

Case Report

Use of an open double incision to treat acute appendicitis in an Amyand's hernia: a case report and review of the literature

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Received June 25, 2017; Accepted December 12, 2017; Epub January 15, 2018; Published January 30, 2018

Abstract: Amyand's hernia (AH) is an inguinal hernia that contains the vermiform appendix within its sac and is difficult to diagnose preoperatively. We encountered a case of AH with acute perforated appendicitis and peritonitis, which was diagnosed based on preoperative CT. Intraoperatively, we discovered that the internal inguinal ring was small, and part of the appendix was within the hernia sac; the proximal end of the appendix was intra-abdominal, and the fascia transversalis was intact. We used a unique double-incision approach for the surgery with inguinal and McBurney's incisions. Via the inguinal incision, we probed the appendix and repaired the hernia using the Bassini technique rather than the Shouldice technique. The appendectomy was performed and the purulent intra-abdominal secretions were cleaned via the McBurney incision. Outcomes for this patient were ideal. We also reviewed the related literature and analyzed recent reports on AH.

Keywords: Amyand's hernia, acute appendicitis, inguinal incision, McBurney's incision, appendectomy

Introduction

When an inguinal hernia contains the vermiform appendix within its sac, it is called an Amyand's hernia (AH) [1]. AH is rare and difficult to diagnose preoperatively; most cases are diagnosed intraoperatively. Preoperative diagnosis would greatly help with the selection of treatment. Preoperative computed tomography (CT) can aid in the establishment of early diagnosis [2-4]. There are no guidelines to help operator to determine where to perform the appendectomy, i.e., through the inguinal incision or the McBurney incision, and there are no previous case reports on the use of the double incision to treat acute appendicitis in the context of AH.

Case report

A 65-year-old man presented with bilateral inguinal swellings. The swelling on the left had been present for about 1 year and was reducible. However, the swelling on the right had

appeared 2 days earlier, after a bout of coughing, and was irreducible. He had had comorbid chronic (asthmatic) bronchitis for 5 years. Abdominal examination revealed abdominal muscle rigidity, marked tenderness in the right lower quadrant, and slight rebound tenderness. CT showed a tubular structure (possible an acutely inflamed appendix) in the right incarcerated inguinal hernia and a sac in the left groin (**Figure 1**). Reconstructed CT showed a cord-like structure (about 6.5 × 1.5 cm) in the right groin (**Figure 2**). Clinically, a diagnosis of AH in the right groin was made. The patient was prepared for emergency surgery.

The right groin was explored through an inguinal incision. An indirect hernia with an edematous sac was identified. Within the sac, the appendix was hyperemic, edematous, and perforated, but no collection of pus was present. The diameter of the internal inguinal ring was about 1.5 cm, which just allowed passage of the appendix and mesoappendix. The ileocecal junction was not visible in the hernia sac, and



Figure 1. The tubular structure (possible an acutely inflamed appendix) is circled.



Figure 2. Reconstructed computed tomography (CT) image showing a cord-like structure approximately 6.5 × 1.5 cm in size (arrow).

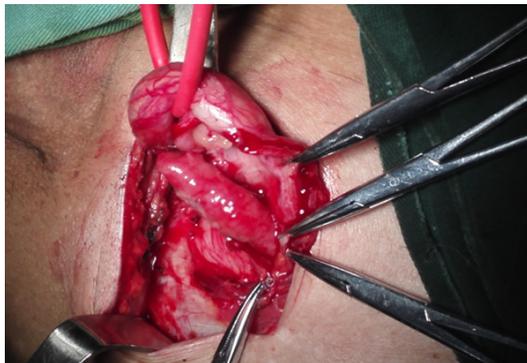


Figure 3. The inflamed appendix in the sac, the internal ring, and the intact fascia transversalis.

the fascia transversalis was intact (**Figure 3**). Therefore, we decided to perform an appendectomy and suture repair of the right hernia and to repair the left hernia at another time. To avoid damage to the internal ring structure, we decided to resect the appendix and to explore the pelvic cavity via a McBurney incision (**Figure**



Figure 4. The two incisions, the constricted ring at the proximal appendix, and pus in the right iliac fossa.

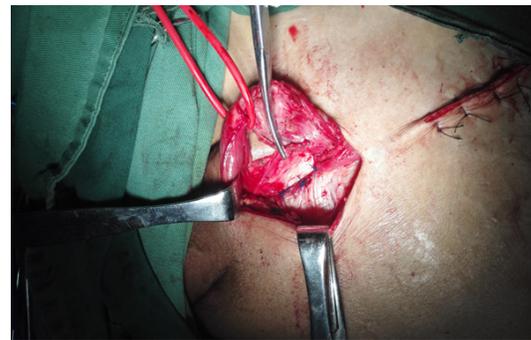


Figure 5. The inguinal incision was repaired using the Bassini technique.

4). After the appendix had been reduced into the abdominal cavity via the two incisions, a constricted ring became obvious at the proximal appendix; no edematous or inflammatory change was detected near the base of the appendix and the corresponding mesoappendix, whereas copious watery pus was found in the right iliac fossa (**Figure 4**). A surgical dressing was used to protect the McBurney incision, and conventional appendectomy was performed. After aspirating about 200 mL watery pus from the iliac fossa, pelvic cavity, and right paracolic sulci, we repeatedly scrubbed these areas with saline gauze to reduce any intra-abdominal inflammatory secretion. We did not leave an indwelling abdominal-cavity drainage tube. We repaired the inguinal incision using the Bassini technique rather than the Shouldice technique with Prolene, and then closed the two incisions (**Figure 5**).

Histopathologically, the specimen was a suppurative, gangrenous, perforated appendix, measuring 7 cm in length and 1.5 cm in diameter. The two incisions healed well (**Figure 6**) and the



Figure 6. Primary healing of the two incisions.

patient was discharged 6 days post-operatively. No recurrence of the hernia was noted at the 3-month follow-up examination.

Discussion

AH is an inguinal hernia where the appendix is contained within the hernial sac. It is rare and difficult to diagnose preoperatively. Techniques for diagnosing and managing AH have been reported in several cases in the literature. We have collected some published AH cases similar to our own and present them in **Table 1**.

Most pelvic cavity organs, including the appendix, have the potential to herniate into the groin [5]. In some patients, a slightly longer mesentery at the ileocecal junction and right paracolic sulci can result in a shift of the ileocecal junction to the pelvic cavity and even to the left side of the abdominal cavity [2, 6-8]. Some patients have especially long appendices, exceeding 10 cm in length [9]. A sudden increase in intra-abdominal pressure may cause the appendix to herniate into the inguinal hernia sac.

This patient had a history of left inguinal hernia only. However, after a bout of coughing, a painful funicular swelling appeared in his right groin. We suspected that the appendix had herniated into the right inguinal sac. AH is a rare condition that is difficult to diagnose preoperatively, and is most often diagnosed intraoperatively [10, 11]. Preoperative diagnosis would greatly facilitate the selection of treatment and improve patients' prognoses. Preoperative CT can aid in early diagnosis [2-4]. As we suspected AH in our patient based on the disease process and preoperative examination, we performed abdominal CT preoperatively. This ex-

amination showed a tubular structure (**Figure 1**), and reconstructed CT showed a cord-like structure measuring about 6.5 × 1.5 cm (**Figure 2**). Therefore, a diagnosis of AH was made preoperatively.

Clinically, hernias in the groin can be classified into four types: reducible, irreducible, incarcerated, and strangulated hernias. Depending on the type, an appendix in the sac can have different pathological manifestations, including normality, inflammation, necrosis, perforation, and even peritonitis [3, 10, 12, 13]. Our patient developed a painful swelling in the right groin for 2 days, but no fever. The local skin color was normal and the leukocyte count was not very high. Therefore, the pathological manifestations of the appendix in the sac were difficult to identify preoperatively. As well, definitive pathological diagnosis preoperatively is difficult with this kind of disease.

To manage the appendix in the AH sac, we followed Losanoff and Basson [14]. We found that this AH contained only an inflamed, perforated appendix, with no pus. The salient features of our patient were acute festering perforated appendicitis combined with peritonitis, classified as type 3 according to Losanoff and Basson [14], who recommend appendectomy for such cases. We added a second incision, i.e., the standard McBurney's incision, for the appendectomy and to drain the abdominal pus. We chose this option for three reasons. First, the diameter of the internal ring was only about 1.5 cm, and the fascia transversalis was intact. If the appendectomy was performed via the inguinal incision, the internal ring would have been cut and enlarged to expose the ileocecal junction and pull it downward, which likely would have destroyed the relatively normal structure of the fascia transversalis and created a new defect. Second, the pus discharged from the perforated appendix might have been squeezed into the abdominal cavity via the narrow internal ring due to the high pressure in the hernia sac, with accumulation in the pelvic cavity. Obviously, the drainage of any intra-abdominal inflammatory secretion through the inguinal incision would have been difficult. Third, performance of the appendectomy via the inguinal incision likely would have increased contamination of the inguinal incision, leading to infection, which would have

Treatment of an Amyand's hernia

Table 1. Clinical features and outcomes of some typical amyand's hernia

Author	Public year	Number of patients	Gender	Age/year	Duration of symptom	Preoperative examination and outcome	Surgical treatment choice	Outcome
D'Alia C [22]	2003	1	Male	84	5 days	X-rays of the abdomen Revealing no pathological elements	1. Inguinal incision 2. Appendectomy 3. Modified Shouldice technique	Recovery
Salemis NS [9]	2006	1	Male	61	3 hour	Ultrasonography Probably containing herniated omentum	1. Inguinal incision 2. Appendectomy 3. Shouldice's herniorrhaphy	Recovery
Livaditi E [23]	2007	2	Male	35	1 day	Ultrasonography A congested intestinal loop	1. Inguinal incision 2. Appendectomy 3. Primary hernia repair	Recovery
			Male	32	?	Ultrasonography Intestinal loop	1. Inguinal incision 2. Appendectomy 3. Primary hernia repair	Recovery
Ranganathan G [13]	2011	1	Male	80	3 days	Abdominal X-ray Unremarkable.	1. Inguinal incision 2. Appendectomy 3. Tension-free repair	Recovery
Singal R [3]	2012	3	Female	70	5 days	Computed enhanced contrast tomography Inflamed appendix	1. Exploratory laparotomy 2. Appendectomy 3. No mesh repair	Recovery
			Male	72	3 days	Ultrasonography Showed an appendix in the inguinal canal	1. Inguinal incision 2. Appendectomy 3. Bassini's repair	Recovery
			Male	64	1 day	Ultrasonography Bowel loops	1. Inguinal incision 2. Hemicolectomy 3. Closed with prolene loop	Asymptomatic
Bo D [6]	2014	1	Male	63	3 days	Computed tomography Ileocecum within the left inguinal hernial sac	1. Left inguinal incision 2. Appendectomy 3. Herniorrhaphy was done with a biological mesh	Recovery
Ciftci F [17]	2015	2	Male	27	10 hour	X-ray of the abdomen Air-fluid levels	1. Inguinal incision 2. Appendectomy 3. Tension-free repair	Inguinal region looked to be healing well
			Male	24	3 hour	X-rays Revealed nothing noteworthy	1. Inguinal incision 2. Appendectomy 3. Tension-free repair	Inguinal region looked to be healing well
Smith-Singares E [4]	2016	1	Male	71	2-3 days	Computed tomography Inflamed vermiform appendix and obstructing fecalith	1. Inguinal incision 2. Appendectomy 3. Bassini's repair	No hernia recurrences
Al-Ramli W [21]	2016	1	Male	20	1 day	Blood investigation Ultrasonography No inflammatory mass identified Elevation of white blood cells	1. Exploratory laparoscopic surgery 2. Appendectomy 3. Elective hernioplasty at a later date	Clinical recovery
Chiang CC [19]	2017	1	Male	53	2 days	Computed tomography Appendix which incarcerated into the hernia sac	1. Laparoscopic appendectomy 2. Performed total extraperitoneal laparoscopic hernia repair with mesh	No recurrence

affected the hernia repair further and might have led to hernia recurrence.

The method of AH repair is worth considering. The use of prosthetic mesh may reduce hernia recurrence, but opinions about this approach to AH repair differ. Most studies have shown that the use of prosthetic mesh increases the complication rate when the mesh is placed directly over the viscera or when the surgical site is contaminated via pre-existing infection or enteric spillage [11, 15, 16]. However, exceptions have been reported [10, 13, 17]. For example, MacArthur and Dhabuwala [10] performed a mesh repair of a type 2 AH. They did not open the hernia sac; they repaired the hernia using a standard open technique and mesh. We believe that the use of prosthetic mesh should be restricted to cases with non-inflamed, non-perforated appendices, as stated by Losanoff and Basson [14]. Our patient had acute festering perforated appendicitis combined with peritonitis; thus, we repaired the hernia using the standard Bassini technique without mesh (**Figure 5**). The results for this patient were ideal (**Figure 6**).

The technology and equipment used to perform a laparoscopic appendectomy are very common [18]. As well, laparoscopic appendectomy has been successfully used in the treatment of AH [19, 20]. In this case of AH, the groin area showing infection was minimal, while the abdominal cavity infection was serious. Similar to what was previously reported by Al-Ramli [21], we were able to explore the abdominal cavity, withdraw the appendix from the sac, and resect the appendix laparoscopically. An elective hernioplasty was planned for a later date, i.e., once the abdominal infection had cleared. However, as described above, it was very difficult to determine the severity of the infection in the AH inguinal area preoperatively.

While no firm conclusion can be reached from the results of a single case study, this report suggests that preoperative CT can aid early diagnosis. We recommend that surgeons avoid damage to the internal ring when it is small and the fascia transversalis is intact. Appendectomy can be performed through the McBurney incision. Then, the hernia can be repaired with Prolene, through the inguinal incision, using the Bassini technique.

Acknowledgements

We acknowledged the work of management involved in the comprehensive treatments in these individuals (Mr. Guofu Zheng, Weiqing Chen, and Ye Bo).

Disclosure of conflict of interest

None.

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