



Amyand's Hernia: Correct Surgical Management

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Abstract: Introduction: The vermiform appendix in an inguinal hernia was described for the first time by Claudius Amyand, French military surgeon (1660-1740), regardless of the location of the appendix. Objective: To present a case. Method: A 57-year-old male presents with a 3-year right inguinal hernia with occasional intermittent fixed colic pain of mild intensity radiating to the ipsilateral testicle with a reducible mass effect and alteration in the conformation of the inguinal region. Amyand's hernia was diagnosed without any appendicular or septic inflammatory process. Laparoscopic inguinal plastic with mesh is performed. No complications. Discussion: classically Amyand's hernia occurs in 1% of all inguinal hernias, and appendicitis in Amyand's hernia accounts for 0.1% of appendicitis cases. Inguinal hernia is a common clinical condition, affecting 27-43% of men and 3-6% of women, its clinical presentation simulates acute appendicitis. Even with proper evaluation, its identification is usually particularly difficult, even by ultrasound or CT scan. Although the surgical treatment strategy remains controversial, especially in cases of Amyand's hernia with abscess formation, it is the question/option. Conclusion: patients with Amyand's hernia are today a challenge in the matter of making decisions regarding what conduct to follow regarding their treatment. Although its incidence is low, it should not be taken lightly, since the moment in which only the expertise of the Chief

Surgeon is presented, will make the difference that will directly impact morbidity/mortality.

Keywords: Inguinal hernia, Amyand's hernia, Acute appendicitis, Abscess, Inguinal plastic, Laparoscopy.

INTRODUCTION

The existence of a vermiform appendix in an inguinal hernia was first described by Claudius Amyand, French military surgeon (1660-1740), conventionally referred to as Amyand's hernia. The name "Amyand's hernia" is used regardless of the location of the vermiform appendix (normal, inflamed, perforated, fistulous, or gangrenous). [1] The actual prevalence of Amyand's hernia appears to be lower than that classically described. It is very rare; when it does occur, it is often misdiagnosed as a strangulated inguinal hernia or is by a trans operative finding. On December 6, 1735, at St. George's Hospital, Surgeon Amyand treated an 11-year-old patient with a chronically inflamed appendix in an inguinal hernia. [2] The name "Amyand's hernia" was first suggested by Creese in 1953, then by Hiatt and Hiatt in 1988, where it is confirmed by Hutchinson in 1993, in recognition of Amyand's early work. [3] He was therefore the first to perform and publish the first appendectomy.

Classically, Amyand's hernia is described as occurring in 1% of all inguinal hernias, and appendicitis in Amyand's hernia account for 0.1% of all appendicitis cases. And inguinal hernia is a common clinical condition, affecting 27%-43% of men and 3%-6% of women. [3, 4] Littre's hernia involves herniation of a Meckel's diverticulum and is also extremely rare, with an incidence to date unknown. [5] The simultaneous occurrence of both entities was reported for the first and only time in 2018, due to their rarity, only a few cases of these hernias have been described in the literature. [6] Amyand's hernia, thought of in pediatric patients, is usually due to persistence of the peritoneal vaginal canal, while in adults, fibrotic adhesions between the appendix and the hernial sac may guide herniation. Contraction of the abdominal wall may cause luminal obstruction and subsequent appendicitis. [7]

Inguinal hernias can contain a wide variety of structures, such as segments of the intestine, omentum, ovaries, bladder, Meckel's diverticulum, and occasionally the appendix. The presence of the vermiform appendix, regardless of whether it is inflamed, within the hernia sac is called Amyand's hernia. [8, 9]

On the other hand, acute appendicitis is defined as the infectious inflammation of the cecal appendix, this intestinal remnant is considered by many as a vestigial organ without function, its etiology is unknown to date. [10] And it is the most frequent emergency surgical pathology in our country and in the world, with presentation at any age, but with a predominance in children and in the age groups of 20 to 30 years, without preponderance of gender. Its incidence is very contrary to the pathology of Amyand's hernia. [11] Historically, the cecal appendix was specified in a drawing from 1492 by Leonardo da Vinci. Later, in 1554, Jean Francois Fernel discovered and identified the appendix in a corpse. But the first to coin the term vermiform appendix was the Italian anatomist Guido Guidi in 1561. Jean Fernel and Von Hilden are credited with their recognition of the disease, and it is in contrast to Lorenz Heister in 1771 where he published an acute perforated appendicitis, when Amyand had done so and published 35 years earlier. [12, 13] Amyand's hernia From an

epidemiological point of view, this condition predominantly affects males, with a male-to-female ratio of 3:1, and is more frequent in infants than in adults. [14]

By pathophysiology, a systematic review suggested that the main cause of the development of appendicitis in Amyand's hernia is external compression generated by muscle contraction and a transient increase in intra-abdominal pressure, which leads to ischemia and a subsequent inflammatory process, which translates into a nonspecific and confusing clinical picture of a strangulated inguinal hernia. [15, 16] In other patients, this hernia is very specific, since many cases do not present complications, or are completely asymptomatic. [17]

Differential diagnosis is usually incidental and intraoperative with a study such as ultrasound is an operator-dependent imaging study, but it is accessible and inexpensive; an Achilles hernia can be found, where CT scan is the imaging study of choice for best visualization; where Achilles hernia when the cecum is closed to the internal inguinal ring, and there is evidence of a thickened appendix and tubular structure in the hernial sac. [18, 19]

OBJECTIVE

Presentation of a case and review of national and international medical literature

METHOD

A 57-year-old male with a history of type 2 diabetes mellitus and systemic arterial hypertension under pharmacological treatment. With a surgical history of septoplasty. He has an allergy to sulfonamides with a history of anaphylactic shock. Drug addiction is present with positive smoking for 30 years intense suspended for 6 years and occasional social alcoholism. He presents a right inguinal hernia of 3 years of evolution with occasional intermittent pain fixed colic type of mild intensity radiating to the ipsilateral testicle with a reducible mass effect and alteration in the conformation of the inguinal region, it is reviewed by the Surgery consultation and electively its surgical programming is decided with preoperative studies with and preoperative assessment by the Anesthesia service. However, a month later he went to the emergency department due to increased pain, with an increase in volume of the right testicle and upper respiratory tract infection.

On conscious physical examination with a 15-point Glasgow, calm cooperative, with vital signs with HR: 76x'. Fr: 18x' Temp:36.6° C. T/W:143/76 mm Hg. Mucous membranes well hydrated with good integument coloration. Head and neck unaltered with cardiopulmonary without involvement, globose abdomen at the expense of adipose panniculus, peristalsis present with evidence of struggle, metallic noises and borborygmi, no visceromegaly with the absence of acute abdomen, no peritonism, and no evidence of peritoneal irritation. Von Blumberg's sign is absent. In the inguinal region, an increase in volume was detected in the right region, with a defect of 3 cm in the conformation with a hernial annulus of approximately 2 cm, not reducible with moderate pain, no changes in coloration with slight edema and minimal erythema. With very marked data of constipation. Therefore, emergency laboratories and cabinet studies are requested. Laboratories on admission with hemoglobin of 15.25 g/dl. Hematocrit 44.89%. Platelets: 370.50 x 103mm3.

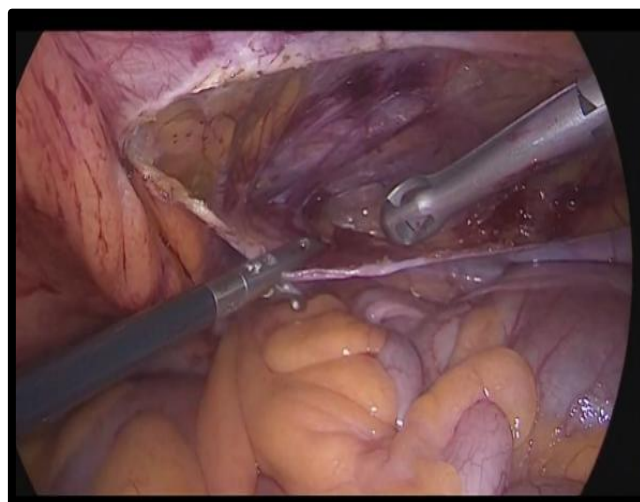
Leukocytes: $10.9 \times 10^3/\text{mm}^3$. Neutrophils: 93.86%. Lymphocytes: 4.59%. Monocytes: 1.39%. Prothrombin time of 11.8". Thromboplastin time of 30.5". Glucose: 173.4 mg/dl. Urea: 24.4mg/dl. Creatinine: 0.7 mg/dl. Sodium: 137 med/l. Potassium: 4.61 med/l. Chlorine: 102 med/l. Initial blood gases with pH: 7.37. PCO₂: 38 mm Hg. PO₂: 84 mm Hg. Lac: 0.6 mmol/L. HCO₃: 21.4 mmol/L. BE if: 0.1 mmol/L SatO₂: 92 %.

With a chest tele radiological x-ray, rotated with deficient technique without finding radiological data of emphysema in soft tissues or pneumomediastinum or anatomical structural alteration of the visible. Electrocardiograms without apparent alterations. Therefore, it was decided to carry out priority inguinal surgery with the diagnosis of imprisoned right inguinal hernia with a laparoscopic approach transabdominal peritoneal technique (TAPP) under general anesthesia. During the procedure, a hernial ring lateral to the epigastric vessels of 3×2 cm was identified with a hernia sac that contained a cecal appendix without any involvement, see figure 1.



Figure 1: Right inguinal hernia with cecal appendix in its contents or Amyand's hernia.

Identification of the ilioinguinal, iliohypogastric and genitofemoral nerves. Dissection of the external boundary to identify the psoas muscle and dissection to the pubic tubercle which is the internal boundary. Identify and dissect the elements of the cord. Dissect the pectineal ligament and femoral vessels, look for femoral defects and avoid the vessels known as "corona mortis", see figure 2.



With the placement and strengthening of the mesh with fixation tacks, peritoneal tissue closure is also performed, without trans operative incidents. **See Figure 3.**



Figure 3: Mesh placement in the hernial groin defect

The estimated bleeding was minimal or less than 10 ml and the use of drains was not necessary. The postoperative diagnosis was indirect inguinal hernia. Its evolution was satisfactory and with discharge to the home for short-stay surgery, with subsequent control in the Surgery consultation.

DISCUSSION

In 2008, Losanoff and Basson introduced a classification based on the inflammatory stage of the appendix, including the recommended treatment for each type.

Type 1 describes a normal appendix and recommends mesh hernioplasty with or without appendectomy.

Type 2 will have uncomplicated acute appendicular inflammation within the hernial sac, and open appendectomy with open hernia repair without prosthetic mesh placement is advised.

Type 3 includes complicated appendicitis (perforation, abscess), and treatment is aimed at controlling the focus of the acute infection. Hernia repair is not recommended during the first operation, given the high risk of infection of the mesh.

Type 4 includes other pathologies as a cause of acute appendicitis (i.e., malignancy, diverticulitis), and treatment should be specific to that disease process. [20] Amyand's hernia represents a diagnostic challenge and is most often considered an incidental intraoperative diagnosis. There is no protocolized treatment, however, the inflammatory degree of the appendix is what guides the surgical approach. [21]

Losanoff-Basson hernia type 4 of Amyand with mixed hernia content on the side has been documented the right artery with a large extension of 370 cm from the angle of Treitz to the scrotum, including the cecum, appendix and terminal ileum, with cecal perforation, appendicular involvement, fecal effusion and Fournier's gangrene of the scrotum, with approximately 30 cm of small intestine. Management is surgical and resection of the small intestine is performed at 340 cm from the angle of Treitz with a colonic pouch, ileostomy of the terminal ileum, right orchiectomy, scrotal debridement with repeated surgical

washes and primary repair of the hernia defect without mesh. [22] Or the case of identifying a patient with Amyand's hernia with acute necrotic and perforated appendicitis complicated by generalized fibrinopurulent peritonitis, in which intraoperative recognition of purulent communication through the internal inguinal ring dictated an immediate escalation from inguinal examination to laparotomy for definitive control of the infectious focus. [23] Amyand's hernia is three times more likely to be diagnosed in the pediatric population due to the patency of vaginal processes but has been reported in patients from three weeks to 92 years. [19, 24] Although it usually occurs in the pediatric population, this type of hernia often goes undetected because its clinical presentation mimics acute appendicitis. Even with proper evaluation, identification is often particularly difficult, including ultrasound or computed tomography. [25] Patients with acute abdomen are given intravenous fluids and preoperative antibiotics. Surgically, laparoscopy revealed an acute swollen appendix within the hernial sac, along with the cecum and terminal ileum. Laparoscopic appendectomy is considered, followed by open repair of the right inguinal hernia with mesh placement. [26] On the contrary, it was decided to perform an elective laparoscopic appendectomy and open hernia repair after attempting manual reduction. The hernia floor was repaired by a tension-free, mesh-free repair, due to the nature of suppurative appendicitis, using the Bassini technique, where the posterior wall of the inguinal canal was reconstructed by suturing the tendon together to the inguinal ligament, without generating tissue tension. [27]

Another modality of treating complicated right Amyand's hernia, inguinal hernia containing a perforated appendix with an appendicolith and a scrotal abscess due to tissue rupture, requiring urgent surgical intervention. This case highlights the importance of CT in the evaluation of atypical inguinal sepsis, the value of surgeon management, and the critical role of timely surgery. In addition, it emphasizes the need for individualized surgical strategies when addressing it. [28] Another way to treat Amyand's hernia is when an inflamed appendix is found in the hernial sac. Despite the absence of appendicitis, an appendectomy was performed due to age, comorbidities, and the potential risk of future complications. Hernia repair was completed using a ProGrip self-fixing mesh and Bassini's technique. [29] Acute appendicitis requires differentiation from various conditions, such as complicated inguinal hernias, acute appendicitis, urogenital emergencies, and soft tissue infections, reflecting the anatomical complexity of the inguinal region. The management of the hernia is already described and as previously mentioned depends on the Losanoff and Basson classification. [30] However, treatment strategies should be tailored to each patient, and classification-based treatment strategies should be updated. While several cases of Amyand's hernia at risk of infection have been reported, cases with extensive inguinal abscesses are limited. [31]

In addition, there are cases of appendicular carcinoma, which is a rare disease, accounting for approximately 1% of all colorectal cancers and 0.9-1.4% of appendectomy specimens. And with an Amyand's hernia appendectomy followed by right hemicolectomy and ileocecal resection combined with abdominal wall resection with non-mesh inguinal plasty. [32]

Although the treatment strategy remains controversial, especially in cases of Amyand's hernia with abscess formation. When diagnosed preoperatively by CT scan, this is the two-stage strategy, which could reduce the likelihood of surgical site infection, and the use of mesh in the second procedure would decrease the chance of hernia recurrence. [33] More technically complex cases with septic conditions are appropriate for suture repair only,

whereas mesh repair is commonly performed in cases of acute appendicitis without inflammation of the appendix and is most often used in conjunction with reduction of the appendix to the abdominal cavity rather than appendectomy. [34]

OBSERVATIONS

- It should be considered that surgeries are classified into four types according to the degree of contamination and the risk of infection of the surgical site, according to the criteria of the *National Research Council* (NRC) and Altemeier. In patients who present with an Amyand's hernia, when performing a prophylactic appendectomy and placing a mesh, the risk of infection is very high and failure due to "rejection" (infection) of the mesh is imminent, condemning to recurrence and extreme morbidity.
- The correct course of action in the treatment of patients with Amyand's hernia is to remit the urgency at the time of diagnosis, since if it is due to complications of the inguinal hernia, only perform what is necessary. A tension-free inguinal plastic without appendectomy.
- Finally, it should be considered that the urgency of cases with Amyand's hernia is acute appendicitis and its complications is the priority in the surgical act, and in a second time schedule the inguinal plastic without tension.
- Each patient is different, depending on whether they have a complicated or complex Amyand's hernia in conjunction with necrotizing fasciitis, mucocoele, cancer or septic shock among others, where the above statements must be taken into account, however, it will depend according to the expert of the chief surgeon to determine a control surgery of damage as an initial strategy.

CONCLUSIONS

Patients with Amyand's hernia are today a challenge in the matter of making decisions regarding what conduct to follow regarding their treatment. One must be zealous in following pragmatic behavior in the matter of never failing to preserve a clean surgery and use of a mesh in the inguinal plastic. When there is a septic process, its control and remission must be forceful and project a surgical intervention in stages.

Although its incidence is low, it should not be taken lightly, since the moment in which only the expertise of the Chief Surgeon is presented will make the difference that will directly impact the morbidity/mortality of the patient. Reason for study/concern of the authors of this research, which provides a regulation in this pathology.

Conflict of Interest

The authors stated that they had no potential conflicts of interest regarding the research, authorship, and/or publication of this article.

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