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2.1 Introduction

Groin pain is typically a multifactorial condition characterized by vague and diffuse pain extended between the lower abdomen and medial thigh. It may be attributed to a variety of diagnostic entities and requires a differential diagnosis [1–4].

To understand groin pain pathogenesis, a precise anatomical knowledge of the pubic region is required.

Even though there is not a consensus on the anatomic definition of the groin, it can be defined as the region extended from the distal aspect of the abdominal wall to the proximal adductor compartment of the thigh, encompassing pubic symphysis [5].

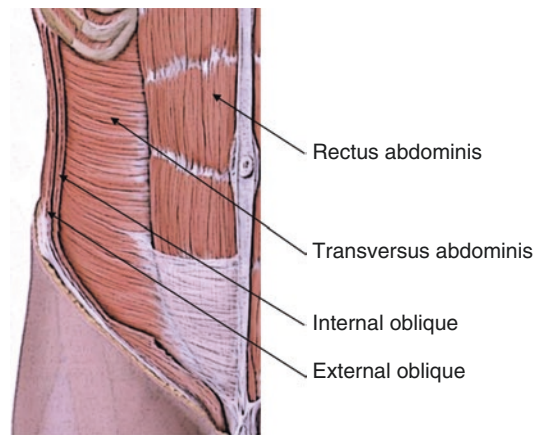


Fig. 2.1 Abdominal wall

2.2 The Abdominal Wall

The abdominal wall (Fig. 2.1) is formed by nine overlying layers that from the surface to the depth are the skin, the subcutaneous tissue, the superficial fascia, the external oblique muscle, the internal oblique muscle, the transversus abdominis

muscle, the transversalis fascia, the preperitoneal adipose and areolar tissue and the peritoneum [6].

The superficial fascia, also known as Scarpa's fascia, is a dense fibrous connective layer contiguous with the fascia lata of the thigh.

The external oblique muscle originates from the lower seven ribs, from the thoracolumbar sheath, from the outer lip of the iliac crest and from the inguinal ligament. The muscle, anteriorly, near the midclavicular line, become a strong aponeurosis that passes anteriorly to the rectus muscle to insert into the linea alba.

The inferior edge of the external oblique muscle aponeurosis forms the inguinal ligament (Poupart's ligament) that is extended from the anterior superior iliac spine to the pubic tubercle [7].

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The internal oblique muscle arises from the lower five ribs, from the thoracolumbar sheath, from the intermediate lip of the iliac crest and from the lateral half of the inguinal ligament. The muscle, anteriorly, become a strong aponeurosis. Above the line of Douglas, this aponeurosis is divided into anterior and posterior sheaths that pass anteriorly and posteriorly to the rectus abdominis, respectively. Below the line of Douglas, instead, the aponeurosis passes anteriorly to the rectus muscle. The lower fibres of the internal oblique muscle insert between the symphysis pubis and pubic tubercle. Some fibres, furthermore, form the cremasteric muscle.

The transversus abdominis muscle originates from the lower five ribs, from the thoracolumbar sheath, from the inner lip of the iliac crest and from the lateral half of the inguinal ligament. Anteriorly, the muscle becomes an aponeurotic sheet that passes posteriorly to the rectus abdominis above the line of Douglas and anteriorly to the rectus muscle below the line.

The aponeurosis of the anterolateral muscles, anteriorly, melt around the rectus abdominis muscle and formed the rectus sheath.

The transversalis fascia contributes to the structural integrity of the abdominal wall covering the deep surface of the transversus abdominis muscle.

The rectus abdominis muscles act as the major abdominal wall stabilizer. They originate from the anterior surface of the fifth, sixth and seventh costal cartilages and from the xiphoid process. Their insertions are on the superior aspect of the pubic crest just lateral to the pubic symphysis, and they are connected near the anterior midline by the linea alba.

The rectus sheath is reported to be continuous with adductor longus via the pubic symphysis capsular tissues. This confluence of soft tissue structures anterior to the pubic symphysis may provide the anatomical substrate for a stabilizing or force transmission mechanism [8–10].

Abdominal wall haematic supply comes from the last six intercostal arteries, four lumbar arteries, superior and inferior epigastric arteries and deep circumflex iliac arteries.

2.3 The Inguinal Canal

The inguinal canal is an about 4 cm canal extended between the internal and the external inguinal rings. It contains the spermatic cord (formed by cremasteric muscle fibres, testicular artery and vein, genital branch of the genitofemoral nerve, vas deferens, cremasteric vessels, lymphatic and processus vaginalis) in men and the round ligament in woman.

The superficial wall of the canal is formed by the external oblique aponeurosis, the cephalad wall by the internal oblique and transversus abdominis aponeurosis, the inferior wall by the inguinal ligament and the lacunar ligament and the posterior wall by the transversus abdominis muscle and transversalis fascia.

The groin area has important sensory nerves: iliohypogastric, ilioinguinal nerves and genital branch of genitofemoral nerve.

2.4 The Pubic Symphysis

The pubic symphysis is an amphiarthrodial joint.

It connects the two pubic bones via a fibrocartilaginous articular disc, and it has no joint capsule. The joint is supported anteriorly by the anterior pubic ligament, inferiorly by the arcuate ligament and superiorly by the pubic ligament.

The pubic symphysis dissipates the heavy forces from the lower limbs and allows minimal movements [11].

2.5 The Hip

The hip (Figs. 2.2 and 2.3) is an enarthrodial joint formed by the articular surface of the femoral head and by the cavity of the acetabulum. The femoral head is covered by the articular cartilage with the exception of the fovea capitis femoris, point of origin of the ligamentum teres. The acetabulum, instead, has an incomplete marginal ring of cartilage called lunate surface. Furthermore, the acetabulum has a central depression occupied by fat covered by synovial membrane [12].

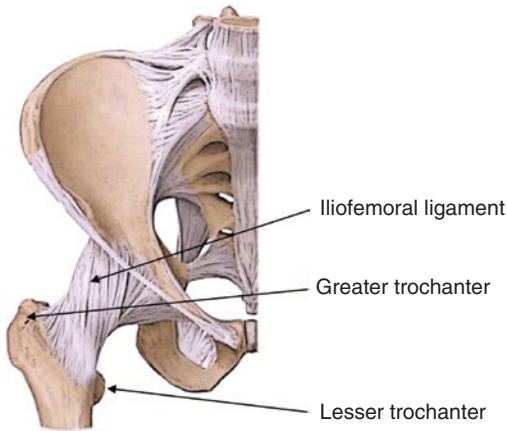


Fig. 2.2 Hip AP

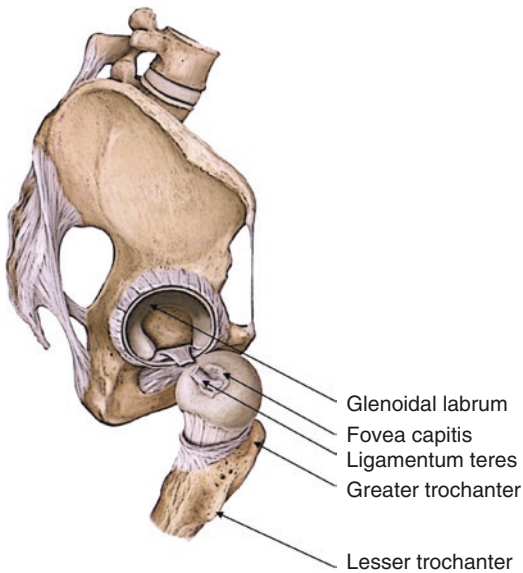


Fig. 2.3 Adductor compartment

The ligamentum teres is implanted on the acetabular notch, and it is tense when the thigh is semiflexed and the limb adducted or rotated outwards and relaxed when the limb is abducted.

The joint is supported by the articular capsule, by the iliofemoral ligament, by the ischiofemoral ligament, by the pubofemoral ligament, by the ligamentum teres femoris and by the glenoid labrum.

The articular capsule is composed by circular fibres in the deep area and by longitudinal fibres in the superficial area. The longitudinal fibres are

greatest in amount at the upper and front part of the capsule, and they are reinforced by capsular ligaments. The capsule is attached to the margin of the acetabulum, to the outer margin of the labrum and to the transverse ligament proximally. Distally, it is attached to the intertrochanteric line anteriorly, to the neck above the intertrochanteric crest posteriorly and to the lower part of the neck inferiorly, near the lesser trochanter.

The iliofemoral ligament, called also Y-ligament or ligament of Bigelow, originates between the lower part of the anterior inferior iliac spine and the acetabular margin; it divides into two bands, one of which is fixed to the lower part of the intertrochanteric line and the other to the upper part of the same line.

The ischiofemoral ligament is sited posteriorly, springs from the ischiatic rim of the acetabulum and blends with the capsular fibres to insert in the posterior area of the femoral neck. It controls the internal rotation and the adduction when the hip is flexed.

The pubofemoral ligament originates from the obturator crest and from the superior ramus of the pubis to insert near the lesser trochanter; its fibres blend with the capsule and with the deep surface of ischiofemoral ligament.

The glenoid labrum is a fibrocartilaginous semicircular rim sited at the acetabular margin and completed at the bottom by the transverse ligament. It closely surrounds the head of the femur.

Finally, the synovial membrane originates from the glenoid labrum and inserts at the margin of the cartilaginous surface of the femoral head [13–16].

2.6 The Adductor Compartment

The adductor compartment (Fig. 2.4) is involved in the stability of the anterior pelvis and pubic joint.

The gracilis is the most superficial muscle on the medial side of the thigh. It originates from the upper part of the pubic arch and from the anterior margins of the lower part of the pubis symphysis. The muscle fibres run vertically and pass behind

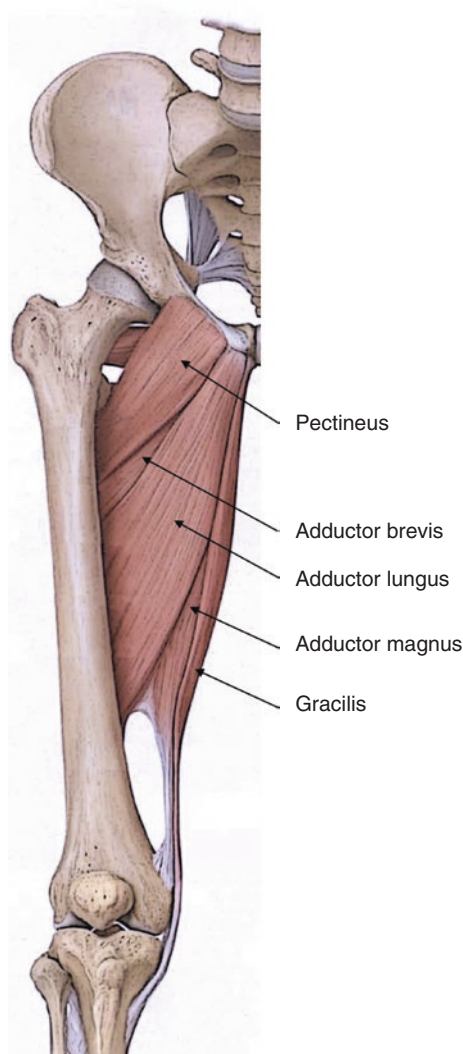


Fig. 2.4 Hip LL

the medial femoral condyle. The insertion is on the upper part of the medial surface of the tibia. Semitendinosus, gracilis and sartorius have a common insertion into the anterior-medial aspect of the tibia called the pes anserinus.

The pectineus is a quadrangular muscle that originates from the pectineal line of the pubis and inserts into the pectineal line of the femur.

The adductor longus is a superficial adductor muscle that arises from the body of the pubis in the angle between the crest and the symphysis. Its tendon is thin anteriorly and composed of muscular fibres on the deep surface of the pubic attachment.

The adductor longus inserts by an aponeurosis into the linea aspera, between the vastus medialis and the adductor magnus.

The adductor brevis is a triangular muscle that arises from the outer surfaces of the superior and inferior rami of the pubis, between the gracilis and obturator externus, and inserts by an aponeurosis into the line leading from the lesser trochanter to the linea aspera and into the upper site of the linea aspera, behind the pectineus and the adductor longus.

The adductor magnus is a large triangular muscle that originates from the inferior pubic ramus and ischial tuberosity, while the remainder arise from the anterior aspect of the superior pubic ramus and the pubic tubercle. His insertion is on the femoral linea aspera [10].

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