



AMYAND'S HERNIA – A CONTINUUM OF CLINICAL PRESENTATION AND LITERATURE REVIEW

General Surgery

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ABSTRACT

Introduction: Amyand's hernia is defined as an inguinal hernia containing a vermiform appendix within its sac. The incidence of this rare entity ranges from 0.9% to 1.7%. It poses a diagnostic challenge due to its low incidence, indistinct clinical presentation, and ambiguous appearance on imaging. Therefore, surgery is often performed for diagnosis as well as for treatment. Here we report different presentations of Amyand's hernia as case scenarios. **Case Presentations:** A 67-year-old male and a 65-year-old-male presented to the emergency room with an irreducible right inguinal hernia and subacute small bowel obstruction. A 77-old-male was electively admitted for right inguinal hernia repair. Normal Appendix was encountered in all three patients when the hernial sac was explored. Hence, they were treated with inguinal hernia repair alone while preserving the appendix. The first patient had an appendix, cecum, and part of ascending colon in a viable state with some infected peritoneal fluid in the hernial sac and was treated with Desarda's hernia repair without mesh. The second patient had appendix, cecum, distal ileum, and part of ascending colon in the hernial sac with no evidence of infection and the third patient had only an appendix in a healthy state in the hernial sac. Both patients were treated with Amid's modification of Lichtenstein's tension-free hernioplasty with polypropylene mesh. All patients had uneventful postoperative period and follow-up visits. **Conclusion:** Surgeons worldwide agree with the fact that, since the appendix may be non-inflamed when found within the inguinal hernia sac, removal is not always compulsory. By the rarity, and the wide divergence of its presentation, each case series and review article bring valuable information regarding its diagnosis and treatment.

KEYWORDS

Amyand's hernia, Inguinal hernia, Appendix, Hernia repair, Appendectomy

Introduction

Hernia is defined as an abnormal protrusion of an organ or fascia through the wall of the containing cavity which contains it. Very rarely, protrusion of the appendix in the inguinal hernial sac occurs. Regardless of whether the appendix is inflamed or not, it is referred to as 'Amyand's hernia'. [1] It is named after Claudius Amyand, who performed appendectomy in an eleven-year-old boy with perforated appendix inside an incarcerated inguinal hernia sac, on December 6, 1735.[2] The incidence varies from 0.19% to 1.7% and is diagnosed mostly incidentally during hernia repair, more commonly in children because of a patent processus vaginalis. However, it has been reported in the range from neonates to the elderly. Appendicitis in this condition is rarer with an incidence of 0.07-0.13%. And perforated appendix is even rarer with an incidence of 0.1%, with mortality ranging from 15 to 30% because of severe abdominal sepsis in these cases.[3] The surgical approach depends on the inflammatory status of the appendix. Appendectomy followed by hernia repair without mesh placement is the widely accepted procedure where there is appendicitis alone. Thus, this article aims to imply the significance of various presentations of Amyand's hernia and provide new insight into the diagnosis and treatment it.

Case Presentations:

Case scenario 1:

A 67-year-old male patient presented to the emergency department with complaints of acute onset, gradually progressive, colicky

abdominal pain in the lower quadrants and right groin for 3 days, swelling over the right groin which gradually progressed to involve the scrotum as well since 3 months. For the past 10 years, the patient was taking inhalational glucocorticoids for bronchial asthma. On clinical examination, the abdomen was tender in the lower quadrants along with an irreducible inguinoscrotal swelling. While the left side inguinal region was unremarkable, expansile cough impulse was present on the right inguinal region. The abdominal radiograph (Figure 1) showed dilated small bowel loops with few air-fluid levels. Ultrasound imaging of the abdomen revealed herniated bowel loops into the right inguinal region appearing dilated with no peristalsis suggestive of subacute small bowel obstruction. Pre-operative blood investigations were normal. The patient was immediately taken to OR (Operating Room) and the right inguinal canal was explored. Cord structures were separated from the indirect hernial sac. We encountered vermiform appendix, cecum, and part of ascending colon in the hernial sac (Figure 2) as its contents. There were no signs of inflammation in the appendix as well as the bowel despite there being around 100 ml of infected peritoneal fluid in the hernial sac. Hence, contents were reduced and the sac was transfixed using polyglactin sutures. Bearing in mind the infected nature of the peritoneal fluid, Desarda's hernia repair was done without mesh reinforcement. Inguino-scrotal skin incision closed with vertical mattress sutures (Figure 3) using monofilament, non-absorbable material after placing a subcutaneous suction drain. The post-operative period was uneventful. Enteral feeds started on POD (Post-Operative Day) 1. The

patient passed stools on POD 3. The subcutaneous drain was removed on POD 3. Sutures were removed on POD 8. Follow-up after a month was unremarkable.



Figure 1 shows dilated small bowel loops with few air-fluid levels



Figure 2 shows the vermiform appendix, cecum, and part of ascending colon inside the hernial sac.



Figure 3 shows the closure of the inguinoscrotal skin incision along with the subcutaneous suction drain

Case Scenario 2:

A 65-year-old male patient presented to the emergency room with painful right sided inguinal swelling extending up to the scrotum for 5 days which was previously reducible for the past 2 years. Examination revealed soft abdomen with irreducible right sided complete inguinal hernia. The patient was taken to OR and the right inguinal canal was explored by taking an inguino-scrotal incision. Hernial sac was separated from the cord structures. Upon entering the hernial sac, vermiform appendix, caecum, terminal ileum and part of ascending colon were identified. There were no signs of ischemia or infection (Figure 4). Hence, the neck was widened and the contents were reduced diligently. The redundant sac was transfixed with polyglactin 2/0 sutures. Amid's modification of Lichtenstein's repair was done with light-weight, macroporous, polypropylene mesh. After placing a subcutaneous suction drain, skin incision closed with vertical mattress sutures using nylon 2/0 sutures (Figure 5). Enteral feeds started after 6 hours and the bowel habits resumed on POD 2 and the patient was discharged afterwards. Follow-up was uneventful.

Figure 4 shows vermiform appendix, caecum, terminal ileum and part of ascending colon in the hernial sac



Figure 5 shows the closure of the inguinoscrotal skin incision along with the subcutaneous suction drain

Case scenario 3:

A 77-year-old male presented to our outpatient department with complaints of right groin swelling that progressed gradually over one year. On examination, a globular swelling was present over the right inguinal region. The swelling was reducible spontaneously and also exerted an expansile cough impulse. The patient was posted for elective hernia repair after obtaining anesthetic fitness. While separating the cord structures from the indirect hernial sac, the sac was opened inadvertently. On further examination, the appendix was visualized along with its mesoappendix with no signs of inflammation (Figure 6). Hence, contents were reduced followed by trans-fixation of sac done. Amid's modification of Lichtenstein's tension-free inguinal hernioplasty was done with the placement of prosthetic polypropylene micropore mesh. Patient was discharged on the next day. There were no complications in the postoperative period as well as on follow-up.



Figure 6 shows the vermiform appendix in the hernial sac

Discussion:

Amyand's hernia occurs when the appendix herniates into the inguinal canal sac. Most commonly seen in the elderly with a male-female ratio of 5.4:1.^[4] In the present study, all of them are elderly male patients. It has been documented in infants as early as 15 days old.^[5] Because of the anatomical proximity of the appendix to the right inguinal canal, it occurs most commonly on the right side. However, it can happen on the left side in case of situs-inversus, long appendix with the mobile cecum, and intestinal malrotation.^[6] Inflammation of the appendix in Amyand's hernia occurs rather due to extra-luminal obstruction caused by pressure at the hernia neck than intraluminal obstruction.^[7] Also, the appendix herniation can occur in femoral hernias, which is known as, 'De Garengeot hernia'.^[8] Amyand's hernia is prone to incarceration due

to its passage through a narrow deep inguinal ring which subsequently results in appendiceal inflammation.^[9]

From a painless groin swelling to an irreducible, tender groin swelling indicating incarceration, the clinical presentation varies.^[1] The continuum of clinical presentation were observed in our current study. Very rarely, they may present with inguinal fasciitis, abscess, or fistula. Most of Amyand's hernia is diagnosed intra-operatively, as most of the incarcerated hernia warrant immediate surgery. Ultrasound imaging and Computed tomography can help in diagnosing this rare entity when the clinical presentation is vague. Only first patient in our study underwent US imaging, still, it was not sensitive enough to diagnose Amyand's hernia. All the patients were diagnosed intra-operatively. Rikki modification of Losanoff and Basson classification (Table 1) is widely used for the surgical management of Amyand's hernia.^[10] Also, the literature review showed (Table 2), usage of the prosthetic mesh should be discouraged in case of enteric spillage or surgical site contamination which increases the infection rates. Sharma et al. reported patients with appendix in normal, inflamed, perforated, gangrenous and their management as per the classification whereas Michalinos performed prophylactic appendectomy in two patients due to medical conditions despite normal appendix, thus escaping from the therapeutic frame of above-mentioned criteria.^[1,11] In our study, the appendix was normal (Type 1) in all three patients. Therefore, it was preserved. Mesh reinforcement was deferred in our first patient, because of mild contamination from the infected peritoneal fluid.

Conclusion:

Amyand's hernia surprises surgeons in unpredicted circumstances. Surgery remains the best diagnostic modality and the treatment of choice. Every article gives further information on diagnosing the condition accurately and eventually, improving patients' outcomes. To conclude, surgeons should be cognizant of this rare clinical condition in case of incarcerated right inguinal hernia and also should be aware of the best surgical treatment options.

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Figure captions:

Figure 1 shows dilated small bowel loops with few air-fluid levels

Figure 2 shows the vermiform appendix, cecum, and part of ascending colon inside the hernial sac.

Figure 3 shows the closure of the inguinoscrotal skin incision along with the subcutaneous suction drain.

Figure 4 shows vermiform appendix, caecum, terminal ileum and part of ascending colon in the hernial sac

Figure 5 shows the closure of the inguinoscrotal skin incision along with the subcutaneous suction drain

Figure 6 shows the vermiform appendix in the hernial sac.

Tables:

Table 2: Rikki modification of Losanoff and Basson classification of Amyand's hernia.

Classification	Description	Management
Type 1	Normal appendix in an inguinal hernia	Hernia reduction, Mesh placement
Type 2	Acute appendicitis in an inguinal hernia with no abdominal sepsis	Appendectomy, primary hernia repair with no prosthetics
Type 3	Acute appendicitis in an inguinal hernia with peritoneal and/or abdominal wall sepsis	Laparotomy, appendectomy, and primary hernia repair with no prosthetics
Type 4	Acute appendicitis in an inguinal hernia with concomitant abdominal pathology	Same as type 3 plus management of concomitant abdominal pathology
Type 5a	Normal appendix within an incisional hernia	Hernia reduction, primary repair of hernia with mesh placement
Type 5b	Acute appendicitis within an incisional hernia without peritonitis	Appendectomy through the hernia, primary closure of the aponeurotic gap, hernia repair with no prosthetics

Type 5c	Acute appendicitis within an incisional hernia with peritonitis or abdominal wall sepsis or about previous surgery	same as type 4
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Table II: Review of literature

Study	No. of cases	Type of Amyand's hernia	Type of repair
Sharma et al. 1 (2007)	18	Normal appendix – 11	Mesh repair
		Inflamed appendix – 4	Appendectomy and hernia repair without mesh
		Perforated appendix – 2	Laparotomy, appendectomy, and hernia repair without mesh
		Gangrenous Appendix - 1	Laparotomy, right hemicolectomy, hernia repair without mesh
Psarras et al (2011)12	4	Normal appendix – 2	Mesh repair
		Inflamed appendix – 1	Appendectomy and hernia repair without mesh
		Long appendix - 1	Appendectomy and hernia repair with mesh
Okur et al (2013) 13	21	Normal appendix – 12	Mesh repair
		Inflamed appendix – 5	Appendectomy and hernia repair without mesh
		Perforated appendix – 1	Appendectomy and hernia repair without mesh
		Appendix adhered to hernial sac - 3	Appendectomy and hernia repair without mesh
Michalinos et al (2013)	3	Inflamed appendix - 1	Appendectomy with mesh and plug hernia repair
		Normal appendix - 2	Prophylactic appendectomy with plug repair (to avoid future catastrophe as one of them was immunosuppressed and the other one had cardiac failure)
Desai et al (2017)14	3	Normal appendix - 1	Mesh repair
		Inflamed appendix - 1	Appendectomy and hernia repair without mesh
		Perforated appendix - 1	Appendectomy and hernia repair without mesh
Gao et al (2021)15	6	Normal appendix – 2	Lichtenstein's repair
		Inflamed appendix – 1	Appendectomy with Trans-abdominal preperitoneal repair
		Perforated appendix - 2	Appendectomy with Bassini suture repair - 1 Appendectomy with Lichtenstein's repair – 1 Appendectomy alone - 1 (serious localized inflammation and infection deferred hernia repair)

Present study (2021)	3	Normal appendix – 3	Mesh repair – 2 Hernia repair without mesh - 1
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