CASE REPORT

De Garengeot's hernia: our experience of three cases and literature review

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SUMMARY

Groin hernia is a common surgical presentation and nearly half of the femoral hernias present acutely with strangulation. The hernia sac usually contains omentum or small bowel. Rarely, the appendix can herniate into the femoral canal. De Garengeot's hernia is the term used to describe the presence of appendicitis in the femoral hernia. Hernia explorations are performed by surgical trainees and encountering a De Garengeot's hernia can be challenging to manage. We report our experience of three cases of this rare entity and a literature review to improve our understanding for optimum management.

BACKGROUND

Femoral hernias account for 4% of all groin hernias and 30–50% present acutely with strangulation. The hernial sac commonly contains omentum or small bowel but other structures including urinary bladder, fallopian tubes, ovary and rarely appendix have also been reported.¹ De Garengeot's hernia is the term used to describe the presence of vermiform appendix in the femoral hernia. It is a rare entity and its presentation is similar to that of an acutely incarcerated or strangulated femoral hernia but without any signs of bowel obstruction.² Groin hernia repair is a common general surgical procedure performed by trainees. However, the finding of an appendix during an acute hernia exploration is challenging, as due to its rare occurrence there are no published guidelines on the procedure of choice. We present three cases of De Garengeot's hernia and a review of literature to aid us in better understanding and management.

CASE PRESENTATION**Case 1**

An 80-year-old woman presented to the emergency department with a 1-day history of a painful right-sided groin swelling after lifting a heavy object. This was associated with nausea and fever. She denied vomiting, abdominal pain or symptoms of bowel obstruction. Her medical history included diabetes mellitus (treated with metformin) and hypertension (treated with amlodipine and valsartan). On examination she had borderline fever (37.6°C) but the rest of her observations were normal. Her abdomen was soft, non-distended and non-tender with normal bowel sounds on auscultation. A firm, tender mass measuring 3×7 cm was palpable in her right groin with mild erythematous skin overlying it. Systemic examination was otherwise unremarkable.

Case 2

A 54-year-old woman presented with a 2-day history of diffuse lower abdominal pains and an enlarging right groin swelling. This was associated with an episode of fever and nausea but no vomiting or symptoms of bowel obstruction. On examination she was haemodynamically stable and non-feverish. Her abdomen was soft and non-distended but mildly tender on palpation in the right lower quadrant. The right groin had a small palpable lump with overlying skin erythema. It was tender to palpate and irreducible. Otherwise systemic examination was normal.

Case 3

A 68-year-old woman presented with a 1-week history of an enlarging right groin lump becoming increasingly painful associated with anorexia and nausea. There was no history of vomiting or symptoms of bowel obstruction. Her medical history included Parkinson's disease, treated with co-beneldopa. On examination she was non-feverish and haemodynamically stable. Her abdomen was soft, non-tender and not distended. A 4×4 cm firm lump was noticed in her right groin below the inguinal ligament. It was tender to palpate and non-reducible. The groin lump was non-expansile but transmitted pulsations could be felt. Distal pulses were palpable bilaterally. On systemic examination there was no palpable lymphadenopathy in the neck, axilla or the left groin.

INVESTIGATIONS**Case 1**

Preoperative blood tests were normal for full blood count (FBC), liver function tests (LFTs), amylase, urea and electrolytes (U&Es) and inflammatory markers—white cell count (WCC) $6.71 \times 10^9/L$ and C reactive protein (CRP) <2 mg/L. The venous blood lactate level was 1 mmol/L.

Case 2

Blood tests were normal for FBC, LFTs, U&Es, inflammatory markers (WCC $9 \times 10^9/L$, CRP <2 mg/L) and lactate levels (0.5 mmol/L). An ultrasound scan (USS) of the right groin revealed a 'gas-filled lumen' herniating into the femoral canal (figure 1). However, the USS did not identify the hernia content to be the appendix.

Case 3

Her blood tests showed a mildly elevated WCC ($11.42 \times 10^9/L$). The CRP was 4 mg/L and a venous blood lactate was 0.8 mmol/L. The rest of her

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Figure 1 Right groin ultrasound scan showing a gas filled lumen, measuring 5.9 mm, herniating into the femoral canal. Note lateral displacement of the femoral vein.

bloods including FBC, renal function and LFTs were normal. An abdominal radiograph did not reveal any signs of bowel obstruction. She underwent a CT examination of her abdomen and the pelvis confirming a femoral hernia with surrounding inflammatory changes (figures 2–4). There was no evidence on the CT scan of small bowel obstruction and the appendix was not visualised.

DIFFERENTIAL DIAGNOSIS

Case 1

The most likely diagnosis in this woman, with a short history, was an acutely incarcerated femoral hernia with a possibility of early strangulation.

Figure 2 Coronal view of CT of the abdomen and pelvis showing femoral hernia. Note faecally loaded caecum lying low in pelvis.

Figure 3 Sagittal view of the CT in image 2 showing femoral hernia.

Case 2

Given her normal blood tests and lack of signs of bowel obstruction as well as the presence of skin erythema overlying the groin lump, the differentials included:

- Groin abscess
- Femoral hernia
- Lymphadenitis

Case 3

- Femoral hernia
- Lymphadenopathy
- Lymphadenitis
- Femoral artery aneurysm

TREATMENT

All three patients underwent surgical exploration of the femoral hernia through a 'low approach' (Lockwood's approach).

Case 1

She was taken to operation theatre for an urgent femoral hernia repair. Intraoperatively, a strangulated dusky appendix was

Figure 4 Axial CT image at the level of femoral canal displaying the femoral hernia.

Figure 5 Intraoperative picture of the right groin exploration revealing an inflamed non-perforated appendix.

found in the hernia sac with surrounding blood-stained fluid (figure 5). There were no signs of perforation. The fluid was drained and an appendicectomy was performed through the groin incision. A primary suture closure of the hernia was performed using 2.0 prolene sutures.

Case 2

Intraoperatively an ischaemic looking appendix was encountered in the femoral hernia sac. It was technically difficult to access the appendix base through the same incision to perform a safe appendicectomy. Therefore, the appendix was removed via a Lanz incision. Primary closure of hernia defect was performed using 2.0 prolene sutures.

Case 3

Exploration of the right groin revealed an oedematous non-perforated appendix in the femoral canal with surrounding inflammatory changes. An appendicectomy was performed through the groin incision. A primary hernia repair was performed using 2.0 prolene sutures.

Postoperatively, all the three patients above received three doses of prophylactic intravenous antibiotics (co-amoxiclav 1.2 g) as per local microbiology guidelines.

OUTCOME AND FOLLOW-UP

All of our patients made an uneventful recovery. Patients in cases 1 and 2 were discharged home on the third postoperative day. Although the patient in case 3 was surgically fit for discharge, this was delayed by 1 week due to mobility issues secondary to her Parkinson's disease. At a routine review at clinic 2 weeks after discharge, all three patients had made a satisfactory recovery. None of the patients had any evidence of infection or hernia recurrence. The histological examination of appendix for all three patients confirmed non-perforated appendicitis.

DISCUSSION

Femoral herniae account for 3–4% of all herniae and are thought to be due to congenital abdominal wall defects.^{1–3} They have the highest incidence of incarceration and strangulation of all groin hernias (30–50%) owing to the narrow anatomy of the femoral canal.^{2–4} The presence of an appendix within the femoral hernia sac is a rare occurrence which was first described

by the Parisian surgeon Rene Jacques Croissant de Garengot in 1731.⁵ The incidence of this is reported in literature between 0.8 and 1%.^{5–7} The presence of acute appendicitis within a femoral hernia is even rarer, occurring in 0.08–0.5% of the femoral herniae.^{6–8} This finding is termed De Garengot's hernia.⁵ To date only around 100 cases have been published.³ Although they share many characteristics, De Garengot's hernia must be separated from the more common Amyand's hernia, where the appendix is present within an inguinal hernia sac.^{2–6}

Unlike Amyand's hernia which is more common in men, De Garengot's hernia predominantly affects postmenopausal women with a male: female ratio of 1:4.^{7–9} This is in keeping with the increased incidence of the femoral herniae in women.⁷ The mean age at presentation is reported as 55 years.^{5–8} It has been suggested that pregnancy related changes may account for the increased incidence of this condition in women.⁷ Other factors associated with an increased risk of De Garengot's hernia are older age, smoking, connective tissue disease and conditions that increase intra-abdominal pressure such as chronic cough and constipation.⁷

The pathogenesis of the condition is disputed in the literature. Two different aetiologies have been proposed.² One hypothesis is that differing degrees of intestinal rotation during embryogenesis result in an abnormal attachment of the appendix to the caecum.^{2–6–7} Alternatively an anatomically large caecum may force the appendix into the pelvis.^{2–6–7} A pelvic appendix is at a greater risk of entering a femoral hernia.⁶ It is unclear whether appendicitis occurs first and the appendix then migrates within the femoral hernia or whether secondary appendicitis occurs following engagement of the appendix inside the femoral hernia.⁹ The latter is more likely, with appendicitis resulting from extraluminal compression at the narrow neck of the femoral hernia.^{2–6–9} In cases where the femoral neck is wider, appendicitis may arise from the primary intraluminal obstruction.^{2–6}

The typical presentation of De Garengot's hernia is that of an irreducible groin lump that is usually painful and tender to palpate.⁷ Often there are changes in the overlying skin such as erythema or cellulitis.^{7–10} Fevers, symptoms and signs of bowel obstruction and in some cases presentation with shock have also been reported.^{7–10} The presentation is usually indistinguishable from a strangulated or incarcerated femoral hernia.^{4–7–10} The differential diagnosis for De Garengot's hernia includes other groin hernias, adnexitis, varix node, ectasia of the vena saphena magna, lipomas, soft tissue tumours, lymphomas and retroperitoneal abscesses.^{7–10} The typical features of acute appendicitis are not usually present because the tight femoral neck acts as a mechanical barrier to prevent spread to the rest of the peritoneum.^{3–4}

The diagnosis of De Garengot's hernia is usually made intraoperatively.² Patients may have raised WCC and CRP levels indicative of inflammation.⁷ Plain abdominal radiographs are useful to assess for small bowel obstruction.^{7–10} USS can often determine whether there is bowel or subcutaneous fluid in the hernia sac.⁷ In one case the use of USS allowed preoperative diagnosis to be made after a fluid-filled tubular structure was seen within the femoral hernia.¹¹ Graded compression USS is reported to have a sensitivity of 78% and specificity of 83% for preoperative diagnosis.⁵ CT scanning remains the gold standard imaging test to establish the diagnosis. In five case reports the diagnosis of De Garengot's hernia was established preoperatively using CT scanning.³ The findings on CT are often difficult to detect and can be non-specific. However, the presence of a low lying caecum in combination with the finding of a tubular

structure within the femoral hernia and stranding of adjacent fat is reported to have sensitivity and specificity up to 98% in achieving diagnosis.^{2 4 5 8} In a recent case, MRI was used for preoperative diagnosis as an alternative to CT in a patient with a contrast allergy and is reported to have comparable sensitivity and specificity.⁵ Despite its utility, the authors of the case report still recommended CT scanning as the gold standard imaging test given its accessibility and cost-difference.⁵

Treatment of De Garengeot's hernia is by emergency surgical management.^{4 7} If the appendix is normal it can be replaced in the abdomen and the hernia repaired with mesh.^{3 6} In cases where appendicitis is present, an appendicectomy either through the same incision, if surgically feasible, or via a separate abdominal incision (McBurney or Lanz) is performed.³ The best management of hernia repair in cases where there is appendicitis is debated.^{4 6} A primary suture repair of the hernia is recommended to avoid the risk of infection with implanted materials.³ However, cases of mesh repair without a postoperative complication have been reported in the literature, with perforation of the appendix being the only absolute contraindication to the

use of mesh.^{3 4 12} It is reasonable therefore to tailor a surgical approach based on the amount of field contamination.^{3 4} The role of laparoscopy has emerged in recent reports in diagnosing De Garengeot's hernia and performing appendicectomy followed by open hernia repair.^{6 13} This technique may become preferable in upcoming years but currently there is little data on the procedure.^{6 13}

The main complication of De Garengeot's hernia repair is wound infection which occurs in 14–29% of cases with appendicitis.^{2 6 9} Antibiotics are required in cases where there are signs of either localised or generalised peritoneal irritation.⁹ A delay in diagnosis is reported to be the biggest factor contributing to the increased incidence of infection in these patients.⁴ Some cases of necrotising fasciitis and death from sepsis have been reported, mostly attributable to the delayed time until diagnosis and older age of the patients.^{2 6}

Competing interests None.

Patient consent Obtained.

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Learning points

- Early surgical exploration is the cornerstone in the management of De Garengeot's hernia. In this report, cases 2 and 3 presented with non-acute symptoms as well as near normal blood tests. Access to immediate radiology services allowed for preoperative imaging without delaying surgical intervention.
- Hernia operations are commonly performed by surgical trainees, therefore, awareness of De Garengeot's hernia is crucial for its safe surgical management.
- Lack of adequate data makes it difficult to identify De Garengeot's hernia preoperatively and to recommend a single best surgical option. However, the operating surgeon needs to tailor their surgical approach in consideration of dealing with two concomitant emergencies in a safe and effective manner.
- We do not recommend the use of mesh in De Garengeot's hernia repair even in non-perforated appendicitis due to risk of infections leading to potentially life-threatening sepsis.

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