



**European Society of
MusculoSkeletal Radiology**

Musculoskeletal Ultrasound Technical Guidelines

IV. Hip

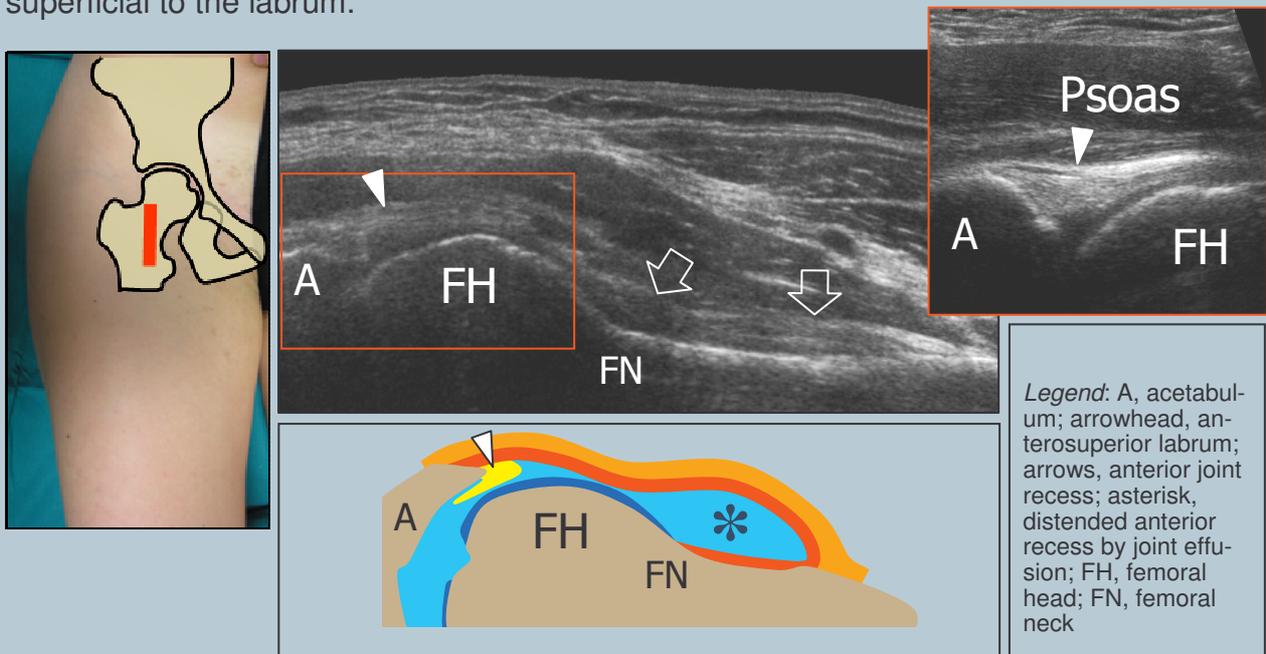
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Note

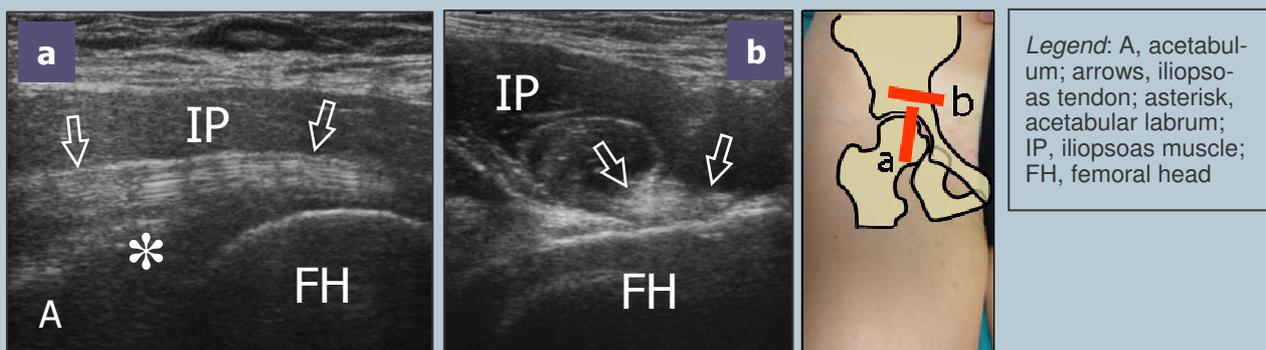
The systematic scanning technique described below is only theoretical, considering the fact that the examination of the hip is, for the most, focused to one quadrant only of the joint based on clinical findings.

I ANTERIOR HIP: anterior joint recess and iliopsoas tendon

With the patient supine, place the transducer in an oblique longitudinal plane over the femoral neck to examine the anterior synovial recess, using the femoral head as a landmark. In obese patients, lower frequency probes may help the examination. Cranial to the anterior recess, the fibrocartilaginous anterior glenoid labrum of the acetabulum can be detected as a homogeneously hyperechoic triangular structure (same appearance as the knee meniscus). Look at the iliofemoral ligament that can be appreciated superficial to the labrum.

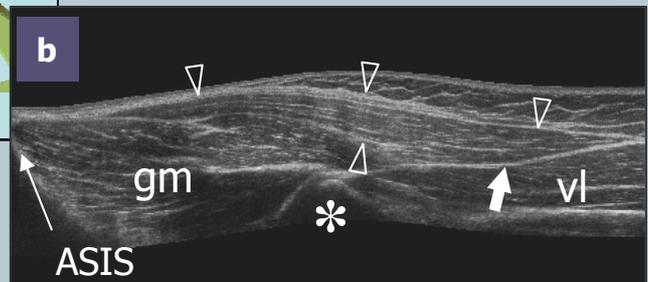
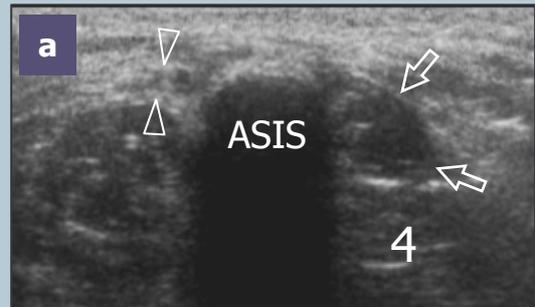
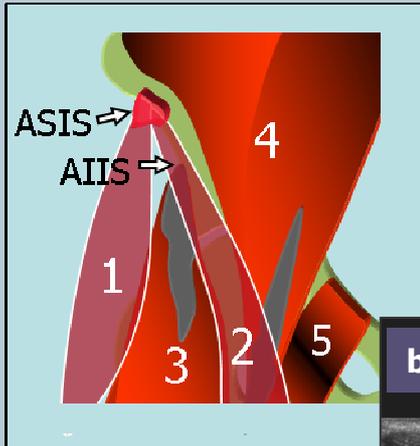
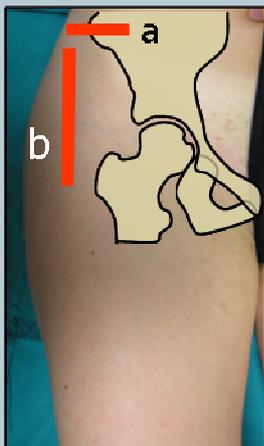


Over the joint space and the femoral head, the iliopsoas muscle is identified lateral to the femoral neurovascular bundle. The iliopsoas tendon is found in a deep eccentric position within the posterior and medial part of the muscle belly and lies over the iliopectineal eminence. The iliopsoas bursa lies between the tendon and the anterior capsule of the hip joint: in normal states, it is collapsed and cannot be detected with US.



2 tensor fasciae latae and sartorius

Place the transducer in the axial plane over the anterior superior iliac spine. The short tendons of the sartorius (medial) and the tensor fasciae latae (lateral) are then visualized by means of sagittal planes. Shifting the probe down over the muscle bellies, the sartorius can be seen directing medially to reach the medial thigh over the rectus femoris muscle, whereas the tensor fasciae latae proceeds laterally and caudally to insert into the anterior border of the fascia lata, superficial to the vastus lateralis.



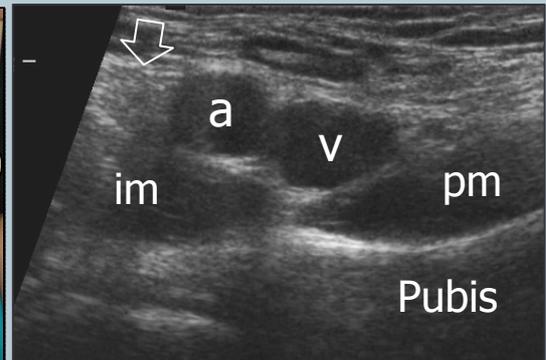
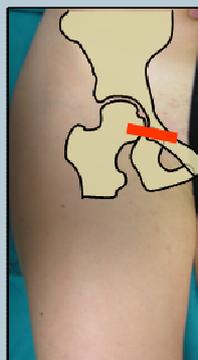
Legend: arrowheads and 1, tensor fasciae latae muscle; AIIS, anteroinferior iliac spine; ASIS, anterosuperior iliac spine; asterisk, greater trochanter; curved arrow, lateral femoral cutaneous nerve; gm, gluteus medius muscle; 3, rectus femoris muscle; 4, iliopsoas muscle; 5, pectineus muscle; void arrows and 2, sartorius muscle; white arrow, insertion of tensor fasciae latae; vl, vastus lateralis muscle



Just medial to the attachment of the inguinal ligament into the anterior superior iliac spine, look at the lateral femoral cutaneous nerve. Shifting the transducer up on axial planes, image the abdominal portion of the psoas and the iliacus muscles which lie internally to the iliac wing.

3 femoral neurovascular bundle

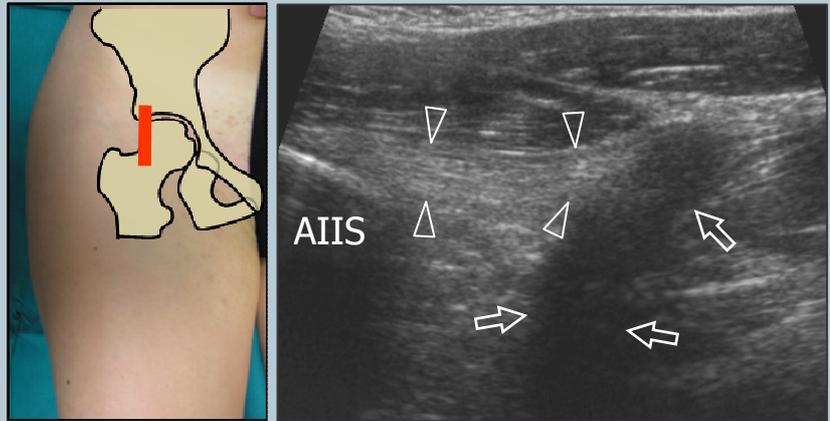
Medial to the iliopsoas muscle and tendon, look at the femoral nerve (lateral), the common femoral artery and the common femoral vein (medial). The vein is larger than the artery and is compressible with the probe. Check for enlarged lymph nodes. Further medially, the pectineus muscle is seen over the pubis.



Legend: a, femoral artery; arrow, femoral nerve; im, iliacus muscle; pm, pectineus muscle; v, femoral vein

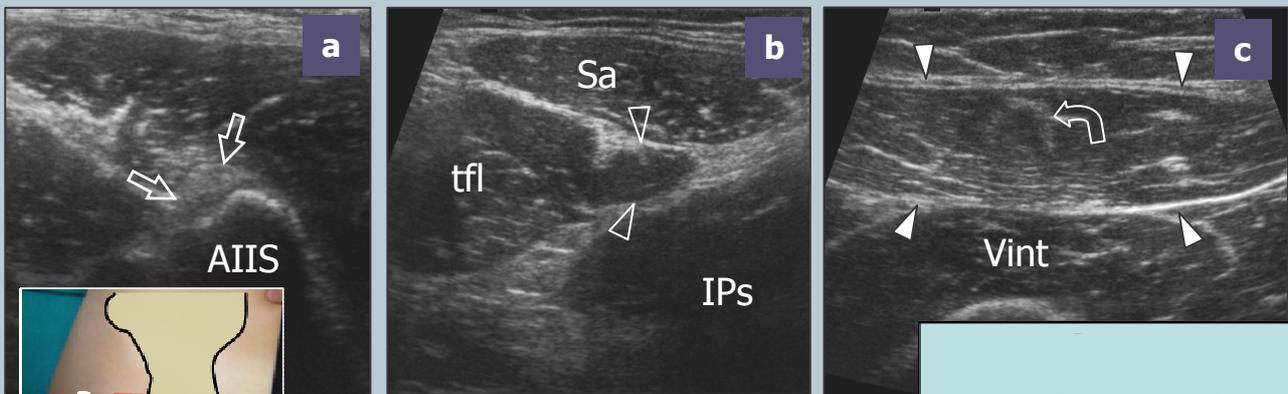
4 rectus femoris

Place the transducer over the anterior inferior iliac spine to examine the direct tendon of the rectus femoris. On long-axis planes, note the posterior acoustic shadowing that underlies the direct tendon related to changes in orientation of tendon fibers at the union of the direct and indirect tendons.



Legend: AIIS, anteroinferior iliac spine; arrowheads, direct tendon of the rectus femoris muscle; arrows, indirect tendon of the rectus femoris muscle

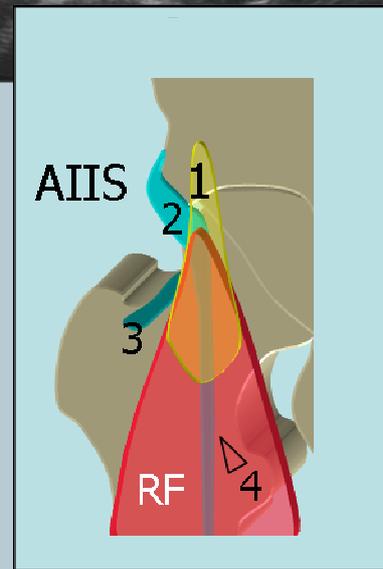
Shifting the transducer downward, transverse planes can demonstrate the myotendinous junction of the rectus femoris with its muscle fibers that arise from the lateral aspect of the tendon. More distally, the muscle belly is seen progressively enlarging between the tensor fasciae latae and the sartorius.



Legend: AIIS, anteroinferior iliac spine; arrows, direct tendon of the rectus femoris muscle; curved arrow, central aponeurosis; IPs, iliopsoas muscle; Sa, sartorius muscle; tfl, tensor fasciae latae muscle; Vint, vastus intermedius muscle; void arrowheads, proximal myotendinous junction of the rectus femoris muscle; white arrowheads, rectus femoris muscle

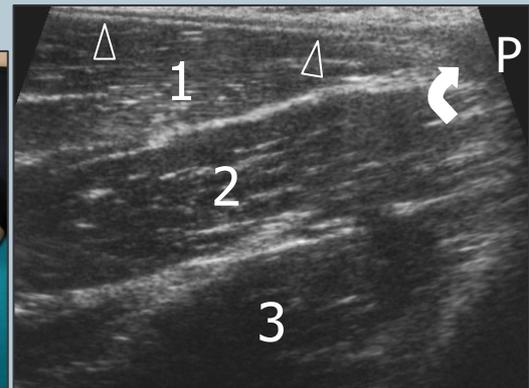
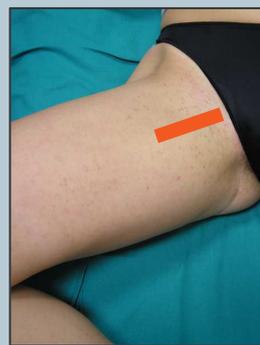
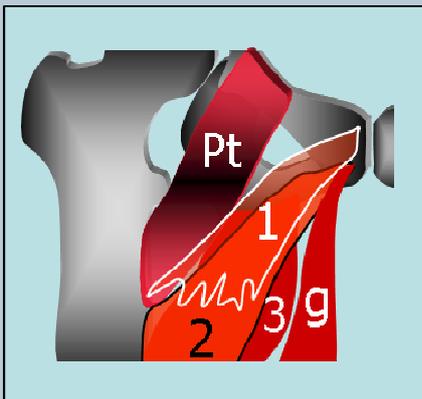
In the proximal rectus femoris muscle, the central aponeurosis is the distal continuity of the indirect tendon, whereas the superficial aponeurosis arises from the direct tendon.

Legend: AIIS, anteroinferior iliac spine; 1, direct tendon; 2, indirect tendon; 3, reflected tendon; 4, central aponeurosis; RF, rectus femoris muscle



5 MEDIAL HIP: adductors

For examination of the medial hip, place the patient with the thigh abducted and externally rotated and the knee bent. Examine the insertion of the iliopsoas tendon on the lesser trochanter using long-axis planes. Placing the probe over the bulk of the adductors, three muscle layers are recognized on axial planes: the superficial refers to the adductor longus (lateral) and the gracilis (medial), the intermediate to the adductor brevis and the deep to the adductor magnus. To image the adductor insertion, scan over the long-axis of these muscles up to reach the pubis. The insertion of the adductor longus tendon is seen with its triangular hypoechoic shape.



Legend: arrowheads, adductor longus tendon; curved arrow, adductor longus insertion; 1, adductor longus muscle; 2 adductor brevis muscle; 3, adductor magnus muscle; g, gracilis muscle; P, pubis; Pt, pectineus muscle

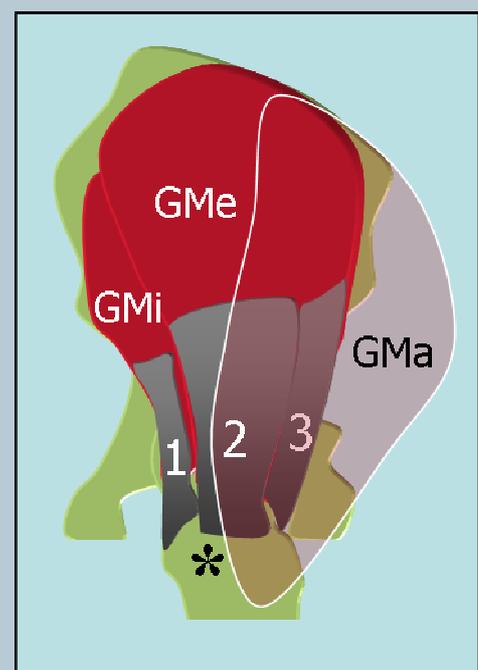
From a transverse plane on the pubis, shift the probe laterally and perform an oblique longitudinal scan over the conjoint tendon of transversus abdominis and internal oblique. Further medially, the anterior aspect of the symphysis pubis may be seen.

6 LATERAL HIP: abductors

The US examination of the lateral hip is performed by asking the patient to lie on the opposite hip assuming an oblique lateral or true lateral position. Transverse and longitudinal US planes obtained cranial to the greater trochanter show the gluteus medius (superficial) and gluteus minimus (deep) muscles. To recognize them, the tensor fasciae latae can be used as a landmark: shifting the transducer posterior to it, the anterior margin of both muscles appears.

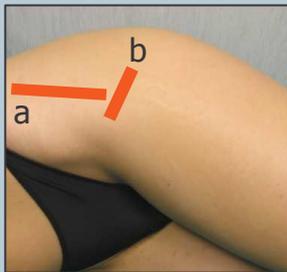
In alternative, obtain posterior US images over the anterior portion of the gluteus maximus: moving the transducer anterior to this muscle, the posterior margin of the gluteus medius appears. The fascia lata lies over the lateral aspect of the gluteus medius and the greater trochanter.

Legend: asterisk, greater trochanter; 1, gluteus minimus tendon; 2, gluteus medius (anterior tendon); 3, gluteus medius (posterior tendon); GMi, gluteus minimus muscle; GMa, gluteus maximus muscle; GMe, gluteus medius muscle



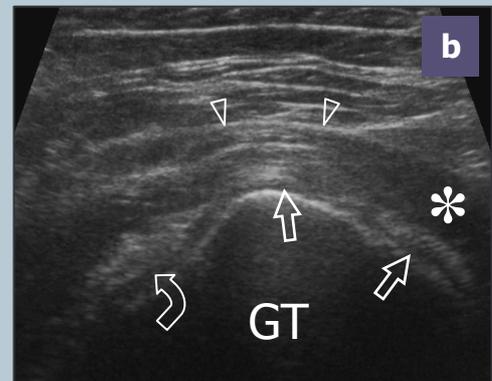
7 gluteus minimus, gluteus medius and fascia lata

Moving the probe down to reach the greater trochanter, the gluteus minimus tendon is seen as an anterior structure that arises from the deep aspect of the muscle and inserts into the anterior facet of the greater trochanter.



Legend: asterisk, gluteus maximus muscle; curved arrow, gluteus minimus tendon; Gmin, gluteus minimus muscle; GT, greater trochanter; void arrow, gluteus medius tendon; white arrow, gluteus minimus tendon; arrowheads, fascia lata

Long-axis and short-axis US images obtained over the lateral facet of the greater trochanter demonstrate the gluteus medius tendon as a curvilinear fibrillar band. Shifting the probe posteriorly, the anterior portion of the gluteus maximus can be seen covering the posterior part of the tendon of the gluteus medius. Coronal planes demonstrate the fascia lata which appears as a superficial hyperechoic band that, from cranial to caudal, overlies the gluteus medius muscle, the gluteus medius tendon and the greater trochanter.

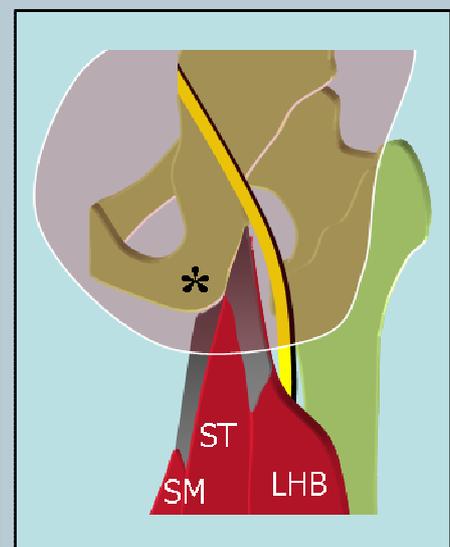


Due to a too small amount of fluid content, the bursae around the greater trochanter are not visible with US in normal conditions.

8 POSTERIOR HIP: hamstrings

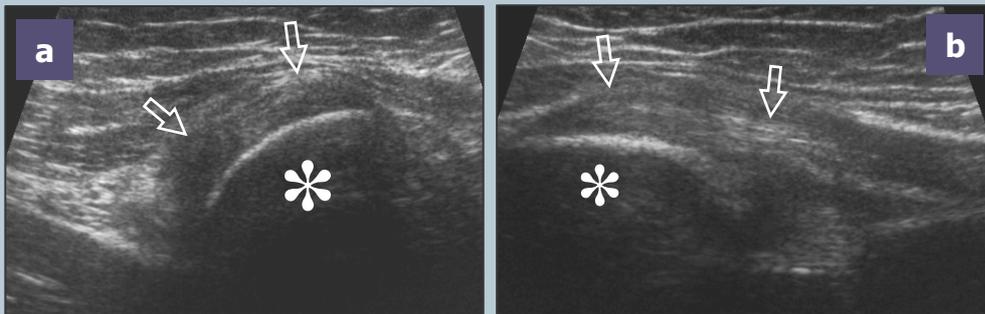
For examination of the posterior hip, the patient lies prone with the feet hanging out of the bed. Lower US frequencies may be required to image thick thighs or obese patients. The gluteus maximus muscle is first evaluated by means of transverse and coronal oblique planes oriented according to its long- and short-axis.

Legend: asterisk, ischiatic tuberosity; Gmax, gluteus maximus muscle; SM, semi-membranosus; ST, semitendinosus; LHB, long head of the biceps femoris

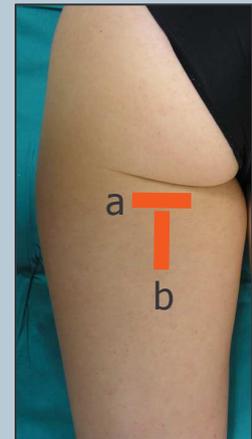


9 hamstrings and sciatic nerve

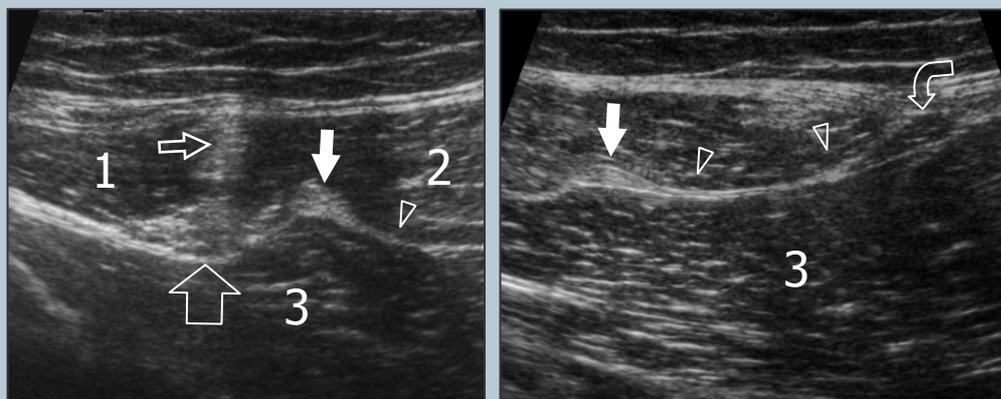
Posterior axial planes are the most useful to recognize the proximal origin of the ischiocrural (semimembranosus, semitendinosus, long head of the biceps femoris) muscles. The ischial tuberosity is the main landmark: once detected, the most cranial portion of the ischiocrural tendons can be demonstrated as they insert on its lateral aspect. At this level, the semimembranosus tendon and the conjoined tendon of the semitendinosus and the long head of the biceps femoris cannot be separated. Lateral to them, the sciatic nerve is seen as a flattened structure with fascicular echotexture emerging from under the piriformis muscle.



Legend: asterisk, ischial tuberosity; arrows, common tendon origin of the semitendinosus-long head of biceps femoris



Shifting the probe downward on axial planes, the conjoined tendon of semitendinosus and biceps femoris can be distinguished from the tendon of semimembranosus due to its more superficial and lateral position. The conjoined tendon of the semitendinosus and biceps femoris appears as a sagittal hyperechoic image separating the muscle bellies of the semitendinosus (medial) and the biceps (lateral). The semimembranosus has a large aponeurosis connected to the medial side of the tendon: its muscle belly arises from the medial end of this aponeurosis.



Legend: large void arrow, sciatic nerve; narrow void arrow, conjoined tendon of the semitendinosus-long head of the biceps; 1, long-head of the biceps muscle; 2, semitendinosus muscle; 3, adductor magnus muscle; white arrow, semimembranosus tendon; arrowheads, semimembranosus aponeurosis; curved arrow, semimembranosus muscle belly

