Diagnosis of inguinal and femoral hernia with CT scan. Is it important to identify "who's who"?

Poster No.: C-2168
Congress: ECR 2015
Type: Educational Exhibit
Authors: D. C. Cuellar, A. Fraino, H. Saenz Acuña; Salamanca/ES
Keywords: Abdomen, CT, Diagnostic procedure, Education and training
DOI: 10.1594/ecr2015/C-2168

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Learning objectives

To review the anatomy of the inguinal and crural canal and the visible structures on a CT scan.

To know the types of hernias in this region and to correlate the findings from the abdominal CT scan study.

To know the keys which make it possible to reach a reliable diagnosis of hernias in the inguino-crural area.
Background

The vast majority of hernias are inguinal hernias (80% of cases), while femoral hernias make up 5%; the remaining 15% include umbilical, epigastric, incisional, and other types of hernias. The risk of strangulation is lowest for direct inguinal hernias, which can often be monitored and managed conservatively. Indirect inguinal hernias are at moderate risk of strangulation, whereas approximately 40% of femoral hernias manifest with strangulation.

Computed tomography (CT) remains the best available imaging tool for evaluation of acute abdomen and abdominal hernias. With the advent of higher-resolution multidetector CT scanners, fine detailed anatomy not well defined previously is now better visualized.

The course of the inferior epigastric vessels as well as the common femoral vein are critical landmarks, as their relationship to the hernia neck will determine the type of hernia.
Findings and procedure details

The normal inguinal canal is a narrow diagonal tunnel lined by the aponeuroses of the three abdominal wall muscles. The anterior wall of the inguinal canal is formed by the aponeuroses of the external and internal oblique muscles; the superior wall is formed by the aponeuroses of the internal oblique and transversus abdominis muscles; the posterior wall is formed by the transversalis fascia and the conjoint tendon (represents the juncture of the internal oblique and transversalis fascia medially at the pectineal line); and the inferior wall is formed by the inguinal ligament of Poupart, which is the folded-up lower border of the external oblique aponeurosis and extends from the anterior superior iliac spine to the pubic tubercle.

The inguinal canal runs from the deep inguinal ring to the superficial inguinal ring from superiorly posterolateral to inferiorly anteromedial.

In the female, the inguinal canal transmits the round ligament of the uterus and the ilioinguinal nerve to the labia majora. In the male, the inguinal canal transmits the spermatic cord to the scrotum. In both genders, the canal also contains lymphatic vessels and sympathetic nerve fibers, along with fat and connective tissue.

The Hesselbach triangle is anatomically defined medially by the rectus abdominis muscle, superolaterally by the inferior epigastric vessels, and inferiorly by the inguinal ligament.

- **Direct Inguinal Hernia**

Direct inguinal hernias protrude through the Hesselbach triangle, above the inguinal ligament and medial to the course of the inferior epigastric vessels. These hernias are generally acquired and increase in incidence with age, as they result from weakening of the transversalis fascia in the Hesselbach triangle. Direct inguinal hernias occur most commonly in men and are less often associated with strangulation than are indirect inguinal or femoral hernias.

A direct inguinal hernia emerges anteromedial to the origin of the inferior epigastric vessels and bulges the anterior abdominal wall lateral to the rectus muscle; the sac is directed inferior to the inferior epigastric vessels as it protrudes (Fig. 1). The inguinal canal contents are compressed and stretched laterally by the hernia, and the normal fat of the inguinal canal is pushed into a semicircle of tissue that resembles a moon crescent. This lateral crescent of fat is a useful diagnostic sign of direct inguinal hernia.
As the hernia extends more inferiorly, the inguinal canal contents are further squeezed and stretched into the lateral crescent, and the fat of the crescent disappears. The neck of the hernia sac can be seen arising medial to the course of the inferior epigastric vessels.

- **Indirect Inguinal Hernia**

Indirect inguinal hernias arise lateral and superior to the course of the inferior epigastric vessels, lateral to the Hesselbach triangle, and protrude through the deep or internal inguinal ring to enter the inguinal canal. In the male, they enter the canal anterior to the spermatic cord and may extend through the external inguinal ring into the scrotum. In the female, indirect hernias follow the round ligament into the labia majora.

Indirect inguinal hernias are five times more common than direct hernias. In boys, indirect inguinal hernias are the result of a congenital defect of a patent processus vaginalis. In adults, they are acquired due to weakness and dilatation of the internal inguinal ring.

On axial CT images, the neck of the hernia arises lateral and superior to the course of the inferior epigastric vessels. The hernia neck will be superolateral to the course of the inferior epigastric vessels (Fig. 2) (Fig. 3). The inguinal canal contents are not compressed into a lateral crescent and may be difficult to identify, as the canal contents will appear to make up part of the hernia and may appear to be contained within the hernia sac.

- **Femoral Hernia**

Femoral hernias exit below the inguinal ligament and protrude through the femoral ring into the femoral canal, medial to the common femoral vein. These hernias often compress the femoral vein.

On axial CT images, the neck of the femoral hernia sac can be seen as a narrow protrusion through the femoral ring just medial to the common femoral vein, which often appears indented and compressed by the hernia sac (Fig. 4) (Fig. 5). Femoral venous compression may then cause engorgement of small distal collateral veins around the hernia sac. Femoral hernias typically have a characteristic funnel-shaped neck.

The inguinal canal, which is medial to the sac, may appear edematous. The neck of the femoral hernia sac emerges caudal to the origin of the inferior epigastric vessels, as the femoral ring is inferior to their origin. The femoral hernia sac may contain edema, with subtle compression of the femoral vein.
Fig. 1: Bilateral direct inguinal hernia that was diagnosed incidentally. It is useful to analyze the course of the inferior epigastric vessels, the hernia sac moves craniocaudal and medial to the inferior epigastric vessels.

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Fig. 2: Right indirect inguinal hernia. The hernia sac, which contains the bladder and perivesical fat, is located lateral to the inferior epigastric vessels.

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**Fig. 3:** Indirect inguinal hernia in which the hernia sac contains fat and a small amount of liquid. The hernia sac is lateral to the inferior epigastric vessels and has a diagonal course.

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**Fig. 4:** Dilation of the loops of the small bowel in a woman with left crural hernia. The hernia sac shows dilated loops of the small bowel. Note the deformity of the femoral vein compared with the contralateral side (caused by compression).

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**Fig. 5:** Abdominal CT scan with contrast shows a dilation of the loops of the small bowel with a change of caliber in a right crural hernia, with ingurgitation of the vessels and the stretches of subcutaneous fat next to the hernia sac.

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Conclusion

CT scan is a reliable diagnostic tool for the diagnosis of inguinal and crural hernias.
References


