Sartorius and Tensor Fasciae Latae

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7.1 Sartorius

7.1.1 Anatomy Key Points

The *sartorius muscle* is the longest muscle in the human body. It is a long, thin strip-like muscle that runs down all the length of the thigh (Fig. 7.1).

Its upper portion forms the lateral border of the femoral triangle (Scarpa's triangle) (Fig. 8.2).

The sartorius muscle arises from the anterior-superior iliac spine (ASIS) as well as from the notch just below the ASIS and then travels inferomedially crossing the upper third of the thigh.

It descends behind the medial condyle of the femur and inserts on the inner tibial tuberosity via an aponeurotic expansion that covers the tendons of the gracilis and semitendinosus muscles forming the *pes anserinus* (Fig. 10.14).

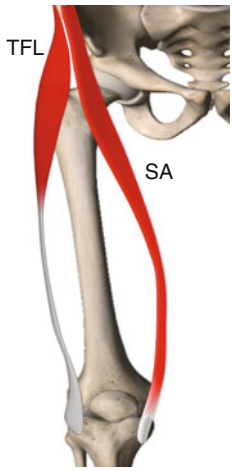

Fig. 7.1 Anatomical scheme of tensor fasciae latae (*TFL*) and sartorius (*SA*) muscles

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The sartorius lies superficially to vastus intermedius, vastus lateralis and adductor longus muscles, and in its entire course, the muscle is covered by a duplication of the fascia lata.

The sartorius muscle innervation is supplied by the superficial branch of the femoral nerve, which is responsible for both sensory and motor components.

The blood supply comes from the muscular branches of the femoral artery.

The sartorius muscle is a two-joint muscle and moves both the hip and knee joint. Its main function is flexion, adduction and lateral rotation of the hip also helping the knee flexion and inward rotation.

7.1.2 Ultrasound Examination Technique

Start the examination of the sartorius muscle with the patient supine, with the lower limb in a neutral position. Then palpate the anterior-superior iliac spine (ASIS), which can be considered an important bony landmark for US examination (Fig. 7.2).

Place the transducer in an axial plane on the ASIS and visualize the two short tendons of the *sartorius* (medial) and the *tensor fasciae latae* (lateral) in a sagittal plane. In this scan plane, it is possible to identify the typical 'pseudothyroid' aspect with the hyperechoic cortical band between the two proximal insertions of the *sartorius* (medial) and *tensor fasciae latae* (lateral) muscles that present a hyperechoic fibrillar structure (Fig. 7.3).

Rotate the probe by 90° to evaluate the insertion on the ASIS in the longitudinal plane (Fig. 7.4).

Then shift the probe downwards following the sartorius muscle belly: this is the only muscle that can be seen superficially to rectus femoris, directing medially towards the medial thigh (Fig. 7.5).

Fig. 7.2 Lower limb position to evaluate the sartorius muscle

The sartorius muscle presents a typical triangular shape and lies superficially just under the fascia and the subcutaneous tissues.

Evaluate the myotendinous junction on axial and longitudinal plane (Figs. 7.6 and 7.7).

Then swipe the transducer distally on an axial scan to reach the distal insertion of the sartorius tendon on the anteromedial surface of the superior aspect of the tibial shaft (Fig. 7.8).

Turn the probe by 90° to evaluate the distal attachment of sartorius tendon on its long axis (Fig. 7.9).

Remember that the femoral vascular bundle is located in strict relationship with the sartorius muscle, representing an important landmark

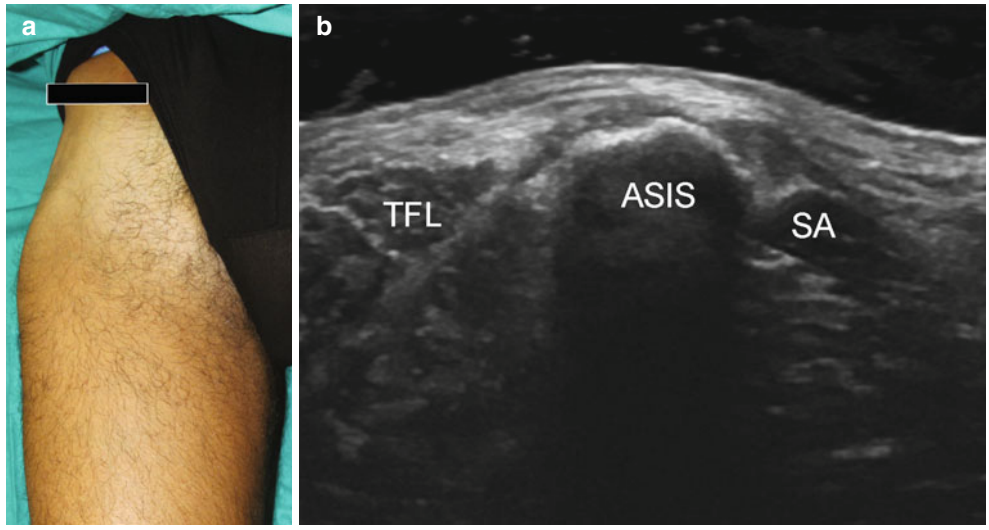

Fig 7.3 (**a**) Probe position for ASIS (anterior-superior iliac spine) evaluation on the axial plane. (**b**) US axial scan at ASIS level: note the proximal insertion of sartorius (*SA*) and tensor fasciae latae (*TFL*) muscles

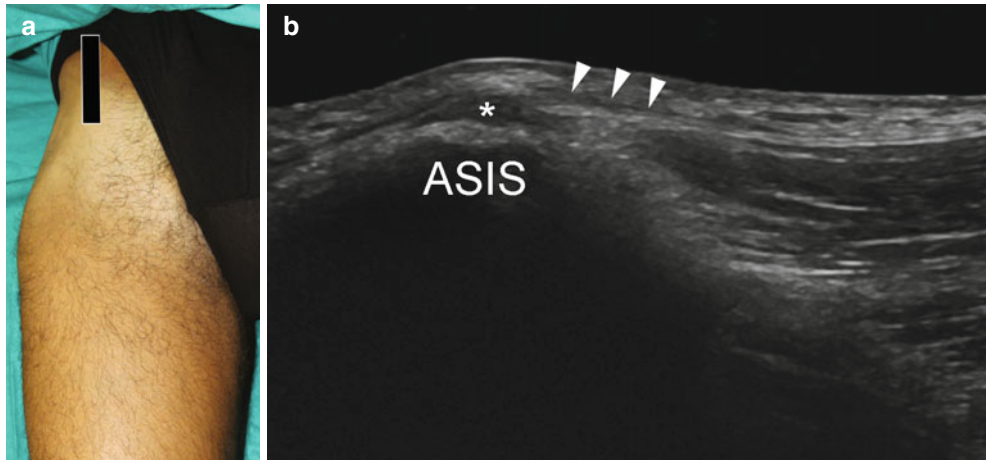

Fig 7.4 (**a**) Probe position for ASIS (anterior-superior iliac spine) evaluation on the longitudinal plane. (**b**) US longitudinal scan at ASIS level: note the proximal insertion (*) of sartorius and its myotendinous junction (*arrowheads*)

during its examination at the middle third of the thigh.

At this level the sartorius, the vastus medialis and the adductor magnus muscles delimitate the medial, anterolateral and posteromedial aspect of the Hunter's canal, respectively (Fig. 7.10).

Finally replace the transducer on the ASIS, medially to the attachment of the inguinal ligament, to identify the lateral femoral cutaneous nerve. This nerve can be seen as a small fasciculate structure crossing the lateral end of the inguinal ligament.

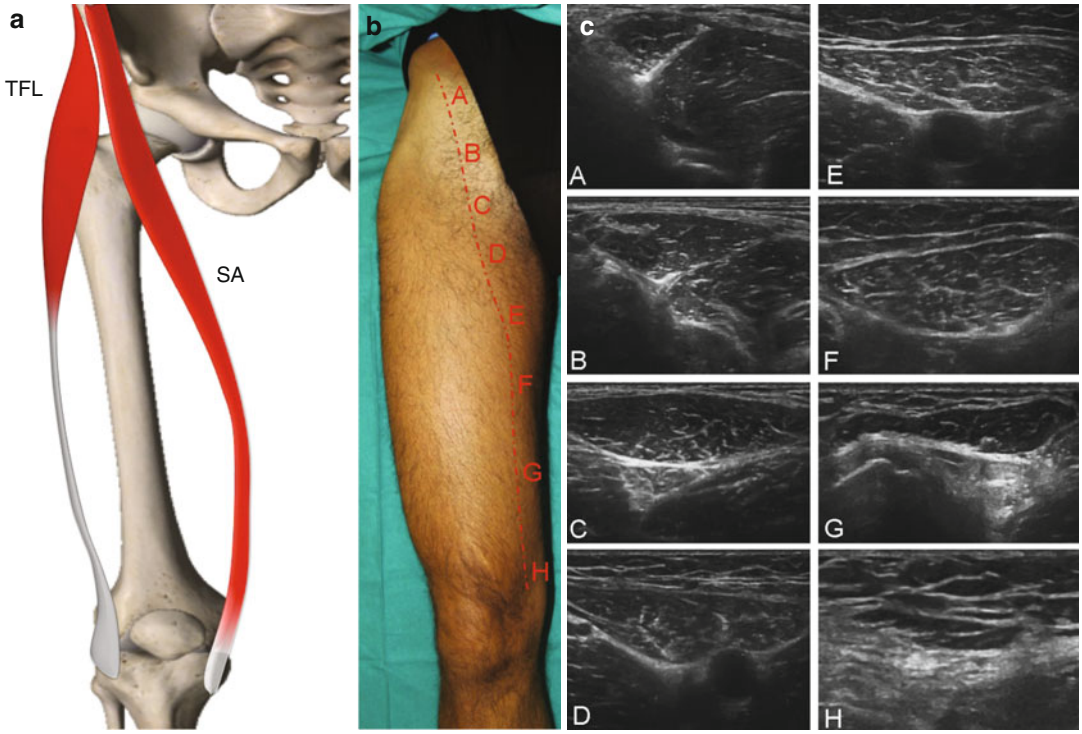

Fig. 7.5 (**a**) Anatomical scheme of tensor fasciae latae (*TFL*) and sartorius (*SA*) muscles. (**b**) US probe path to explore SA muscle from proximal to distal insertion; (**c**) US axial scans demonstrate SA muscle belly at different level of the thigh (**A–H**)

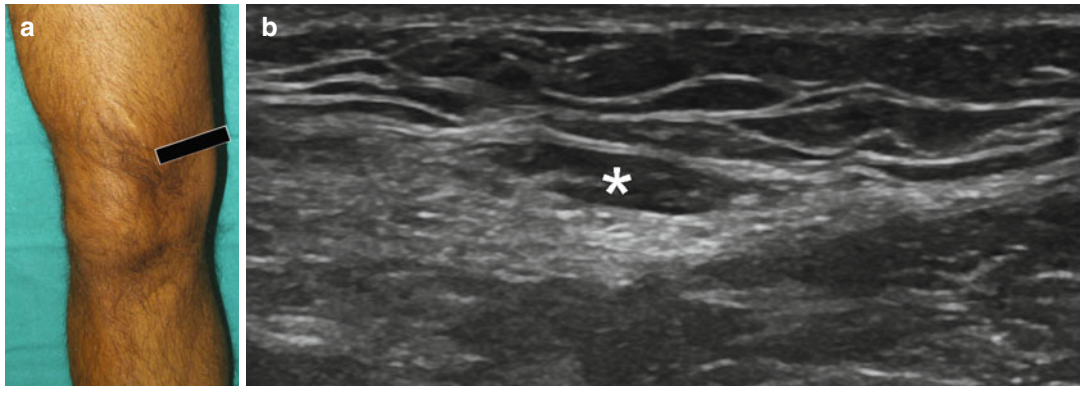

Fig. 7.6 (**a**) Probe position to explore the myotendinous junction on axial plane. (**b**) US axial scan of myotendinous junction of sartorius muscle (*)

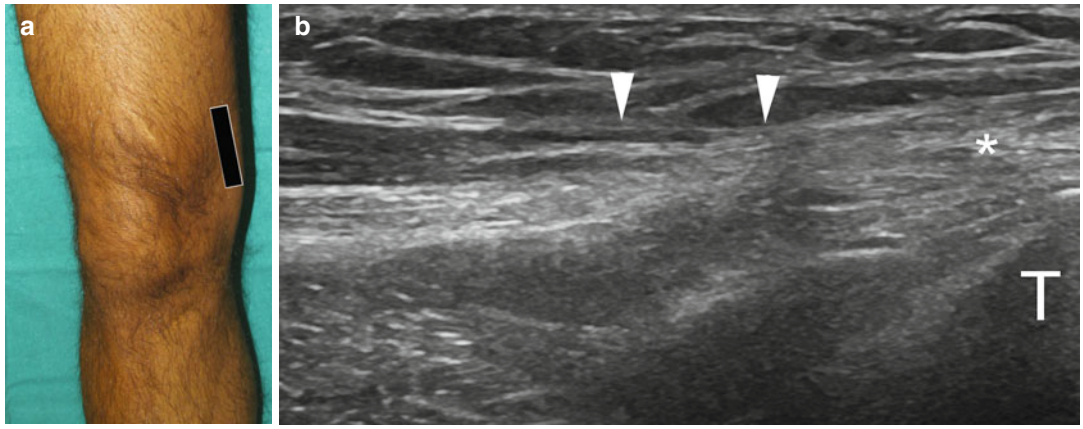

Fig. 7.7 (**a**) US probe position to explore the myotendinous junction on longitudinal plane. (**b**) US longitudinal scan of myotendinous junction (*arrowheads*) of sartorius muscle and tendon (*). *T* tibial shaft

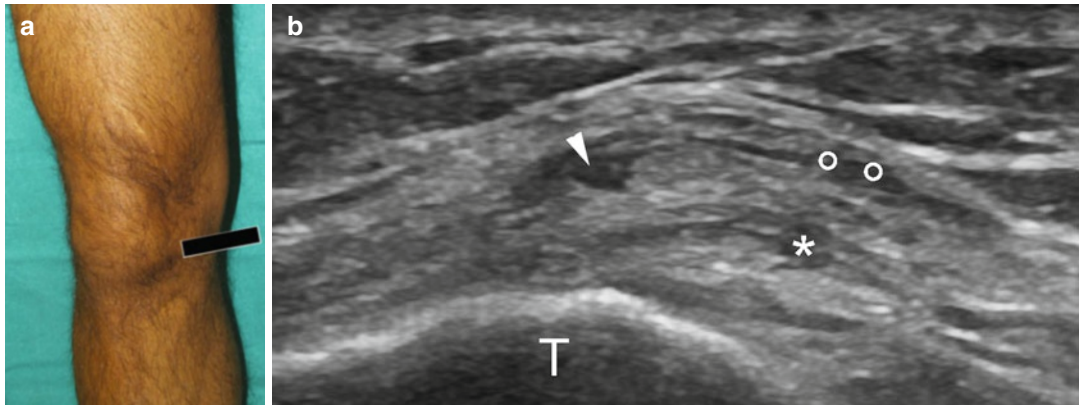

Fig. 7.8 US probe position (**a**) and US axial plane (**b**) to explore the distal insertion of the SA muscle (*circles*) on the surface of the tibia medial to the tibial tuberosity, just anterior to the gracilis (*) and the semitendinosus tendons (*arrowhead*). *T* tibial shaft

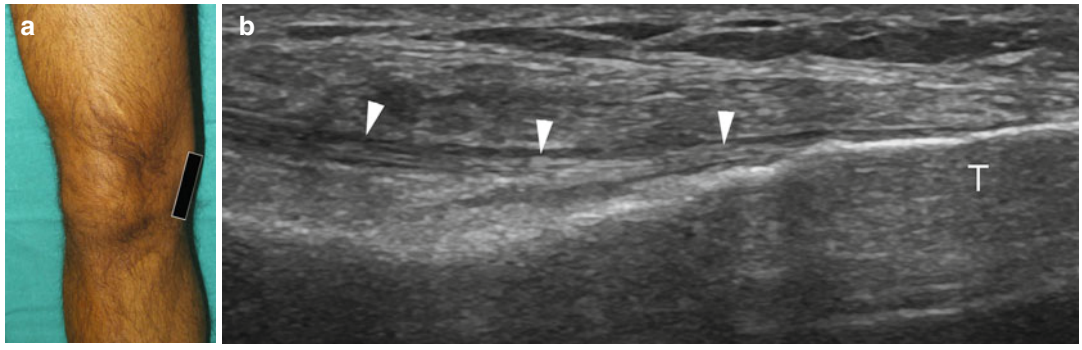

Fig. 7.9 US probe position (**a**) and US longitudinal plane (**b**) to explore the pes anserinus (*arrowheads*). *T* tibial shaft

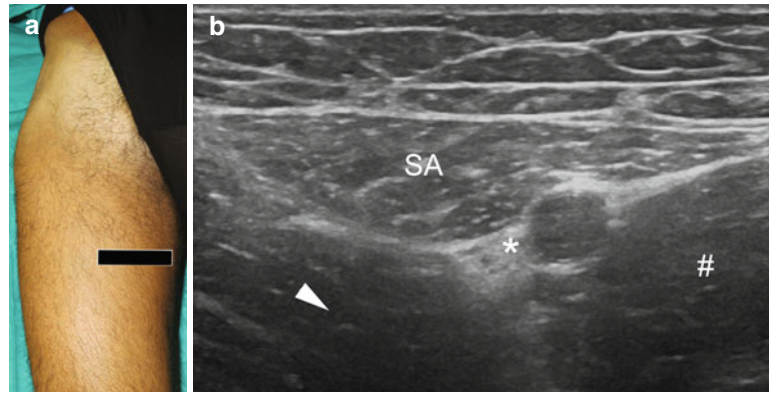

Fig. 7.10 (**a**) Patient and US probe position for the assessment of the proximal third of the sartorius muscle (*SA*) on an axial scan plane; (**b**) US axial scan: in the proximal third of the thigh SA is in a superficial position, coursing under the fascia and in strict relationship with the femoral vascular bundle (*). *Arrowhead* vastus medialis, # adductor longus

7.1.3 Summary Table

Muscle	Origin	Insertion	Action	Innervation
Sartorius	Anterior-superior iliac spine and the region just below it	Anteromedial margin of the superior aspect of the tibial shaft	Flexion, abduction and lateral rotation of the thigh at the hip; flexion of the knee	Femoral nerve

7.2 Tensor Fasciae Latae

7.2.1 Anatomy Key Points

The tensor fasciae latae muscle is located in a very superficial position, just under the fascia on the anterolateral aspect of the hip (Fig. 7.1). It arises from the lateral aspect of the anterior-superior iliac spine and descends with its short belly over the anterolateral aspect of the proximal thigh. Then, it converge in the anterior edge of the fascia lata which is a fibrous lamina covering the lateral aspect of the thigh. This structure is also referred to as the 'iliotibial tract' and courses superficially along the lateral aspect of the thigh, from the lateral edge of the iliac crest down to its insertion into Gerdy's tubercle at the anterolateral aspect of the proximal tibial epiphysis.

7.2.2 Ultrasound Examination Technique

Start the US evaluation placing the probe on the anterosuperior iliac spine (ASIS), with a transverse orientation. The US image shows the 'pseudothyroid' typical aspect, with the iliac cortex simulating the trachea, and the sartorius (medially) and the tensor fasciae latae (laterally) origins simulating thyroid lobes (Fig. 7.3).

Proceed laterally and caudally following the tensor fasciae latae muscle belly, which courses superficially on the anterolateral aspect of the proximal thigh (Fig. 7.11).

Note that, this muscle has a more echogenic appearance than the others, due to a large amount of fatty tissue among its fascicles. At its proximal portion, tensor fasciae latae covers the gluteus medius muscle belly; more distally, it courses over the vastus lateralis muscle, whose fibres can be seen arising from the deep portion of the image and lateral to the rectus femoris proximal portion (Fig. 7.12).

In a scanning plane corresponding to the greater trochanter, turn the probe by 90° and follow the distal portion of the muscle converging in the antero-inferior aspect of the fascia lata and continuing into the iliotibial tract (Fig. 7.13).

At this level, when scanning patients suffering for hip trauma, remember also to investigate the superficial anatomical planes between the fascia and the subcutaneous tissue that are commonly distended by fluid (Morel-Lavallée syndrome).

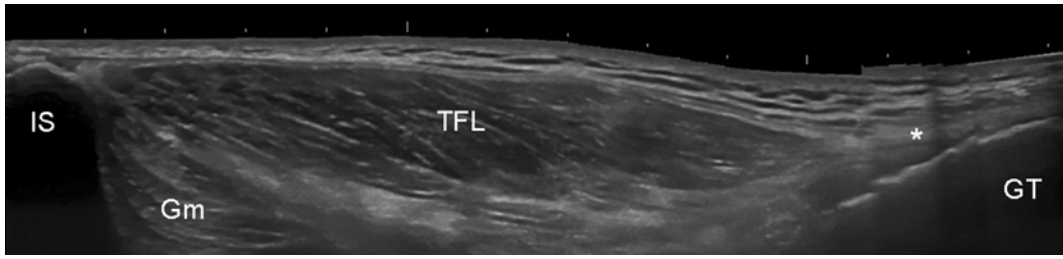

Fig. 7.11 Extended field of view; the longitudinal US scan shows the course of the tensor fasciae latae muscle (*TFL*) from the anterior-superior iliac spine (*IS*), passing over the gluteal muscles (*Gm*) to continue into the iliotibial tract (*asterisk*) at the level of the greater trochanter (*GT*)

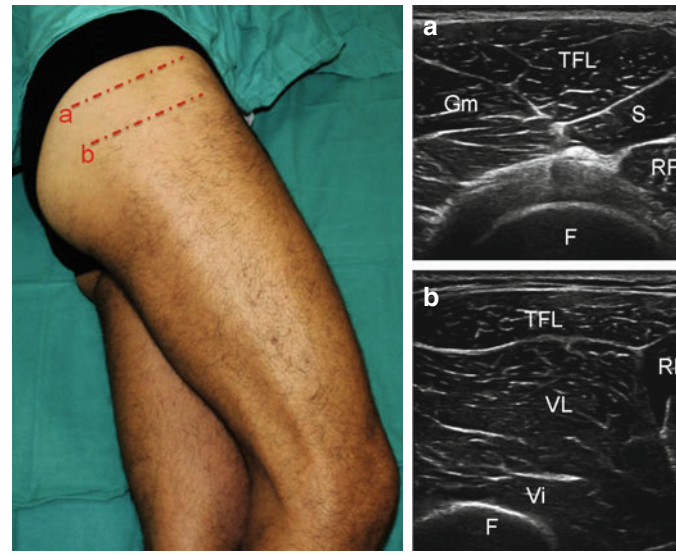

Fig. 7.12 Probe position over the lateral hip on different planes for the evaluation of the tensor fasciae latae muscle. (**a**) Corresponding more proximal US axial scan: gluteus medius muscle (*Gm*), tensor fasciae latae (TFL) muscle, sartorius muscle (S), rectus femoris muscle (*RF*) and femoral head (*F*) covered by the hip joint capsule. (**b**) Corresponding more distal US axial scan: vastus lateralis muscle (*VL*), vastus intermedius muscle (*VI*), tensor fasciae latae muscle (*TFL*), sartorius muscle (*S*), rectus femoris muscle (*RF*) and femur (*F*)

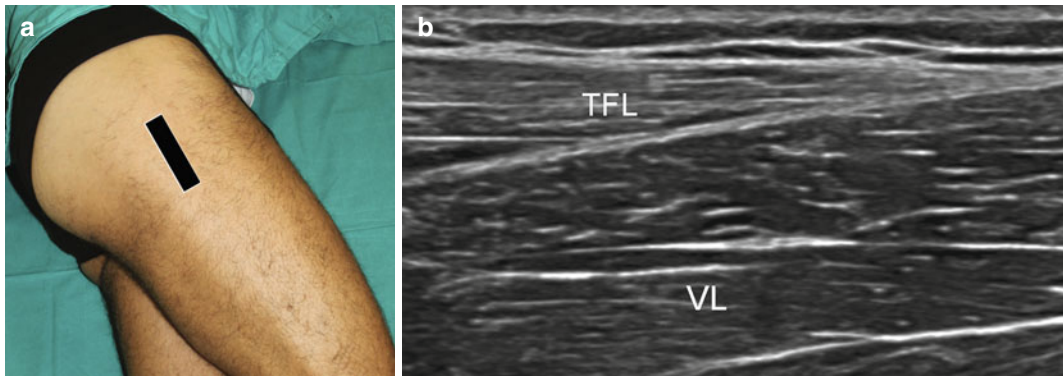

Fig. 7.13 (**a**) Probe position over the lateral hip for the evaluation of the tensor fasciae latae muscle. (**b**) Longitudinal-oblique US scan over the distal portion of the tensor fasciae latae muscle (*TFL*): see the tensor fasciae latae fibres in a superficial position and the muscular fibres of the vastus lateralis (*VL*) passing just deep to it

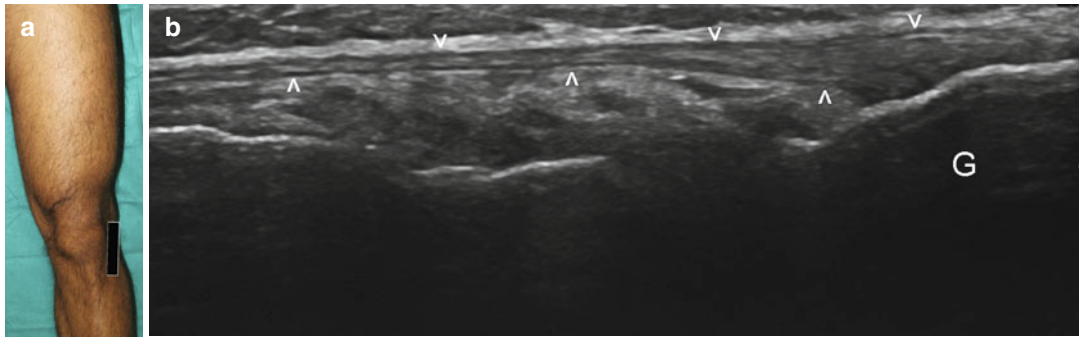

Fig. 7.14 (**a**) Probe position over the anterolateral knee for the evaluation of the iliotibial tract insertion. (**b**) Corresponding longitudinal-oblique US scan: the image shows the distal portion of the iliotibial tract (*arrowheads*) inserting onto the Gerdy's tubercle of the tibia (G)

Complete the examination following this hyperechoic fibrous band over the lateral aspect of the thigh, over the vastus lateralis muscle, till its distal insertion on the Gerdy's tubercle on the anterolateral aspect of the proximal tibia (Fig. 7.14).

Pay particular attention to the distal portion of the iliotibial tract, at the passage over the knee, where the band may come in conflict with the lateral condyle of the femur in the so-called runner's knee.

Dynamic manoeuvres may help to investigate clinical symptoms as in the snapping hip syndrome or in the iliotibial tract friction syndrome. In the former condition, the patient lies on the examination table in contralateral decubitus. Flex and externally rotate the adducted and internally rotated patient hip with the US probe placed over the lateral aspect of the greater trochanter. The iliotibial tract, tensor fasciae latae or gluteus medius tendon slides back and forth across the greater trochanter. This normal action becomes a snapping hip syndrome when one of these connective tissue bands thickens and catches with motion. The underlying bursa may also become inflamed, causing a painful external snapping hip syndrome. Transverse US scan easily depict the impingement of the posterior border of the fascia lata (or the anterior portion of the gluteus maximus) over the osseous prominence of the greater trochanter.

The iliotibial band friction syndrome could be evaluated moving the patient knee forward in extension and backward in flexion: the transverse US scan over the lateral condyle of the femur shows the impingement between such structure and the pre-insertional portion of the iliotibial tract.

7.2.3 Summary Table

Muscle	Origin	Insertion	Innervation	Action
Tensor fasciae latae	Anterior-superior iliac spine	Gerdy's tubercle of the tibia	Superior gluteal nerve	Abduction and flexion of the thigh; also tightens the iliotibial tract

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