Value of the pubic tubercle as a CT reference point in groin hernias

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Abstract

Purpose. To assess the value of the pubic tubercle as a CT reference point in diagnosing the different types of groin hernia before surgery in patients presenting with mechanical bowel obstruction.

Materials and methods. Retrospective review of CT examinations performed for small bowel obstruction in our department during 2003. Twelve cases of groin hernia causing small bowel obstruction were included. All CT examinations were reviewed by 2 abdominal radiologists. The surgical report of all 12 included cases was reviewed for final diagnosis.

Results. Twelve cases of groin hernia causing small bowel obstruction were reviewed in our department during 2003. Eight cases corresponded to small bowel obstruction caused by inguinal hernia (4 direct and 4 indirect) and 4 to small bowel obstruction caused by femoral hernia. In each case, the diagnosis suggested at CT using the pubic tubercle as a reference point was surgically confirmed.

Conclusion. The pubic tubercle is an excellent reference point at CT for diagnosing inguinal and femoral hernias. Preoperative diagnosis is important because it may change the choice of surgical procedure.

M eshernia at the groin is frequent. The hernia may be inguinal, direct or indirect, or femoral. Anatomically, the neck of both main categories of hernia is located above and below the inguinal ligament respectively (fig. 1). In spite of this anatomical difference in location, it may be difficult to distinguish between both types at clinical examination. Furthermore, the hernia may sometimes not even be detectable at clinical examination (1). In such cases, and in the presence of overt bowel obstruction, CT is routinely used to further assess (2-5). CT can confirm the diagnosis of bowel obstruction, demonstrate the groin hernia, and detect signs of bowel compromise. To our knowledge, no formal CT criteria to differentiate between inguinal and femoral hernia have been presented (6). This distinction is important since surgical management is different.

It is for this reason that we have elected to identify and evaluate an anatomical landmark that could reliably and accurately distinguish between inguinal and femoral hernia. Because the inguinal ligament is not visible at CT, and similar to Wechsler et al. (7), we have selected the pubic tubercle as a landmark because it is easily identifiable and because it corresponds to the antero-inferior insertion site of the inguinal ligament. The purpose of this study was to correlate CT results using the pubic tubercle as a landmark with surgical findings.
Materials and Methods

A total of 74 CT examinations showing mechanical small bowel obstruction in 2003 were retrospectively reviewed. Inclusion criteria were: presence of a groin hernia and related mechanical small bowel obstruction. Twelve of the 74 reviewed CT examinations showed small bowel obstruction due to a groin hernia. The CT examinations were performed using two different CT units: single detector row GE HiSpeed (GE Healthcare) and four detector row Siemens Volume Zoom CT (Siemens Medical). All patients received a total of 120 ml of iodinated contrast material injected at a rate of 2 ml/sec using a power injector (Medrad). Contiguous 7 mm thick axial CT images were obtained at the portal venous phase of contrast distribution. All 12 examinations were reviewed twice to evaluate the reproducibility of positioning of orthogonal lines at the pubic tubercle on axial CT images (fig. 2). The hernia was considered inguinal when the herniating bowel loop was ventral to the absciss axis (x-x’) and femoral when dorsal to the same axis. The type of inguinal hernia (direct versus indirect) was established using the ordinate axis (y-y’). Hernias entirely lateral to this axis were considered direct whereas hernias transgressing this axis, even if only partially, were considered indirect (fig. 4 and 5). All 12 cases of groin hernia in our series were characterized using this set of criteria and results were correlated to surgical findings.

Table I
Summary table of all cases.

<table>
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<tr>
<th>Case</th>
<th>Sex</th>
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<th>x-x’ relationship</th>
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</table>

M: Male; F: Female; DIH: Direct Inguinal Hernia; IIH: Indirect Inguinal Hernia; FH: Femoral Hernia.

Fig. 1: Line drawing of the groin region showing the 3 types of hernia. 1=Indirect inguinal hernia; 2=Direct inguinal hernia; 3=Femoral hernia; White star = pubic tubercle.

Fig. 2: Contrast-enhanced CT scan at the level of the pubic tubercles. Schematic construction of orthogonal lines focused on the pubic tubercles.

Fig. 3: Case n°1. Contrast-enhanced CT at the level of the left pubic tubercle. Left direct inguinal hernia (white star) located ventral to the X-axis (x-x’) and lateral to the Y-axis (y-y’).

Fig. 4: Schéma de la région de l’aine montrant les 3 types herniaires. 1 = Hernie inguinale indirecte ; 2 = Hernie inguinale directe ; 3 = Hernie fémorale ; Étoile blanche = épine du pubis.

Fig. 5: CoupeTDM passant par les épinés pubiennes. Construction schématique de 2 repères orthogonaux centrés sur les épinés pubiennes.
Results

Results are summarized in table I. Twelve patients, 4 males and 8 females (sex ratio = 1:2) with a mean age of 79 years, with mechanical small bowel obstruction secondary to a groin hernia were evaluated in our service in 2003. Based on orthogonal lines placed at the pubic tubercle on axial CT images, 4 cases were characterized as femoral hernias and 8 as inguinal hernias (4 direct and 4 indirect). There was no inter-observer discrepancy. There was 100% correlation between CT diagnoses and surgical findings.

Discussion

Groin hernias include inguinal hernias, direct or indirect, and femoral hernias. Both types of hernias are defined by their relationship relative to the inguinal ligament. Inguinal hernias are superior to the ligament whereas femoral hernias are below the ligament.

Indirect inguinal hernias and femoral hernias are more prone to obstruction than direct inguinal hernias (8), frequently due to incarceration of a short segment of bowel herniating through a narrow hernia neck. These small hernias may be difficult to correctly diagnose clinically, and may even be clinically undetectable (1).

With the increasing use of CT in patients with acute abdomen, especially those with bowel obstruction, these hernias frequently undergo CT imaging. Excluding the clinically apparent inguinoscrotal indirect inguinal hernia, we are not aware of any reported CT criteria that readily differentiates between the different types of groin hernia causing bowel obstruction. Only the inferior epigastric artery, easily identified on postcontrast CT, can effectively differentiate between both types of inguinal hernias, with the direct type medial to the artery and the indirect type lateral to the artery (9, 10).

The current study is based on the hypothesis, previously introduced by Wechsler et al. (7), that while the inguinal ligament, corresponding to the antero-inferior insertion site of this ligament, is easily detected on CT. Based on this hypothesis, inguinal hernias, anatomically situated above the ligament, should be located entirely anterior to (direct inguinal hernia) or partially anterior to (indirect inguinal hernia) orthogonal lines drawn at the pubic tubercle from an axial image. On the other hand, femoral hernias that are situated below the ligament can only be located posterior to orthogonal lines drawn at the pubic tubercle from an axial image. To test this hypothesis, we have correlated CT findings with surgical results in 12 patients with small bowel obstruction due to a groin hernia evaluated at our institution in 2003. Results confirmed our hypothesis since using this anatomical landmark, all femoral hernias (n = 4) were correctly distinguished from inguinal hernias (n = 8), and direct inguinal hernias (n = 4) were correctly distinguished from indirect inguinal hernias (n = 4). The pubic tubercle is thus an excellent landmark on CT for characterization of groin hernias. This is valuable since optimal surgical management is different for direct and indirect inguinal hernias and femoral hernias (11). Inguinal hernias typically require an oblique surgical incision along the inguinal ligament whereas femoral hernias require a vertical incision. Presurgical knowledge of the exact type of hernia is thus advantageous for optimal surgical management.

In conclusion, and in spite of the small number of patients, it appears that the pubic tubercle is a very valuable anatomical landmark on CT for accurate characterization of groin hernias prior to surgical management of patients presenting with mechanical bowel obstruction.

References

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E Delabrousse et al.