

# Hernias of the Abdominal Wall: Inguinal Anatomy in the Male

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The surgical repair of an inguinal hernia, although one of the most common of surgical procedures, presents a special challenge: Groin anatomy remains one of the more difficult topics to master for both the entry-level student and the first assistant. This article reviews the relevant anatomy of the male groin.

## MAJOR FASCIAL AND LIGAMENTAL STRUCTURES

The abdominal wall contains muscle groups representing two broad areas: anterolateral and posterior (see Figure 1). The posterior muscles, the quadratus lumborum, do not concern us

in this discussion. The anterolateral group consists of two muscle groups whose bodies are near the midline and whose fibers are oriented vertically in the standing human: the rectus abdominis and the pyramidalis. The muscle bodies of the other three groups are more lateral, have significantly larger aponeuroses, and have obliquely oriented fibers. These three groups contribute the major portion of the fascial and ligamental structures in the groin area.<sup>1,2,3</sup>

At the level of the inguinal canal, the layers of the abdominal wall include skin, subcutaneous tissue (Camper's and

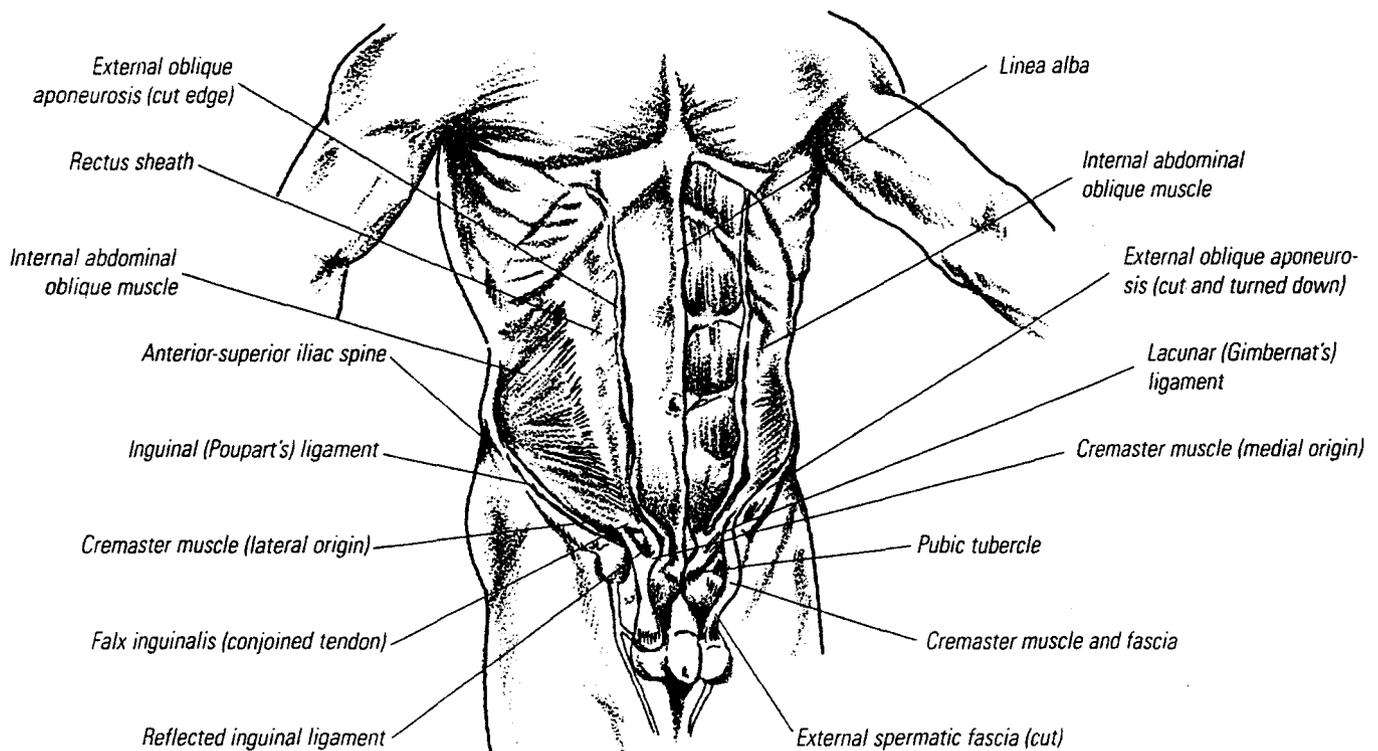
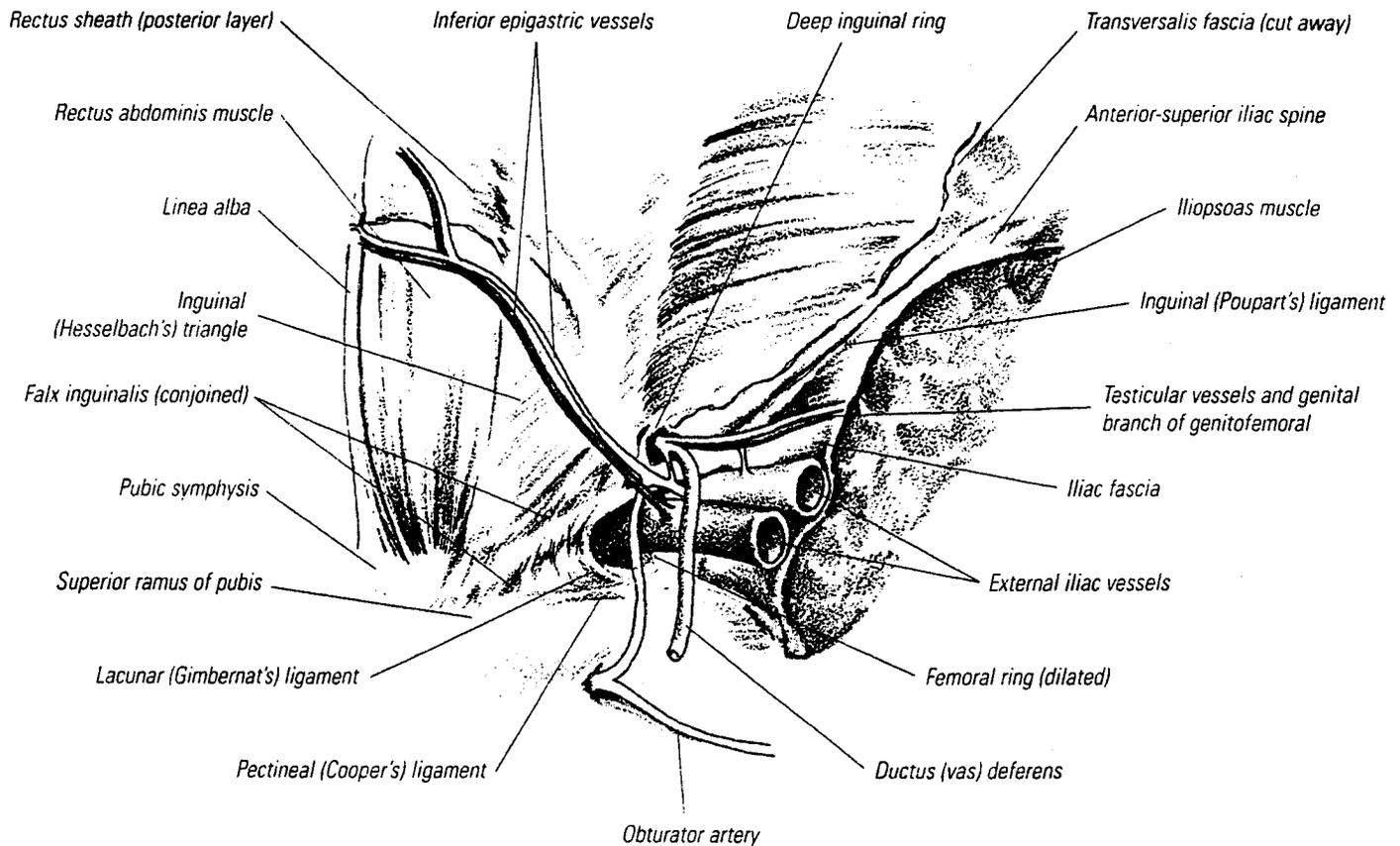


Figure 1—Dissection of the anterior abdominal wall.



**Figure 2**—Dissection of the inguinal region (posterior view).

Scarpa's fascia), external oblique fascia, cremasteric muscle fibers, spermatic cord structures, the transversus abdominis aponeurosis, the transversalis fascia, preperitoneal tissues, and peritoneum.<sup>1,2,3</sup>

#### **EXTERNAL ABDOMINAL OBLIQUE MUSCLE**

The external abdominal oblique muscle is the most superficial, thickest, and largest of the anterolateral muscle groups. The muscle body is found laterally, having a strong, flat aponeurosis occurring anteriorly. The external abdominal oblique muscle arises from the lower outside border of the lower eight ribs. Fibers from the bottom two ribs insert in the iliac crest, while fibers

from the upper six ribs course downward obliquely and anteriorly to become the external oblique aponeurosis. The aponeurotic fibers from each side interlace with fibers from the opposite side in the linea alba. Fibers of the external abdominal oblique fuse with fibers from the underlying internal abdominal oblique to form the sheath of the rectus abdominis muscle.<sup>1,2,3,4</sup>

#### **INGUINAL LIGAMENT**

In the groin area, a continuation of the aponeurosis of the external abdominal oblique stretches from the pubic tubercle to the anterior-superior iliac spine. This extension is a rolled-under, inferior margin of the aponeurosis of the external abdominal oblique and is called the

inguinal (Poupart's) ligament. This ligament marks, in the groin, the separation between the abdominal wall and the lower limb. Hernias that occur immediately above this ligament are considered to be in the inguinal area, while hernias existing below the ligament are called femoral hernias (see Figures 2 and 3).

The more medial of the rolled-under fibers of the inguinal ligament flatten into a horizontal shelf. These fibers attach to the os pubis, and this continuation of the inguinal ligament is called the lacunar (Gimbernat's) ligament. The spermatic cord, which courses through the inguinal canal, rests on the lacunar ligament until it turns to exit through the superficial inguinal ring. Fibers that continue laterally along the

anterior border of the superior ramus of the pubis contribute to the pectineal (Cooper's) ligament.<sup>1,2,3</sup>

### INTERNAL ABDOMINAL OBLIQUE MUSCLE

The internal abdominal oblique muscle—as the middle one of the three flat abdominal muscles—is a thin, muscular sheet arising from the posterior layer of the thoracolumbar fascia, the anterior two-thirds of the iliac crest, the lateral two-thirds of the inguinal ligament, and the iliacus fascia. Posterior fibers ascend vertically to the inferior borders of the lower 3 or 4 ribs, while the other fibers spread fan-like in a forward and medial fashion. The ultimate insertion of these fibers is the linea alba and the pubic bone.

In the upper abdomen, the internal abdominal oblique aponeurosis splits at the linea semilunaris, having an anterior and posterior sheath. In the lower quarter of the abdomen, the aponeurosis does not split, but masses to the midline, anterior to the rectus abdominis muscle. The lower fibers arch over the spermatic cord and insert in the superior border of the pubis. These fibers join with similar fibers from the transversalis muscle to form the falx inguinalis.<sup>1,2,3</sup>

### CREMASTER MUSCLE AND FASCIA

The cremaster muscle originates from the inferior margin of the internal abdominal oblique muscle and forms part of the coverings of the cord and testis: It underlies the external spermat-

ic fascia and serves as the middle one of the three covering layers of the cord and testis (see Figure 4).<sup>1,2</sup>

### TRANSVERSUS ABDOMINIS MUSCLE

The transversus abdominis muscle is the innermost of the flat muscles of the abdomen, having an extensive and varied origin in the cartilages of the six lower ribs, the thoracolumbar fascia, the iliac crest, and the inguinal ligament. The internal surface of the muscle is lined by the transversalis fascia.<sup>1,2,3</sup>

### TRANSVERSALIS FASCIA

The endoabdominal fascia forms a continuous lining of the abdominal cavity. When this fascia lies deep to the transversus abdominis muscle, it is labeled

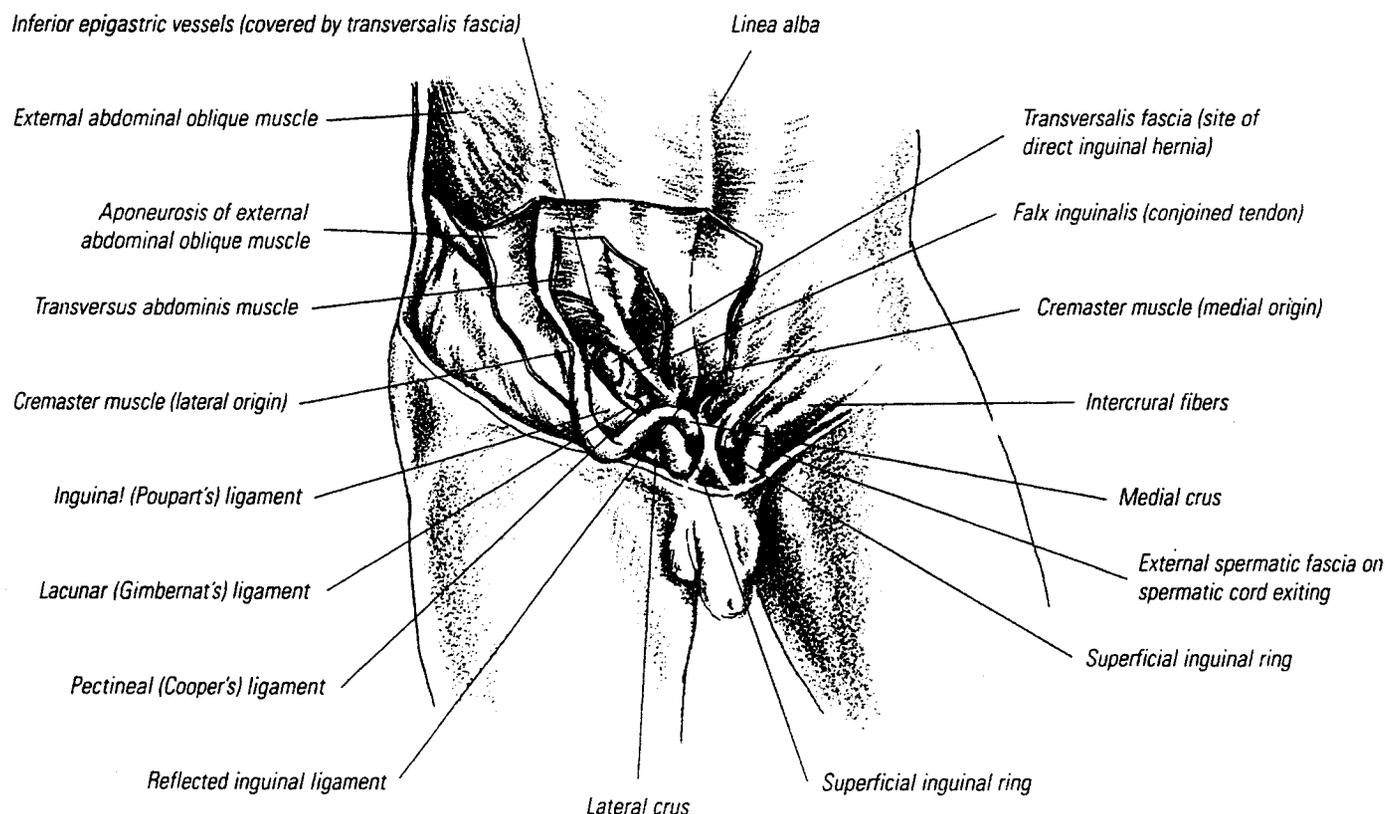


Figure 3—Dissection of the inguinal region (anterior view).

"transversalis fascia." When the endoabdominal fascia is intact, no hernia exists; therefore, all hernias in the groin represent a defect in the transversalis fascia. This fascia is attached to the iliac crest and descends upon the iliac fascia, serving as the superior fascia of the pelvic diaphragm. The internal spermatic fascia is the principle out-pouching of the transversalis fascia; its mouth is the deep inguinal ring.<sup>1,2,3</sup>

### INGUINAL CANAL

The inguinal canal is approximately 4-cm long and obliquely oriented; it lies 2 cm to 4 cm above and parallel to the inguinal ligament. Entrance to the

canal is the deep inguinal ring found above the midpoint of the inguinal ligament. The deep inguinal ring is not truly "ring-like," but a finger-like diverticulum of the transversalis fascia. The canal is directed lateral to medial, deep to superficial, and cephalad to caudad, exiting at the superficial inguinal ring occurring above and lateral to the pubic tubercle.

Whereas the superficial boundary of the canal is formed by the external oblique aponeurosis, the most cephalad wall is formed by the internal oblique and transversus muscles, along with aponeurotic fibers from each. The inferior wall is formed by the inguinal and

lacunar ligaments; the posterior wall—sometimes called the "floor"—is formed by the transversalis fascia and transversus abdominis muscle.

In the male, the contents of the inguinal canal include the vas deferens; deferential artery and vein; testicular artery; lymphatics; autonomic nerves; the ilioinguinal nerve and genital portion of the genitofemoral nerve; and the cremaster artery, which is a branch of the inferior epigastric artery.<sup>1,2,3,4</sup>

### INFERIOR EPIGASTRIC VESSELS

The external iliac arteries supply blood to the legs, and the internal iliac arteries supply the pelvis and perineum. The

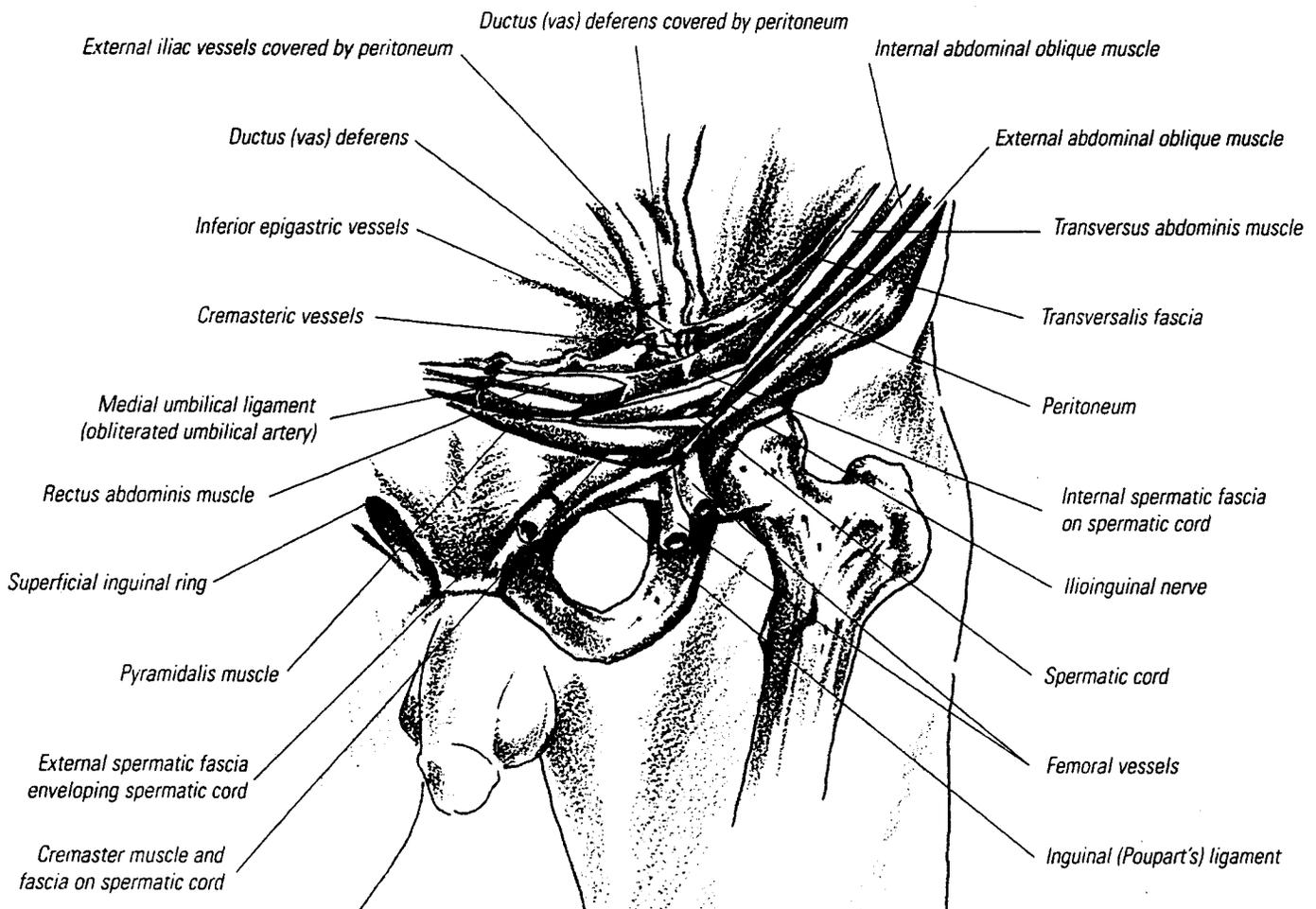
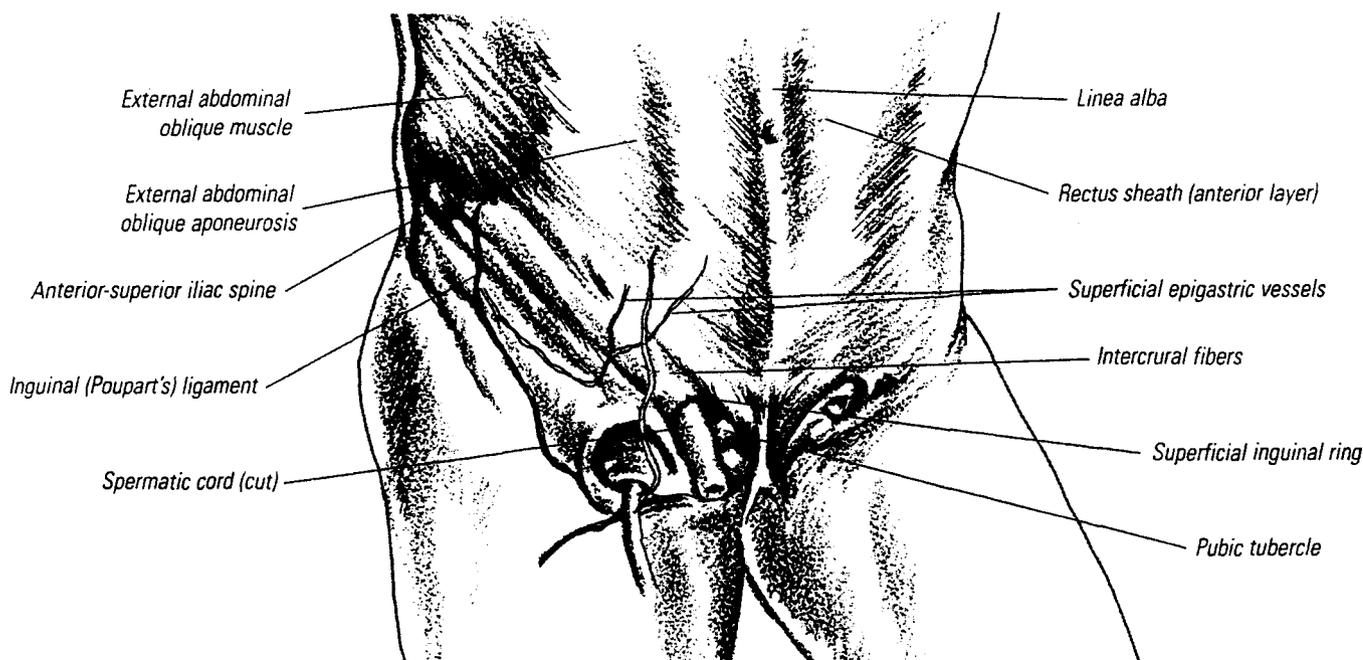


Figure 4—Spermatic cord and inguinal canal.



**Figure 5**—Femoral and inguinal regions (subcutaneous fascia has been removed).

external iliac artery passes under the inguinal ligament at a point midway between the anterior-superior iliac spine and the symphysis pubis: At that crossing point, it becomes the femoral artery. The external iliac artery follows the medial border of the psoas muscle, giving off several branches. The inferior epigastric artery branches from the external iliac artery just above the inguinal ligament and has its origin at the medial border of the deep inguinal ring. The spermatic cord passes behind and lateral to the epigastric artery and vein.

By using three points—the inferior epigastric artery and vein, the symphysis pubis, and the rectus abdominis muscle as it reaches the midline of the abdomen—one can create an imaginary triangle called “Hesselbach’s triangle,” which is used to determine whether a hernia is considered direct or indirect.<sup>1,2,3</sup>

### INGUINAL HERNIAS

Several schemes are used to describe hernias: One of the more traditional distinctions made when referring to inguinal hernias is that between *direct* and *indirect* hernias. The indirect inguinal hernia is characterized by a herniation of abdominal contents into an unobliterated vaginal process within the coverings of the spermatic cord that begins at the deep inguinal ring. The structures traverse the inguinal canal to emerge at the superficial inguinal ring, and the contents may descend into the scrotum (see Figure 5).

The direct inguinal hernia, which occurs one-third as frequently as the indirect hernia, develops secondarily to a weakness in the superficial inguinal ring and the abdominal wall lateral to the falx inguinalis. The inferior epigastric artery lies lateral to the mass; that is to say, the mass occurs in Hesselbach’s triangle. The covering layers of this type of hernia are those of the abdominal wall.

The techniques of hernia repair are beyond the scope of this review, but the certified surgical technologist will recognize that the various methods of repair tend to make use of different ligaments to reconstruct an intact and sufficiently strong transversalis fascial plane.<sup>1,2,3,4</sup>

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