



Body Imaging

Radiographic and surgical findings of type I obturator hernias in patients with refractory groin pain

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ABSTRACT

Groin pain is a common complaint in the general population, with an underlying etiology that may be difficult to diagnose. Although uncommon, type I obturator hernias may be a significant source of chronic or refractory groin pain. In this review, we discuss the commonly missed findings of type I obturator hernias at CT and MRI, as well as correlate these findings with images obtained at the time of laparoscopic repair.

1. Introduction

Groin pain is a common complaint in the general population, with an underlying etiology that may be difficult to diagnose. As many as 27% of men and 3% of women will develop a groin hernia of any type during their lifetime [1,2]. In the workup of these patients, radiographic imaging may be employed to determine the anatomic or functional cause of pain. As a tertiary center for groin pain and hernia surgery, we regularly see patients with refractory groin pain in whom a missed obturator hernia is later diagnosed. Of particular interest have been type I obturator hernias, as these are an under-reported [3] and often significant source of pain. This may in part be due to their relative rarity, accounting for less than 0.1% of all hernia subtypes [3]. Despite the increasingly accurate diagnostic capabilities of CT and MRI [4–6], the radiographic diagnosis of type I obturator hernias is frequently overlooked. We therefore intend to discuss the anatomy, classification, imaging, and surgical characteristics of type I obturator hernias, as well as how their diagnosis may more effectively be made at the time of imaging and clinical exam.

2. Anatomy

Obturator hernias form through the obturator foramen, an opening inferior to the acetabulum bordered by the ischial and pubic rami (Fig. 1). Musculoaponeurotic contributions from the obturator internus and obturator externus partially cover this opening, forming the obturator membrane. At its anterosuperior border, this membrane opens

to form the obturator canal, a narrow passage through which the obturator nerve, artery and vein (*obturator neurovascular bundle*) communicate with the medial thigh. At the level of this canal the obturator nerve divides into its anterior and posterior divisions (Fig. 2). The anterior division travels superficial to the obturator externus before interposing between the pectineus and adductor brevis, supplying cutaneous sensory innervation to the medial thigh as well as motor innervation to the pectineus, gracilis, and adductor longus and brevis muscles [7]. The posterior division descends medial to the obturator externus before piercing it, traveling between the adductor brevis and adductor magnus as it courses distally. This posterior division supplies motor innervation to the obturator externus, adductor brevis and adductor magnus muscles [7].

Weakening of the obturator membrane leads to enlargement of the obturator canal, with herniated contents passing either anteromedial to the neurovascular bundle or splaying them apart. In women this canal may be larger and more horizontal, leading to a 6:1 female-to-male predominance. Risk factors include multiparity, advanced age, increased intraabdominal pressure and profound weight loss, with patients often weighing less than 40 kg [3,8]. Although bilaterality is common, isolated right-sided obturator hernias occur three times more commonly than isolated left-sided hernias [9].

3. Classification

Three types (or *stages*) of obturator hernia are described based on the underlying anatomic defect [10]. Hernias containing only

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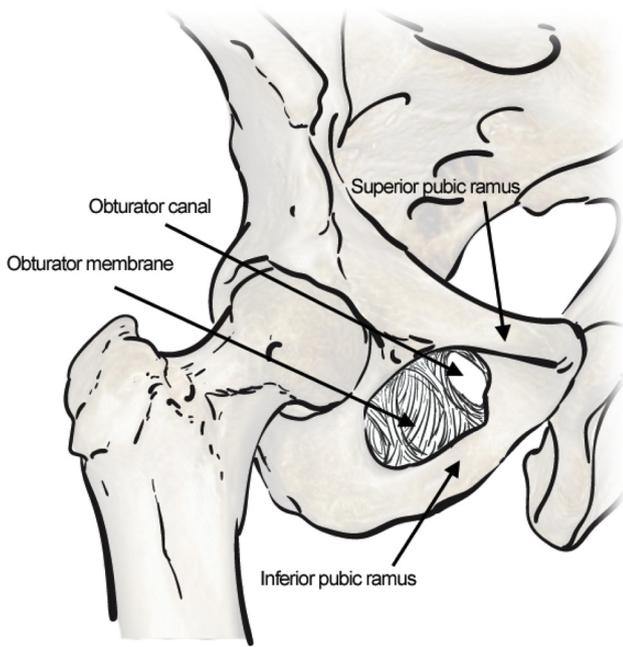


Fig. 1. Obturator anatomy. Musculuoaponeurotic contributions of the obturator internus and externus muscles form the obturator membrane. At its anterosuperior margin this membrane opens to form the obturator canal, through which the obturator neurovascular bundle and potential hernias traverse.

preperitoneal connective tissue and fat (*pilot tag*) are classified as type I (Fig. 3). Once peritoneum indents upon the internal opening of the obturator canal, the hernia progresses to invaginate peritoneal sac and is classified as type II. At cross-sectional imaging this usually presents with a fluid-filled sac. Further herniation of pelvic or peritoneal viscera such as bowel, bladder, or ovary classifies the hernia as type III.

4. Physical findings

At clinical examination, the Howship-Romberg sign is a specific indicator for obturator hernia, occurring in 37–67% of cases [11]. This sign may be produced by direct intravaginal palpation of the obturator foramen, or indirectly via abduction, extension and medial rotation of the affected hip. In the presence of an obturator hernia, these maneuvers compress the cutaneous sensory branches of the obturator nerve’s anterior division, causing pain and/or paresthesia to radiate from the medial thigh to the knee. The Hannington-Kiff sign may also be observed, where compression of the posterior obturator nerve motor branches causes loss of the adductor magnus reflex while retaining a positive patellar reflex [12].

In our experience, any obturator hernia regardless of subtype may be a clinically significant source of groin pain. We make this distinction because many patients carrying the radiographic diagnosis of obturator hernia do so only when types II or III are apparent at imaging. This is inadequate, however, as even an isolated pilot tag of a type I hernia may prove as debilitating as those containing peritoneal sac or viscera. This observation is largely due to mass effect and compression of the neurovascular bundle. We estimate that as many as 50% of symptomatic obturator hernias presenting through our outpatient clinics are later determined to be type I.

It should be noted, however, that not all type I obturator hernias are symptomatic. Perry and Hantes have reported that type I obturator hernias are present in up to 64% of women at cadaveric dissection [11]. The relative rarity of type II and type III obturator hernias therefore suggests that most hernias do not progress beyond an asymptomatic type I stage [10].

5. Medical imaging

Due to their low incidence, type I obturator hernias may present a diagnostic challenge for the radiologist or surgeon. As with any neurovascular bundle, trace volumes of fat normally travel along the obturator nerve and vessels through the obturator canal. This may

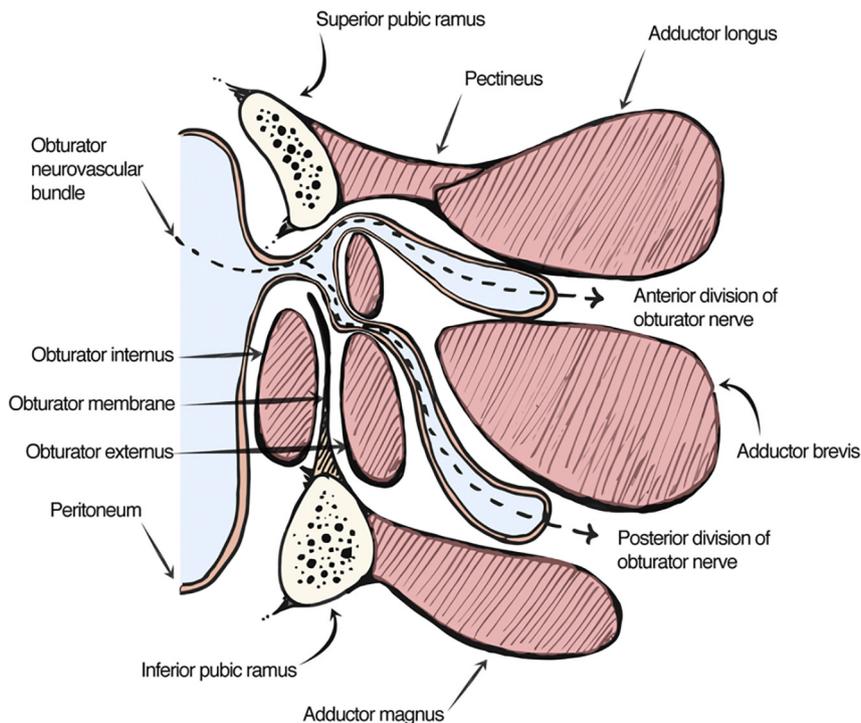


Fig. 2. Obturator hernia pathways. Anterior and posterior divisions of the obturator nerve serve as pathways for obturator hernia propagation. Reproduced with modification via Gray et al. [18].



Fig. 3. Obturator hernia subtypes at axial CT. Type 1 obturator hernia (A) represents an asymmetric or abnormal volume of fat herniating through the obturator canal. Type 2 obturator hernia (B) is defined by herniation of peritoneal sac, often with trapped peritoneal fluid. Type 3 obturator hernia (C) is usually the most clinically and radiographically apparent subtype, occurring when pelvic or abdominal viscera herniate through the obturator canal.



Fig. 4. Coronal T1-weighted MR images of the obturator canal. The patient in image A demonstrates a normal right obturator canal, with only a small volume of fat accompanying the obturator neurovascular bundle as it passes between the obturator muscles. The patient in image B demonstrates an abnormal volume of fat traversing the left obturator canal, compatible with a fat-containing type I obturator hernia.

increase with body habitus and deposition of intraabdominal fat. Protrusion of this fat through the foramen between the pectineus and obturator externus muscles has traditionally been considered a pathognomonic imaging feature [13]. Less frequently this fat may instead interpose between the adductor magnus and adductor brevis muscles along the course of the obturator nerve's posterior division. Comparison for symmetry with the contralateral canal is therefore the first and most important step in evaluation (Fig. 4). This may be performed in any plane using either multidetector CT or MRI. Due to potential obliquity of the pelvis, comparison with sagittal and/or coronal planes is essential and may be of greater diagnostic value than axial imaging alone. This may more readily be done with non-fat-suppressed imaging such as T1 in multiple planes. It is our experience that patients presenting with MR imaging of the pelvis from outside facilities often includes multiplanar fat-suppressed imaging with T1- or intermediate-weighted sequences limited to the axial plane only. This utilization of fat suppression decreases conspicuity of type I obturator hernias and may consequently contribute to missed diagnoses (Fig. 5). Due to the greater

proportion of young athletes seen in our practice, MR imaging is preferred over CT in an effort to limit cumulative radiation exposure. MR imaging also provides better soft tissue contrast over CT, and is therefore considered of greater diagnostic value in the identification of type I hernias.

It should be noted that visualization of fat on either side of the canal alone is insufficient for the diagnosis of type I obturator hernia. Instead, accurate diagnosis depends on an abnormal volume of fat traversing the canal. While a mass-like component of fat extending through the obturator canal to the obturator externus is clearly diagnostic more subtle findings of an asymmetric distribution of fat within the canal and splaying of the neurovascular bundle is also highly suggestive. In our experience, obturator hernias containing loops of bowel and/or fluid are less likely to be missed by the referring clinician on exam and prior imaging. Existing radiology literature is replete with case reports of bowel and peritoneal fluid-containing hernias [14,15], however relatively few reports of type I hernias are available. Radiologists have consequently and inadvertently been trained to limit their satisfaction-



Fig. 5. Effects of fat saturation on the conspicuity of fat-containing hernias. Sagittal Proton Density-weighted image (A) demonstrate clear visualization of fat-containing obturator (arrow) and inguinal (arrow head) hernias. Fat suppression (B) obscures these findings, making the diagnosis more difficult and easily missed.

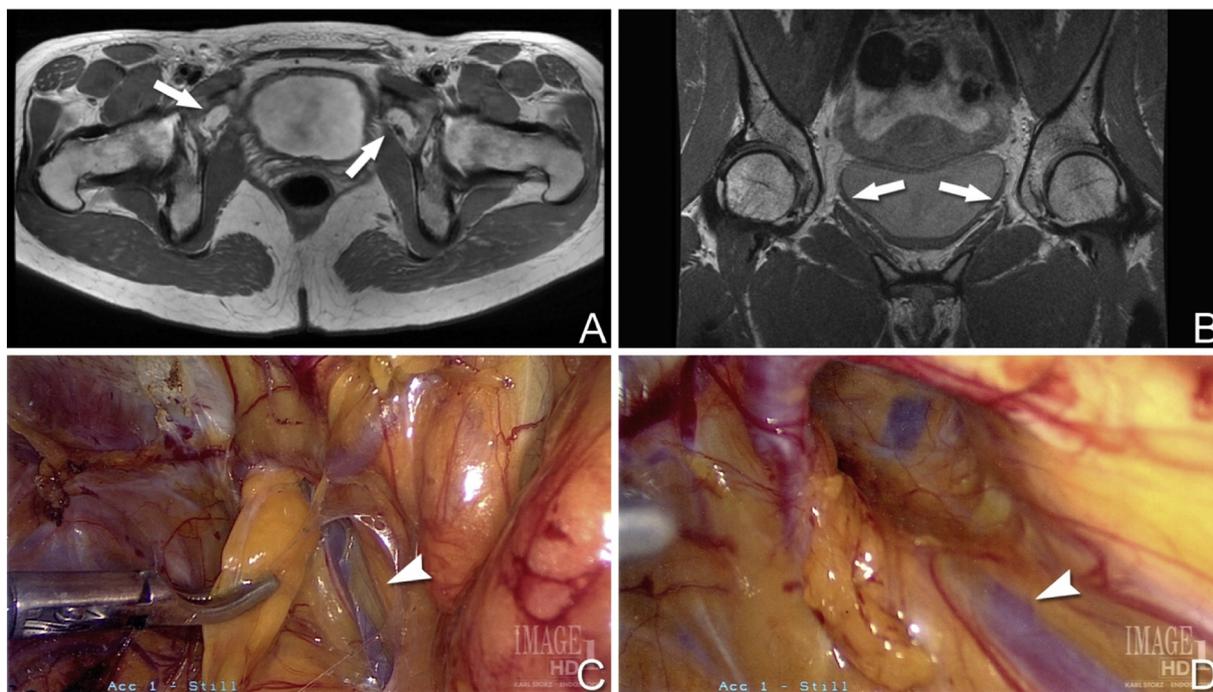


Fig. 6. 32-year old female with chronic groin pain. Axial (A) and coronal (B) Proton Density-weighted images demonstrate bilateral type-1 obturator hernias (arrows). Intraoperative laparoscopic images (C and D) confirm a pilot fat tag traversing the right obturator canal, compressing the obturator neurovascular bundle (arrow head). Following reduction the obturator canal is free of herniated fat (D).

of-search to bowel and/or fluid herniating through the obturator canal, often omitting the potentially significant presence of fat.

An accurate history and specific symptomatology is crucial to appropriately protocol the examination. While patients with groin pain are often referred for imaging of the hip, the referring physician and radiologist must delineate symptoms referable to diagnoses that may exist beyond the hip. As such, imaging should be tailored and viewed with appropriate clinical suspicion for not only pelvic or abdominal hernias, but for other diagnoses as well [16].

Lastly, while sonography continues to gain traction in the evaluation of inguinal hernias, we have found it to be comparatively

ineffective in the initial diagnosis of a type I obturator hernia. It is the opinion of these authors that the depth of the obturator canal and acoustic reflections of the osseous ring limit adequate evaluation. An important exception, however, is that while the initial diagnosis is not easily made by sonography, ultrasound-guided perineural obturator nerve injection does remain helpful in confirming obturator neuralgia secondary to an obturator hernia identified on other imaging modalities.

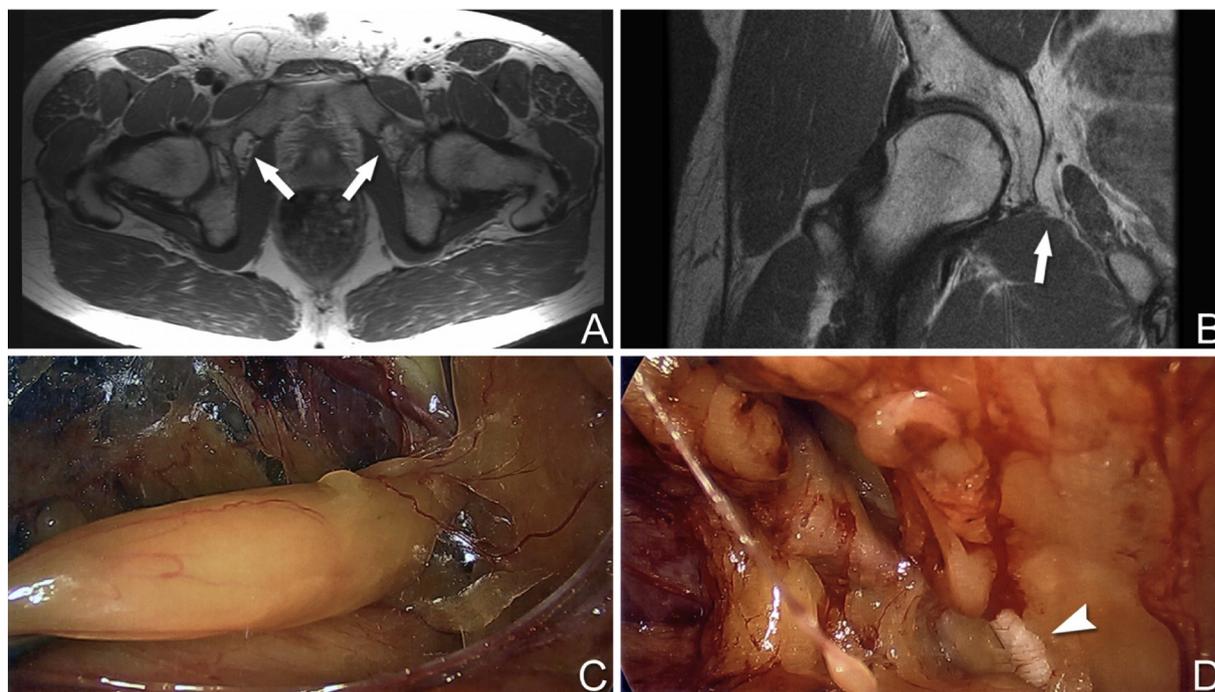


Fig. 7. 40-year old male with chronic groin pain. Axial (A) and coronal (B) Proton Density-weighted images again demonstrate bilateral type-1 obturator hernias (arrows) and bilateral fat-containing indirect inguinal hernias. Laparoscopic images (C and D) confirm the presence of bilateral type I obturator hernias (right shown). Following reduction, the obturator canal is free of herniated fat and the obturator nerve is unimpinged (D, arrow head).

6. Clinical cases

6.1. Case 1

A 32-year old female presented with 2–3 years of bilateral groin pain (Fig. 6). She had undergone bilateral hip arthroscopy for CAM impingement during that time. Although she experienced greater range of motion in both hips, she continued to have groin pain which was centered predominantly at the inner thigh and just posterior to the adductor insertion. Noncontrast CT imaging did not reveal significant pathology. Of note, however, T1-weighted MRI in the coronal, sagittal, axial and oblique planes did reveal larger amounts of fat protruding into the obturator canals. Diagnostic injection of the obturator nerve on the more symptomatic side was done and provided short-term relief. She was taken to the operating room for laparoscopic exploration where large fat-containing obturator hernias were noted and reduced into the preperitoneal space. A mesh was placed over the defect as well as covering the internal inguinal ring and direct space. The patient experienced relief of the inner thigh pain postoperatively.

6.2. Case 2

A 40-year old female with a well-known history of endometriosis was evaluated for persistent bilateral groin pain (Fig. 7). She was status post multiple prior laparoscopies during which several endometrial deposits were excised in the pelvis and retroperitoneum. Although some of her symptoms improved, she continued to have significant inner thigh pain, adductor weakness (left greater than right), and a small degree of neuropathy to the medial aspect of the left foot. MRI revealed bilateral inguinal hernias as well as large bilateral type 1 fat-containing obturator hernias. Laparoscopy in the preperitoneal space confirmed fat-containing indirect inguinal hernias and fat-containing obturator hernias bilaterally. These were both repaired and mesh placed over both obturator canals, direct spaces and internal inguinal rings. Several symptoms referable to the obturator canal hernias subsequently improved.

7. Conclusion

Obturator hernias are a significant and often underdiagnosed cause of groin pain [10]. A type I obturator hernia containing only preperitoneal fat may easily be overlooked at the time of imaging [17]. A clear understanding of the anatomy and radiographic findings of obturator hernias will help to reduce lengthy workups and promote effective surgical management. We recommend that in patients presenting with chronic and refractory groin pain that the diagnosis of obturator hernia be considered and subsequently imaged by dedicated multiplanar MRI, particularly with non-fat suppressed sequences in multiple planes.

Disclosures

None.

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