Rare cases of external hernias and differential diagnosis

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Authors: A. Uchida, T. Katayama, E. Yamazaki, J. Miyaji; Tokyo/JP
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Learning objectives

To learn about the points and pitfalls that may be encountered during the diagnosis of rare external hernias.
Background

An incarcerated external hernia is one of the most common and important diseases encountered in patients with an acute abdomen. Since this condition affects the indications for surgery, an accurate diagnosis is necessary. In addition to physical findings, computed tomography (CT) examinations are useful during diagnosis. However, diagnosis can often be difficult in cases exhibiting uncommon hernia contents, locations, or forms. Several conditions are rare but should be recognizable by radiologists. Moreover, many diseases can exhibit similar CT findings, and this should be kept in mind to avoid mistakes when making crucial decisions.
Findings and procedure details

1. Hernia containing the appendix: Amyand's hernia and de Garengeot hernia

Amyand's hernia

Amyand's hernia was first described by Claudius Amyand in 1735. This condition is defined as an incarcerated hernia containing the appendix, which may be normal or inflamed. The incidence of Amyand's hernia is 0.19%-1.7% of reported hernia cases, with an inflamed appendix present in 0.07%-0.13%. [1, 2] Amyand's hernia is 3 times more frequent in children than in adults. Ultrasonography (US) and CT examinations are useful for detecting the appendix in the inguinal hernia sac and evaluating the complications. [2] However, distinguishing between strangulation (especially congestion because of venous compression) and inflammation is often difficult. An inflamed Amyand's hernia should be removed surgically, but the standard treatment when the appendix is not inflamed is controversial. [1] Because of the low incidence and nonspecific clinical presentations, Amyand's hernia is rarely suspected clinically. [2] Thus, the role of diagnostic imaging is important.

A case of Amyand's hernia with a strangulated appendix

A 45-year-old male presented with a right scrotal pain and swelling. A plain CT showed a right inguinal hernia containing the appendix and part of the cecum within the hernia sac. The appendix was enlarged and its wall was thickened. The operative findings showed no inflammation in the appendix, so the enlargement was considered to have been caused by congestion. (Figure 1)

A case of Amyand's hernia with a normal appendix

A 47-year-old male presented with swelling in the right inguinal region lasting for 1 year. A contrast-enhanced CT examination showed a right inguinal hernia containing a normal appendix. This case was followed without treatment because of the absence of pain. (Figure 2)

De Garengeot hernia

De Garengeot hernia was first described by Rene-Jacques Croissant De Garengeot in 1731. This condition is defined as a femoral hernia containing the appendix. [3] The incidence of De Garengeot hernia is 0.5%-5% of all femoral hernias. The incidence of an
inflamed appendix within the femoral hernia is 0.08%-0.13%. De Garengeot hernia is 13 times more frequent in women than in men. [3] CT is useful for the identification of this pathophysiology and the planning of surgical management. Femoral hernia repair and an appendectomy are often performed as a treatment.

A case of De Garengeot hernia with a strangulated appendix.

A 67-year-old female presented with a right groin pain and swelling lasting for 1 week. A contrast-enhanced CT examination showed the presence of the appendix within a femoral hernia. The appendix was enlarged and the walls were thickened. The surrounding adipose tissue was hyperattenuating. An appendectomy and hernia repair were performed after follow-up. A postoperative pathologic diagnosis revealed a femoral hernia containing the appendix and ectopic endometrial tissue. (Figure 3)

2. Sciatic hernia

A sciatic hernia is a hernia through the sciatic foramen. The sciatic foramen is divided by the sacrospinous ligament into two foramen: the upper is the greater sciatic foramen, and the lower is the lesser sciatic foramen. The greater sciatic foramen is subdivided by the piriformis muscle (Figure 4). Regarding the prevalence, recent reports suggest that sciatic hernias are not rare (Miklos et al. reported 20 cases out of 1100 women exhibiting chronic pelvic pain [4], and Karasaki et al. reported 9 incidental cases among 38 patients who were surgically treated for obturator hernias [5]). In a series of 77 cases, the reported incidences of hernia contents were as follows: 30% contained the small intestine or large intestine, 14% contained the ureter or bladder, 4% contained both the intestinal tract and the urinary system, 31% contained an ovary or fallopian tube, 3% contained a tumor, and 18% had unknown hernia contents. [6] Sciatic hernias can be either asymptomatic or symptomatic. Symptoms such as pelvic or femoral pain can be caused by bowel obstruction, hydronephrosis, or compression of the sciatic nerve. [6] In some reports, surgical repair was performed for symptomatic cases. Meanwhile, there have been no problems reported for follow up without treatment in asymptomatic cases. [5]

A case of right sciatic hernia of the small intestine

A 69-year-old female presented with a right lower abdominal and groin pain. A plain CT examination showed the protrusion of the small intestine through the right greater sciatic foramen. Bowel obstruction was not observed. The sciatic hernia was suspected to be associated with the patient's symptoms, and hernia repair surgery was performed. (Figure 5)
A case of left sciatic hernia of the ureter

A 76-year-old female presented with left lumbago. A CVA tapping pain was present. A plain CT examination was ordered based on a suspicion of urolithiasis. The CT examination showed the protrusion of the left ureter through the left greater sciatic foramen and hydronephrosis. The patient's condition was improved through the placement of a ureteral stent. (Figure 6)

3. Double loop hernia

A double loop hernia, also called a hernia in W or a retrograde hernia, is a condition in which there are two loops in the hernia sac and an intra-abdominal loop between them. Incarcerated inguinal hernias that have two loops in the hernia sac are called Maydl's hernia. Maydl's hernia was first described by Maydl in 1895. The intra-abdominal loop tends to be the most strangulated. During surgery, the intra-abdominal loop should be observed carefully so as not to overlook the strangulation. Maydl's hernia is a rare condition (<2% of strangulated inguinal hernias). [7] (Figure 7)

A case of right Maydl's hernia

A 72-year-old female presented with a right inguinal hernia that could not be reduced by herself. A plain CT examination revealed two loops of the small bowel in a right inguinal hernia sac and one intra-abdominal closed loop. The intra-abdominal loop and its mesentery were edematous. The hernia was treated by manual reduction, and surgical repair was performed thereafter. (Figure 8)

Our experiences suggest that strangulation of the intra-abdominal loop may depend on whether the mesenteric vessels of the intra-abdominal loop pass through the hernia orifice. (Figure 9)

A case of double loop hernia (incisional hernia)

An 89-year-old female visited our hospital because of an abdominal pain lasting for 1 week. A contrast-enhanced CT examination showed an incisional hernia containing two loops of the small bowel within the hernia sac. No strangulation of the intra-abdominal loop and its mesentery was observed. The mesenteric vessels of the intra-abdominal loop did not pass through the hernia orifice. (Figure 10)
A case of inguinal hernia containing the small intestine and bladder, mimicking Maydl's hernia

A 68-year-old male presented with occasional right groin pain and swelling. A plain CT examination was performed, and two fluid-filled structures within an inguinal hernia sac were identified. The continuity with the intraperitoneal cavity was evaluated, and the structures were identified as the small intestine and the bladder. (Figure 11) Herniation of the urinary bladder is mainly related to the inguinal or femoral canal and is not uncommon (1% to 3% of inguinal hernia). Most bladder hernias are asymptomatic and are usually discovered incidentally. However, dysuria, frequent urination, urgent urination, nocturia, or hematuria may occur. Imaging modalities for diagnosis include excretory urography, retrograde cystography, CT, ultrasonography, and MRI. [8]

4. Richter's hernia

Richter's hernia is a hernia in which only part of the circumference of the bowel is entrapped and strangulated. The incidence of this hernia is relatively rare (5%-15% of strangulated hernias). Necrosis is frequent in this type of hernia. There are multiple explanations for the high frequency of necrosis: first, the hernia orifice might be firm and narrow. Second, the protruding part of the wall is usually the side opposite to the mesentery, which contains terminal arterioles and is vulnerable to ischemia. Moreover, alarming intestinal obstruction may be absent because the entire lumen is not entrapped. [9] In diagnostic imaging, careful attention is required because of the high frequency of necrosis despite the hernia being small and easy to overlook.

A case of left femoral hernia (Richter's hernia)

An 89-year-old male presented with a chest discomfort and anorexia from the previous day. A contrast-enhanced CT examination showed a left femoral hernia and bowel obstruction. Reflecting the anatomical features of a Richter's hernia, the protruded part of the intestine looked like a unilocular cystic lesion within the hernia sac. The enhancement of its wall was poor. The surgical findings showed Richter's hernia with necrosis. (Figure 12)

A case of right obturator hernia (Richter's hernia)

An 89-year-old female presented with a lack of appetite beginning three days earlier and dyspnea from the day before. A contrast-enhanced CT examination showed a right-sided tiny obturator hernia and bowel obstruction. The operative findings showed no necrosis, and hernia repair was performed. As seen in this case, the protruded part is often very
small in Richter's hernia, so careful attention is required to prevent such hernias from being overlooked. (Figure 13)

Differential diagnosis of Richter's hernia

As mentioned above, Richter's hernia can appear as a unilocular cystic lesion on CT. Thus, there are many differential diagnoses based on CT examinations, of which examples are presented below.

Nuck hydrocele

Nuck hydrocele used to be reported as a rare condition but is presently believed to be a more common entity. During embryonic development, the parietal peritoneum evaginates into the inguinal canal and accompanies the round ligament. This is called the processus vaginalis peritonei or, especially in women, the canal of Nuck. It is usually obliterated completely during the first year of life. However, if incomplete obliteration occurs, it can potentially result in an indirect inguinal hernia or a hydrocele called Nuck hydrocele. Associated pathologies include an indirect inguinal hernia (present in approximately one third of cases) and endometriosis. The typical clinical presentation is painless swelling of the inguinolabial region, but pain and discomfort can occur when it is associated with endometriosis. Treatment requires complete resection. [10]

A case of Nuck hydrocele

A 37-year-old female presented with a painless swelling in the right groin region for 1 year. A plain CT examination showed a fluid-filled tubular structure in the right groin region extending into the inguinal canal. A radical resection of the Nuck hydrocele and repair of a co-existing indirect hernia were performed. (Figure 14)

A case of endometriosis of a canal of Nuck

A 37-year-old female recognized an induration lasting for 2 months, with pain beginning 3 days earlier. A contrast-enhanced CT examination showed a solitary cystic mass in the right groin region. The mass had a thick wall, and the surrounding soft tissue was hyperattenuating. The postoperative diagnosis was a canal of Nuck, and histopathology revealed granular tissue with endometriosis. In this case, the pain appeared at the same time as menstruation, but it was not a cyclic symptom. Thus, the possible association with menstruation in this case is unknown. In the literature, areas of endometriosis at sites distant from the uterus tend to lose their hormone receptors and are not related to the menstrual cycle. [11] (Figure 15)
Ascites filling in a hernia sac

The sac of an external hernia is a direct extension of the parietal peritoneum, and it communicates freely with the peritoneal cavity. So, not only protruded organs, but also fluids such as ascites can fill the hernia sac.

A case of ascites in a hernia sac

A 64-year-old male presented with abdominal fullness. A contrast-enhanced CT examination performed to investigate the cause of the symptoms showed the presence of ascites extending through the left inguinal canal. In this case, the hernia contents were continuous with the ascites in the peritoneal cavity. Importantly, the wall of the sac was thinner than the intestinal wall. (Figure 16)

A case of ascites in the hernia sac mimicking an incarcerated hernia

An 83-year-old female presented with anal pain, nausea and vomiting for 2 days. A contrast-enhanced CT examination revealed a small bowel obstruction and cystic structures in right obturator region. It had a relatively thick wall and features like those of an obturator hernia. Moreover, the obstructing point of the bowel was located at the right side of the lesser pelvis. However, a closed loop was recognized in the pelvic cavity, which was considered to have caused the bowel obstruction. The cystic mass in the right obturator region was ascites within the hernia sac (confirmed by operation). (Figure 17)

Generally speaking, bowel obstruction can produce ascites that may extend into the hernia sac. In such cases, there is a risk of misdiagnosis as an incarcerated hernia because of the co-existing intestinal obstruction and the similarities between a bowel protrusion and ascites within the hernia sac on CT findings.

A case of abscess in the abdominal wall

An 81-year-old female presented with a progressing right lower abdominal pain and swelling lasting for one month. A plain CT examination showed a bulky mass of the ascending colon, forming an abscess at the adjacent abdominal wall. She was first treated with drainage and antibiotics, and a surgical resection for colon cancer was performed thereafter. When the lesion contains gas, as in this case, the differential diagnosis includes free air and abscess. (Figure 18)

Metastatic tumor within a hernia
Metastatic tumor within a hernia is a rare condition (0.07% of surgically treated inguinal hernias). The symptoms and signs are a palpable mass (53%), abdominal pain (47%), weight loss (27%), inguinal pain (20%), and abdominal distention (14%). Surgical repair of the hernia may be the only diagnostic opportunity. If a grossly abnormal specimen of the hernia sac is obtained surgically, microscopic examination is recommended. [12]

A case of metastatic tumor in the right inguinal hernia sac (biopsy: neuroendocrine tumor)

A 69-year-old female visited our hospital because of multiple lung nodules that were identified during a chest plain radiograph obtained during a general check-up. A contrast-enhanced CT examination revealed multiple tumors in the lung, liver, spleen and peritoneal cavity and a bulky mass in Douglas' pouch. In addition, there was a right groin mass continuous with the pelvic cavity. The mass was diagnosed as a neuroendocrine tumor by a rectal biopsy, but the primary tumor site was unknown. A diagnosis was easy in this case because of the numerous disseminations found throughout the peritoneal cavity. However, a recognizable tumor can occur only within the hernia sac [13], so this condition can be an important differential diagnosis when a mass is found within a hernia sac. (Figure 19)

Other differential diagnoses

Inguinal lymphadenopathy and tumors that are unrelated to hernias (such as primary or metastatic tumors of soft tissues) are depicted as solitary tumors, which can also be a differential diagnosis for hernia. In addition, as mentioned above, bladder hernia resembles Richter's hernia in the sense that part of the luminal structure protrudes like a sac.

CT images of the following cases are shown below.

A case of lymphadenopathy (malignant lymphoma) in a 75-year-old male. (Figure 20)

A case of an pectineus muscle metastasis of colon cancer in an 86-year-old male. (Figure 21)

A case of bladder hernia in a 67-year-old male. (Figure 22)

Finally, since Richter's hernia has been confused with Littre hernia (a hernia containing Meckel's diverticulum) historically, distinguishing Richter's hernia from Littre hernia can also be difficult.
Fig. 1: A plain CT of Amyand's hernia with a strangulated appendix. This CT shows a right inguinal hernia containing the appendix (yellow arrow). The appendix is enlarged and its wall is thickened.

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Fig. 2: A contrast enhanced CT of Amyand's hernia with a normal appendix (yellow arrow).

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Fig. 3: A contrast-enhanced CT of De Garengeot hernia with a strangulated appendix. This CT shows a right femoral hernia containing appendix (yellow arrow). The appendix is enlarged and the wall is thickened. The surrounding adipose tissue is hyperattenuating.

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Fig. 4: A schema of sciatic foramen.

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**Fig. 5:** A plain CT showing right sciatic hernia of small intestine. This CT shows protrusion of the small intestine through the right greater sciatic foramen (yellow arrow).

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Fig. 6: A plain CT showing left sciatic hernia of ureter. It depicts hydronephrosis (blue circle) and the protrusion of the left ureter through the left greater sciatic foramen (yellow arrows).

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Fig. 7: A schema of double loop hernia. There are two loops in the hernia sac and one intra-abdominal loop between them. Four bowels pass through the hernia orifice. The intra-abdominal loop tends to be the most strangulated.

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Fig. 8: A plain CT of double loop hernia (Maydl's hernia). A plain CT revealed two loops of the small bowel in a right inguinal hernia sac (first loop: orange arrowhead, second loop: blue arrowhead). Four bowels are depicted at the hernia orifice (yellow arrows). The intra-abdominal loop and its mesentery (green circle) are edematous.

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**Fig. 9:** A schema of double loop hernia (The mesenteric vessels of the intra-abdominal loop do not pass through the orifice).

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Fig. 10: A contrast-enhanced CT of double loop hernia without intra-abdominal congestion (incisional hernia). The hernia sac contains two loops of the small bowel (first loop: orange arrowheads, second loop: blue arrowheads). No edema is seen in the intra-abdominal loop and its mesentery (green circle). The mesenteric vessels of the intra-abdominal loop do not pass through the hernia orifice.

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Fig. 11: A plain CT of right inguinal hernia mimicking Maydl's hernia. It contains the small intestine and the bladder.

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**Fig. 12:** A contrast-enhanced CT of left femoral hernia (Richter's hernia). A protrusion of the small bowel through the left femoral canal is shown (yellow arrows). The enhancement of its wall is poor. The protruded part of the intestine looks like a unilocular cystic lesion.

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Fig. 13: A contrast-enhanced CT of right obturator hernia (Richter's hernia). A tiny obturator hernia and bowel obstruction are depicted (yellow arrows).

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Fig. 14: A plain CT of Nuck hydrocele. A cystic mass in the right groin region is depicted. It is extending into the inguinal canal (yellow arrows).

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Fig. 15: A contrast-enhanced CT of endometriosis of a canal of Nuck. Cystic mass is shown in the right groin region (yellow arrow). The mass has a thick wall, and the surrounding soft tissue is hyperattenuating.

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**Fig. 16:** A contrast-enhanced CT showing ascites in the left inguinal hernia sac. The ascites is extending through the left inguinal canal (yellow arrows).

**Fig. 17:** A contrast-enhanced CT showing ascites in the hernia sac. A small bowel obstruction is shown on CT, and the obstructing point is located at the right side of the lesser pelvis (blue arrowhead). There is also a cystic mass in the right obturator region.
(yellow arrow), and it has features like those of an obturator hernia. However, a closed loop is depicted in the pelvic cavity (green circle) and the cystic mass in the right obturator region was ascites within the hernia sac (confirmed by operation).

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**Fig. 18:** A plain CT of an abscess in the abdominal wall. A plain CT shows a bulky mass of the ascending colon (blue arrowheads), forming an abscess at adjacent abdominal wall (yellow arrows).

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**Fig. 19:** A contrast-enhanced CT of metastatic tumor in the hernia sac. A contrast enhanced CT shows a bulky mass in the Douglas’ pouch (blue arrowheads) and a right groin mass (yellow arrows) continuous with the pelvic cavity. Multiple tumors in the lung, liver, spleen and peritoneal cavity (not presented) were recognized on other slices on this CT. The mass was diagnosed as a neuroendocrine tumor by a rectal biopsy, but the primary tumor site was unknown.

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Fig. 20: A plain CT of lymphadenopathy (malignant lymphoma). A solitary mass is depicted at the left groin region (yellow arrow).

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**Fig. 21:** A contrast-enhanced CT of an pectineus muscle metastasis. A mass is depicted at the right pectineus muscle (yellow arrow), mimicking obturator hernia.

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Fig. 22: A plain CT of bladder hernia. A plain CT shows a right inguinal hernia containing bladder (yellow arrow).

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Conclusion

We have presented diagnostic points and pitfalls for the diagnosis of rare but clinically important external hernias.
References


