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Littre hernia in adults: imaging features and clinical implications

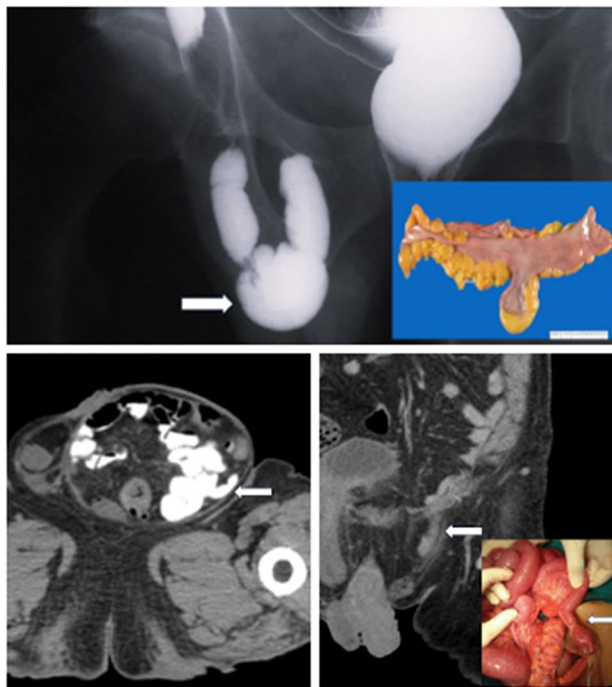
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Abstract

Littre hernia is an inguinal or abdominal wall herniation that contains a Meckel's diverticulum alone or with other intestinal loops. The diagnosis is usually made at surgery, but its pre-operative radiological recognition has been a challenge due to inherent difficulties in detecting the Meckel's diverticulum within hernial content. The aim of this article is to present 8 adults in whom a Meckel's diverticulum protruding into their inguinal, umbilical or incisional hernia had been demonstrated by barium examination of the small bowel or colon, or on computed tomography and magnetic resonance imaging of the abdomen and pelvis. This series included 7 men and 1 woman, who ranged in age from 34 to 78 years (mean age:57 years). Seven patients had subsequent hernia repair, when the diverticulum was visualized and resected. This report highlights the imaging features of these 8 Littre hernias since only 5% of published cases had been diagnosed pre-operatively because the Meckel's diverticulum had resulted in complications. It also reviews the pertinent literature regarding the prevalence and clinical implications of this rare entity.

Graphical abstract



Littre hernia in adults

- **Findings:** Meckel's diverticulum protruding into a hernial sac
- **Hernia location:** Inguinal (6), Umbilical(1) and Incisional(1)
- **Material:** 7 Men and 1 women, ages 34 to 78 years
- **Imaging Method:** Barium examination (2), CT (6),MR (1)
- **Operation:** Elective diverticulectomy and hernia repair (7)

Keywords Littre hernia · Radiological diagnosis · Meckel's diverticulum · Abdominal disorders · Computed tomography · Magnetic resonance imaging

Introduction

Littre hernia denotes any inguinal or abdominal wall hernia that contains a Meckel's diverticulum, occasionally in conjunction with other intestinal loops. It is named after the French surgeon Alexis de Littre, who had described an out-pouching of the ileum extending into an inguinal hernia in 1700. The embryologic origin of such a diverticulum was later documented by the German anatomist, Johann Friedrich Meckel, in 1809 [1, 2]. Although Meckel's diverticulum is the most common congenital anomaly of the human intestinal tract and occurs in 2–3% of individuals, its herniation is very rare. About 100 isolated cases of Littre hernia have been reported in the surgical literature [3, 4]. However, pre-operative radiological diagnosis was made in 5 patients who had presented with complications of Meckel's diverticulum, indicating that only 5% of the cases were correctly recognized by imaging examinations [5–9].

The author had encountered 8 adult patients with Littre hernia, whose Meckel's diverticula were demonstrated by various imaging studies and confirmed at surgery. These cases prompted a review of this rare entity and its diagnostic features.

Materials and methods

This series consisted of 7 men and 1 woman, whose age ranged from 34 to 78 years (mean age: 57 years). Six of them had inguinal hernias, while the other two had presented with large umbilical or incisional hernias. All of them were examined pre-operatively, and their Meckel's diverticula were demonstrated by various imaging techniques that included barium examinations in 2 patients, and computed tomography (CT) or magnetic resonance (MR) imaging of the abdomen and pelvis in 6 cases. The protocol for contrast-enhanced CT included intravenous administration of 100 ml of Omnipaque 350, images acquired in the arterial and portal venous phase and reconstructed in 3.75 mm axial and 3 mm coronal and sagittal sections.

The diagnosis of Littre hernia was confirmed during subsequent surgery in 7 patients, and all of them recovered without any complications. One 75-year-old man was not operated because his small and asymptomatic hernia was an incidental finding of abdominal and pelvic CT examinations for an unrelated condition. The medical and radiological records of these patients were reviewed retrospectively for the purpose of obtaining their clinical history and outcome data, selecting the best images for reproduction, and correlating them with photographs taken intra-operatively or of the resected specimens.

Results

Radiographic findings

Two patients had been referred for pre-operative barium examinations to determine the intestinal content of their inguinal hernias. The requested studies were performed under fluoroscopy by the author in 1988 and 1993 at the Evanston Hospital - Northwestern University in Evanston, Illinois.

Case 1 The air-contrast colon examination of a 45-year-old man showed retrograde filling of distal ileum, which had herniated through the right inguinal canal and harbored a 2.5 cm round saccular outpouching (Fig. 1). Because the hernia was irreducible, the incarcerated segment of the ileum and its attached normal Meckel's diverticulum were resected during hernia repair.

Case 2 Small bowel examination with barium was done in a 34-year-old man, who had developed a painful right inguinal mass. It demonstrated opacification of a 7 cm long Meckel's diverticulum with bulbous configuration, which protruded and incarcerated in the right scrotal sac (Fig. 2A, B). Inflammatory changes of its tip were noted at the time of its removal during hernia repair, and its histopathology showed acute diverticulitis with patches of ectopic gastric and pancreatic tissue in the mucosa.

CT and MR imaging features

Six patients had been evaluated by abdominal and pelvic CT with intravenous or oral contrast, and one of them also had MR imaging by a 1.5 T equipment. These examinations had been reviewed or reported by the author at the University of California-San Diego Medical Center during the period 2000–2018. The Meckel's diverticula of these patients were clearly demonstrated on the obtained images, thus leading to an accurate pre-operative diagnosis of Littre hernia.

Case 3 A 74-year-old man presenting with large bilateral inguinal hernias underwent an abdominal and pelvic CT with oral contrast. The images showed that the cecum had protruded into the right inguinal hernia, whereas the displaced ileal loops and a 3 cm long Meckel's diverticulum had herniated into the left scrotal sac (Fig. 3).

Case 4 A 68-year-old man with history of prior right inguinal herniorrhaphy had developed large bilateral inguinal hernias. His abdominal and pelvic CT revealed that the urinary bladder was in the right-sided hernia, and a tubular-shaped Meckel's diverticulum protruded into the left

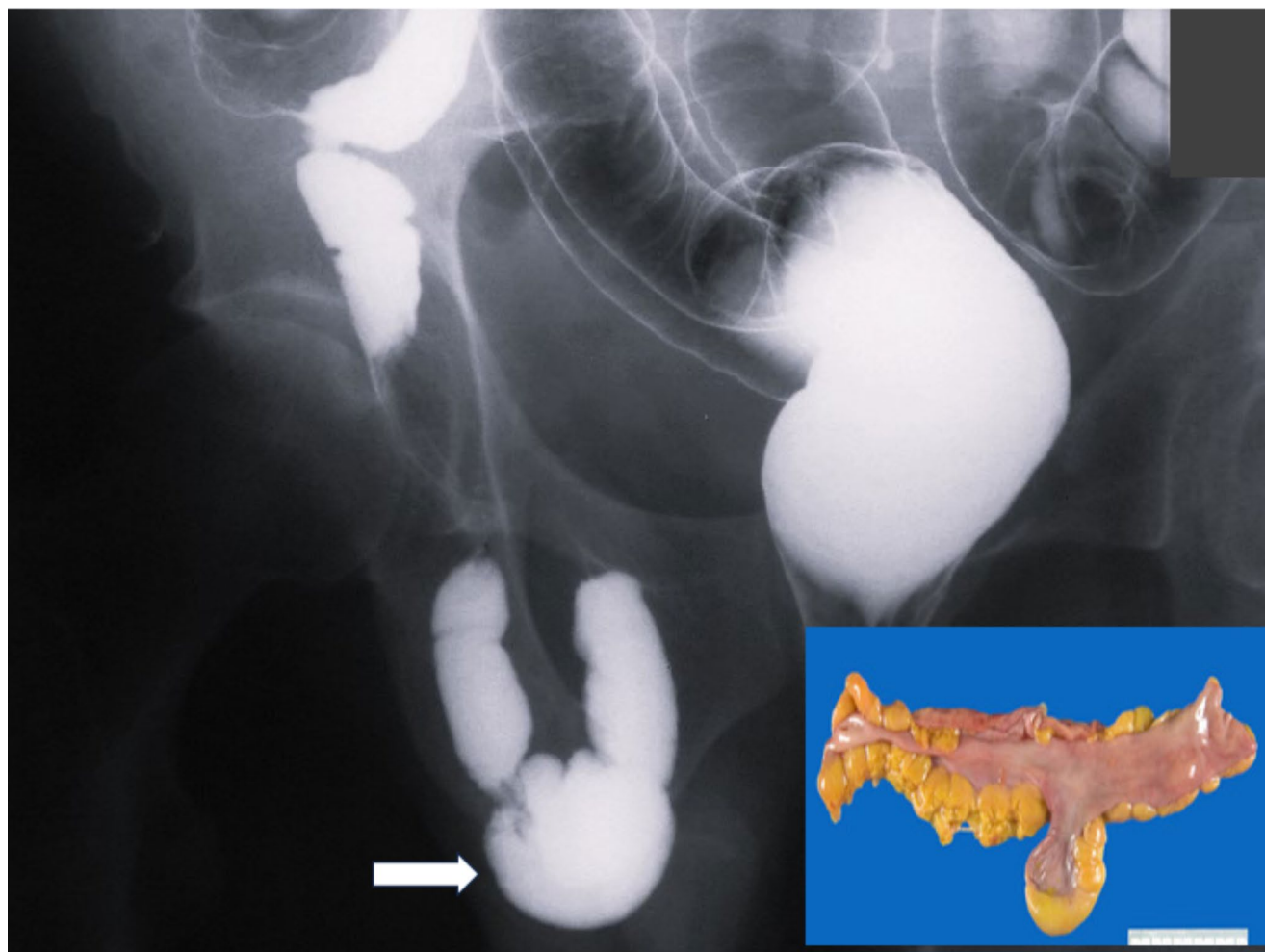


Fig. 1 Air-contrast barium examination of the colon in this 45-year-old man shows a right inguinal hernia containing an ileal loop and its attached 2.5 cm round Meckel's diverticulum (arrow). Inset: photo of the resected segment and normal diverticulum

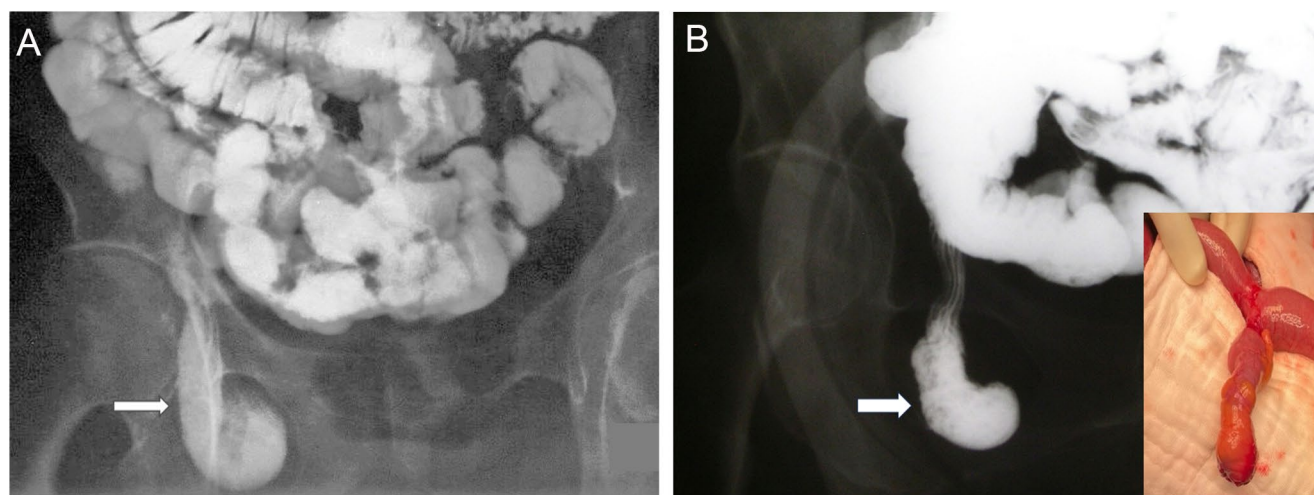


Fig. 2 **A** Radiograph from small bowel series of this 34-year-old man presenting with a painful groin mass demonstrates a 7 cm elongated Meckel's diverticulum with bulbous appearance of its distal part within the right inguinal hernia (arrow). **B** Spot film obtained during

external compression of the incarcerated diverticulum (arrow). Inset: intraoperative photograph of the distal ileum and its attached Meckel's diverticulum with inflamed tip

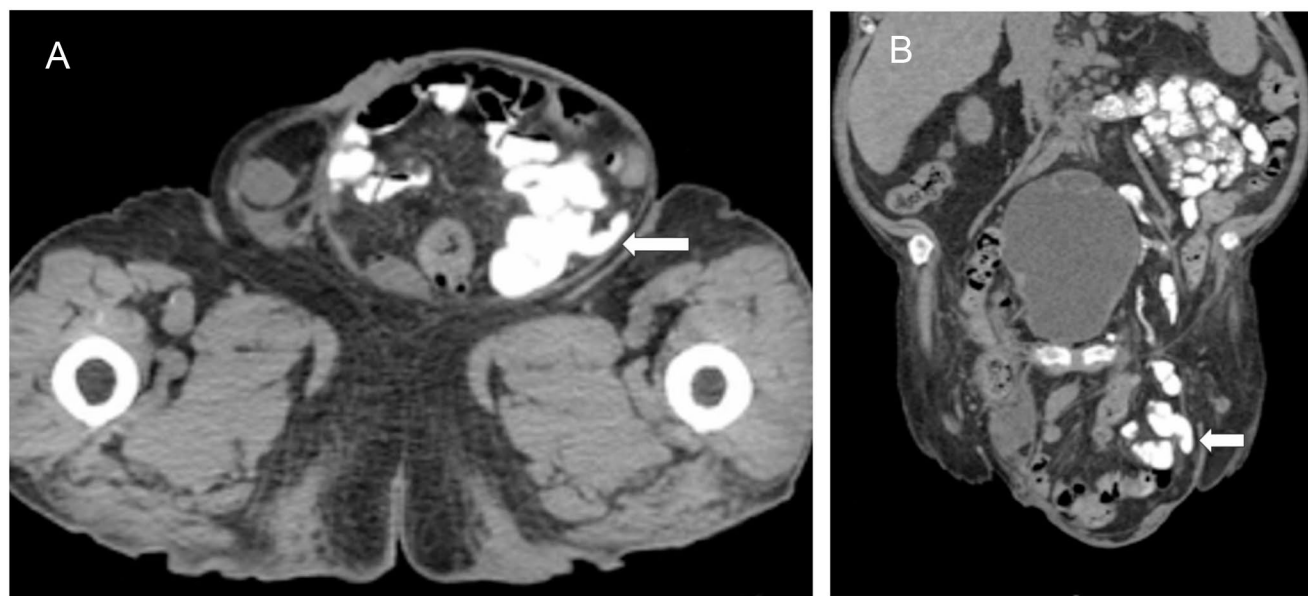


Fig. 3 A Axial section of the groin area from the abdominal and pelvic CT with oral contrast in this 74-year-old man reveals the opacified ileal loops with a 3 cm long Meckel's diverticulum (arrow) within the left

scrotal sac. B Coronal image shows the large bilateral hernias, containing the cecum on the right and the small bowel with Meckel's diverticulum in the left hernia (arrow)

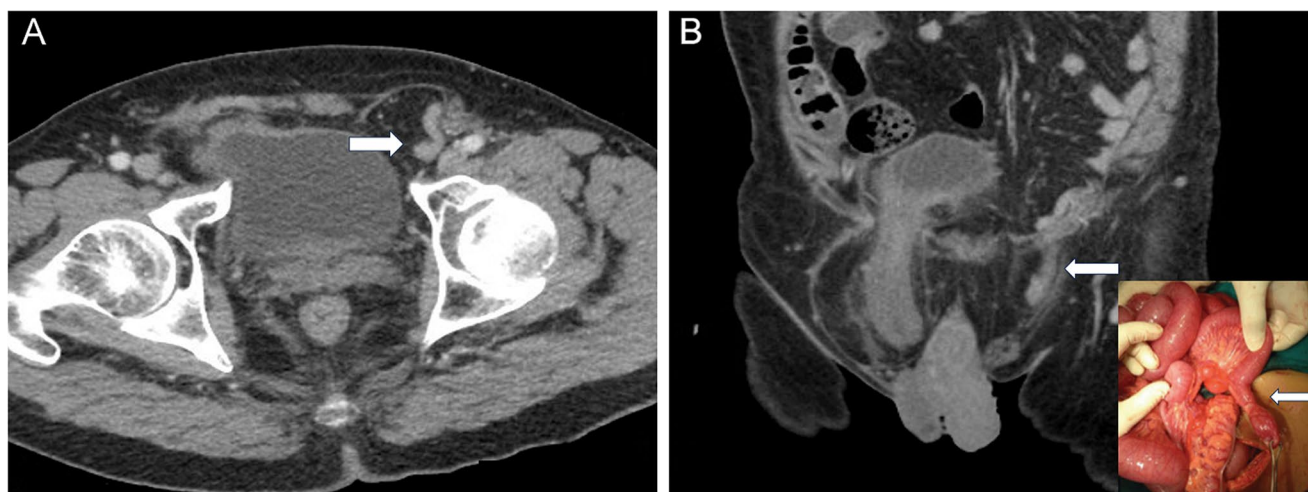


Fig. 4 A, B Axial and coronal CT images of the abdomen and pelvis in a 68-year-old man demonstrate a Meckel's diverticulum protruding into the left inguinal hernia (arrows) while the bladder has herniated on

the right side. Inset: intra-operative photograph of the intestinal loops with a 3 cm long Meckel's diverticulum (arrow)

inguinal region due to the markedly distorted visceral anatomy (Fig. 4A, B).

Case 5 A 48-year-old woman suffering from long-standing obesity had developed small bowel obstruction due to a large recurrent incisional hernia. CT of the abdomen showed a 2.5 cm Meckel's diverticulum that was attached to the antimesenteric border of a distal ileal loop (Fig. 5). Her subsequent laparotomy included the lysis of peritoneal

adhesions, diverticulectomy, and repair of the hernia with mesh insertion.

Case 6 Another overweight patient was a 34-year-old man who had presented with an incarcerated umbilical hernia. His abdominal CT demonstrated that the omental fat and a gas-filled Meckel's diverticulum had protruded through the umbilical defect (Fig. 6A-C).

Case 7 A 75-year-old man had undergone partial gastrectomy and Billroth II procedure because of an antral

Fig. 5 The coronal CT image of the abdomen in this 48-year-old woman with obesity and large incisional hernia shows distended small bowel proximal to a tubular-shaped Meckel's diverticulum (arrow). Inset: Intra-operative appearance of the obstructed intestinal loops and the attached diverticulum (black arrow)



adenocarcinoma. Several CT and MR examinations of the abdomen and pelvis with contrast enhancement were performed during the course of his follow-up. These studies showed a Meckel's diverticulum in the right inguinal hernia (Fig. 7A, B). However, it proved to be asymptomatic, and his underlying medical condition did not warrant a surgical repair.

Case 8 A 78-year-old man had presented with urinary symptoms due to an enlarged prostate and elevated PSA levels. CT of the abdomen and pelvis following intravenous contrast injection disclosed a 3–4 cm Meckel's diverticulum in the right inguinal region. This finding was also redemonstrated on the CT examination one year later (Fig. 8, A–D). He subsequently underwent a robotic prostatectomy, and his hernia was also repaired after a prophylactic diverticulectomy.

Discussion

About 1.6 million groins and abdominal wall hernias are operated in the United States each year and over 20 million globally, representing the most common general surgery procedure in this country and worldwide [10–12]. It has been estimated that about 0.1% of these hernias contain a Meckel's diverticulum and thereby classified as Littre hernia [13, 14]. It develops in only 1% of individuals who have Meckel's diverticulum [3, 13], but several studies had concluded that pre-operative diagnosis of a herniated Meckel's

diverticulum may be very difficult with imaging techniques [15–18].

A search of medical literature through PubMed database had revealed 98 published cases of Littre hernia as of March 2022 [4]. The vast majority were isolated cases of incarcerated Littre hernia described in surgical journals. Some of these patients had been evaluated by abdominal and pelvic CT or sonography, but their Meckel's diverticula were not detected prior to surgery [17–20]. In fact, the preoperative diagnosis of Littre hernia has been reported in only 5 patients presenting with perforated Meckel's diverticulitis or other complications [5–9]. These 5 cases as compared to 106 surgically proven cases reported through the end of 2024 would indicate that pre-operative imaging diagnosis of Littre hernia has been achieved in about 5% of these patients. Therefore, the herein presented series is a rather unique collection of this rare hernia diagnosed pre-operatively. It should be noted that these 8 cases were encountered by the author during the 3 decades of clinical practice at 2 major medical centers (1988–2018), and this may also reflect his particular interest in the imaging of Meckel's diverticulum and its complications [21–23].

The usual sites of Littre hernia are the inguinal (50%), umbilical (20%), and femoral (20%) regions [2]. Schizas et al. reviewed 53 adults with Littre hernia and found that 39% had presented as femoral and 34% as inguinal hernias, and 77% of them had been incarcerated [3]. Other authors have described more frequent occurrence of Littre hernia

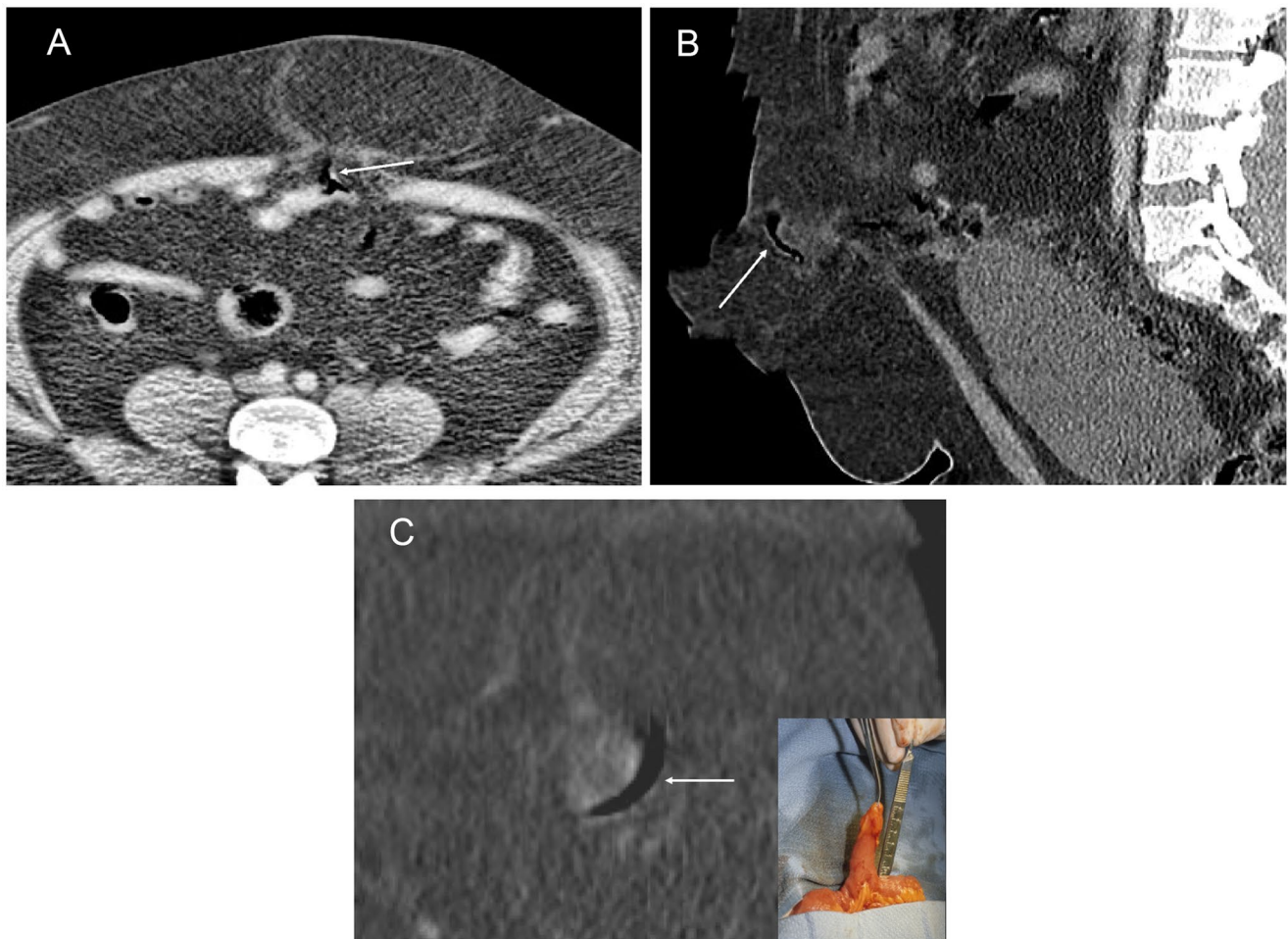


Fig. 6 **A, B** Axial and sagittal views of the abdominal CT in this 34-year-old man with obesity reveal a gas-filled Meckel's diverticulum in the large umbilical hernia (arrow). **C** The coronal section of the

hernia shows the omental fat and Meckel's diverticulum (arrow). Inset: intraoperative photograph of the normal Meckel's diverticulum

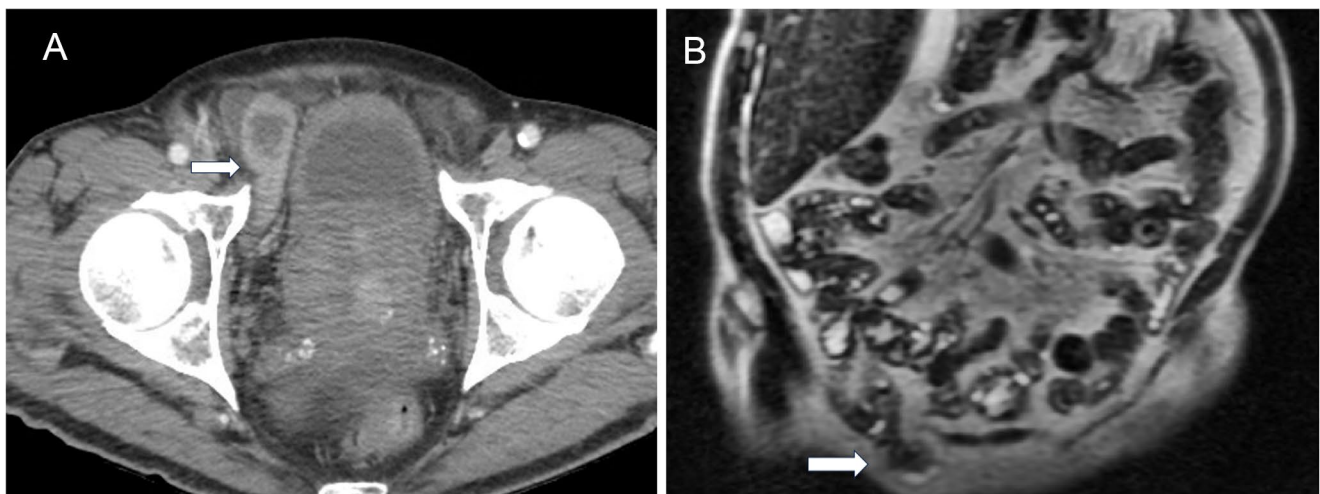


Fig. 7 **A** CT section of the pelvis in this 75-year-old man with prior partial gastrectomy for cancer demonstrates a Meckel's diverticulum in the right inguinal hernia (arrow). **B** Coronal image of abdominal MR in T2 sequence also shows the herniated diverticulum (arrow)

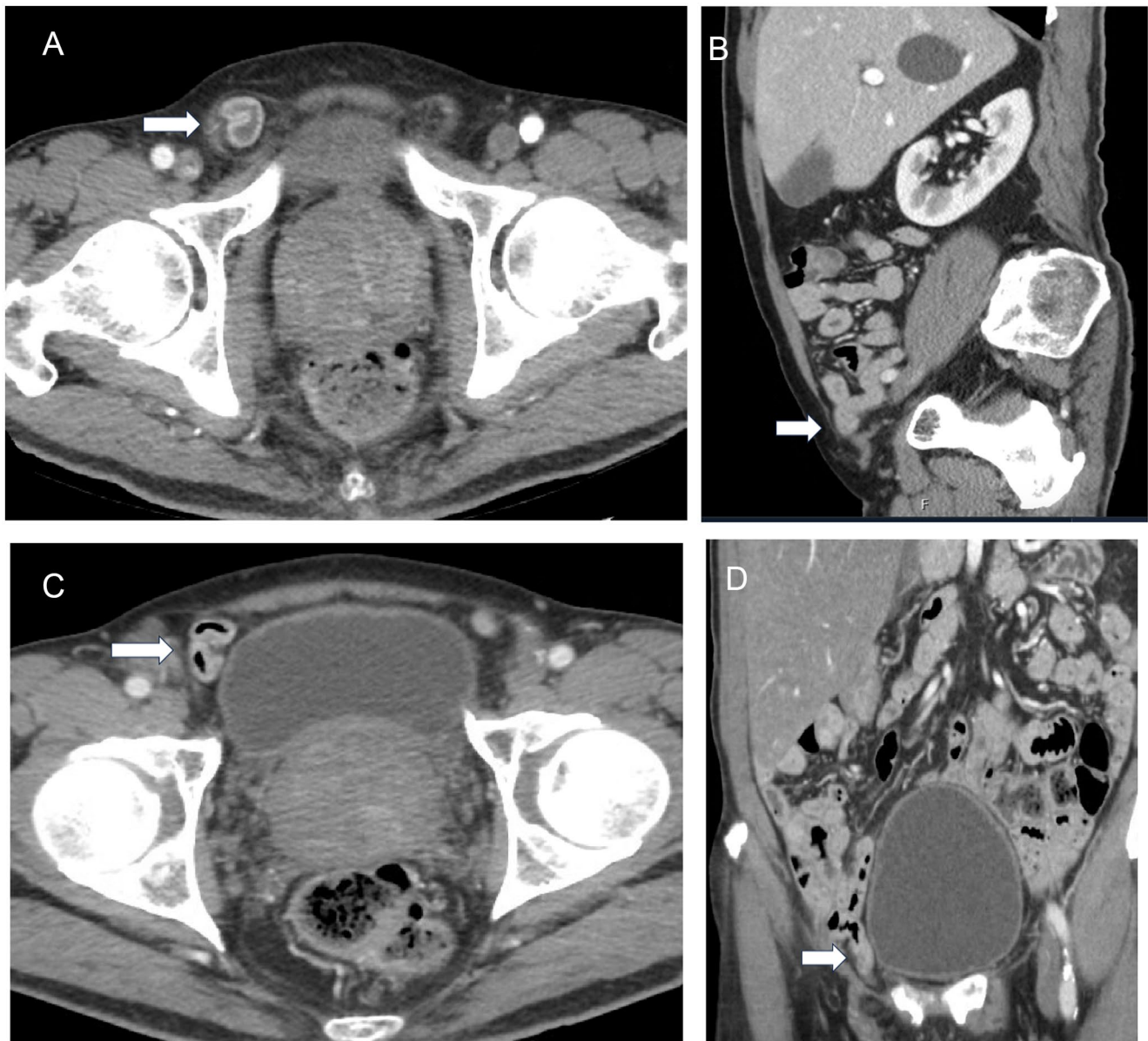


Fig. 8 **A** CT section of the pelvis in a 78-year-old man with enlarged prostate. The arterial phase of the study shows the enhancing walls of Meckel's diverticulum within the right inguinal hernia (arrow). **B** Sagittal view of the venous phase also illustrates this finding (arrow).

C and **D** Axial and coronal images of CT performed one year later show a more prominent Meckel's diverticulum with some gas in its lumen (arrows)

involving the umbilical region in the pediatric age group [2, 15, 24].

Four of 8 patients in this series had Meckel's diverticulum protruding into the right inguinal hernia sac (Figs. 1, 2, 7 and 8). This is a predisposed location because Meckel's diverticulum is attached to the antimesenteric border of distal ileum in the right lower abdomen and often in close proximity to the right inguinal canal [21–23]. However, the other 2 patients had it within their left inguinal hernia because of the markedly distorted intestinal anatomy (Figs. 3 and 4). The Meckel's diverticulum in two remaining patients

was visualized within their umbilical or incisional hernia (Figs. 5 and 6).

The radiologists and surgeons should be aware that in patients with large Littre hernia the Meckel's diverticulum may be displaced to very unusual sites as illustrated herein, thus requiring a careful search to locate it on the pre-operative imaging studies or during laparotomy and hernia repair. There have been a few reported cases of Littre hernia with Meckel's diverticulum found in other unexpected anatomical regions, such as its protrusion through an abdominal wall defect caused by trocar insertion during laparoscopy

[25], or its presence within the content of femoral, obturator, trans-mesenteric, and spigelian hernia [26–29].

All of the Meckel's diverticula in this series were asymptomatic and detected incidentally during the imaging examinations to delineate the intestinal content of hernia prior to surgery (Figs. 1, 2, 3, 4, 5 and 6)) or performed for unrelated medical conditions (Cases 7 and 8). Two patients proved to have an incarcerated Meckel's diverticulum in their right inguinal hernia and the resected specimens showed that one diverticulum was normal (Fig. 1), whereas the histopathology of the other one disclosed diverticular inflammation with heterotopic tissues in its mucosa (Fig. 2B). Five remaining patients in this series had undergone prophylactic diverticulectomy during their hernia repair.

The treatment of an incidentally found Meckel's diverticulum has been a controversial subject. Two studies published in 1976 and 1995 had concluded that prophylactic diverticulectomy should not be done because the likelihood of it causing any complication during the patient's lifetime would be about 4.2–4.6% [30, 31]. However, a comprehensive study by Cullen et al. recommended the resection of an asymptomatic diverticulum in patients younger than 80 years [32]. Park et al. reviewed the Mayo Clinic experience with 1476 cases and recommended removal of an incidentally detected Meckel's diverticulum if it is longer than 2 cm, has a palpable mass or abnormal features, particularly when the patient is male and younger than 50 years [33]. The authors also reported that 806 asymptomatic Meckel's diverticula resected from their adult patients showed histopathologic findings of ectopic gastric mucosa (8.3%), pancreatic tissue (2.7%), carcinoid (2.1%) and diverticulitis (3.2%). Therefore, the incidentally discovered Meckel's diverticula in the herein presented series of patients had been removed on elective basis during hernia repair to prevent future complications such as diverticulitis, ulceration, perforation, intussusception, and intestinal bleeding [2, 4, 14, 16]. Some of the previously published cases of Littre hernia had already developed such diverticular complications when they were admitted to the hospital [5–9, 18, 27, 29]. It is for such reasons that this article is presented to illustrate different locations and appearances of Meckel's diverticulum in Littre hernia and to highlight the pre-operative imaging features of this rare condition.

Various surgical techniques are used for the treatment of groin or abdominal wall hernias but the Lichtenstein method of open properitoneal mesh repair is currently the preferred approach [34, 35]. Several authors have reported favorable results of laparoscopic and robotic procedures for hernia repair when performed by surgeons with appropriate skill and experience [36, 37].

Two patients with Littre hernia in this series had a marked degree of obesity (Cases 5 and 6). Zidan et al. state that the

detection of a Meckel's diverticulum during bariatric surgery is a rare finding because the distal ileum is not explored routinely when performing a sleeve gastrectomy or gastrojejunum bypass. Hence an overlooked Meckel's diverticulum may occasionally lead to postoperative complications in these individuals [38].

Conclusion

Imaging studies play a substantial role in the pre-operative diagnosis of Littre hernia by detecting the presence of Meckel's diverticulum in unusual anatomical locations within the intestinal content of an inguinal or abdominal wall hernia. This can be achieved by barium examination of the small bowel or colon, or by currently preferred CT or MRI of the abdomen and pelvis if the studies are carefully evaluated to identify a possibly coexisting Meckel's diverticulum. It is hoped that the herein provided information will facilitate an accurate diagnosis of this rare entity by the practicing radiologists.

Author contributions The author has been personally responsible for the collected data and preparation of this manuscript.

Data availability No datasets were generated or analysed during the current study.

Declarations

Ethical approval Due to the retrospective review of the already performed and medically warranted examinations, the patient consent, and IRB approval was waived. The ethical standards for retrospective reviews were followed.

Competing interests The authors declare no competing interests.

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