



A practical guide to identify the major sensory nerves of the groin on ultrasound

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Learning objectives

To describe the landmarks on ultrasound to identify the ilioinguinal, iliohypogastric, genitofemoral, obturator and pudendal nerve, enabling ultrasound-guided diagnostic or therapeutic infiltration.

Background

The ilioinguinal, iliohypogastric, genitofemoral, obturator and pudendal nerve are the major sensory nerves of the groin and may be involved in the chronic groin pain.

1.The ilioinguinal (II) nerve supplies the skin of the superomedial thigh, the skin over the root of the penis and anterior scrotum in men and the mons pubis and labium majus in the female.

2.The iliohypogastric (IH) nerve supplies the skin over the lower part of the rectus abdominis or mons pubis.

3.The genital branch of the genitofemoral (GF) nerve supplies the skin of the anterolateral scrotum (or labium majus) and contains a motor branch to the cremaster muscle . The femoral branch innervates the skin of the anterior thigh below the inguinal ligament or femoral triangle.

Because of their course, these 3 nerves (II, IH, GF) are at risk to injury from lower abdomen incision leading to the so-called border nerve pain syndrome, as they supply the skin between the abdomen and the thigh.

The many variations and free communication between the sensory branches of these nerves, implies the examination of these 3 nerves as a whole in the proper clinical setting.

4.The obturator nerve supplies the skin of the medial thigh and motor innervation of the adductor muscles.

5.The pudendal nerve gives rise to 3 terminal branches including the genital nerve supplying the skin of the penis (or clitoris), the perineal area and the posterior scrotum or labia majora.

Imaging findings OR Procedure Details

Nerve identification using the appropriate landmarks on ultrasound;

1. Ilioinguinal and iliohypogastric nerves.

-Originating from the TH12-L1 nerve roots, both nerves run subperitoneally until they pierce the abdominal wall muscles, at a level superior to the anterior superior iliac spine (ASIS). At this point, the nerves can be picked up on ultrasound.

-*Landmarks:* starting on the ASIS, a linear high frequency probe is placed in a transverse plane medial to it and shifted 3 to 5 cm superior. The muscle bellies of the internal oblique abdominal muscle (IO) is recognized lying superficial to the transverse abdominal muscle (TA). Between these layers, splitting of the fascia is visualized and the IH nerve is usually seen running medially to the II nerve in this plane ([Fig. 1](#) on page 6).

-*Infiltration:* using an in-plane approach, the needle is inserted laterally aiming to the fascial plane between the IO and TA.

2. Genitofemoral nerve.

-Originating from the L1-L2 nerve roots, the nerve runs superficial to the psoas muscle and splits into a femoral and a genital branch above the inguinal ligament. The genital branch enters the inguinal canal through the deep inguinal ring, lateral to the inferior epigastric artery (IEA).

-*Landmarks:* The inguinal ligament stretches between the ASIS and the pubic tubercle. A linear high frequency probe is placed parallel to the inguinal ligament and shifted upwards along the external iliac artery (EIA) lying deep to the ligament. The IEA emerges from the EIA superficially, running medially towards the deep portion of the rectus abdominis muscle. The genital branch sits lateral to the IEA origin ([Fig. 2](#) on page 6).

-*Infiltration:* using an in-plane approach, the needle is inserted laterally pointing to the lateral side of the IEA origin.

3. Obturator nerve.

-Originating from L2-L4 nerve roots, the nerve pierces the psoas muscle, runs through the obturator foramen and splits into an anterior and posterior branch. The branches are separated by the adductor brevis (AB) muscle at the level of the thigh.

-*Landmarks:* a linear high frequency probe is placed in a transverse plane on the pectineus muscle covering the medial part of the superior ramus of the pubic bone. The probe is shifted downwards, revealing the adductor muscles, the adductor longus (AL) lying superficial to the adductor brevis muscle and the deeper adductor magnus muscle (AM). The anterior and the posterior branches are located in the fascial plane superficial and deep to the AB respectively ([Fig. 3](#) on page 7).

-*Infiltration:* using an in-plane approach, the needle is inserted laterally pointing towards the anterior branch in the fascial plane between AL and AB. Tilting the needle point deeper towards the fascial plane between AB and AM allows reaching the posterior branch.

4. Pudendal nerve.

-Originating from the S2-S4 nerve roots, the nerve travels distally and posteriorly to exit the pelvis through the greater sciatic notch. It then runs between the sacrotuberous (STL) and sacrospinous (SSL) ligaments at the level of the ischial spine (IS) with the internal pudendal artery (IPA) on the lateral side of it. This is the point to pick up the nerve on ultrasound, although it runs further distally into Alcock's canal.

-*Landmarks::* a linear high frequency probe (or low frequency curved array probe in the obese) is placed in a transverse plane on the ischial tuberosity and shifted upwards to reveal the STL as a moderate hyperechoic line superior to it. The IS is the bright hyperechoic straight line, continuous with the posterior acetabulum, lateral to the moderate hyperechoic SSL. At this position, color Doppler locates the IPA pulsations. The pudendal nerve sits medial to the artery ([Fig. 4](#) on page 8).

-*Infiltration:* using an in-plane approach, the needle is inserted medially and directed towards the medial aspect of the IPA.

Images for this section:

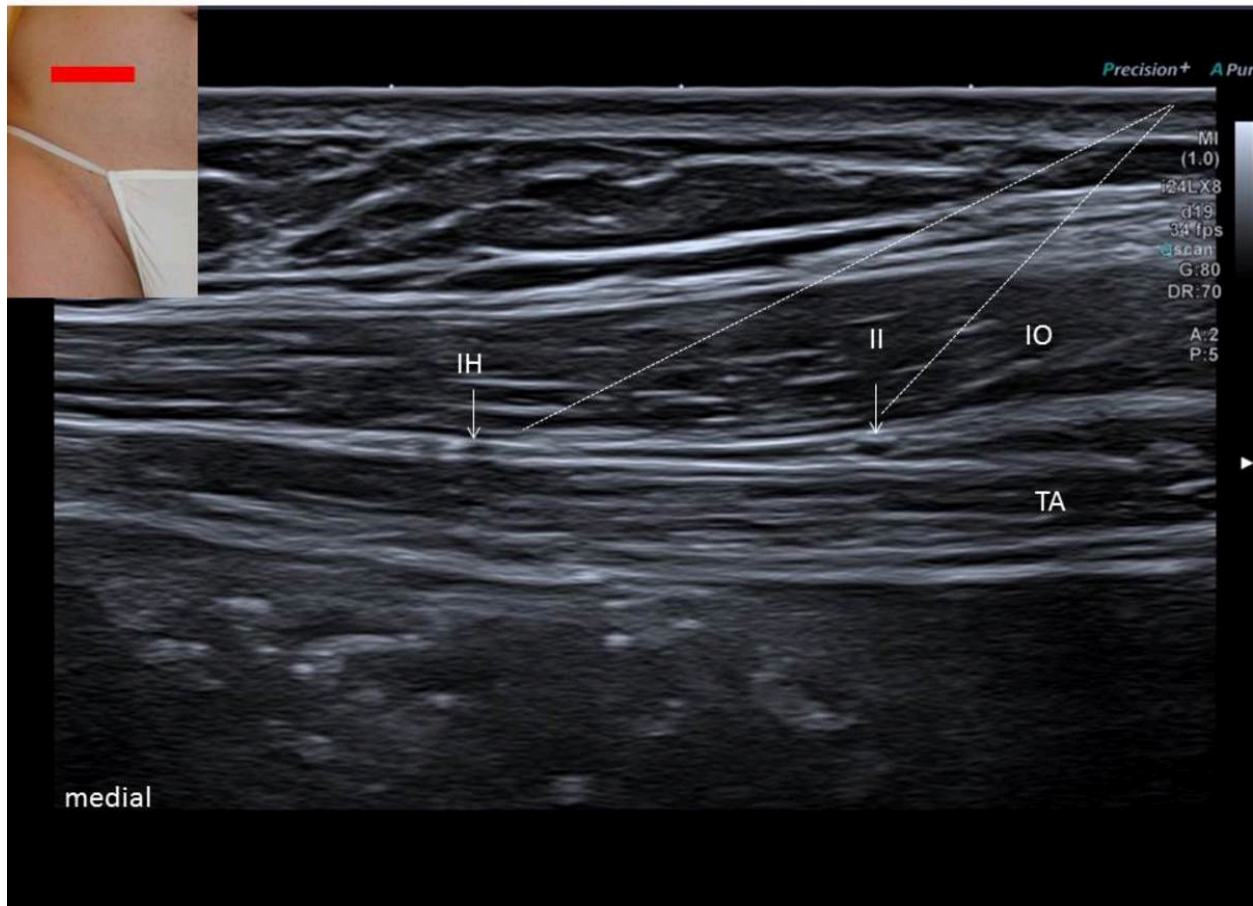


Fig. 1: In the fascial plane between the internal oblique abdominal muscle(IO)and the transverse abdominal muscle(TA), the iliohypogastric nerve (IH) sits medial to the ilioinguinal nerve (II). The dotted lines suggest the needle paths. The red line on the insert indicates the probe positioning.

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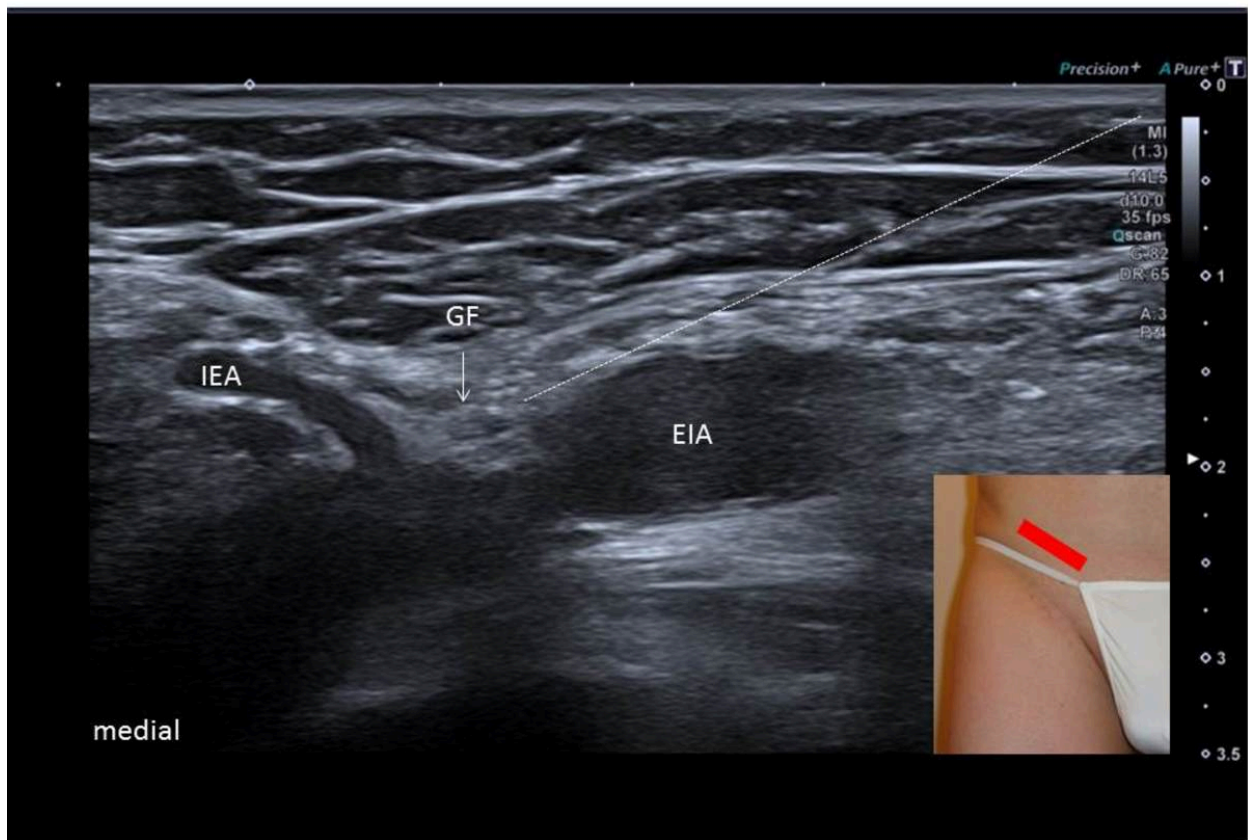


Fig. 2: Where the inferior epigastric artery(IEA)comes off the external iliac artery(EIA), the genitofemoral nerve(GF)sits lateral to the base of the IEA. The dotted line suggests the needle path. The red line on the insert indicates the probe positioning.

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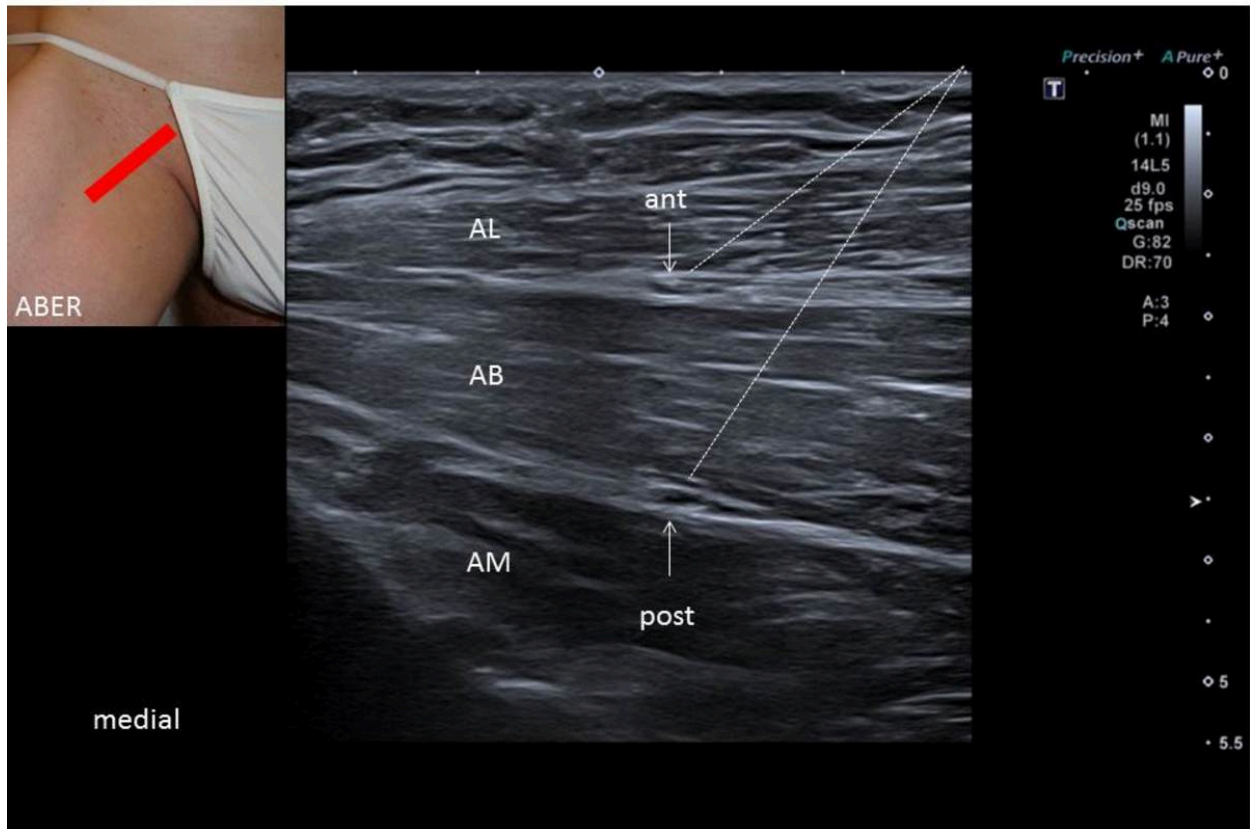


Fig. 3: With the leg in abduction & exorotation (ABER position), the anterior branch (ant) of the obturator nerve is found between the adductor longus (AL) and the adductor brevis (AB) muscles, while the posterior branch (post) is located between the AB and the adductor magnus (AM) muscles. The dotted lines suggest the needle paths. The red line on the insert indicates the probe positioning.

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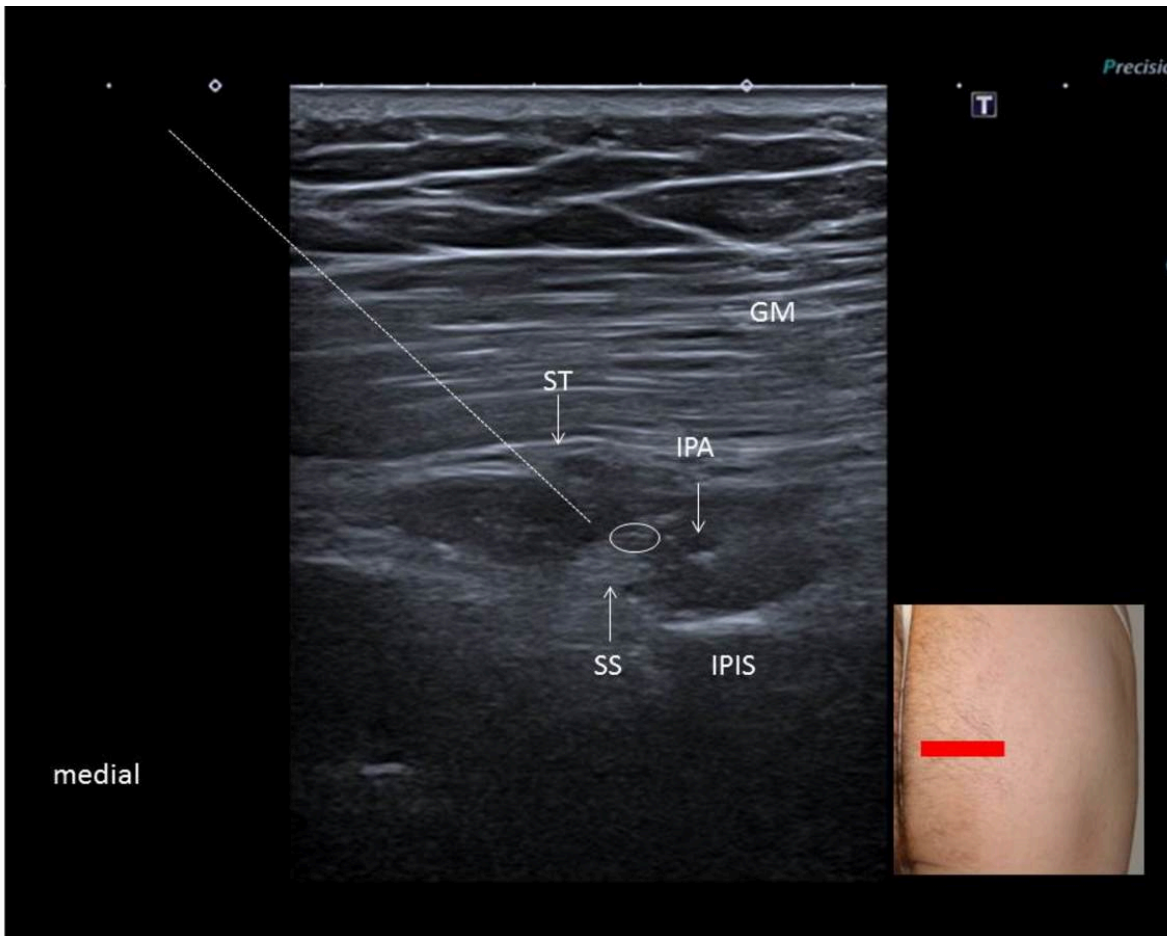


Fig. 4: At the level of the ischial spine (IS), the internal pudendal artery (IPA) is found in a plane between the sacrotuberous ligament (STL) and the deeper sacrospinal ligament (SSL). The pudendal nerve (encircled) sits medial to the IPA. GM: gluteus maximus muscle. The dotted line suggests the needle path. The red line on the insert indicates the probe positioning.

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Conclusion

The landmarks on ultrasound described in this presentation offer an easy and practical tool to identify the ilioinguinal, iliohypogastric, genitofemoral, obturator and pudendal nerve, enabling ultrasound-guided diagnostic or therapeutic infiltration.

References

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