:00 – 18:00</b>
<b>Saturday, June 15</b>	<b>08:00 – 17:00</b>

## List of Exhibitors

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# Diploma

## EUROPEAN SOCIETY OF MUSCULOSKELETAL RADIOLOGY (ESSR)

The ESSR Diploma is a certificate awarded by the ESSR on satisfactory completion of a programme within a **5** year period.

Application fees are € **100.00** (Members) and € **200.00** (Non-Members).  
The diploma programme comprises **3** components

Category 1	Category 2	Category 3
ESSR Annual Scientific Meetings	Training Modules or Courses	Refresher Courses
Scientific presentation / exhibit		

Visit our website [www.essr.org](http://www.essr.org) and learn more about the ESSR Diploma!



## Thursday, June 13, 2013

Time	Room 1	Room 3
13:00-14:00	Anatomy Demonstrations	
14:00-15:00	Video Demonstrations Group 1	Hands-On Demonstrations Group 2
15:00-16:00	Video Demonstrations Group 2	Hands-On Demonstrations Group 1
16:00-16:30	BREAK	
16:30-18:00	Rapid Fire Lectures	

The ESSR meeting offers Ultrasound Workshops, which will focus on Sports Lesions, including Video and Live Hands On Demonstration. Participants will follow the US Hands On Demonstrations in small groups (divided into „beginners“ and „experts“ according to their level of experience) due to better understanding and quality assurance.

## Friday, June 14, 2013

Time	Room 1	Room 2	Room 3
08:00-09:00	Scientific Papers – Tumours	Scientific Papers – Technique 2, Bone Density	Scientific Papers – Intervention MSK
09:00-09:15	Opening Ceremony		
09:15-10:45	Hip	Metabolic Session	
10:45-11:15	BREAK		
11:15-13:00	Knee	Tumour Session	
13:00-14:00	Esaote Symposium – Latest Advances in Sports Imaging		
14:00-14:30	BREAK		
14:30-15:30	Scientific Papers – Sports	Hip	Scientific Papers – Technique 1, Metal Artifact
15:30-17:00	Ankle and Foot	MR Arthrography: How I do it	
17:00-17:15	BREAK		
17:15-18:30	Sports along all ages	Scientific Papers – Shoulder	Scientific Papers – Knee

# Welcome Reception

## **ESSR 2013** **MUSCULOSKELETAL** **RADIOLOGY**

**19:00 GARDEN AREA IN FRONT OF  
CONGRESS CENTRE MARBELLA**

Dresscode: smart/business casual

The ESSR Office may not accept liability for personal injury, loss/damage to property, personal or otherwise belongings of participants and/or accompanying persons, either during or as a result of the evening event.

**Saturday, June 15, 2013**

Time	Room 1	Room 2
08:00-09:00	Scientific Papers – Wrist and Foot	Scientific Papers – Spine with Intervention
09:00-10:30	Upper extremity	Interventions
10:30-11:00	BREAK	
11:00-12:30	Shoulder	Arthritis
12:30-14:00	Muscles, tendons, bone and spine	Hot Topics
14:00-15:00	GE Healthcare – Dreaming up the role of Imaging in Sports Medicine	
15:00-15:30	BREAK	
15:30-17:00	ESSR Quiz Session	
17:00-18:00	ESSR General Assembly	

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## THURSDAY, JUNE 13, 2013

ESSR ULTRASOUND COURSE 2013

Course Organiser: R. Campbell, Liverpool/UK

<b>13:00–14:00</b>	<b>Anatomy Demonstrations</b> <i>R. Campbell, Liverpool/UK</i>	<b>ROOM 1</b>
<b>13:00</b>	<b>Anterior hip and groin</b> S. Ostlere, Oxford/UK; E. McNally, Oxford/UK	
<b>13:20</b>	<b>Hamstrings</b> A. Bueno, Alcorcon/ES; A. Tagliafico, Genoa/IT	
<b>13:40</b>	<b>Ankle and foot ligaments</b> G. Allen, Oxford/UK; D. Wilson, Oxford/UK	
<b>14:00–16:00</b>	<b>Video demonstrations</b> <i>(alternating with Hands-On demonstrations)</i> <i>Ph. O'Connor, Leeds/UK</i>	<b>ROOM 1</b>
<b>14:00 / 15:00</b>	<b>Hernias</b> J. Jacobson, Ann Arbor/US	
<b>14:15 / 15:15</b>	<b>Snapping hip</b> D. Fessell, Ann Arbor/US	
<b>14:30 / 15:30</b>	<b>US diagnosis of shoulder impingement</b> A. Plagou, Athens/UK	
<b>14:45 / 15:45</b>	<b>Tips and tricks of US guided intervention</b> Ph. O'Connor, Leeds/UK	
<b>16:00–16:30</b>	<b>Coffee Break</b>	<b>FOYER</b>
<b>16:30–18:00</b>	<b>Rapid Fire Lectures</b> <i>I. Beggs, Edinburgh/UK</i>	<b>ROOM 1</b>
<b>16:30</b>	<b>US features of tendonopathy</b> J. Teh, Oxford/UK	
<b>16:40</b>	<b>US guided tendon therapies</b> A. Grainger, Leeds/UK	
<b>16:50</b>	<b>US grading of muscle tears</b> P. Peetrans, Waterloo/BE	
<b>17:00</b>	<b>Complications of muscle tears</b> E. Drakonaki, Heraklion/GR	
<b>17:10</b>	<b>Ankle ligament tears</b> L. Sconfienza, Genoa/IT	
<b>17:20</b>	<b>Injuries of the medial elbow</b> D. Fessell, Ann Arbor/US	
<b>17:30</b>	<b>Biceps and triceps injuries</b> J. Jacobson, Ann Arbor/US	
<b>17:40</b>	<b>ECU tendon instability</b> H. Guerini, Paris/FR	
<b>17:50</b>	<b>Plantar fascia injuries</b> M. Court-Payen, Frederiksberg/DK	



## FRIDAY, JUNE 14, 2013

ESSR ANNUAL SCIENTIFIC MEETING 2013

08:00–09:00

### Scientific Papers – Tumours

ROOM 1

*A. Baur-Melnyk, Munich/DE, V. Vasilevska Nikodinovska, Skopje/MK*

**Sarcoma referral: The effectiveness of Sarcoma Diagnostic Triage in streamlining referrals – Our experience.**

A. Shah, Leicester/UK

**Whole body magnetic resonance imaging in comparison to whole body bone scintigraphy for the detection of metastases in patients with primary bone tumours**

M. Calleja, Stanmore/UK

**Quantitative dynamic contrast-enhanced MRI in the differentiation of benign and malignant vertebral body fractures**

T. Geith, Munich/DE

**Soft-tissue solitary fibrous tumors: Imaging features and clinical-pathologic correlation**

D. Rodriguez Bejarano, Llobregat/ES

**Giant cell tumour of bone: imaging features, with special emphasis on MRI, and pathology correlation.**

A. Pons Escoda, Llobregat/ES

**Tumor load in patients with multiple myeloma:  $\beta$ -2 Microglobulin levels versus whole-body MRI**

A. Baur-Melnyk, Munich/DE

08:00–09:00

### Scientific Papers - Technique2, Bone Density1

ROOM 2

*J. Adams, Manchester/UK, F. Aparisi Rodriguez, Valencia/ES*

**The role of additional semi-automatic computered morphometry on assessment of number and severity of vertebral fractures in HIV infected patients**

A. Magenta Biasina, Gambolo/IT

**Bone mineral density of the lumbar spine by DXA: accuracy of three new lumbar regions of interest on whole-body scan**

D. Diano, Bologna/IT

**Body composition and bone metabolism: what is the link?**

D. Diano, Bologna/IT

**Early changes of trabecular bone structure in asymptomatic subjects with knee malalignment**

T. Baum, Munich/DE

**MR quantification of bone marrow iron deposition in beta-thalassemia by means of R2 relaxometry with fat suppression**

O. Papakonstantinou, Athens/GR

**Different response of the skeletal muscle to sport in Type-1 Diabetics: A preliminary study by <sup>1</sup>H-MR Spectroscopy**

A. I. Garcia Diez, Barcelona/ES

<b>08:00–09:00</b>	<b>Scientific Papers - Intervention MSK</b> <i>P. Aparisi Gomez, Valencia/ES, J. Teh, Oxford/UK</i>	<b>ROOM 3</b>
	<p><b>Efficacy of intra-tendinous injection of Platelet-Rich Plasma to treat tendinopathy: assessment on a long-term follow-up experience: a large case study</b>          B. Dallaudiere, Paris/FR</p> <p><b>Simplified percutaneous sonographically guided needle tenotomy of chronic recalcitrant tendinosis of the lower limb tendons.</b>          M. Seghers, Edegem/BE</p> <p><b>Infiltration of growth factors in elite footballers: do we really need to be accurate?</b>          L. Guillen Vargas, Elche/ES</p> <p><b>Image-guided percutaneous bone biopsy with a simulated Van Sonnenberg removable hub system</b>          Z. Maras Ozdemir, Malatya/TR</p> <p><b>Feasibility and effectiveness of transcatheter arterial embolization for knee pain resistant to non-operative management</b>          Y. Okuno, Tokyo/JP</p>	
<b>09:00–09:15</b>	<b>Opening Ceremony ESSR 2013</b>	<b>ROOM 1</b>
<b>09:15–10:45</b>	<b>Hip</b> <i>S. Anderson, Melbourne/AU, A. Kassarian, Madrid/ES</i>	<b>ROOM 1</b>
<b>09:15</b>	<b>Imaging FAI: How to do it and what we need to know</b> C. Faletti, Turin/IT	
<b>09:35</b>	<b>Groin pain and athletic pubalgia</b> E. Kavanagh, Dublin/IR	
<b>09:55</b>	<b>Extraarticular hip imaging. Tendons and bursae</b> C. Pfirrmann, Zurich/CH	
<b>10:15</b>	<b>Bone Marrow and Sports</b> A. Karantanas, Heraklion/GR	
<b>10:35</b>	<b>Case presentation</b> A. Kassarian, Madrid/ES	
<b>09:15–10:45</b>	<b>Metabolic Session</b> <i>G. Guglielmi, Foggia/IT, W. Peh, Singapore/SG</i>	<b>ROOM 2</b>
<b>09:15</b>	<b>Osteoporotic vertebral fractures: How to recognize and report</b> G. Krestan, Vienna/AT	
<b>09:30</b>	<b>DXA measures beyond BMD, including body composition and vertebral fracture assessment (VFA)</b> J. Adams, Manchester/UK	
<b>09:45</b>	<b>Myths and real facts about QCT: Dose/advantages</b> J. Damilakis, Heraklion/GR	
<b>10:00</b>	<b>Beyond BMD measurements</b> J. Bauer, Munich/DE	
<b>10:15</b>	<b>Vertebro and Kyphoplasty</b> F. Aparisi, Valencia/IT	
<b>10:45–11:15</b>	<b>Coffee Break</b>	<b>FOYER</b>

# Esaote, the MSK Imaging Specialist

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**11:15-13:00**      **Knee**      **ROOM 1**  
*R. Arkun, Izmir/TR, J. Kramer, Linz/AT*

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- 11:15      **Menisci: Pearls and pitfalls**  
 E. McNally, Oxford/UK
- 11:35      **MR patterns of ligament injuries**  
 X. Demondion, Lille/FR
- 11:55      **The extensor mechanism: What is important?**  
 A. Barile, LAquila/IT
- 12:15      **Lesions of the articular surface of the knee**  
 K. Bohndorf, Augsburg/DE
- 12:35      **Case presentation**  
 R. Arkun, Izmir/TR
- 12:45      **Post operative imaging of the knee**  
 J. Kramer, Linz/AT

**11:15-13:00**      **Tumour Session**      **ROOM 2**  
*I. Noebauer-Huhmann, Vienna/AT, C. van Rijswijk, Leiden/NL*

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- 11:15      **Radilological diagnosis of benign and malignant bone tumors**  
 M.-A. Weber, Heidelberg/DE
- 11:35      **Diagnosis and local staging of soft tissue tumors**  
 F. Vanhoenacker, Antwerp/BE
- 11:55      **Biopsy techniques of musculoskeletal tumors**  
 C. van Rijswijk, Leiden/NL
- 12:15      **Assessing response to preoperative treatment**  
 K. Vilanova, Girona/ES
- 12:35      **Practical approach of imaging after surgical treatment: Is it a local recurrence or not?**  
 S. Anderson, Melbourne/AU

**13:00-14:30**      **Esaote - Latest Advances in Sports Imaging**      **ROOM 1**  
*J. Kramer, Linz/AT, M. Padron, Madrid/ES*

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- The hamstrings: Imaging-oriented anatomy**  
 M. Miguel Perez, Barcelona/ES
- Muscular Strain: its identity in US**  
 A. Rolon, Buenos Aires/AR
- Weight-bearing MRI in sports medicine: a new technique for a better diagnostic approach**  
 J.C. Vilanova, Gerona/ES
- Sport-specific nerve injuries: Emphasis on high-resolution US**  
 C. Martinoli, Genoa/IT



**14:00-14:30**      **Coffee Break**      **FOYER**

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14:30–15:30

**Scientific Papers – Sports**

**ROOM 1**

*G. Allen, Oxford/UK, A. Bueno, Alcorcon/ES*

**MR imaging findings in asymptomatic elite artistic gymnasts**

A. Bintoudi, Thessaloniki/GR

**Injury profile of wrestlers: A study from the Indian Subcontinent**

S. Agarwal, Rohtak, Haryana/IN

**Grading of Hamstring muscle injury in professional football players: Warrington Index**

B. Chari, Prescott/UK

**Changes of severity and location of lower leg muscle injuries in the different year seasons – own experience with Polish champion football team in years 2009–2012.**

R. Obuchowicz, Cracow/PL

**Combined dynamic high resolution ultrasound (d-HRUS) and magnetic resonance imaging (MRI) of thigh muscles injuries in professional football players: from diagnosis to follow-up**

A. Corazza, Genoa/IT

**Complications in adult sportsmen patients with postoperative lumbar spine**

K. Kukawska-Sysio, Katowice/PL

14:30–15:30

**Scientific Papers – Hip**

**ROOM 2**

*F. Amores Ramirez, Malaga/ES, M. Tzalonikou, Athens/GR*

**Radiographic signs of FAI in an active young male population: what is normal?**

A. West, Birmingham/UK

**Coexistence of osteitis pubis and hip labral tear in young adult patients**

K. Kukawska-Sysio, Katowice/PL

**Hip MR imaging: How useful is intraarticular contrast for evaluating labrum and articular cartilage lesions?**

R. Sutter, Zurich/CH

**Instability of the hip joint – Finding at MR arthrography**

T. Dietrich, Zurich/CH

**Normal anatomical variants of the labrum of the hip at magnetic resonance imaging: a systematic review**

T. Kwee, Maastricht/NL

**Sciatic nerve entrapments in the subgluteal space: A review of anatomy, etiology and MR Imaging features in Deep Gluteal Syndrome**

M. Fernandez Hernando, Santander/ES

**Secondary ischiofemoral impingement syndrome: a cross sectional imaging study**

A. Bintoudi, Thessaloniki/GR

14:30–15:30

**Scientific Papers – Technique1, Metal Artifact**

**ROOM 3**

*M. Epermane, Riga/LV, I. Engele, Riga/LV*

**Bone marrow edema on MR imaging indicates ARCO stage 3 disease in patients with AVN of the femoral head**

R. Meier, Munich/DE

**Metal on metal hip arthroplasty: the MRI pattern of pelvic muscle atrophy**

Z. Jibri, Cardiff/UK

**View-angle-tilting (VAT) and Slice-encoding Metal Artifact Correction (SEMAC) for Metal Artifact Reduction in MR Imaging of orthopaedic Tumor-Prostheses.**

P. M. Jungmann, Munich/DE

**The role of metal artefact correction MR techniques in patients with metallic joint prostheses**

Ph. O'Connor, Leeds/UK

**CT Classification of Pseudotumours in Metal on Metal Hip Arthroplasty**

M. F. Boomsma, Zwolle/NL

**Anatomical study of the indirect tendon of the rectus femoris using ultrasonography**

A. Moraux, Lille/FR

**15:30-17:00**      **Ankle and Foot**      **ROOM 1**  
*M.J. Argueso Chamorro, Madrid/ES, M. de Jonge, Amsterdam/NL*

- 15:30      **Ankle tendons: What is the best way to image them**  
 C. Maschiocchi, LAquila/IT
- 15:50      **Metatarsalgia in Sports**  
 M. Maas, Amsterdam/NL
- 16:10      **Impingement syndromes of the ankle**  
 P. Robinson, Leeds/UK
- 16:30      **Imaging of Talalgia**  
 V. Pansini, Lille/FR
- 16:50      **Case presentation**  
 M. de Jonge, Amsterdam/NL

**15:30-17:00**      **MR Arthrography: How I do it**      **ROOM 2**  
*J. Jacobson, Ann Arbor/US, E. Llopis, Alzira/ES*

- 15:30      **CT arthrography**  
 A. Blum, Nancy/FR
- 15:42      **MR arthrography, technique and ideal dilution**  
 V. Mascarenhas, Lisbon/PT
- 15:54      **Shoulder**  
 F. Idoate, Pamplona/ES
- 16:06      **Hip**  
 E. Llopis, Alzira/ES
- 16:18      **Knee**  
 M. Taljanovic, Tucson/US
- 16:30      **Wrist**  
 M. Shahabpour, Brussels/BE
- 16:42      **Ankle and elbow**  
 S. Waldt, Munich/DE

**17:00-17:15**      **Coffee Break**      **FOYER**

**17:15-18:30**      **Sports along all ages**      **ROOM 1**  
*V. Cassar-Pullicino, Shropshire/UK, F. Kainberger, Vienna/AT*

- 17:15      **The young athlete**  
 C. Martinoli, Genoa/IT
- 17:35      **The aging athlete**  
 I. Beggs, Edinburgh/UK
- 17:55      **Sport injuries in the chronic patient**  
 F. Kainberger, Vienna/AT
- 18:15      **The female athlete**  
 C. Schueller-Weidekamm, Vienna/AT



# SAMSUNG UGEO H60

## Faster access with higher precision.

Our UGEO H60 Ultrasound system has a slim, sleek and modern design. The hybrid beamforming engine and 18.5" LED monitor guarantee superb imaging with higher precision. The Smart User Interface on the 10.1" Touch Screen allows faster access to all relevant features.

Bringing the technology of tomorrow, today.





**17:15-18:30**

**Scientific Papers – Shoulder**

**ROOM 2**

*A. Navas Canete, Leiden/NL, S. Ostlere, Oxford/UK*

**Prevalence of diffuse increased MR signal in the posterosuperior glenoid labrum, and its lack of effect on accuracy for labral tears.**

J. Tang, Madison/US

**CT arthrography for anterior shoulder instability: the reproducibility of measurements for quantifying glenoid bone loss and correlation with surgical findings**

N. Kotnis, Sheffield/UK

**Assessment of the size and extent of full thickness rotator cuff tears on MRI: is there variability between General and Musculoskeletal Radiologists in a District General Hospital?**

J. P. Singh, Delhi/IN

**Diagnostic Signs for Capsular Laxity on ABER Position MR Arthrography of the Shoulder in Patients with Atraumatic Multidirectional Instability**

C. Schäffeler, Munich/DE

**Post-traumatic lesions of rotator cuff at the myotendinous junction**

J. Silvera, Paris/FR

**Hydrodilatation for adhesive capsulitis of the shoulder : “The patient decides!”**

S. Basu, Manchester/UK

**Rotator Cuff Calcific Tendinitis: US-guided needling and lavage vs. subacromial corticosteroids - A Randomized Controlled Trial -**

A. Navas Canete, Leiden/NL

**17:15-18:30**

**Scientific Papers – Knee**

**ROOM 3**

*A. Leone, Rome/IT, J.M. Morales, Seville/ES*

**Mild (ICRS grade I and II) patellofemoral cartilage defects: is there any association with patellar maltracking parameters?**

Z. Jibri, Cardiff/UK

**Autologous Chondrocyte Implantation using Chondron gel-type chondrocyte transplantation – A Preliminary Imaging Study**

R. Hargunani, Stanmore/UK

**MRI T2-mapping with clinical correlation after treatment of knee osteoarthritis with autologous mesenchymal stem cells: a pilot study**

J. C. Vilanova, Girona/ES

**Novel high-resolution phase-contrast CT of the human knee joint: comparison of cartilage imaging to conventional clinical CT and 3T MRI**

A. Horng, Munich/DE

**MRI Characteristics of Healed and Unhealed Peripheral Vertical Meniscal Tears**

A. C. Cheung, Madison/US

**Medial collateral ligament activation: Is this a significant indirect sign for posterior attachment vertical tear of medial meniscus?**

V. Vasilevska Nikodinovska, Skopje/MK

**Ultrasound: a new method to assess patellar subluxation**

K. Grigaite, Kaunas/LT

**Early post-operative imaging after ACL reconstruction surgery – a European survey**

A. P. Parkar, Bergen/NO



## SATURDAY, JUNE 15, 2013

ESSR ANNUAL SCIENTIFIC MEETING 2013

### 08:00–09:00 **Scientific Papers – Wrist and Foot** **ROOM 1**

*J.A. Narvaez Garcia, Barcelona/ES, H. Umans, NewYork/US*

#### **Elasticity of the Median Nerve in Carpal tunnel syndrome: Sonoelastography findings**

M. Kastlunger, Innsbruck/AT

#### **Diagnostic criteria of Carpal tunnel syndrome using high resolution ultrasonography**

C. C. Ooi, Singapore/SG

#### **Forefoot MRI of 2nd Intermetatarsal Space Lesions: Association with adjacent plantar plate pathology as compared to similar lesions in the 3rd Intermetatarsal Space**

H. Umans, NewYork/US

#### **Concordance between joint swelling or tenderness at physical examination and inflammation on MRI in early arthritis patients**

W. Stomp, Leiden/NL

#### **Spondyloarthritis of the ankle and hindfoot: MR imaging findings**

J. A. Narvaez Garcia, Barcelona/ES

#### **3T direct MR arthrography of the wrist: value of finger trap distraction to assess intrinsic ligament and triangular fibrocartilage complex tears**

M. Cerny, Lausanne/CH

### 08:00–09:00 **Scientific Papers – Spine with Intervention** **ROOM 2**

*R. Arkun, Izmir/TR, G. Guglielmi, Foggia/IT*

#### **Is there a correlation between the degree of fatty degeneration of dorsal paraspinal muscles and degenerative abnormalities of the lumbar spine?**

C. Bardach, Vienna/AT

#### **Does normalized signal intensity of cervical disks on T2 weighted MRI images change in whiplash patients?**

E. J. Ulbrich, Zurich/CH

#### **Percutaneous, minimally invasive, image-guided techniques for the treatment of symptomatic spinal hemangiomas: study of clinical safety and efficacy**

A. Kelekis, Athens/GR

#### **New procedure in the treatment of spinal traumatic and osteoporotic fractures type Magerl A: implementation of Spine Jack System. VAS, Kyphosis and discopathy evaluation at 0, 3, 6**

N. H. Theumann, Lausanne/CH

### 09:00–10:30 **Upper extremity** **ROOM 1**

*D. Fessell, Ann Arbor/US, S. Martin, Palma de Mallorca/ES*

#### **09:00 Imaging of intrinsic and extrinsic ligaments of the wrist**

N. Theumann, Lausanne/CH

#### **09:20 Finger injuries**

J.L. Drape, Paris/FR

#### **09:40 Ulnar side pain**

L. Cerezal, Santander/ES

#### **10:00 Elbow in sports**

M. J. Ereño Ealo, Bilbao/ES

#### **10:20 Case presentation**

S. Martin, Palma de Mallorca/ES

**09:00-10:30      Interventions      ROOM 2**  
*G. Astrom, Uppsala/SE, J. Martel, Alcorcon/ES*

- 09:00      **US guided therapy in the upper extremity**  
 M. Obradov, Nijmegen/NL
- 09:20      **Minimally invasive procedures in the lumbar spine**  
 N. Amoretti, Nice/FR
- 09:40      **Intraarticular therapy procedures**  
 L. Sconfienza, Genoa/NL
- 10:00      **US Guided Intervention in the lower extremities**  
 J. Gielen, Edegem/BE

**10:30-11:00      Coffee Break      FOYER**

**11:00-12:30      Shoulder      ROOM 1**  
*E. Galvan, Marbella/ES, A. Oktay, Izmir/TR*

- 11:00      **Anatomy and biomechanics of the shoulder in sports**  
 J. Beltran, Brooklyn/NY
- 11:20      **Imaging of the labrum: What do I need to know and report**  
 K. Woertler, Munich/DE
- 11:40      **Imaging of the rotator cuff and biceps tendon. Pearls and pitfalls**  
 M. Zanetti, Zurich/CH
- 12:00      **Imaging of the shoulder in throwers: What do you see**  
 L. Bancroft, Orlando/FL
- 12:20      **Case presentation**  
 A. Oktay, Izmir/TR

**11:00-12:30      Arthritis      ROOM 2**  
*A.G. Jurik, Aarhus/DK, C. Schueller-Weidekamm, Vienna/AT*

- 11:00      **US in rheumatology: What are the essentials for the rheumatologist to know?**  
 Ch. Dejaco, Graz/AT
- 11:15      **New horizons in MRI for imaging of the arthritis**  
 A. Grainger, Leeds/UK
- 11:30      **When do we still need the conventional radiographs?**  
 A. Cotten, Lille/FR
- 11:45      **MRI of the sacroiliac joint: Alternative diagnosis to inflammatory sacroiliitis**  
 I. Eshed, Ramat Gan/IL
- 12:00      **Arthritis imaging in children: pathologies and normal variants**  
 N. Boutry, Lille/FR

**12:30-14:00      Muscles, tendons, bone and spine      ROOM 1**  
*X. Tomas, Barcelona/ES, S. Tormenta, Rome/IT*

- 12:30      **Muscle injuries in high performance athletes**  
 I. Boric, Zagreb/HR
- 12:50      **Stress fractures**  
 R.M. Rodrigo del Solar, Bilbao/ES
- 13:10      **Overuse injuries: The entheses and myotendinous unit: An integrated approach**  
 A. Vieira, Porto/PT
- 13:30      **Sports and Spine**  
 D. Wilson, Oxford/UK
- 13:50      **Case presentation**  
 S. Tormenta, Rome/IT

# GE Healthcare at ESSR 2013

GE Healthcare, as corporate sponsor,  
is pleased to welcome you to the  
ESSR 20<sup>th</sup> Annual Conference in Marbella.

We will contribute to scientific activities with the lunch  
symposium **"Dreaming up the role of Imaging in Sports  
Medicine"** on **June 15<sup>th</sup> at 14:00h** and will showcase the  
latest innovations in musculoskeletal imaging at our  
booth, including:

- Our range of Ultrasound systems, led by the LOGIQ\* E9 with XDclear, delivering extraordinary image quality combined with the latest advanced features in musculoskeletal imaging. You can discover more during the ultrasound workshops.
- Optima\* MR430s, our compact specialty MR 1.5T system, offers excellent comfort to patients in combination with the high and consistent image quality you expect from a high field magnet. The Optima MR430s is a clear example of GE Healthcare's vision of humanizing MR: a comfortable exam experience and uncompromised image quality.

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LOGIQ Family



Optima MR430s



GE imagination at work

**12:30-14:00**      **Hot Topics**      **ROOM 2**  
*K. Bohndorf, Augsburg/DE, M. Shahabpour, Brussels/BE*

- 12:30**      **Cartilage imaging: An update**  
 Ch. Glaser, Munich/DE
- 12:45**      **Dedicated MRI for joint imaging**  
 W. Peh, Singapore/SG
- 13:00**      **Lessons learned from imaging the 2012 Olympic Games**  
 Ph. O'Connor, Leeds/UK
- 13:15**      **Nerve imaging**  
 E. Silvestri, Genoa/IT
- 13:30**      **Imaging considerations at a disability games**  
 R. Campbell, Liverpool/UK

**14:00-15:00**      **GE Healthcare - Dreaming up the role of Imaging in Sports Medicine**      **ROOM 1**  
*M. Padron, Madrid/ES*

- Welcome from the President of ESSR**  
 M. Padron, Madrid/ES
- The challenge of Imaging in Sports Medicine**  
 J. Ekstrand, Linköping/SE
- What do Orthopaedic Surgeons expect from imaging today? What will they need tomorrow?**  
 S. Orava, Turku/FI
- MSK MRI: The roadmap to the future**  
 J. Coumans, Milwaukee/US
- A Roundtable of experts: Dreaming up the role of diagnostic imaging in Sports Medicine. Present and future challenges**  
 S. Orava, Turku/FI; J. Ekstrand, Linköping/SE; C. Faletti, Turin/IT; J. Coumans, Milwaukee/US; Ch. Pfirrmann, Zurich/CH; Ph. O'Connor, Leeds/UK

**15:00-15:15**      **Coffee Break**      **FOYER**

**15:15-15:30**      **ESSR 2014 - Welcome to Riga**      **ROOM 1**

**15:30-17:00**      **ESSR Quiz Session**      **ROOM 1**  
*J. Beltran, Brooklyn/NY, V. Pullicino, Shropshire/UK*

**17:00-18:00**      **ESSR General Assembly**      **ROOM 1**

All active members of ESSR are kindly invited to join the General Assembly.

GE Healthcare





# Gala Dinner

**Saturday, June 15, 2013**  
**Restaurant El Ancla**

Dresscode: smart/business casual  
One ticket per person required.

20:00 Meeting point Congress Centre Marbella  
(Shuttle bus transfer)  
20:30 Dinner start

*Sport Injuries*  
**ESSR 2013**  
**MUSCULOSKELETAL**  
**RADIOLOGY**  
JUNE 13-15, MARBELLA/SPAIN

The ESSR Office may not accept liability for personal injury, loss/damage to property, personal or otherwise belongings of participants and/or accompanying persons, either during or as a result of the evening event.

## INVITED ABSTRACTS

### **Anterior hip and groin**

*E.G.G. McNally; Oxford/UK*

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The important aspects of anterior hip and groin anatomy will be demonstrated.

### **Hamstring: ultrasound anatomy demonstration**

*A.L. Bueno; Alcorcon/ES*

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The hamstring or ischiocrural muscles are three: the biceps femoris, the semitendinosus and the semimembranosus muscles (from lateral to medial aspects of the posterior compartment of the thigh).

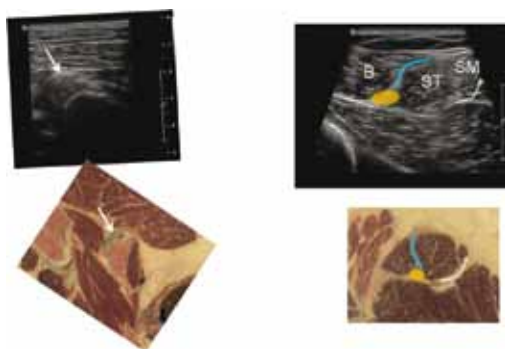
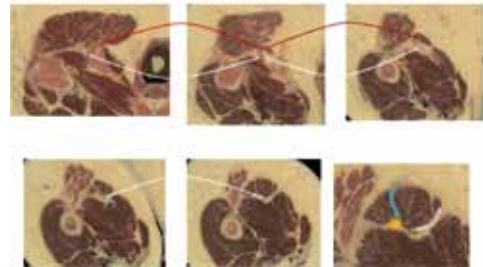
**At the middle posterior thigh** we can easily recognize them on a transverse image. The semitendinosus muscle shows a characteristic V-shaped internal septum. The long head biceps femoris is seen laterally (its lateral aspect is a frequent site of myotendinous rupture), and the more proximal semimembranosus muscle is located medially. Between the long head biceps femoris and semitendinosus muscles we find an hyperechoic aponeurotic line. It is other frequent site of rupture, known as "the upper zipper-like rupture" which tends to recur more. Sciatic nerve is nicely viewed just deeper this hyperechoic line. Slight sweep medially to find other echogenic ovoid smaller structure (on transverse view): the large flat proximal aponeurosis of semimembranosus. At this level it is deeper to the semitendinosus muscle. Scanning distally the semimembranosus muscle belly becomes larger and rounder (proximally it shows a characteristic crescent-shape which is other frequent site of rupture).

**The upper posterior thigh.** From the anterior position we transversally scan cranially. The biceps femoris and semitendinosus muscles become a strong conjoined tendon to insert onto the inferior aspect of the ischial tuberosity. The semimembranosus proximal aponeurosis also inserts onto the ischial tuberosity forming the lateral aspect of the proximal ischiocrural tendon insertion. Next it is the sciatic nerve laterally. Longitudinal planes should be done to see the longitudinal view of the frequent proximal myotendinous detachment and the osteotendinous insertion.

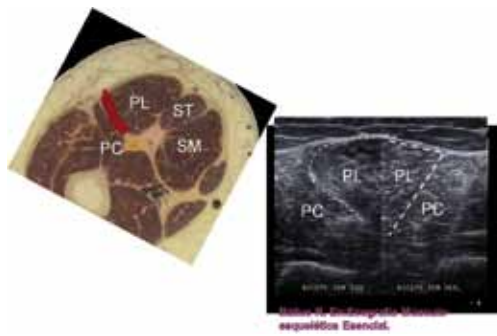
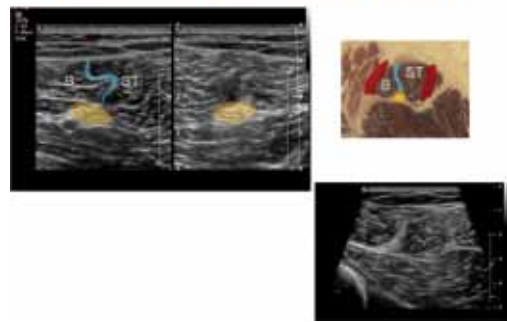
**The lower posterior thigh.** Scanning caudally on the transverse plane we find a new muscle next to the lateral aspect of the biceps femoris long head: the biceps femoris short head, with other aponeurotic hyperchoic line between them. It is the site of other frequent rupture: "the lower zipper-like rupture" which may be difficult to recognize because findings may be very subtle. Distally the muscle belly of the semitendinosus becomes smaller until we just see its distal tendon superficial to the large muscle belly of semimembranosus. The latter inserts distally at the posteromedial aspect of tibial epiphysis. Distal tendon of semitendinosus forms together with gracilis and sartorius tendons the pes anserinus which inserts onto anteromedial aspect of the proximal tibia. Biceps femoris inserts at the fibular head (together with the lateral collateral ligament).



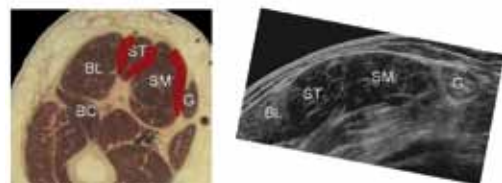
Hamstrings: Anatomy



Middle posterior thigh > upper zipper-like rupture

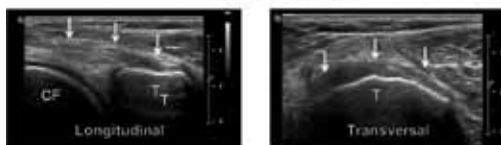


Lower posterior thigh

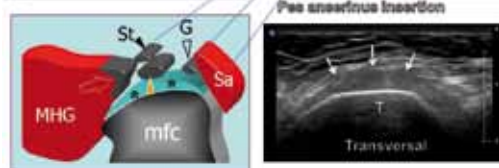


Hamstrings: Distal insertion

Semimembranoseus tendon insertion



Hamstrings: Distal insertion





## **Ankle and foot ligaments**

*D.J. Wilson; Oxford/UK*

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Dr Wilson and Dr. Allen will demonstrate normal ligament anatomy using ultrasound in this session with practical advice and tips. They advise that delegates would benefit from revision of the anatomy using their standard anatomy texts prior to the presentation.

## **Hernias**

*J.A. Jacobson; Ann Arbor, MI/US*

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Evaluation for inguinal-region hernias with sonography is often difficult given lack of osseous landmarks, which is further compromised in patients with a large body habitus; however, evaluation can be effective with knowledge of soft tissue landmarks and the use of dynamic imaging. One important landmark is the inferior epigastric artery. Ultrasound scanning can begin in the transverse plane over the rectus abdominis muscle inferior to the umbilicus. When moving the transducer inferiorly, the inferior epigastric artery can be identified moving from medial to lateral. This artery is followed to its origin from the external iliac artery. Just superior to this point is located the deep inguinal ring, where the spermatic cord (in men) or round ligament (in women) can be identified moving lateral to medial within the inguinal canal. The above soft tissue landmarks of the lateral border of the rectus abdominis, the inferior epigastric artery, and the inguinal ligament demarcate Hesselbach's triangle, the location where direct inguinal hernias occur. With the transducer positioned over and long axis to the inguinal canal, the patient is asked to perform a Valsalva maneuver. An indirect inguinal hernia will characteristically follow the inguinal canal, moving from lateral to medial over the external iliac vessels parallel to the skin surface. A direct inguinal hernia will characteristically appear as a focal bulge or movement of abdominal contents directly anteriorly through Hesselbach's triangle. It is important to evaluate for inguinal hernias short axis to the inguinal canal as well. This position will identify contents of an indirect inguinal hernia that may be superior to the spermatic cord or round ligament in the inguinal canal and potentially out of plane to the ultrasound beam when imaging long axis. In addition, imaging direct inguinal hernias in two planes is essential to demonstrate the focal movement of the abdominal contents, which is unlike the global inferior movement of bowel contents that may occur normally during the Valsalva maneuver. Lastly, imaging over and medial to the femoral vessels just inferior to the inguinal ligament in two planes is required to diagnose femoral hernias.

## **US diagnosis of shoulder impingement**

*A. Plagou; Athens/GR*

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External (subacromial) impingement occurs when the bony and soft tissue structures of the superior aspect of the shoulder encroach upon the coracoacromial ligamentous arch during abduction of the arm.

In athletes, especially those involved in sporting activities that require repetitive overhead use of the arm (tennis, baseball, volleyball, swimming) pain in the shoulder is sometimes due to external impingement. Impingement in this population can be caused mainly by instability of the shoulder joint.

Ultrasound can be helpful in the diagnosis of subacromial impingement by means of dynamic assessment of shoulder abduction. The ultrasound test of impingement is performed with the arm abducted in or slightly forward of the scapular plane. Simultaneous visualisation of the coracoacromial ligament, subacromial-subdeltoid bursa (SASD) bursa and the supraspinatus tendon allows the depiction of impingement findings which include "bunching" or fluid distension of the SASD bursa, "bunching" of the supraspinatus tendon and less commonly complete "blocking" of supraspinatus tendon motion. Dynamic sonography is a helpful diagnostic tool to make the diagnosis of shoulder impingement because it can directly show this dynamic process in addition to evaluating the rotator cuff and other abnormalities known to be associated with impingement. Tendinopathic changes, calcific tendinopathy and tendon tears are frequent findings associated with impingement. Tendinopathy ultrasound characteristics include enlargement and inhomogeneity of the tendon. In calcific tendinopathy calcium deposits causing enlargement of the tendon and in some cases SASD bursitis are present. Rotator cuff tears – usually partial thickness tears- are often present in patients with impingement.

Video demonstrations of the ultrasound technique and impingement ultrasound findings will be presented.

- References:** 1. Tagg CE, Campbell AS, McNally EG. Shoulder impingement. *Semin Musculoskelet Radiol.* 2013 Feb;17(1):3-11  
2. Bureau NJ, Beauchamp M, Cardinal E, Brassard P. Dynamic sonography evaluation of shoulder impingement syndrome. *AJR Am J Roentgenol.* 2006 Jul; 187(1):216-20.  
3. Wang YC, Wang HK, Chen WS, Wang TG. Dynamic visualization of the coracoacromial ligament by ultrasound. *Ultrasound Med Biol.* 2009 Aug;35(8):1242-8



### **US features of tendonopathy**

*J. Teh; Oxford, OXFORDSHIRE/UK*

Tendons are a critical link in the musculoskeletal chain, and are composed of linear fibrils of collagen with a supporting matrix. „Tendinopathy“ is the generic term for tendon abnormality. „Tendinitis“ is a misnomer as there are usually no inflammatory cells histologically. „Tendinosis“ is a non-inflammatory condition of collagen degeneration with scattered vascular ingrowth and areas of mucoid degeneration or calcification, usually the result of repetitive microtrauma. The ultrasound appearances of the normal and the diseased tendon are presented. The use of Doppler and sonoelastography is discussed. Ultrasound is an excellent modality for evaluation of common tendon abnormalities.

### **US grading of muscle tears**

*P. Peetrons; Brussels/BE*

Grading muscular lesions in athletes may be important for these athletes, their trainers and the medical staff to prognose the delay before going back to sports. It may also have an importance for the therapy. We described 4 grades in 2002 (Eur. Radiology) of muscular lesions in Ultrasound. Grade 0 is when no lesion is shown, Grade 1 is when there is a disorganization of the muscle, hyperechogenicity and only some little hypoechoic zones. Grade 2 concerns hematoma in the muscle, less than half the thickness of the muscular structure. Grade 3 is when the muscle is completely retracted or when the hematoma is more than half of the muscular tissue. Recently, authors (Eckstrand et al. Br. J. Sports. Med) adapted this grading system to MRI imaging and found a statistically related delay in sports activity and this grading system in hamstring injury among professional soccer players. It seems then that a relatively simple grading system can be used to approximately assess the absence of the sportsman from the field. However, it doesn't help for treatment, as the treatment must always be followed by clinical assessment.

### **Complications of muscle tears**

*E. Drakonaki; Heraklion/GR*

The complications of muscle injury are a result of impaired muscle healing and include myositis ossificans, fibrotic scar tissue formation, chronic intramuscular hematoma, hygroma or cyst, acute and chronic compartment syndrome and muscle herniation. This short talk highlights the role of dynamic ultrasonography in the follow up of muscle injury. Technical aspects, tips and tricks as well as the advantages and limitations of ultrasound in the diagnosis of muscle injury complications are discussed.

### **Ankle ligament tears**

*L.M. Sconfienza; Milan/IT*

The ankle is one of the most frequently injured joints, especially in subject playing sport activities involving the lower limb. In this setting, ankle ligament injury is a common occurrence. The anterior talofibular ligament is the most involved structure in patients who sustained an inversion trauma, an event that is extremely common in football and basketball players. Other ligaments around the ankle, such as the medial deltoid ligament, are less prone to tears, not only because they are stronger, but also because trauma that lead to their damage is remarkably less common. The presence of associate findings, such as bone bruise, bone avulsion, intrarticular effusion or osteochondral lesions, has a non-negligible occurrence. US has been demonstrated as an effective, quick, inexpensive imaging modality to assess most of ligaments around the ankle. It can also evaluate the presence of associate findings such as intrarticular effusion or tenosynovitis. However, US cannot be used to detect intrarticular pathology or certain ligaments (e.g., posterior talofibular, subtalar ligaments) due to lack of an adequate sonographic window. In these cases, MR can be effectively used to evaluate difficult ligaments and to detect the presence of bone marrow edema or subchondral damage. Finally, radiography can be used to detect associate bony abnormalities, such as fractures or small avulsions.

## **Biceps and triceps injuries**

*J.A. Jacobson; Ann Arbor, MI/US*

The biceps brachii, comprised of two heads, demonstrates a terminal bifurcation of the distal tendon at its insertion on the radial tuberosity. The anatomy of the distal tendon shows a twisting of the tendons, such that the lateral long head moves deep to the superficial short head. Knowledge of this anatomy explains the imaging appearance of partial-thickness distal biceps brachii tears, where the superficial short head may retract with an intact deep long head. Because sonographic evaluation of the distal biceps brachii can be challenging, there are several scanning techniques that may be used. If scanning from an anterior approach is inadequate, the use of a medial approach using the brachial vessels or pronator teres may be helpful. When differentiating partial-thickness from full-thickness distal biceps tendon tear, the use of dynamic imaging with ultrasound is very helpful. While this can be accomplished from a medial approach, scanning from a lateral approach with elbow flexion is often employed. Such dynamic imaging with ultrasound may be used as a problem-solving tool when differentiation between partial and full-thickness tear is problematic.

The triceps brachii, comprised of three heads, demonstrates essentially two attachments onto the olecranon process of the proximal ulna. The lateral and long heads combine to form a superficial tendon. The medial head is located deep to this superficial tendon, and attaches to the olecranon with very little tendon. Often this medial head attachment is overlooked at imaging, which can result in a misinterpretation of a partial-thickness triceps brachii tear as a full-thickness tear. This distal triceps anatomy explains the imaging features of a partial-thickness tear, where the superficial combined lateral and long head tendon tears with an intact deep medial head. This type of partial-thickness tear is often associated with a retracted olecranon enthesophyte bone fragment.

## **Groin Pain and Athletic Pubalgia**

*E. Kavanagh; Dublin/IE*

Groin pain and athletic pubalgia are commonly encountered problems in musculoskeletal radiology. The diagnosis can be difficult to establish, based on the complex interconnected anatomy at the pubic symphysis and surrounding structures. The differential diagnosis is therefore broad, and diagnostic imaging is crucial in reaching the correct diagnosis. This presentation reviews the relevant anatomy and differential diagnoses encountered in injuries of the groin. Familiarity with the pubic anatomy and with MR imaging findings in athletic pubalgia and in other confounding causes of groin pain allows accurate imaging-based diagnoses and helps in planning treatment that targets specific pathologic conditions.

## **Bone marrow and sports**

*A. Karantanas; Heraklion/GR*

Diagnosis of the cause of hip and groin pain in athletes is a difficult task. Elite athletes participating in sports with repetitive kicking, side to side movements and twisting, are mostly at risk for hip and groin injuries. Young athletes are susceptible to avulsion injuries which are specific to the growing skeleton. Weekend athletes as well as middle aged or elderly patients with moderate activities, are also prone to a wide spectrum of injuries.

Bone marrow edema (BME) in the context of sports related activities, represents a non specific finding. Hip joint BME in sports, may result from acute and chronic or repetitive injuries.

Acute injuries include bone bruise, osteochondral injuries, fracture, avulsion fracture and pathologic fracture. Bone bruises and osteochondral injuries are rare because of the deep-seated ball-in-socket morphology of the joint which provides stability and protection. Chondral and osteochondral injuries are best assessed with MR arthrography.

Chronic or repetitive injuries include stress reaction, stress fracture, thigh splints, chronic apophysitis and friction/impingement such as the greater trochanter pain syndrome, internal snapping hip syndrome, iliofemoral ligament snapping and cam type femoroacetabular impingement syndrome. Stress/fatigue injuries occur usually in the inferior pubic ramus and the medial neck of the femoral bone and regarding military endurance athletes and recruits typically in the acetabulum. They are best assessed with fat suppressed MRI sequences. Similarly, chronic or recurrent apophyseal injuries with minimal displacement, can be depicted with fat suppressed MRI sequences which will show soft tissue edema and BME. These injuries, may show irregular pattern of ossification that can easily be confused with an aggressive lesion and CT is helpful to assess their benign nature. In the pediatric age group and adolescent athletes, the list of differential diagnosis of BME should include early Perthe's and SFCE. Middle aged weekend athletes suffer from tendinopathies which may provoke reactive BME. Elderly, who are active, show age-related sports injuries such as tendon tears and avulsion fractures due to the weakened osteoporotic bone. In middle aged and elderly weekend athletes, radiologists should be able to recognize underlying disorders complicating the sports related injury.

In conclusion, the pattern and location of BME combined with age, sex and overall profile of the athlete, may contribute to narrow the differentials or to arrive to a single diagnosis. Radiologists need to be familiar with the above as initiation of proper treatment will prevent an ongoing serious athletic injury with potential subsequent complications.



### **Osteoporotic vertebral fractures: How to recognize and report**

*C. Krestan; Vienna/AT*

This lecture focuses on the occurrence, imaging, differential diagnosis and the reporting of osteoporotic vertebral fractures. The prevalence and the most common sites of osteoporotic vertebral fractures and their clinical implications are discussed. Osteoporotic vertebral fractures are due to low energy force exerted on weakened vertebral bodies. Most commonly postmenopausal osteoporosis is the cause for vertebral fractures. Additional risk factors are osteomalacia, chronic renal failure, immunosuppressive agents, antiestrogen therapy in breast cancer treatment and high-dose corticosteroid therapy. Radiographs of the spine are still the most frequent method for screening of vertebral fractures. However underreporting, especially in lateral chest x-rays, which are primarily indicated for other reasons, is a frequent problem. Basic principles of vertebral morphometry are introduced and the semiquantitative grading of vertebral fractures according to Genant is discussed in detail. Other tools like vertebral fracture assessment together with bone densitometry have been frequently used since they were introduced by the manufacturers of DXA-machines. They provide a "one stop shopping tool" for the combined assessment of bone mineral density and a screening tool for vertebral fractures. Underreporting is even a problem with MDCT, if sagittal or coronal multiplanar reformations are not being used routinely. Differential diagnosis of vertebral fractures can usually be approached by MDCT and/or MRI. Magnetic resonance imaging is a very sensitive tool to visualize bone marrow abnormalities associated with vertebral fractures and allows differentiation of benign versus malignant fractures. Positron emission tomography-CT (PET-CT) with hybrid-scanners has been the upcoming modality for the differentiation of benign from malignant fractures. The end of the lecture will summarize the most important steps for a structured report to meet the expectations of the referring clinician.

### **Myths and real facts about QCT: dose/advantages**

*J. Damilakis; Heraklion/GR*

The purpose of this presentation is to discuss advantages and limitations of QCT and present a review of published data on the role of QCT in the assessment of osteoporosis. QCT provides bone mineral density (BMD) and geometric measurements in central and peripheral skeletal sites. Examinations are carried out using a software package and a calibration phantom scanned simultaneously with the patient. A typical 2D QCT protocol consists of slices acquired in the mid plane of each of three or four adjacent vertebrae. This 2D technique has a limited precision. With the development of MDCT systems, 3D QCT protocols have been developed. 3D volume sets are acquired and from these the estimation of spine or hip BMD and bone geometry is possible. MDCT technology has also allowed evaluation of distal radius BMD with good accuracy and reproducibility.

The main advantages of QCT over DXA include a) ability to separately measure the cortical and trabecular bone, b) assessment of true volumetric trabecular and cortical BMD and c) measurements less affected by spinal artefacts. QCT also provides geometric measurements of bones, from which biomechanical parameters can be derived. Despite these important advantages, the clinical application of QCT is limited in comparison with that of DXA. This is usually attributed to higher patient dose, limited availability of CT scanners, higher cost and fewer data on fracture risk prediction. Patient effective doses on the order of 90  $\mu$ Sv have been reported from 2D QCT. This level of dose is very low and the expected benefits from the examination outweigh the likely radiation risks. Patient radiation burden from distal radius QCT is very low (< 10  $\mu$ Sv). Effective doses from spine and hip 3D QCT examinations range from 1.5 to 3.0 mSv. These doses are significantly higher than doses from other methods used for estimation of bone status. Strategies should be developed for dose reduction while maintaining diagnostic confidence.

Using peripheral QCT (pQCT) scanners, bone morphology and BMD estimation at appendicular bones is possible. Modern high-resolution pQCT scanners allow evaluation of cortical and trabecular bone architecture. Patient doses from pQCT are lower than 10  $\mu$ Sv. These advantages make pQCT an excellent tool for pediatric examinations.

### **Beyond BMD measurements**

*J.S. Bauer<sup>1</sup>, J.M. Patsch<sup>2</sup>; <sup>1</sup>Munich/DE, <sup>2</sup>Vienna/AT*

To review recent advances in imaging and post processing methods for diagnosing and monitoring osteoporosis. Advances in scanner technology pushed the spatial resolution to higher limits. The highest in-vivo resolution can be achieved using high resolution peripheral quantitative computed tomography (HRpQCT) with a voxel size of 80µm isotropic at the peripheral skeleton. HR magnetic resonance imaging was also successfully employed with a resolution of about 150µm isotropic at the peripheral skeleton and 200x200x1000µm at the hip. Using whole body MDCT, the spine and the hip can be imaged with a resolution of about 200x200x600µm. These high resolution datasets were successfully analyzed with conventional histomorphometric parameters, but better results in predicting fracture risk and bone strength were found for nonlinear scaling measures and the Finite Element Method.

Recent developments in both hardware and software push limits towards a better fracture prediction. They also give new insight in different ways of bone loss that still are summarized in the term „osteoporosis“, but may be related to different pathophysiologic mechanisms.

### **Vertebro and kyphoplasty**

*F. Aparisi Rodriguez; Valencia/ES*

The vertebral fracture by compression in most cases can be treated by methods of Interventional Radiology. To get control of the pain we can inject acrylic cement, but if we also want to remodel the vertebra we need that injection occurs with very precise control so that we can create pressure spots capable of moving bone. Generically these techniques are named as vertebral augmentation (VA).

Percutaneous vertebroplasty is a relatively new technique, and its long-term results are not exactly known. It stabilizes the spine by strengthening the broken vertebra. Although the rate of complications is less than 1%, percutaneous vertebroplasty may cause infection, bleeding and embolism due to leakage of cement mixture into the bloodstream.

Spinal augmentation is considered standard of care for pain palliation in patients suffering from nonhealing, osteoporotic compression fractures. Multiple randomized trials have recently been reported. An unblinded trial (Fracture Reduction Evaluation, or FREE) comparing Kyphoplasty to medical therapy showed profound benefit of augmentation at all time points up to two years.

Prophylactic vertebral augmentation (PVA) is considered one of the most challenging topic for people interested in vertebral augmentation, and recently there is increasing number of papers suggesting the opportunity to perform augmentation before future fracture, particularly supported by biomechanical studies concerning the possible increase in vertebra adjacent to previous treated level. However we must remember that VA, it is insufficient to prevent the emergence of new fractures. If VA are associated with a rehabilitation program this risk decreases to one-quarter.

The fundamental difference between vertebroplasty and VA techniques is that in the first act passively, while in the VA will actively modify the structure of vertebra creating a cavity through the inflation of a balloon. Nowadays we have instrumentation that has largely diminished the difficulties for the introduction of the balloons, but unfortunately the price remains too significant difference against the techniques of VA.

Both techniques have risks of leakage of cement and creation of a too-hard area to facilitate the presence of new adjacent fractures. No doubt that the percentage of success or failure is closely linked to the care with the development of the technique. For both techniques are risky and needed to be carried out by expert staff who knows exactly risks of each one of them.

Even knowing the advantages of the VA, I consider that vertebroplasty is still the standard treatment method, fast, secure and inexpensive

### **Menisci: Pearls and pitfalls**

*E.G.G. McNally; Oxford/UK*

Menisci are paired intra articular fibrous structures composed of fibrocartilage on an organised collagen structure. They appear to function by distributing the biomechanical forces across the femorotibial joint. Their failure leads to accelerated articular cartilage loss. Meniscal tears occur either following acute trauma, often a torsional injury or secondary to structural changes within the meniscus which are most commonly, but not always, age related. Meniscal tears are not always symptomatic, particular in the older age group and the finding of a meniscal tear associated with extensive cartilage disease is not always a relevant finding clinically. On MRI, the meniscus has low signal on all but the shortest TE images. Tears manifest in two ways. Simple tears are fluid signal reaching an articular surface in one of three planes, horizontal vertical or radial. Horizontal tears are the most common. If the tear reaches the meniscal periphery a meniscal cyst may form. Vertical tears frequently involve the periphery of the meniscus, the so-called red zone, and may heal. Plain MRI struggles to differentiate the healed from fresh vertical tear. Radial tears run in the Z plane, most commonly in two locations. One is the junction of anterior and middle thirds. In this location the tear is small and well demarcated in the sagittal plane and is seen as a blunting of the normal sharp tip of the meniscus in the coronal plane. The second location is iposterior close to or involving the meniscal root. The sagittal plain images may demonstrate complete absence of the meniscus or increase in signal the so called ghost sign. The meniscus may also be extruded if the radial tear completely transgresses the meniscal width.

Complex tears involve several planes and are frequently associated with displaced fragments. The most well known is the bucket handle tear however smaller flap tears with fragments of meniscus displaced around the tibial or femoral rims are more common. The majority of meniscal tears can be detected by evaluating two questions. One whether any high signal interrupts the meniscus and two whether there is a piece of meniscal tissue missing. Occasional pitfalls arise where meniscofemoral ligaments attach as the cleavage plain between the ligament and meniscus may simulate a tear. This occurs at the attachment of the meniscofemoral ligament and anteriorly at the attachment of the anterior intermeniscal ligament. Discoid lateral menisci are common, discoid medial menisci are extremely rare.

### **MR patterns of ligament injuries**

*X. Demondion; Lille/FR*

The ligaments of the knee are often involved in trauma and sports-related knee injuries. Magnetic resonance imaging (MRI) has proven to be a very useful and efficient tool to identify these structures and can help treatment by providing an early diagnosis. However realization of the MRI examination requires a meticulous MRI technique and accurate interpretation requires knowledge of the imaging anatomy, and understanding of the lesion appearance. The aim of this presentation is to review the normal anatomy of the ligaments of the knee as well as the MRI appearance of normal and injured ligaments. Mechanisms of injury, primary and secondary MRI signs are discussed.

### **The extensor mechanism: What is important?**

*A. Barile, S. Mariani, A. La Marra, C. Masciocchi; L' Aquila/IT*

The patellar and quadriceps tendons form a morphological and functional structure with the patella involved in the movement of flexion-extension. The repeated engagement, that is typical of disciplines such as volleyball, basketball, or those involving the gestures of jumping, is the main cause of the painful syndrome secondary to insertional tendinopathy of the quadriceps or more often of the patellar tendon. The process begins with microlesions involving the least resistant structures to mechanical stress. Among the main causes of an anterior pain syndrome we can consider the patello-femoral syndrome, the jumper's knee syndrome, the quadriceps tendinopathies and the Hoffa syndrome. The patello-femoral syndrome onset is represented by an anterior pain around the patella occurring as articular scrubbing due to overuse in presence of an abnormal contact between the patella and the femoral trochlea. The jumper's knee syndrome is typical in sports activities where the athletes perform repetitive jumping. It occurs as a symptomatic tendinosis or as a partial tear of the proximal part of the patellar tendon. The quadriceps tendinopathies are tendonitis of the insertional part of the quadriceps tendon resulting from acute episodes, microtraumas and microlesions, the latter misdiagnosed or ill-treated. The Hoffa syndrome is caused by a traumatic or repeated episode with hyperextension movement of the leg or with rotational forces where the Hoffa body comes into conflict with tibia and femur. After the clinical phase, the diagnostic study is based on X-ray (demonstrating patellar maltracking or tendon-calcifications), US (demonstrating the tendons and soft tissues of the knee) and MRI examinations (providing a panoramic view of all the structures of the knee).

## Lesions of the articular surface of the knee

*K. Bohndorf; Augsburg/DE*

Acute or repetitive trauma can cause a variety of articular surface injuries including fissures, chondral flaps and loss of a fragment or articular cartilage. The lecture will include

- Anatomic considerations about the response to injuring of the articular surface
- The mechanisms of injury, incidence and clinical presentation of articular fractures
- The classification of acute injuries of the articular surface
- Discussion of MRI classifications MRI is capable to detect and classify acute osteochondral lesions. However, acute and chronic osteochondral lesions are not always easy to be differentiated by MRI and recalls the fact that strong correlation with history and clinical findings yield best diagnostic results.

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## Post operative imaging of the knee

*J. Kramer; Linz/AT*

Since many years MR imaging is the modality of choice for the evaluation of injuries of the knee joint. The same is true for patients with persisting or recent complaints when surgical procedures in the region of the knee joint have been performed. In contrast to prior treatments of meniscal (total or subtotal removal of the torn meniscus) lesions, nowadays usually as less as possible of the meniscus will be resected to preserve the functional capacity of meniscal tissue to avoid early cartilage degeneration. However, in these situations a meniscal re-tear may occur not rarely. After ligamentous injuries (mostly the ACL is affected) mainly a repair procedure is the best treatment option. However, beside the normal healing process several complications especially after ACL reconstructions can be observed not rarely. MR imaging depicts clearly once again all these findings and contributes definitely to further treatment planning.

## Radiological diagnosis of benign and malignant bone tumors

*M.-A. Weber; Heidelberg/DE*

Primary bone tumours are categorized according to their tissue of origin into cartilage, osteogenic, fibrogenic, fibrohistiocytic, haematopoietic, vascular, lipogenic tumours and several other tumours like Ewing sarcoma and giant cell tumour (WHO classification of bone tumours 2006). Also, they are classified into benign, malignant and semi-malignant, as well as tumour-like lesions. They are rare, but found on radiographs during an investigation of a painful skeletal region or incidentally, e.g. when performing a joint or whole-body MRI. The radiograph is the first method to distinguish benign from malignant lesions: at first by analysing the aggressiveness of a lesion according to the classification of Lodwick and second by analysing the mineralisation of tumour matrix. The matrix may be osteolytic, osteoblastic, or mixed: osteolytic with matrix mineralisation. Based on the Lodwick classification an overview of the three main types of bone destruction patterns visible on radiographs will be given with many examples: Type 1: geographic (with a: well-defined border with sclerotic rim, b: well-defined border without sclerotic rim, c: ill-defined border); Type 2: geographic with moth-eaten or permeated pattern; Type 3: small, patchy, ill-defined areas of lytic bone destruction with moth-eaten or permeated pattern. Periosteal reactions are also indicators of lesion aggressiveness and will be demonstrated on selected examples.

In malignant lesions, MRI is needed to determine the tumour's extension preoperatively or before starting (neoadjuvant) chemotherapy. Presentation of standardised MRI protocols will be given. Functional imaging like T1-weighted dynamic contrast-enhanced (DCE) MRI will be shortly discussed. DCE MRI is beneficial to identify vital tumour tissue to which biopsies should be targeted and shows benefits for therapy monitoring under (neoadjuvant) chemo- or radiotherapy to detect the degree of tumour necrosis preoperatively. After surgery DCE better differentiates relapse from postoperative changes than standard MRI.

Typical examples of benign and malignant bone tumours will be demonstrated, the various imaging modalities will be compared and their utility will be discussed. Moreover, the key points the treating physicians want to know from radiologists will be given upon these examples. Also, advices will be given for cases a tumour is found incidentally at a MRI study. To make a specific tumour diagnosis the location within the tumour-bearing bone and the patient's age is also important. With an optimized combination of the different parameters, the expert achieves a correct, specific diagnosis in about 80% of cases. Image gallery with pearls and pitfalls, as well as tumours behaving like "chameleons" will be presented.



### **Diagnosis and local staging of soft tissue tumors**

*F.M.H.M. Vanhoenacker<sup>1</sup>, A.M. de Schepper<sup>2</sup>; <sup>1</sup>Antwerp (Edegem)/BE, <sup>2</sup>Antwerp/BE*

The WHO recognizes four categories for STT: benign, intermediate (locally aggressive), intermediate (rarely metastasizing), and malignant.

Differentiation between benign and malignant (grading) and making a tissue-specific diagnosis are based on combining parameters: prevalence, age at presentation, location, morphology, signal intensities on MRI, including fat suppression sequences, and pattern and degree of contrast enhancement. Characterization and grading of Soft Tissue Tumors (STT) based on imaging remains limited and histology is usually required for a definitive diagnosis. Ultrasound is mostly nonspecific but may be used for superficially located cystic STT. On MRI, analysis of multiple parameters (shape, presence of signal voids, fluid-fluid levels, SI, intratumoral necrosis, multiplicity, pattern/degree of enhancement) yields the best results. DWI may help in specific scenarios.

The highest confidence is reached in benign lesions, such as lipomas, vascular lesions, benign neural tumors, periarticular cysts, hematomas, PVNS, GCTTS, and abscesses.

The major role of MRI consists -however- of local tumor staging and monitoring of treatment. Whole body MRI and PET-CT may evaluate distant tumor spread. This lecture will focus on diagnosis and local staging.

### **Biopsy techniques of musculoskeletal tumors**

*C.S.P. van Rijswijk; Leiden/NL*

Biopsy is a key step in the diagnosis of bone and soft tissue tumors. An inadequately performed biopsy may fail to allow proper diagnosis, delay treatment and therefore even negatively influence patient survival. Poorly performed biopsy remains a common finding in patients with musculoskeletal tumors who are referred to orthopaedic oncology centers. The general principles and techniques by which an adequate and safe biopsy of musculoskeletal tumors should be planned and performed are discussed. Special attention will be given to difficult locations and consistency of lesions (eg sclerotic lesions).

### **Assessing response to preoperative treatment**

*J.C. Vilanova; Girona/ES*

Objectives: To learn the different criteria to evaluate tumor response. To know the imaging techniques that can be applied to evaluate tumor response.

In order to assess the effectiveness of cancer therapy traditionally it has been evaluated changes in tumor size by comparing tumour images acquired before and after therapeutic intervention by inspection of cross-section images. For some tumors during successful chemotherapy or radiotherapy, tumour size does not diminish significantly. It is essential to monitor the response to chemotherapy to determine whether the prescribed treatment regimen is effective. The possibility to use functional imaging on MRI such as diffusion weighted images (DWI) or dynamic contrast enhanced (DCE) on MRI can provide earlier information about therapeutic outcome and may allow to develop new response criteria, other than traditional anatomic tumor response criteria based on uni- or bidimensional changes in tumor size. These new criteria should ultimately result in more effective treatments that translate to maximum benefit for sarcoma patients. Other imaging techniques such as PET-CT could also be used to monitor treatment.

### **Ankle tendons - What is the best way to image them?**

*C. Masciocchi, A. La Marra, S. Mariani, A. Barile; L'Aquila/IT*

In the study of the ankle tendons, US and MRI play a key role in the definition of damage and recovery periods. User friendly and able to demonstrate the tendon fibrillar structures, also in dynamic phases through high frequency probes (10-13MHz), diagnostic ultrasound is the first choice instrumental investigation technique. With axial, longitudinal and oblique scans, it is possible to identify tendon tears at the level of the anterior compartment (anterior tibialis, extensor hallucis longus and extensor digitorum communis), the medial compartment (posterior tibialis), the lateral compartment (peroneal) and in particular the alterations of the echogenicity at the level of the Achilles tendon whose crucial role is to sustain the ankle. Additionally, US allows assessment of the degree of ligament injuries, namely I, II, III degree, and whether the lesion is partial or complete. MRI still remains the gold standard for the study of tendon disorders, due to its multiparametric ability to reproduce images not only of the anatomical configuration and pathological tendons of the ankle but also of bony structures as well as the tendon insertions on them. The limits of MRI are the higher costs and the duration of the examination, and, in addition, the inability to define the degree of ligamentous lesions.



## **Impingement syndromes of the ankle**

*P. Robinson; Leeds/UK*

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### **AIMS**

1. To illustrate and understand the ankle anatomy and pathophysiology of impingement.
2. To demonstrate the use of MR imaging and ultrasound in the diagnosis and management of soft tissue impingement syndromes.
3. Describe the technique of image guided therapy and its role in the management of impingement syndromes.

### **BACKGROUND**

Soft tissue and osseous impingement syndromes are now increasingly recognized as a significant cause of chronic ankle pain professional athlete and younger population. Impingement syndromes have been described in the anterolateral, anterior and posterior ankle. Symptoms for all these conditions relate to physical impingement of osseous or soft tissue resulting in painful limitation of the full range of ankle movement.

The conditions to be discussed include;

- 1) Anterolateral Impingement
- 2) Anterior Impingement
- 3) Posterior Impingement
- 4) Anteromedial Impingement
- 5) Posteromedial Impingement

### **READING**

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## **Imaging of talalgia**

*V.M. Pansini; Lille/FR*

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Heel pain (or talalgia) is a common and frequently disabling clinical complaint that may be originated by a large spectrum of osseous or soft-tissue disorders. These disorders are classified on the basis of anatomic origin of heel pain permitting a better understanding of the disease. The disorders include plantar fascial lesions (fasciitis, rupture, fibromatosis, xanthoma), tendinous lesions, osseous lesions (fractures, bone bruises, osteomyelitis, tumors), bursal lesions (retrocalcaneal bursitis, retroachilleal bursitis), tarsal tunnel syndrome and heel plantar fat pad abnormalities. Radiographs are often obtained to exclude acute causes of heel pain, such as calcaneal fracture or to demonstrate more subtle osseous abnormalities such as the Haglund deformity manifested by a bony projection along the superior posterior aspect of the calcaneal tuberosity on the lateral view. Thanks to its superior soft-tissue contrast resolution and multiplanar capability, magnetic resonance (MR) imaging allows to determine the cause of heel pain and to assess the extent and severity of the disease particularly in clinically difficult cases. The majority of patients with heel pain can be successfully treated conservatively, but in cases requiring surgery (eg, plantar fascia rupture in competitive athletes, deeply infiltrating plantar fibromatosis, masses causing tarsal tunnel syndrome), MR imaging is useful in planning surgical treatment demonstrating the exact location and extent of the lesion. Due to its high spatial resolution, ultrasound has recently gained an important role in assessing heel pain permitting to guide pain-relief procedures with corticosteroids infiltration in selected cases.

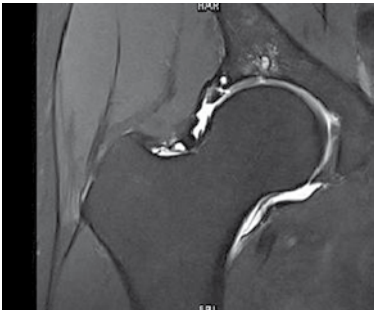
## MR arthrography - Technique and ideal dilution

V. Mascarenhas; Lisbon/PT

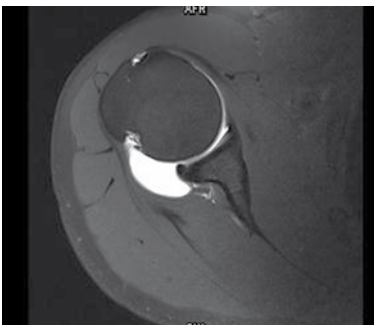
Continual improvements in diagnostic modalities used for joint imaging have led to better resolution, sensitivity, and specificity.

Although MR arthrography is presently regarded as the imaging gold standard for joint pathology characterization, there is no generalized consensus in the literature about whether conventional MRI, direct MR arthrography, indirect MR arthrography, or CT arthrography is the best method for joint imaging.

Publications from diverse origins propose different criteria for selecting the technique to apply in different patients and in different joints. Technique of injection is reviewed, either under fluoroscopic guidance, CT guidance or with ultrasound guidance as well problems and advantages of mixtures containing only saline or gadolinium-based contrast solutions. Optimal SI and SNR gadolinium mixture content are discussed, namely optimal concentration of a gadolinium-based contrast agent, problems with iodine mixtures, usefulness of intra-articular anesthesia and influence of field strength. Precise knowledge regarding the technique, mixture content and field-strength are critical factors for an optimal MR arthrogram.



Coronal DP Fat-Sat MR arthrography. Femoro-acetabular impingement



Axial T1 Fat-Sat MR arthrography. Normal MR examination.

## Hip arthrography, CT and MR

E. Llopis<sup>1</sup>, V. Higuera Guerrero<sup>2</sup>, E. Belloch<sup>1</sup>; <sup>1</sup>Alzira/ES, <sup>2</sup>Valencia, 46/ES

The purpose of this lecture is to review hip arthrography technique with emphasis on some small tips and tricks to make it easier.

CT vs MR arthrography of the hip are both useful tools for intraarticular hip disorders, minimally invasive with a minimal rate of complications. We will review current state of femoroacetabular impingement. We will describe which information surgeons need when planning hip arthroscopy, divided into: osseous, labrum, cartilage, teres ligament.

## **MR Arthrography of the Knee**

*M.S. Taljanovic; Tucson, AZ/US*

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The major clinical indications for direct MR arthrography (MRA) of the knee are the evaluation of the postoperative menisci, characterization of chondral/osteochondral lesions, and delineation of joint bodies in the patients without joint effusions. All other findings that can be evaluated on the routine MRI can also be diagnosed on direct MRA. Alternatively an indirect MRA may be performed approximately 30-60 minutes after intravenous injection of gadolinium based contrast medium and gentle joint exercise. The disadvantage of indirect MRA is the lack of adequate joint distension. Indirect MRA has been used in the evaluation of postoperative meniscus, autologous chondrocyte implants and biodegradable scaffolds for the treatment of osteochondral lesions.

Several studies showed improved accuracy in evaluation of the postoperative menisci, articular cartilage and the stability of osteochondral defects with MRA when compared to routine MRI.

For the intra-articular injection of the knee the lateral approach is used most frequently for needle placement. A majority of radiologists inject between 35-50 mL of contrast solution with intra-articular gadolinium concentration of 2 mmol/L. Whether the iodinated contrast is added to the injected solution varies among institutions. In our institution 20-30 mL of saline is mixed with the same amount of Omnipaque 300 and 0.2-0.3 mL of Multihance gadolinium based contrast. We perform all knee injections under fluoroscopic guidance. The MRA studies are performed within 30 minutes after the injection in a dedicated knee coil on 1.5T or 3T MRI machines.

Increased meniscal signal that extends to the articular surface may persist for years in the repaired meniscus and may represent granulation tissue, scar tissue, or intrasubstance degeneration. Displaced meniscal fragment is consistent with meniscal tear in both preoperative and postoperative setting. Other findings consistent with a re-tear or nonhealed tear of the repaired meniscus include contrast extension to both articular surfaces, while the extension to a single articular surface may represent partial tear healing. New abnormal signal in a different location in the postoperative meniscus that extends to the articular surface on two or more slices is consistent with a new tear. After partial meniscectomy the extension of intra-articular contrast into the meniscal substance is consistent with recurrent or residual tear. Direct and indirect MRA have demonstrated similar diagnostic accuracies in the detection of a recurrent meniscal tear with the exception of the first postoperative year when enhancement of postoperative granulation tissue may result in false positive results.

## **Ankle and elbow**

*S. Waldt; Munich/DE*

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In this refresher course technical considerations, potential complications and indications for MR arthrography of the ankle and elbow will be reviewed. The diagnostic efficacy of MR arthrography, typical pitfalls and commonly encountered pathologies of the ankle and elbow will be discussed. Compared with conventional MR imaging, MR arthrography provides additional information, that is attributed to an optimized contrast between intraarticular structures and to joint extension. Since CT arthrography plays a major role especially in the diagnosis of chondral and osteochondral lesions of the ankle and elbow as well, the diagnostic performance of both imaging modalities (CT and MR arthrography) will be compared.



## The young athlete

*C. Martinoli; Genoa/IT*

Especially in the age range between 12 and 16 years, the ossification centers of most apophyses are still immature and the cartilage, under hormonal influence, loses elasticity and is unable to give firm stability to the osteotendinous junction. Hence, the rough application of shear or torsion forces, exercised upon them by tendons and ligaments can overcome the threshold of cartilage and bone resistance causing fragmentation or detachment with variable functional impairment. The apophyseal damage derives from a traction mechanism that produces traumatic injury to the cartilage and subchondral bone. Then, there is a sequence of overlapping damage-repair events. At the site of insertion into apophyses, two main categories of tendon lesions may occur: chronic and acute. The first is caused by microtrauma from repeated traction, often in relation to functional overload. These injuries lead to fragmentation of the tendon-to-bone interface (e.g. Osgood-Schlatter disease). In these syndromes, imaging is basically used in phases of re-exacerbation of symptoms to check the status of the tendon insertion. If the degree of displacement of fragments is not much and they are in close contact with the apophyseal cartilage, they go to be reabsorbed inside the apophysis during bone maturation. When the fragment is instead dislocated far away the growing apophysis, it can be transformed into a permanent ossicle. Acute apophyseal injuries typically derive from a unique indirect major trauma. In these injuries, the tendon applies an excessive traction force with respect to the resistance posed by an apophysis. Acute apophyseal injuries can be subdivided into major and minor types based on the degree of fragment dislocation. Major apophyseal lesions cause displacement of the avulsed fragment at an extent that it cannot be longer reabsorbed. Growth may become compromised, and, in case of complete avulsion, significant biomechanical deficit occurs. When traction is not enough to cause complete avulsion of the apophysis, the fragmentation pattern can differ, involving variable amounts of cartilage and bone. The imaging pattern of acute apophyseal lesions may vary based on the amount of detached bone and cartilage. Compared with MR imaging, US has the advantage of being a clinical examination directed towards the patient symptoms and is able to identify even minimal cartilage and bone abnormalities. In minor apophyseal injuries, US used as a complement of plain films can be enough to diagnose and characterize the injury, thus limiting the use of MR imaging to the evaluation of major lesions.

## Sports injuries in the chronic patient

*F. Kainberger; Vienna/AT*

**Indications:** In patients with painful conditions, after endoprosthetic surgery, after oncologic treatment, or with metabolic diseases, imaging is used to plan sporting activities and rehabilitation, thus preventing from progression of subclinical or clinically manifest diseases.

**Investigation:** A pain free investigation should be approached by proper patient positioning (no superman position for imaging of arthritis) and short investigation times.

**Interpretation** of images is in such cases indispensably combined with consultation. For interpretation of malalignment, the use of the concept of kinetic chains has been empirically shown to be helpful. Forms and variants of hyper- and hypomobility as well as instability should be quantified. Muscle volume and fatty degeneration should be mentioned in every radiological report with respect to atrophy and degenerative joint or spine disease. Sarcopenia is about to become an imaging diagnosis. Degenerative tendon disease may eventually result in a rupture but to date only scarce publications about the prognostic impact of imaging findings exist. In joints, subtypes of degeneration should be assessed as osteophytes may cause impaired function or degenerated ligaments may lead to instability. Bone loss should be assessed with respect to both bone density and bone architecture.

**Conclusion:** The role of imaging in rehabilitation medicine has been underestimated and existing strategies to assess underlying diseases or abnormalities and to use the prognostic impact of imaging findings should be implemented.

## **The female athlete**

*C. Schueller-Weidekamm; Vienna/AT*

During the last several decades, women's participation in sports has greatly expanded. However, women are at greater risk for certain sports injuries, primarily attributable to two main factors.

First, because of the different anatomy, female biomechanics differ from those of males. Capsule laxity, lower stiffness, and higher energy loss in external tibial rotation in females have an impact on knee movement and external loading patterns on the knee, and result in a higher risk of anterior cruciate ligament tears in females. The patellofemoral pain syndrome and the iliotibial band syndrome are more common in females compared to males. The second main factor is related to bone density, which is significantly lower in females. Athletic-associated amenorrhea and endothelial dysfunction induce reduced bone density, and therefore, are a risk factor for stress fractures. The female athlete triad is a syndrome of three interrelated conditions that includes eating disorders (nutrition deficit), amenorrhea, and decreased bone density. The resulting osteoporosis is likely the main factor for a significantly higher proportion of female than of male athletes who present with stress fractures (20% vs. 4%). The positive development that recreational and elite sport has become very popular in women produces not only healthier and happier women but also a significant increase of gender-related sports injuries in females.

## **Imaging of intrinsic and extrinsic ligaments of the wrist**

*N.H. Theumann; Lausanne/CH*

Chronic wrist pain is a common and difficult diagnostic problem that, in some cases, relates to carpal instability. Such wrist pain may potentially be caused by ligamentous injury not related to recognized carpal instability. The ligamentous anatomy of the wrist and the ligamentous integrity are important to carpal stability. Controversy exists in the literature regarding the terminology applied to individual ligaments of the wrist. They are divided into two major groups: extrinsic ligaments and intrinsic ligaments. The intrinsic ligaments are ligaments that are entirely within the carpus, between carpal bones. The extrinsic ligaments are those that have an attachment on the carpus and pass out of the carpus. Injuries to the intrinsic and extrinsic ligaments of the wrist are probably more common than appreciated. The identification of ligamentous attachment sites is important to ensure analysis of the entire ligament.

The purpose of the lecture is to describe the normal MR arthrographic anatomy of the major carpal ligaments and their involvement in terms of carpal instabilities.

## **Finger injuries**

*J.-L. Drape, H. Guerini; Paris/FR*

Plain films remain the initial imaging of finger injuries. At the moment US and MRI are competitive additional imaging modalities. US of the fingers remains underused whereas high frequency transducers provide high-quality images close to MR images. Cautious dynamic maneuvers may increase the detection of ligament, retinaculum and tendon injuries. The main indications of both techniques are:

- injuries of the finger tendons, mainly the flexor tendons. Imaging must measure the tendon retraction and locate the tendon ends. The central band of the extensor tendon may be injured in PIP dislocations.
- complications after surgery of the flexor tendons (mainly in zone 2). Imaging can differentiate a new tear, adhesions and a lengthening of the suture.
- injuries of the annular pulleys, particularly partial tears are better depicted with dynamic US.
- injuries of a palmar vasculonervous digital bundle: US Doppler and MR angiography are helpful.
- injuries of the extensor hood of the extensor tendon at the metacarpophalangeal joint. Dynamic imaging with flexion of the joint depicts the tear of the sagittal band and the tendon instability. Associated injuries of the collateral ligaments or the interosseous expansions of the long fingers are only accessible with MRI.
- swollen and painful PIP joint, mainly after dislocation. Imaging must be global with assessment of the bone/cartilage, volar plate, collateral ligaments and tendons.
- injuries of the medial collateral ligament of the MCP joint of the thumb. Imaging can diagnose a Stener lesion with the entrapment of the adductor pollicis aponeurosis into the torn collateral ligament. Dynamic US with flexion of the IP joint mobilizes the aponeurosis and is helpful to assess its relationship with the torn ligament.

Imaging of tendon and ligament injuries must be performed with a short delay (less than one week after the trauma) before the appearance of retraction and adhesion.



## Elbow in sports

*M.J. Ereno Ealo; Bilbao/ES*

Athletic injuries of the elbow are common especially in throwing sports such as baseball and tennis.

### Lateral elbow pain

Lateral epicondylitis (Tennis Elbow) is the most common cause of lateral elbow pain. Lateral epicondylitis is an overuse injury. It is associated with repetitive and excessive use of the wrist extensors. Tendinosis is characterized by thickening and heterogeneous echotexture of the tendon. Partial tears are seen as focal anechoic areas with loss of the normal fibrillar pattern. The role of MRI is to confirm the presence of tendinosis/tear of the common extensor origin or, in the absence of such, to suggest an alternative diagnosis for the lateral elbow symptoms.

### Medial Elbow pain

Medial Epicondylitis (Golfer's elbow) is a chronic degenerative of a tendon of the inner side of the elbow. It is does not only affect golfers. The speed, force, and repetitive nature of the throwing motion in the elite athlete lead to several characteristic patterns of injury at the adult elbow. In children medial tension overload injuries of the elbow include medial epicondylar apophysitis (Little Lique Elbow), medial epicondylar avulsion fracture, and ulnar collateral ligament tears.

### Distal Biceps Pathology

The biceps tendinopathy is a degeneration of the tendon that attaches the biceps muscle of the upper arm to the radius bone of the forearm.

Ruptures of the distal biceps are usually seen in heavy lifting athletes and workers, particularly bodybuilders and strength athletes. Mechanical impingement during pronation and irritation by an osteophyte-enthesophyte at the radial tuberosity (a common finding) may also lead to tears of the distal biceps tendon.

### Osteochondritis Dissecans

Osteochondritis dissecans (OCD) is a fragmentation and possible separation of a portion of the cartilage of the joint. This usually presents during adolescence. Sport involving repetitive motion—for example, throwing sports—or activities that increase the load across the elbow—for example, gymnastics—are associated with the problem.

### Posterior Impingement

Sports which involve repetitive hyperextension of the elbow, such as tennis and boxing can lead to posterior impingement.

### Elbow Instability

Posterolateral rotatory instability (PLRI) is characterized by external rotation and posterior subluxation of the ulna relative to the trochlea secondary to disruption of the lateral collateral ligament complex of the elbow.

### Radial Tunnel Syndrome (RTS)

Causes of compression include a thickened leading edge of ECRB, prominent recurrent radial vessels, schwannoma, or a distended bicipitoradial bursa.

Before a diagnosis of RTS is made it is important to rule out other cause of pain in this region.

## US guided therapy in the upper extremity

*M. Obradov; Nijmegen/NL*

**Introduction:** US guided therapy of the upper extremity consist of intra-articular diagnostic injection of local anesthetics to confirm the origin of the local pain, therapeutic injection of the corticosteroids and hyaluronans and extra-articulare tendon sheaths and ganglion corticosteroids injections, needling of the tendinopathy and needling of the tendon calcific deposit.

**Methods:** This review includes separate discussion of the indications, anatomy, patient position, equipment, possible complications and aftercare of the US guided therapy in the upper extremity. Special attention is devoted to US injection technique of the shoulder, acromioclavicular joint, elbow, distal radioulnar, radiocarpal and carpometacarpal I joint and injection for de Quervain tenosynovitis, trigger finger, wrist ganglia and finally needling of epicondylitis and tendon calcific deposit.

Contraindications for the injections are coagulopathy, systemic infection or skin infection, allergy to the injective and having already received the maximum amount of injectate.

Routine radiographic images of the region to be injected have to be obtained and reviewed. Preexisting pathologic condition or anatomic variations can affect the technique.

High frequency small part US transducers are essential. A timeout procedure is part of every intervention. The procedures are performed in accordance with the sterile condition protocols.

The possible complications are subcutaneous fat atrophy, infections, allergic reactions, transient synovitis, transitory joint weakness, vascular injury/bleeding and tendon rupture.

Attention should be paid to aftercare, especially in case of therapeutic injections and needling.

**Conclusion:** Making a "mental" game plan, using a time-out procedure, using the right equipment and medication and following the procedure precisely when it is done the first time is essential for a successful outcome. When one feels that he/she can do it with eyes closed than they can act with confidence and are ready to start making own small adjustments. The foolproof performance is based on theoretically knowledge but also on training and experience.

### **Intraarticular therapy procedures**

*L.M. Sconfienza; Milan/IT*

Intraarticular therapy is gaining increasing importance. Different kind of substances can be injected in or around the joints to achieve interesting therapeutic results. Low-solubility steroids have been traditionally used for injections. Steroids have a well-known anti-inflammatory effect, but they can be burdened by negative effects, such as joint damages, or increased incidence of infection after injection. Hyaluronic acid is a polysaccharide that can be injected within joints to achieve mechanical (viscosupplementant) and pharmacological (viscoinductive, lightly anti-inflammatory) effects. Hyaluronic acid is less prone to induce adverse events, but is far much more expensive than steroids. Also, some doubts on a true efficacy have been recently raised.

In this setting, imaging guidance allows for correctly positioning the desired drug within the joint space. If this is only desirable when dealing that steroids (that may achieve their therapeutic goal also diffusing through tissues), it becomes mandatory when dealing with hyaluronic acids, which explicate their function only when they are exactly injected within joint space. Fluoroscopy was traditionally used to guide these injection maneuvers, but its use should be definitely discouraged as it administers high doses of ionizing radiations. Conversely, ultrasound has emerged as a quick, cheap, readily available, and radiation free imaging modality that can be effectively used to guide injection procedures throughout the whole body.

### **US Guided Intervention in the Lower Extremities**

*J. Gielen<sup>1</sup>, J.J.J. Veryser<sup>1</sup>, M. Obradov<sup>2</sup>; <sup>1</sup>Edegem/BE, <sup>2</sup>Nijmegen/NL*

Ultrasound guided interventions are primarily used to guide needle placement for injections, aspirations, and biopsies. The major advantages are the real-time and multiplanar imaging aspect and the possibility to compare with the asymptomatic side of ultrasound without using ionizing radiation, the low cost and the availability. A disadvantage is the operator dependency who has to have detailed knowledge of the relevant anatomy resulting in a long learning curve. Physically deep located lesions and osseous lesions may not be visualized. Percutaneous needle tenotomy (PNT), platelet rich plasma injection (PRP), prolotherapy and intratendinous calcium aspiration or fragmentation under ultrasound guidance may have potential in the treatment of refractory chronic tendon disorders at the lower limb. Pathology of the tendon should always be confirmed on diagnostic ultrasound prior to intervention. Deeply located tendon insertions at the hamstrings origin, gluteus medius and minimus insertion but also patellar tendon origin and Achilles tendon insertion or fascia plantaris do profit of US guided PNT procedures. PNT procedures are performed after instillation of a mixture of rapid onset (lidocaine 2%) and slower onset but prolonged active (Bupivacaine 0.25%) local anesthetic preparates. Fascia plantaris procedures are preceded by posterior tibial nerve block. Corticosteroids are not typically used and are never injected into the tendon. If corticosteroids are used methylprednisolone or triamcinolone is preferred because of the low reported number of side effects. Intervention of joints, bursae, tendon sheaths and ganglion cysts are also performed at the lower limb. Blind hip joint injections – aspirations are successful only in about 67% of cases, ultrasound guided injections have an accuracy rate of 97%. Aspirations are used in monoarthritis to differentiate crystal arthropathy and septic or reactive arthritis. Intraarticular injection of a local anesthetic is typically used in the hip as diagnostic block to document the articular origin of the pain. Diagnostic and therapeutic infiltration of the sinus tarsus is easy and performed distal to the extensor retinaculum. Nerve interventions with injections of local anesthetics and/or corticosteroids are also performed at the lower limb, a common procedure is the block of the lateral femoral cutaneous nerve in meralgia paresthetica, nerve bloc in tarsal tunnel syndrome or sural nerve block post Achilles surgery or in case of ganglion conflict. Neurosclerosis by phenolisation of post amputation stump neuroma gives better results in ultrasound guided intraneural drug administration. Good results are also obtained after ultrasound guided ethanol ablation of Morton's neuroma.

### **Anatomy and biomechanics of the shoulder in sports**

*J. Beltran; Brooklyn, NY/US*

An understanding of the normal anatomy and biomechanics of the shoulder is important for proper identification of lesions as depicted on MRI and MR arthrography when dealing with the throwing athletic population. Additionally, a clear understanding of the normal variants of rotator cuff and glenoid labrum is also essential for proper image interpretation. This presentation will focus on the detailed anatomy of the rotator cuff and labrum, the normal variants and the biomechanical activities developed during the throwing motion, introducing concepts of altered biomechanics that can lead to internal impingement syndromes and damage of the rotator cuff and labrum in the throwing athlete.

### Imaging of the labrum - What do I need to know and report

*K. Wörtler; Munich/DE*

The glenoid labrum is a fibrocartilaginous rim around the bony glenoid that directly borders on its articular cartilage covering. It forms a functional unit with the inferior glenohumeral ligament (IGHL) inferiorly (labro-ligamentous complex) and the biceps anchor superiorly (labral-bicipital complex) and thus plays an important role in joint stability. Anatomically, the glenoid labrum is a highly variable structure. Familiarity with the typical location and morphology of these anatomic variants (sublabral hole, Buford complex, sublabral recess) is crucial in order to avoid the misdiagnosis of labro-ligamentous or labro-bicipital injuries (Bankart (variant) lesions, SLAP lesions). This refresher course will review the function and MR imaging anatomy of the glenoid labrum and will define guidelines for the differential diagnosis of anatomic variants and labral injuries with an emphasis on basic knowledge and reporting.

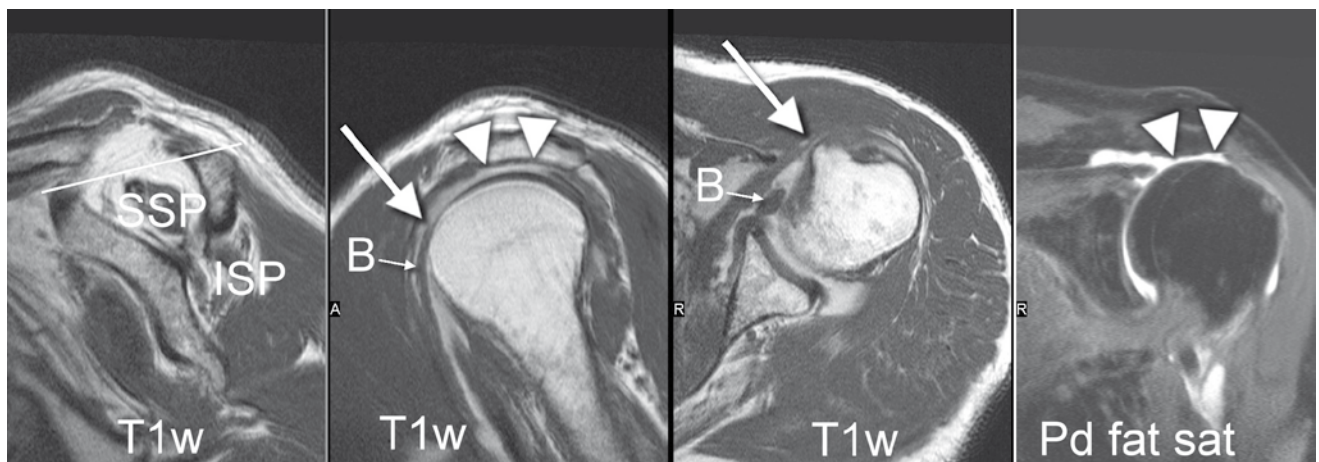
### Imaging of the rotator cuff and biceps tendon - Pearls and pitfalls

*M. Zanetti; Zurich/CH*

Ultrasound and MR imaging can demonstrate the extent and configuration of rotator cuff abnormalities. Rotator cuff tears can be classified according to size, either as small (<1 cm), medium (1–3 cm), large (3–5 cm), or massive (>5 cm). The other important classification describes the tears either as full-thickness or partial thickness tears. Partial-thickness tears are optimally diagnosed with MR arthrography. The partial thickness tears can be subclassified with various acronyms such as PASTA lesion (**P**artial **A**rticular **S**upraspinatus **T**endon **A**vu**S**ion), “Rim—Rent” lesion synonym to PASTA lesion, “reverse” PASTA lesion indicating a tear at the bursal side, or a PAINT lesion (**P**artial thickness **A**rticular surface **I**ntra-**T**endinous). With regard to surgical outcome, controversy exists concerning the effect of this subclassification. Repair of a rotator cuff tear will not result in optimal functional outcome if the ability of the muscle to contract is irreversibly lost, primarily due to muscle atrophy (Fig. 1). CT and MR seem more appropriate than ultrasound for assessing muscle atrophy.

The intraarticular portion of the long head of the biceps brachii tendon is associated with the coracohumeral and the superior glenohumeral ligaments, which, together with superior fibers from the subscapularis tendon, act as a pulley that keeps the long head of the biceps brachii tendon from subluxating or dislocating. The intraarticular portion of the long head of the biceps brachii tendon is optimally seen in parasagittal images.

In addition, pearls of differential diagnoses and pitfalls can be encountered on imaging in patients with clinically suspected rotator cuff and biceps tendon lesion. Such pearls and pitfalls will be shown during the lecture.



*Fig. 1 Complete subscapularis tendon tear (arrow), full-thickness supraspinatus tendon tear (arrow head), and dislocated tendon of the long head of the biceps (B). Muscle atrophy of the supraspinatus (SSP) (positive tangent sign) and Infraspinatus (ISP).*



## **Imaging of the shoulder in throwers - What do you see**

*L.W. Bancroft; Orlando, FL/US*

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Shoulder pain in the overhead throwing athlete may be due to extrinsic shoulder pathology (rotator cuff tendinitis or tear, subacromial impingement or scapular dysfunction), intrinsic shoulder pathology (Bankart lesions/anterior instability, superior labral anterior and posterior lesions, posterior labral tear /instability, humeral avulsion of the glenohumeral ligament, multidirectional instability, glenohumeral internal rotational instability, osteochondral lesion, osteoarthritis, Bennett's lesion and biceps tendon pathology) as well as neurovascular causes (thoracic outlet syndrome, long thoracic and suprascapular nerve palsy). The pathophysiology of shoulder injuries in throwing athletes will be discussed in this overview, as well as the most common imaging findings on radiographs, computed tomography (CT), magnetic resonance imaging (MRI) and MR arthrography.

## **When do we still need the conventional radiographs?**

*A. Cotten; Lille/FR*

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Even with its limitations, amongst which are the lack of visualization of the synovial membrane and the lack of sensitivity in detecting early erosive changes, conventional radiographs remain the standard reference for monitoring structural damages and for exclusion of differential diagnoses. Indeed, the radiographic features of the inflammatory disorders have been well known for many decades, which is not yet the case for ultrasound and MRI features. Moreover, development of new techniques may increase its usefulness in future for earlier depiction of bone lesions.

The aims of this presentation are:

- To remind the early / mild features that need to be recognized on radiographs
- To know how to recognize the radiographic features that allow differentiation between inflammatory disorders affecting the hands and wrists.
- To know the recent improvements that may help in early diagnosis of rheumatoid arthritis

## **US in rheumatology - What are the essentials for the rheumatologist to know**

*C. Dejaco; Graz/AT*

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Musculoskeletal ultrasound (MSUS) was introduced in rheumatology more than a decade ago and an increasing amount of data now supports its high impact for diagnostic and monitoring purposes. Advantages of MSUS include the safe and non-invasive approach, the lack of contraindications and the relatively low costs compared to other imaging tools like magnetic resonance imaging.

MSUS is frequently used as an additional tool to clinical examination, laboratory findings and conventional radiography.

Particularly in cases of diagnostic doubt, MSUS can be used to improve the certainty of a diagnosis.

In rheumatoid arthritis (RA), MSUS findings are not only of diagnostic relevance but are also of prognostic value concerning future clinical and structural outcomes, particularly in the setting of clinical remission. Several studies demonstrated that radiographic progression is not halted in patients with Power Doppler signals in one or more joints even if they are in clinical remission. Besides, patients with ultrasound verified active inflammation were at a higher risk for short term clinical relapses.

One concern regarding the use of MSUS in rheumatology is the reproducibility of ultrasound results. Several studies, however, reported a high reliability of sonographic findings and suggest an even better reproducibility of MSUS compared to clinical examination.

In summary, MSUS is increasingly used in rheumatology as published data indicate a good reliability as well as a high diagnostic and prognostic value of the method.

## **MRI of the sacroiliac joint - Alternative diagnosis to inflammatory sacroiliitis**

*I. Eshed<sup>1</sup>, K.-G. Hermann<sup>2</sup>; <sup>1</sup>Ramat Gan/IL, <sup>2</sup>Berlin/DE*

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Magnetic resonance imaging (MRI) is the most sensitive imaging modality for the detection of inflammation in the sacroiliac joints so that MRI is considered the imaging modality of choice for diagnosing inflammatory sacroiliitis in patients with spondyloarthropathy. Thus increasing number of sacroiliac joints MRI examinations are performed for suspected inflammatory sacroiliitis.

Diagnosing sacroiliitis on MRI is not always straightforward and can be challenging in some cases. Also, several alternative diagnoses can be suggested based on characteristic MRI appearance.

Causes for sacroiliac pain other than inflammatory sacroiliitis are not infrequent. Radiologists should be familiar with the characteristics findings of these alternative diagnoses and to differentiate them from inflammatory sacroiliitis.

In the current presentation we aim to describe and characterize the MR appearance of inflammatory sacroiliitis and of the most common alternative diagnoses to inflammatory sacroiliitis including septic sacroiliitis, hyperostosis condensans ilii, degenerative changes, anatomic variants and more.



## **Muscle injuries in high performance athletes**

*I. Boric; Zabok/HR*

Injuries to muscle in the elite athlete are common and may be responsible for prolonged periods of loss of competitive activity. Severity and significance of muscle injuries may be difficult to determine clinically in some cases. Imaging is increasingly being used to confirm injury, to assess its location, extent, and severity, and plays a crucial role in prognosis and timing of return to sports.

Ultrasound and magnetic resonance imaging (MRI) are the imaging modalities of choice. Both methods are accurate for diagnosis but also for measurements of the extent of injury what correlate with athlete prognosis and recovery time.

With new advances in ultrasound technology, images of tiny details allow diagnosis of muscle injuries that matches the accuracy of MRI. The benefits of real-time and Doppler imaging, relative cost benefits and ability to perform interventional procedures place ultrasound in forefront in managing of muscles injuries in many circumstances.

MRI has established itself as the imaging modality for the estimation of time lost from injury and in stratification of athletes who are at higher risk of recurrent injury. MRI is more sensitive for injury to deeper muscles and dual injuries but also to tissue alterations that is not apparent clinically (such early stages of overuse syndromes). Therefore, MRI is generally the modality of choice in high performance athletes.

Muscle injuries may be divided into acute and chronic pathology or may be classified as myotendinous strain, delayed onset muscle soreness, muscle contusion, myositis ossificans, muscle laceration, muscle herniation and compartment syndrome. Each of mentioned categories has specific ultrasound and MR appearance what allows precise diagnosis of muscle injuries.

## **Stress fractures**

*R.M. Rodrigo Del Solar, J.M. Santisteban; Bilbao/ES*

Stress injuries (fatigue type) represent a spectrum of osseous abnormalities that are increasing in recreational and professional athletes nowadays. Their diagnosis and treatment are often challenging and it is necessary to diagnose them as soon as possible in order to prevent future complications to the athletes. In the first part of the lecture, the definition, pathophysiology, location, diagnosis and clinical classification (according to the risk of complication) of fatigue fractures are briefly reviewed. In the second part of the lecture, an extensive exposure of high risk fractures is revised through some clinical examples of different athletes. 1) Fredicson's and modified Fredicson's classification of tibial stress injuries are updated. 2) The usually delayed navicular stress fractures are described and classified following Saxena's classification. 3) The proximal fifth metatarsal stress fractures are divided into fractures with a different outcome and prognosis. 4) Second base metatarsal fractures described in ballet dancers are revised. 5) Freiberg infraction & subchondral fracture, that probably share the same pathogenesis, are clearly exposed. 6) The compression neck femoral stress fractures commonly seen in runners are graded. 7) The symptomatic spine stress fractures (spondylolysis), seen in athletes, are classified adhering to Hollenberg's classification and the need to diagnose them before childhood is emphasized in order to prevent a chronic disease.

### **Dedicated MRI for joint imaging**

*W. C. Peh; Singapore/SG*

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Dedicated extremity MRI systems were developed as an alternative to high-field whole body systems for cost savings and better patient comfort. First commercially produced in the early 1990s, these systems were limited by their low field strength (typically around 0.2T) and limited capabilities such as poor fat suppression, fewer imaging contrast mechanisms and relatively-low image resolution. The images produced by these systems however met the needs of the rheumatologists, being adequate for evaluation of joint lesions such as occult erosions and synovitis. The first high-field dedicated MRI for extremities was developed by ONI in 1997 and the superconducting 1.0T Ortho One MRI appeared in 2000. This unit found acceptance among the musculoskeletal radiology community. ONI then developed a 1.5T extremity MRI, but ONI was acquired by GE in 2009. The GE Optima MR430s MR unit, an improved successor of the ONI Extreme 1.5T, is currently the only dedicated extremity 1.5T MR imaging system. This system has a slew rate of 300 mT/m/ms, maximum gradient power of 70 mT/m, rise time of 233  $\mu$ sec, and RF power of 2000W peak RMS (75W average). The magnet weighs only 408 kg and occupies a small footprint.

For patients, this MRI system provides a quiet, comfortable and non-claustrophobic experience. The patient reclines on a padded chair, with the extremity inserted into the magnet's bore. The volume coil can be selected to match the size of the knee, foot, ankle, elbow, wrist or hand. Unintended patient movement can be minimized. An accompanying person can stay in the suite and talk to the patient, being particularly comforting for children. Patients can also read or distract themselves with simple activities, as most of their body is outside the magnet bore and they are free to use their upper limbs during knee, ankle or foot imaging.

In our 1.5 year experience with a dedicated 1.5T MRI system, we found that a high image quality was achievable for joint evaluation. This system enabled fast scan sequences with homogeneous fat suppression. Structures such as ligaments, tendons, bone marrow, and subchondral and osteochondral lesions were easily assessed.

A dedicated extremity 1.5T MRI is a useful supplement to a standard whole body 1.5T MRI in the setting of a busy acute general hospital, particularly where there is a reasonably large workload for extremity imaging, or can be a stand-alone unit for a specialized orthopaedic or sports practice in an ambulatory setting.

### **Nerve imaging**

*E. Silvestri; Genoa/IT*

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Clinical examination and electrophysiologic studies are widely used and have high sensitivity for the evaluation of peripheral nerves abnormalities; however, they lack specificity and cannot display spatial information regarding the nerve anatomy needed for precise localization and treatment planning. Indeed, high-resolution imaging of peripheral nerves, combining the high spatial resolution and dynamicity of ultrasound and the wide field-of-view and high sensitivity of magnetic resonance (MR), currently represent the two imaging modalities of choice for the study of peripheral nerves. The latter allows to detect direct signs of nerve abnormality related to changes in nerve caliber and signal and indirect signs including signal changes in muscles innervated by the affected nerves. Moreover, some technological improvements such as diffusion tensor imaging (DTI) and tractography offer great opportunities of fibers tracking, allowing a quantitative evaluation of plexus abnormalities and entrapment syndromes.

Hereby we will summarize the current concepts regarding nerve imaging, highlighting a multimodality imaging approach dedicated to the most commons peripheral nervous system abnormalities.



## SCIENTIFIC POSTERS

- P-0001** **CT evaluation of patellar tendon-bone graft healing after anterior cruciate ligament reconstruction**  
B. T. Bjornara, A. K. Aune; Drammen/NO
- P-0002** **Ischiofemoral Impingement: Spectrum of Findings**  
A. Thomas<sup>1</sup>, R. Dominguez Oronoz<sup>1</sup>, M. Vera Cartas<sup>1</sup>, S. Roche<sup>1</sup>, X. Merino-Casabiel<sup>1</sup>, V. Pineda<sup>1</sup>, S. Gispert<sup>2</sup>;  
<sup>1</sup>Barcelona/ES, <sup>2</sup>Badalona/ES
- P-0003** **Non-inflammatory disease is more common than sacroiliitis on MRI of the sacroiliac joints**  
L. Jans, L. Van Praet, P. Carron, D. Elewaut, F. Van den Bosch, W. Huysse, V. Lambrecht, K. L. Verstraete; Ghent/BE
- P-0004** **Feasibility study of high resolution imaging of cartilage of the CMC1 joint at 7Tesla MRI**  
M. A. Korteweg<sup>1</sup>, F. Visser<sup>2</sup>, P. Chernohorsky<sup>1</sup>, S. D. Strackee<sup>1</sup>, P. Luijten<sup>2</sup>, M. Maas<sup>1</sup>, D. W. J. Klomp<sup>2</sup>; <sup>1</sup>Amsterdam/NL, <sup>2</sup>Utrecht/NL
- P-0005** **MR arthrography correlated with arthroscopy in the evaluation of articular cartilage in patients with femoroacetabular impingement**  
A. Bintoudi<sup>1</sup>, M. Natsika<sup>2</sup>, A. Papavasiliou<sup>1</sup>, A. H. H. Karantanas<sup>3</sup>; <sup>1</sup>Thessaloniki/GR, <sup>2</sup>Athens/GR, <sup>3</sup>Heraklion/GR
- P-0006** **Anatomical study of the dorsal cutaneous branch of the ulnar nerve using ultrasonography**  
S. A. Bauones, T. Le Corroller, S. Acid, D. Guenoun, A. Lagier, B. Maurel, P. Champsaur; Marseille/FR
- P-0007** **"The Role of Dynamic Ultrasound and MRI in the poorly resolving ankle sprain"**  
J. M. Zietkiewicz, P. Mercouris, M. C. Marshall; Durban/ZA
- P-0008** **Lumbar total disc replacement: Correlation of radiological parameters and clinical outcome**  
A. Hoffmann<sup>1</sup>, O. Boss<sup>1</sup>, O. Tomasi<sup>2</sup>, B. Bäurle<sup>1</sup>, F. Sgier<sup>1</sup>, O. N. Hausmann<sup>1</sup>; <sup>1</sup>Luzern/CH, <sup>2</sup>Salzburg/AT
- P-0009** **Imaging of posterior cruciate ligament (PCL) reconstruction: normal postsurgical appearance and complications**  
A. Alcalá-Galiano Rubio, M. Baeva, F. Buendía, M. J. Argüeso Chamorro; Madrid/ES
- P-0010** **Metatarsal pathologies. MRI findings**  
S. Sal de Rellan Arango<sup>1</sup>, A. Velasco Bejarano<sup>1</sup>, C. Mejía<sup>1</sup>, N. A. Abbas Khoja<sup>1</sup>, F. Pérez López<sup>1</sup>, R. Menéndez de Llano Ortega<sup>2</sup>; <sup>1</sup>Oviedo/ES, <sup>2</sup>Soto de Llanera/ES
- P-0011** **Magnetic resonance imaging of direct or indirect injuries to the anterior knee in athletes**  
P. Melloni, M. T. Veintemillas, A. Marin, N. Lugo, C. Spinu, R. Valls; Sabadell/ES
- P-0012** **Patellofemoral abnormalities in patients with Hoffa's fat pad edema**  
I. Aguirregoicoa<sup>1</sup>, B. Canteli<sup>2</sup>, A. Urresola Olabarrieta<sup>3</sup>, A. I. Ezquerro<sup>4</sup>, A. Garcia Etxebarria<sup>4</sup>, J. J. Fondevila<sup>4</sup>, A. Castrillo Maortua<sup>5</sup>; <sup>1</sup>Basauri Vizcaya/ES, <sup>2</sup>Bilbao, Vizcaya/ES, <sup>3</sup>Bilbao/ES, <sup>4</sup>Barakaldo/ES, <sup>5</sup>Las Arenas/ES
- P-0013** **How far can bone marrow MR signal changes help in approaching the diagnosis of diabetic foot?**  
N. Sabir, C. Kaya; Denizli/TR
- P-0014** **Evaluation of cortical bone density and microarchitecture of lung transplant recipients by HR-pQCT**  
L. Fischer, A. Valentinišch, M. D. DiFranco, C. Schueller-Weidekamm, B. Zweytick, F. Kainberger, G. Langs, J. M. Patsch; Vienna/AT
- P-0015** **Bone mineral density in young adult females using oral contraceptives: a controlled prospective study**  
O. Kiritsi<sup>1</sup>, N. Ververidou<sup>2</sup>, K. Tsitas<sup>2</sup>, D. Vavilis<sup>2</sup>, D. Rousso<sup>2</sup>, V. Karagiannis<sup>2</sup>; <sup>1</sup>Gorleston on sea/UK, <sup>2</sup>Thessaloniki/GR
- P-0016** **Ultrasound-guided interventional procedures around the shoulder**  
A. Tagliafico<sup>1</sup>, G. Russo<sup>2</sup>, B. Bignotti<sup>1</sup>, N. Villosio<sup>1</sup>, G. Succo<sup>3</sup>, G. Serafini<sup>3</sup>, C. Martinoli<sup>1</sup>; <sup>1</sup>Genoa/IT, <sup>2</sup>Villanova Mondovi'/IT, <sup>3</sup>Pietra Ligure, SV/IT,
- P-0017** **LuBo diseases: Disorders affecting the Lung and Bone - a Review**  
B. Jobke, D. Wormanns; Berlin/DE
- P-0018** **Imaging findings of soft tissue infections**  
S. Baleato González<sup>1</sup>, J. C. Vilanova<sup>2</sup>, X. Tomàs Batlle<sup>3</sup>, G. Bierry<sup>4</sup>; <sup>1</sup>Santiago de Compostela, A Coruña/ES, <sup>2</sup>Girona/ES, <sup>3</sup>Barcelona/ES, <sup>4</sup>Strasbourg/FR
- P-0019** **A new web-based tool to form a concise differential diagnosis of findings in musculoskeletal radiology - an update**  
R. Talanow<sup>1</sup>, P. D. Afonso<sup>2</sup>, V. Mascarenhas<sup>2</sup>; <sup>1</sup>Lincoln, CA/US, <sup>2</sup>Lisbon/PT

- P-0020** When compared to pre-contrast MR images assessing tumors following neoadjuvant therapy, does gadolinium-enhanced MR change diagnosis or reader confidence?  
 P.D. Afonso<sup>1</sup>, C. Spritzer<sup>2</sup>; <sup>1</sup>Lisboa/PT, <sup>2</sup>Durham, NC/US
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- P-0021** Bone mineral density differences between femurs of scoliotic patients undergoing dual-energy X-ray absorptiometry  
 M. Bandirali, L. M. Sconfienza, C. Messina, G. Di Leo, F. M. Ulivieri, F. Sardanelli; Milan/IT
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- P-0022** In vivo differences among scan modes in bone mineral density measurement at dual-energy X-ray absorptiometry  
 M. Bandirali<sup>1</sup>, L. M. Sconfienza<sup>1</sup>, A. Aliprandi<sup>1</sup>, A. Delnevo<sup>2</sup>, E. Lanza<sup>1</sup>, F. Sardanelli<sup>1</sup>; <sup>1</sup>Milan/IT, <sup>2</sup>San Donato Milanese/IT
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- P-0023** Osseous variants generating symptoms in ankle and foot  
 S. Daineffe<sup>1</sup>, B. G. H. G. Pilet<sup>2</sup>, S. Van de Perre<sup>3</sup>, E. De Smet<sup>4</sup>, M. Smets<sup>1</sup>, F. M. H. M. Vanhoenacker<sup>5</sup>; <sup>1</sup>Vilvoorde/BE, <sup>2</sup>Aalst/BE, <sup>3</sup>Mol/BE, <sup>4</sup>Mechelen/BE, <sup>5</sup>Antwerp, Ghent, Mechelen/BE
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- P-0024** Dose absorption in lumbar and femoral dual-energy X-ray absorptiometry examinations using three different scan modalities: an anthropomorphic phantom study  
 E. Lanza<sup>1</sup>, L. M. Sconfienza<sup>1</sup>, M. Bandirali<sup>2</sup>, C. Messina<sup>1</sup>, F. M. Ulivieri<sup>1</sup>, G. Di Leo<sup>1</sup>, F. Sardanelli<sup>1</sup>; <sup>1</sup>Milan/IT, <sup>2</sup>San Donato Milanese/IT
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- P-0025** Precarious string/nail shaped bone-cement leakage in major vessels after percutaneous vertebroplasty.  
 H.-S. Kim, J.-H. Park, J.-Y. Yu, S.-H. Lee; Seoul/KR
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- P-0026** Clinical Assessment of Knee MRI in the Presence of Metal Implants Comparing MAVRIC-SL and FSE sequences in at 1.5 and 3 Tesla Field Strength  
 H. Liebl<sup>1</sup>, U. Heilmeyer<sup>1</sup>, S. Lee<sup>1</sup>, L. Nardo<sup>1</sup>, J. M. Patsch<sup>1</sup>, C. Schuppert<sup>1</sup>, S. Banerjee<sup>2</sup>, K. Koch<sup>3</sup>, T. M. Link<sup>1</sup>, R. Krug<sup>1</sup>; <sup>1</sup>San Francisco, CA/US, <sup>2</sup>Menlo Park/US, <sup>3</sup>Milwaukee/US
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- P-0027** Unlocking the locked Knee  
 J. P. Singh<sup>1</sup>, S. Srivastava<sup>1</sup>, S. S. Baijal<sup>2</sup>; <sup>1</sup>Gurgaon, Delhi NCR/IN, <sup>2</sup>Lucknow, Uttar Pradesh/IN
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- P-0028** CT-guided bone biopsy using battery-powered needle drilling biopsy system : comparison with manual system  
 K. L. Lee, J. F. Griffith, W. H. A. Ng, H. Y. J. Leung; Hong Kong/CN
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- P-0029** Whole Body MRI (WBMRI) sport injury and eligibility in high level athletes  
 S. Giannini; Rome/IT
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- P-0030** Spring ligament in acquired adult flat foot deformity: static and dynamic sonographic evaluation  
 E. Gallardo Agromayor<sup>1</sup>, H. Vidal Trueba<sup>2</sup>, B. González Humara<sup>2</sup>, R. M. Landeras<sup>2</sup>, R. Garcia Barredo<sup>2</sup>, M. R. De La Puente Formoso<sup>2</sup>; <sup>1</sup>Santander, Cantabria/ES, <sup>2</sup>Santander/ES
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- P-0031** MR imaging of the reconstructed anterior cruciate ligament  
 I. Y. Y. Tsou; Singapore/SG
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- P-0032** Femoral and tibial torsion measurements in children and adolescents: Comparison of 3D models based on low-dose biplanar radiographs and low-dose computed tomography  
 A. Roskopf, L. E. Ramseier, R. Sutter, C. W. A. Pfirrmann, F. Buck; Zurich/CH
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- P-0033** A case of Bizarre Parosteal Osteochondromatous Proliferation  
 G. Antoniadou<sup>1</sup>, K. Chiu<sup>2</sup>, P. Matteucci<sup>3</sup>, A. Roy<sup>3</sup>, A. D. Taylor<sup>2</sup>; <sup>1</sup>Beverly/UK, <sup>2</sup>Hull/UK, <sup>3</sup>Cottingham/UK
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- P-0034** Ultrasound (US) guided interventional procedures around the hand and the wrist  
 D. Orlandi<sup>1</sup>, G. Ferrero<sup>1</sup>, E. Fabbro<sup>1</sup>, C. Martini<sup>1</sup>, L. M. Sconfienza<sup>2</sup>, E. Silvestri<sup>1</sup>; <sup>1</sup>Genoa/IT, <sup>2</sup>San Donato Milanese/IT
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- P-0035** Correlation of healing and clinical functionality of postoperative achilles tendon by percutaneous or open techniques  
 C. Mejia, J. A. Diáñez Raimúdez, A. Velasco Bejarano, S. Sal de Rellan Arango, M. D. V. Lopez, F. Arias; Oviedo/ES
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- P-0036** Differences among array, fast array and high definition scan modes in BMD measurement at dual-energy x-ray absorptiometry on a phantom  
 E. Lanza<sup>1</sup>, L. M. Sconfienza<sup>1</sup>, M. Bandirali<sup>1</sup>, F. M. Ulivieri<sup>1</sup>, A. Delnevo<sup>2</sup>, G. Di Leo<sup>1</sup>, F. Sardanelli<sup>1</sup>; <sup>1</sup>Milan/IT, <sup>2</sup>San Donato Milanese/IT
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- P-0037** Superolateral Hoffa's fat pad edema, an analysis of imaging finding  
 S. I. Alam; Qatar/QA
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- P-0038** Imaging characteristics of synovial sarcomas in an intramuscular location  
 M. Gruber<sup>1</sup>, K. Specht<sup>2</sup>, H. Rechl<sup>2</sup>, S. Waldt<sup>2</sup>, K. Wörtler<sup>2</sup>; <sup>1</sup>Vienna/AT, <sup>2</sup>Munich/DE

- P-0039 Diagnostic imaging in follow-up and response to treatment of advanced giant cell tumors**  
U. Grzesiakowska, D. Makuła, M. Olszewski; Warsaw/PL
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- P-0040 Synovial hemangioma of the suprapatellar bursa**  
A. Yesildag, S. Keskin, H. Kalkan, S. Kucuksen, U. Kerimoglu; Konya/TR
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- P-0041 Infrared nanoscopy of bone**  
T. Geith<sup>1</sup>, S. Amarie<sup>2</sup>, A. Cernescu<sup>1</sup>, S. Milz<sup>1</sup>, F. Keilmann<sup>3</sup>; <sup>1</sup>Munich/DE, <sup>2</sup>Martinsried/DE, <sup>3</sup>Garching/DE
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- P-0042 Quadratus Femoris Muscle edema as spectrum of Ischiofemoral impingement**  
A. Castrillo<sup>1</sup>, J. J. Fondevila<sup>2</sup>, I. Aguirregoicoa<sup>3</sup>, A. I. Ezquerro<sup>2</sup>, A. Urresola Olabarrieta<sup>1</sup>, B. Canteli<sup>4</sup>; <sup>1</sup>Bilbao/ES, <sup>2</sup>Barakaldo/ES, <sup>3</sup>Basauri Vizcaya/ES, <sup>4</sup>Bilbao, Vizcaya/ES
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- P-0043 A pseudomass of hypertrophied palmaris longus muscle; Simulating a reversed palmaris longus muscle**  
C. Cevikol, Ö. Özbilek, K. Karaali; Antalya/TR
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- P-0044 US versus MRI in clinically suspected Distal Biceps Brachii Tendon Tears**  
J. L. González Montané, J. D. Guerrero Bravo; Jaén/ES
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- P-0045 Soft tissue vascular malformation with adjacent cortical thickening simulating a primary bone tumor**  
H. Ario<sup>z</sup>, N. Akgül, C. Cevikol; Antalya/TR
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- P-0046 MR evaluation of the evolution of anterior cruciate ligament mucoid degeneration**  
P. Cardello, A. Ricci, C. Gigli, E. Pofi; Viterbo/IT
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- P-0047 Tibial stress injury: MRI findings**  
A. Castrillo<sup>1</sup>, J. J. Fondevila<sup>2</sup>, B. Canteli<sup>3</sup>, A. Urresola Olabarrieta<sup>1</sup>, A. I. Ezquerro<sup>2</sup>, I. Aguirregoicoa<sup>4</sup>; <sup>1</sup>Bilbao/ES, <sup>2</sup>Barakaldo/ES, <sup>3</sup>Bilbao, Vizcaya/ES, <sup>4</sup>Basauri Vizcaya/ES
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- P-0048 "Check for MRI findings of osseous and soft-tissue abnormalities associated with anatomical variants of the posteromedial talocalcaneal joint"**  
R. Garcia Barredo, E. Gallardo, R. M. Landeras, B. González Humara, A. Andrés Paz, D. Quintana; Santander/ES
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- P-0049 Medium term safety and efficacy of percutaneous vertebroplasty using a medium viscosity cement of longer injection time: clinical experience and results**  
A. D. Kelekis, D. K. Filippiadis, A. Mazioti, G. Velonakis, E. Alexopoulou, E. Brountzos, N. L. Kelekis; Athens/GR
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- P-0050 Bifurcation of the long head of the biceps tendon within the bicipital groove**  
N. Akgül, H. Ario, C. Cevikol; Antalya/TR
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- P-0051 Unusual forms of presentation of tuberculous vertebral osteomyelitis.**  
P. Márquez Sánchez, T. Garcia de la Oliva, J. D. D. Colmenero Castillo, J. D. Ruiz Mesa; Málaga/ES
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- P-0052 Magnetic resonance image analysis of morphological risk factors of patellofemoral region in patients with lateral patellar dislocations**  
T. W. Yeung, O. C. Leung, M. K. E. Yuen; Hong Kong/CN
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- P-0053 The many faces of osteosarcoma – a pictorial review**  
J. Tuckett, A. Karsandas, E. A. Fatone, R. Sinha, G. Hide; Newcastle Upon Tyne/UK
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- P-0054 Glenoid Articular Surface on Magnetic Resonance Arthrography of the Shoulder**  
S. Jackson; Manchester/UK
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- P-0055 The Imaging Features of Madura Foot (mycetoma pedis)**  
A. K. Bharath<sup>1</sup>, M. Chandramohan<sup>2</sup>, H. Bardgett<sup>2</sup>, C. Groves<sup>2</sup>; <sup>1</sup>Leeds/UK, <sup>2</sup>Bradford/UK
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- P-0056 Unusual ultrasound images of muscle fibers in young high level athletes. Metaplasia or fibrosis of the muscles?**  
S. Giannini; Rome/IT
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- P-0057 Prestyloid recess of the wrist: normal appearance on 3T MR arthrography using 3D DESS sequence**  
S. Döring, S. Bal, S. Corstjens, E. Cattrysse, P. Van Roy, M. Shahabpour; Brussels/BE
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- P-0058 Low back pain in children. A pictorial review of the causes and imaging findings**  
M. Karamesini<sup>1</sup>, M. Mylona<sup>2</sup>; <sup>1</sup>Kato Ahaia/GR, <sup>2</sup>Patras/GR
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- P-0059 Imaging assessment of complications in the postoperative patient with metal hardware. Preliminary results**  
A. Balanika, S. Theocharakis, C. Baltas, S. Vrizidou, E. Drakoulakis, M. Tsouroulas, O. Papakonstantinou; Athens/GR

- P-0060 High-grade pleomorphic undifferentiated sarcoma of bone in association with a preexisting bone infarct**  
 Ö. Özbilek, C. Cevikol, A. Apaydin; Antalya/TR
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- P-0061 Hydrodilatation for the treatment of frozen shoulder – our early experiences**  
 J. Tuckett, N. Rose, E. A. Fatone, G. Hide, R. Sinha; Newcastle Upon Tyne/UK
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- P-0062 Estimation of radiation dose to patients undergoing postoperative CT after ACL reconstruction surgery**  
 A. P. Parker<sup>1</sup>, M. Adriaensen<sup>2</sup>, T. Strand<sup>1</sup>, E. Inderhaug<sup>1</sup>, E. Solheim<sup>1</sup>; <sup>1</sup>Bergen/NO, <sup>2</sup>Heerlen/NL
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- P-0063 Three cases of post-traumatic osteolysis of the femoral neck: clues to diagnosis of a process to keep in mind**  
 A. I. Garcia Diez, X. Tomás, M. del Amo, J. Pomes-Tallo, J. Ramirez, A. M. Carreño, G. Bori, C. Pineda, A. Combalia; Barcelona/ES
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- P-0064 CT-guided percutaneous intraspinal needle aspiration for the diagnosis and treatment of epidural collections**  
 G. Petrocheilou<sup>1</sup>, I. Vlachou<sup>1</sup>, S. Stathopoulou<sup>2</sup>, C. Kokkinis<sup>2</sup>; <sup>1</sup>Athens/GR, <sup>2</sup>Papagou, Athens/GR
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- P-0065 Assessment of Apparent Diffusion Coefficients in Lumbar Discs of Patients with Low Back Pain and Ankylosing Spondylitis**  
 H. T. Sanal<sup>1</sup>, S. Ince<sup>1</sup>, S. Yilmaz<sup>1</sup>, I. Simsek<sup>2</sup>; <sup>1</sup>Ankara/TR, <sup>2</sup>Ankara, Kecioren/TR
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- P-0066 (CT)-Guided percutaneous biopsy of spinal lesions**  
 I. Vlachou<sup>1</sup>, G. Petrocheilou<sup>1</sup>, S. Stathopoulou<sup>2</sup>, C. Kokkinis<sup>2</sup>; <sup>1</sup>Athens/GR, <sup>2</sup>Papagou, Athens/GR
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- P-0067 Scapular fractures**  
 H. T. Sanal; Ankara/TR
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- P-0068 Bone marrow edema in the acetabulum may not be innocent in a youngster: a lymphoma case**  
 H. T. Sanal, U. Aydingoz; Ankara/TR
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- P-0069 Peroneal tendon disorders**  
 H. T. Sanal; Ankara/TR
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- P-0070 Correlation of bone bruise pattern of the knee joint with trauma mechanism and soft-tissue knee injuries**  
 N. Berger, G. Andreisek, A. Karer, B. Seifert, E. J. Ulbrich; Zurich/CH
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- P-0071 Deviation of the humerus bone axis in the course of solitary bone cyst treatment**  
 J. Glowacki, A. Ignys-O'Byrne; Poznan/PL
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- P-0072 US evaluation in differential diagnosis of painful hip**  
 S. Stathopoulou<sup>1</sup>, C. Iosifidis<sup>2</sup>, T. Dagla<sup>2</sup>, T. N. Spyridopoulos<sup>3</sup>, K. Tsilikas<sup>4</sup>, I. Vlachou<sup>2</sup>, A. Sakelaropoulos<sup>2</sup>, N. Evlogias<sup>2</sup>; <sup>1</sup>Papagou, Athens/GR, <sup>2</sup>Athens/GR, <sup>3</sup>Palea Penteli, Athens/GR, <sup>4</sup>Halandri, Athens/GR
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- P-0073 Coracoid process fractures: an uncommon injury?**  
 J. Isern, A. M. Gallart Ortuño, A. Olarte, F. X. Zarco, M. J. Conde Martinez, E. Grive, V. Querol Borrás, L. Milla Rallo, S. Llaverias Borrell; Barcelona/ES
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- P-0074 Imaging pathway for a child with limp**  
 N. Jain, J. Chakraverty, M. Sah, A. Evans, S. Kamath; Cardiff/UK
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- P-0075 The prevalence of chondrocalcinosis in routine MDCT examinations of the wrist**  
 A. von Schneider-Egestorf, C. von Falck, B. C. Meyer, F. Wacker, H. Rosenthal; Hanover/DE
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- P-0076 Assessment of the preoperative chemotherapy of bone sarcomas using anatomical and functional methods of visualization: development of the decisive rule and comparative analysis**  
 A. Bludov, Y. Zamogilnaya, A. Nered; Moscow/RU
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- P-0077 Case report: Chronic expanding haematoma mimicking a soft tissue sarcoma**  
 W. Harzallah-Hizem, M. Koubaa, A. Zrig, W. Mnari, M. Maatouk, B. Hmida, R. Salem, M. Golli; Monastir/TN
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- P-0078 Reproducibility of cortical measures assessed with the threshold independent segmentation tool (TIST) in HR-pQCT images**  
 A. Valentinitsch, L. Fischer, M. D. DiFranco, J. M. Patsch, G. M. Gruber, F. Kainberger, G. Langs; Vienna/AT
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- P-0079 An in vitro analysis of metal artefact reduction in the MR imaging of hip prostheses using SEMAC**  
 M. R. Backhouse, R. Hodgson, M. H. Stone, A. C. Redmond, P. O'Connor; Leeds/UK
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- P-0080 MRI of the Brachial Plexus: A pictorial review**  
 P. P. Nagtode<sup>1</sup>, M. Haris<sup>2</sup>, C. Nel<sup>3</sup>; <sup>1</sup>WF14SL, YO/UK, <sup>2</sup>Halifax/UK, <sup>3</sup>Wakefield/UK

- P-0081 The iliotibial band syndrome: MR Imaging findings**  
W. Harzallah-Hizem, M. Maatouk, A. Zrig, R. Salem, W. Mnari, B. Hmida, M. Golli; Monastir/TN
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- P-0082 MRI in plantar plate disease evaluation: "stress test" advantages**  
C. Ottonello, L. Lombardi, I. D'Ambrosio, P. Giuliani, P. Ronconi; Rome/IT
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- P-0083 Value of MDCT to differentiate between Mechanical Loosening, Infection or Granulomatous Aggressive Disease of the Prosthesis in patients with Total Hip Arthroplasty**  
X. Tomás, N. G. Macías, G. Bori, S. Garcia-Ramiro (doe), A. Soriano (doe), A. B. Larque (doe), J. Ramirez, J. Rios (doe); Barcelona/ES
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- P-0084 Age-related findings in knees with clinical suspicion of meniscopthy but no MR signs of meniscal damage**  
A. Garcia-Bolado<sup>1</sup>, S. Sánchez Bernal<sup>2</sup>, E. Torres Diez<sup>2</sup>, R. Garcia-Barredo<sup>3</sup>; <sup>1</sup>Soto de la Marina/ES, <sup>2</sup>Santander/ES, <sup>3</sup>Kantabrien/ES
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- P-0085 MR Imaging features of Spindle Cell Lipoma**  
A. Kirwadi, R. Abdul-Halim, M. Fernando, A. Highland, N. Kotnis; Sheffield/UK
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- P-0086 Usefulness of DWI MR-neurography in the diagnosis of piriformis muscle syndrome**  
F. Caro Mateo<sup>1</sup>, A. Luna Alcalá<sup>2</sup>, M. J. Romero Rivera<sup>1</sup>, P. Caro Mateo<sup>1</sup>; <sup>1</sup>Cádiz/ES, <sup>2</sup>Jaén/ES
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- P-0087 Shoulder Measurements using CT: What the orthopedic surgeon wants to know**  
F. Shah<sup>1</sup>, N. Marks<sup>1</sup>, J. Fernandez Jara<sup>2</sup>, R. F. Ocete Pérez<sup>3</sup>, J. Beltran<sup>4</sup>; <sup>1</sup>New York, NY/US, <sup>2</sup>Leganes/ES, <sup>3</sup>Seville/ES, <sup>4</sup>Brooklyn, NY/US
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- P-0088 Post-procedural infection after sonographically guided percutaneous needle lavage in calcific tendinitis of the shoulder using only local sterilization of skin and probe**  
V. H. P. Tran, R. E. Westerbeek; Deventer/NL
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- P-0089 Dimensions of the intercondylar notch and the distal femur throughout life**  
L. Hirtler, S. Röhrich, F. Kainberger; Vienna/AT
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- P-0090 The craniocervical junction; anatomy, variants, trauma and pathologies**  
A. Isaac<sup>1</sup>, P. A. Tyler<sup>1</sup>, L. F. Wilson<sup>2</sup>; <sup>1</sup>London/UK, <sup>2</sup>Stanmore/UK
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- P-0091 Trans-foraminal infiltration in the cervical spine through the ipsilateral facet joint: clinical experience and results**  
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- P-0092 Suspected Calcaneal Fractures: Are we doing the correct views?**  
A. Karsandas<sup>1</sup>, D. Keane<sup>2</sup>, R. Cooper<sup>2</sup>; <sup>1</sup>Newcastle Upon Tyne/UK, <sup>2</sup>South Tyneside/UK
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S. Purushothamdas, F. Almallah, R. Kundra; Walsall/UK
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G. Montanari, S. Martella, P. Tripodi, A. Rocchi, M. Pietrangeli, S. Giannini; Rome/IT
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- P-0095 Why, how and when should I use CT to manage talar bone fractures?**  
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- P-0096 A new predictive index for back muscle degeneration and sagittal alignment associated with aging**  
K. Takayama, T. Kita, F. Kanematsu, T. Yasunami, H. Sakanaka, Y. Yamano; Osaka/JP
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- P-0097 Upper and lower extremity sport injuries in the emergency department of a military hospital**  
E. Perdikakis<sup>1</sup>, E. Stamoulis<sup>2</sup>; <sup>1</sup>Xanthi/GR, <sup>2</sup>Athens/GR
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- P-0098 Pseudotumour or sarcoma in mild haemophiliacs?**  
J. Farrant<sup>1</sup>, B. Holloway<sup>2</sup>, H. Marmery<sup>2</sup>, T. T. Yee<sup>2</sup>; <sup>1</sup>Leeds/UK, <sup>2</sup>London/UK
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- P-0099 Aging-associated Changes in Paraspinal Muscles and Psoas Muscles**  
T. Kita, K. Takayama, F. Kanematsu, T. Yasunami, H. Sakanaka, Y. Yamano; Osaka/JP
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K.-M. Chew, W. C. Peh; Singapore/SG



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 R. Obuchowicz<sup>1</sup>, J. Franiel<sup>2</sup>, I. Dwojak<sup>1</sup>; <sup>1</sup>Cracow/PL, <sup>2</sup>Zabrze/PL
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- P-0103 Musculoskeletal injuries in extreme sports. A pictorial review**  
 M. González Vázquez<sup>1</sup>, M. Costas Álvarez<sup>2</sup>, R. Prada Gonzalez<sup>1</sup>, G. Tardáguila<sup>1</sup>, N. Silva<sup>1</sup>, R. Oca Pernas<sup>1</sup>, F. M. Tardaguila<sup>1</sup>; <sup>1</sup>Vigo/ES, <sup>2</sup>Pontevedra/ES
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- P-0105 Melorheostosis- melting the myths**  
 P. Mohaghegh, P. A. Tyler; Stanmore/UK
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- P-0106 Radiologic Findings in Rosai-Dorfman disease**  
 C. L. Calvo Corbella, A. Gil Sierra, P. Gallego Gomez; Móstoles/ES
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- P-0107 State-I osteochondritis dissecans or normal variants of ossification in pediatric knee**  
 I. Elía<sup>1</sup>, P. Nogues-Melendez<sup>2</sup>; <sup>1</sup>Valencia/ES, <sup>2</sup>Rocafort, VA/ES
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 D. Sieron<sup>1</sup>, W. Wawrzyniek<sup>1</sup>, S. Kasprowska<sup>2</sup>, J. M. Skupinski<sup>1</sup>, K. Kukawska-Sysio<sup>3</sup>, A. Z. Koczy<sup>1</sup>, M. Trzepaczynski<sup>1</sup>, R. Majer<sup>1</sup>; <sup>1</sup>Piekary Slaskie/PL, <sup>2</sup>Chorzów/PL, <sup>3</sup>Katowice/PL
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- P-0109 A review of Tumoral lesions of the shoulder**  
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 J. Hochwallner, R. Milos, P. Ziai, C. Schueller-Weidekamm; Vienna/AT
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 Y. Chen, M. Khanna, M. Walker; London/UK
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- P-0114 The role of percutaneous spinal biopsy in the diagnosis of spinal infections- a retrospective review of microbiology and histology findings**  
 P. Mohaghegh, C. Offiah; London/UK
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 N. Jain<sup>1</sup>, A. Pandey<sup>1</sup>, A. R. Jones<sup>1</sup>, I. P. Gunatunga<sup>2</sup>, S. Singh<sup>1</sup>; <sup>1</sup>Cardiff/UK, <sup>2</sup>Newport/UK
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R. King<sup>1</sup>, E. Umut<sup>2</sup>, A. Tindall<sup>1</sup>, M. S. Gulati<sup>1</sup>, G. Constantinescu<sup>1</sup>; <sup>1</sup>London/UK, <sup>2</sup>Charlton London/UK
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T. Colegate-Stone<sup>1</sup>, T. H. Truong<sup>1</sup>, R. Singh<sup>1</sup>, M. S. Gulati<sup>2</sup>, G. Constantinescu<sup>2</sup>; <sup>1</sup>Dartford/UK, <sup>2</sup>London/UK
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Y. Arous, L. Dridi, M. Aloui, M. Ouji, H. Boujemaa, N. Ben Abdallah; Tunis/TN
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D. K. Filippiadis, A. Mazioti, G. Velonakis, O. Papakonstantinou, A. Malagari, N. L. Kelekis, A. D. Kelekis; Athens/GR
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A. Corazza, E. Fabbro, G. Ferrero, D. Orlandi, A. Arcidiacono, E. Silvestri; Genoa/IT
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E. A. Fatone, J. Tuckett, A. Karsandas, R. Sinha, G. Hide; Newcastle Upon Tyne/UK
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T. Pehle, K. Hamburg, D. E. Liebsch, P. Roeder, R. Rulands, G. J. Schmid; Neuss/DE
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 P. Spinnato, A. Bazzocchi, D. Diano, A. Moio, C. Tetta, U. Albisinni; Bologna/IT
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 I. Pressney<sup>1</sup>, C. Main<sup>2</sup>, M. Thomas<sup>2</sup>, M. Sampson<sup>2</sup>; <sup>1</sup>Brighton/UK, <sup>2</sup>Southampton/UK
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 F. Huber, A. Wielandner, B. Neubauer, A. Sachs, L. Hirtler, F. Kainberger; Vienna/AT
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- P-0159** **Assessment of bone mineral density of the lumbar spine by DXA: conventional examination vs. new regions of interest on whole-body scan**  
 F. Ponti<sup>1</sup>, D. Diano<sup>1</sup>, M. Amadori<sup>1</sup>, E. Salizzoni<sup>1</sup>, E. Grillini<sup>1</sup>, U. Albisinni<sup>1</sup>, G. Guglielmi<sup>2</sup>, G. Battista<sup>1</sup>, A. Bazzocchi<sup>1</sup>; <sup>1</sup>Bologna/IT, <sup>2</sup>San Giovanni Rotondo, Foggia/IT
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- P-0160** **Collagenous fibroma (desmoplastic fibroblastoma): clinical, pathological and imaging findings**  
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**P-0161 MR imaging the Post operative shoulder – What to expect!**

A. Jain, A. Dunn; Liverpool/UK

**P-0162 Proximal rectus femoris rupture - Spectrum of findings!**

A. Jain, A. Dunn; Liverpool/UK

**P-0163 Pictorial review of the more common deep seated myxoid soft tissue tumours seen at The Royal Sussex County Hospital Sarcoma Clinic**

N. Brejt, J. L. Bush; Brighton/UK

**P-0164 Femoroacetabular impingement on plain radiograph from a general radiologist point of view**

B. Chari<sup>1</sup>, M. Paravasthu<sup>2</sup>, D. Earnshaw<sup>3</sup>, P. Evans<sup>4</sup>; <sup>1</sup>Prescot/UK, <sup>2</sup>Warrington/UK, <sup>3</sup>Liverpool/UK, <sup>4</sup>Wirral/UK

**P-0165 A pictorial review of meniscal pathology on MRI and the benefit of a systematic approach to interpretation**

O. J. Flanagan<sup>1</sup>, E. McCarthy<sup>1</sup>, J. Kavanagh<sup>2</sup>, K. Billington<sup>1</sup>, C. Johnston<sup>1</sup>, E. C. Kavanagh<sup>1</sup>; <sup>1</sup>Dublin/IE, <sup>2</sup>Dublin 8, Leinster/IE



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