

CLINICAL EVALUATION AND TREATMENT OF AMYAND HERNIA WITH SEVERE APPENDICITIS: A CASE REPORT

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Abstract:

Background:

Amyand hernia is an uncommon clinical condition in which appendix coexists with an inguinal hernia sac. The condition can be challenging to diagnose and necessitates quick surgical action.

Case Presentation:

We report the case of a 27-year-old man with a history of reducible bilateral inguinal hernias who presented to the emergency room after experiencing abdominal pain, fever, vomiting, and anorexia for four days. Physical examination revealed tenderness in the right lower quadrant and epigastric region, along with positive rebound tenderness and Rovsing's sign. Laboratory results showed leukocytosis, and an abdominal CT scan revealed complicated appendicitis within the right inguinal hernia sac, surrounded by a fluid collection.

Discussion:

The pathophysiology of Amyand hernia is not fully understood, and the exact cause of appendicitis in this context remains speculative, primarily attributed to microcirculatory ischemia and compression.

Management of Amyand hernia is controversial, with the most established framework being the Losanoff and Basson Classification. However, we discuss three critical issues that warrant reconsideration within this classification: the indications for appendectomy in type 1, the role of laparoscopic approaches in general, and the necessity for a laparotomy incision in type 3.

Conclusion:

The three points of disagreement highlight the need for a revised management protocol based on additional publications, such as this case report. This concern has also been echoed by Losanoff and Basson.

Keywords:

Amyand hernia, inguinal hernia, appendicitis, Losanoff and Basson Classification, Case report

Introduction:

While inguinal hernias are prevalent, it is unusual for an inflamed and ruptured appendix to coexist with the hernia sac. In the sporadic syndrome known as Amyand hernia, defined as the presence of the vermiform appendix within the inguinal hernia sac, it may present with complex appendicitis, the vermiform appendix gets imprisoned within an inguinal hernia sac, causing acute inflammation and ultimately rupture.¹ The ailment was initially identified by the surgeon Claudius Amyand in 1735 after he successfully removed an appendix from an 11-year-old child who had an incarcerated hernia that contained the appendix.²

The possibility of severe complications and the danger of life-threatening outcomes make early diagnosis and treatment of Amyand hernia with complex appendicitis crucial from a clinical standpoint. This condition can result in peritonitis, sepsis, abscess development, and even death.³

Thus, in patients with inguinal hernias, particularly on the right side, who arrive with severe abdominal discomfort and indications of peritonitis, doctors must be aware of this particular presentation and consider it as a differential diagnosis.⁴

The paper aims to help understand and describe such situations, which can add to the body of medical knowledge, broaden general surgeons' expertise, and support early detection and effective therapy of this uncommon presentation. We also encourage debates about the best care plans for Amyand hernia with severe appendicitis by publishing this literature review and case report.

Case Presentation:

On the sixteenth of June, 2023, a 27-year-old man came to our emergency department. He had no prior surgical or medical history other than a four-year-old diagnosis of a reducible bilateral inguinal hernia. The patient arrived at the emergency room complaining of abdominal pain that had been present for four days. The pain started at the epigastric region and shifted to the right lower quadrant (RLQ). The sharp and ongoing discomfort was made worse by eating and moving about, and any known causes did not alleviate it. Along with several episodes of vomiting, nausea, and anorexia, the patient claimed to have an increased temperature of 40°C.

The patient's vital signs were within the normal range during physical examination. An epigastric and right lower abdominal quadrant tenderness with rebound tenderness was elicited along with the Rovsing's sign. Upon inspection, no skin changes, palpable lumps, or positive cough impulses were found in the inguinal region.

Diagnostic Assessment:

Laboratory results showed leukocytosis, with a white blood cell count of 23,400 microliters, but the rest of the data fell within the normal range.

A computerized tomography scan with intravenous and oral contrast revealed a dilated appendix in the right iliac fossa measuring 1.5 cm with a mucosal hyperenhancement and significant mesenteric fat stranding and regional lymph node. The distal appendix extended to the right inguinal canal with associated fluid collection/abscess in the inguinal region measuring 4.9×2.3 cm in craniocaudal and transverse dimensions, respectively.

There was a left inguinal hernia containing fat and tiny blood vessels, and the inguinal canal neck measures approximately 2.5 cm. [Fig. 1, 2 & 3]

The patient was identified as having type 2 Amyand hernia based on Losanoff and Basson's classification of Amyand's hernia with acute complicated appendicitis based on these clinical symptoms and imaging data.⁵

Losanoff and Basson Classification of Amyand's Hernia ⁵	
Type 1	Inguinal Hernia containing Normal Appendix as one of the content
Type 2	Inguinal Hernia containing Acute Appendicitis
Type 3	Inguinal Hernia containing Acute Appendicitis with related Peritonitis
Type 4	Inguinal Hernia containing Acute Appendicitis with Another Intra – Abdominal Disease

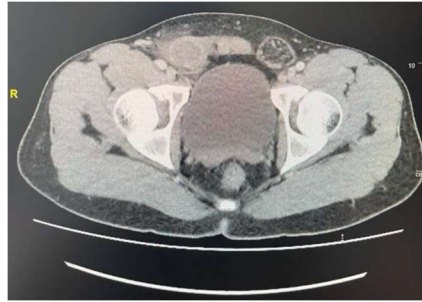


Figure 1



Figure 2



Figure 3

Therapeutic Intervention:

Following the SCARE guidelines, an urgent surgical intervention was decided to manage the acute appendicitis and prevent complications like intra-abdominal abscess, peritonitis, or sepsis. The patient received broad-spectrum intravenous antibiotics, analgesia, and fluid hydration before consenting to laparoscopic surgery, with the option to convert to open surgery if needed.⁶

The laparoscopic approach was chosen for its minimally invasive nature, leading to less postoperative discomfort and quicker recovery.⁷

Under general anesthesia, the abdomen was insufflated, and laparoscopic exploration revealed an inguinal hernia containing an inflamed appendix [Fig. 4]. A thorough suctioning method was utilized to prevent pus spread [Fig. 5]. A laparoscopic appendectomy was performed with careful handling to minimize damage and risk of contamination [Fig. 6]. The inflamed appendix was

retrieved in an Endobag and sent for histopathological assessment. A Jackson-Pratt drain was placed, and the abdomen was subsequently closed without complications.

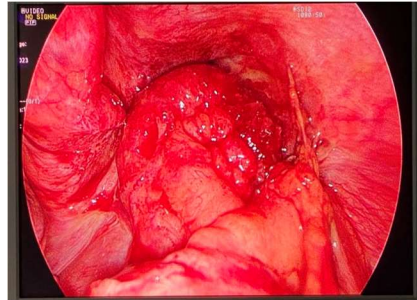


Figure 4

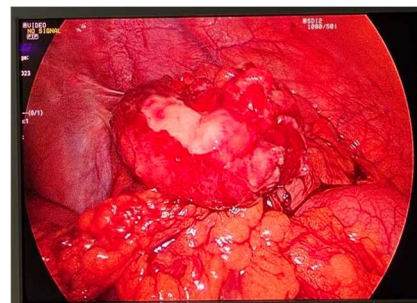


Figure 5

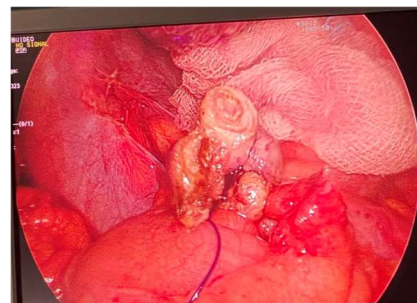


Figure 6

Follow-up and Outcome:

1. Postoperative Course:

The patient had a smooth recovery with manageable pain, returning to normal gastrointestinal function. The drain was removed by the second postoperative day, and the patient was deemed fit for discharge after improvement in clinical status and leukocyte count.

2. Discharge Plan and Medications:

On the third postoperative day, the patient received home care instructions and prescriptions, including Omeprazole, Paracetamol, Ibuprofen, and Augmentin for infection prevention.

3. Follow-up Appointments and Assessments:

The patient was scheduled for follow-ups every two weeks to monitor recovery and plan for future bilateral inguinal hernia repair.

4. Laboratory and Imaging Results During Follow-up:

Histopathology confirmed acute appendicitis for a 5 cm long appendix. The culture of aspirated fluid showed no bacterial growth. [Fig. 7 & 8] The culture of aspirated fluid was negative for any bacterial growth.

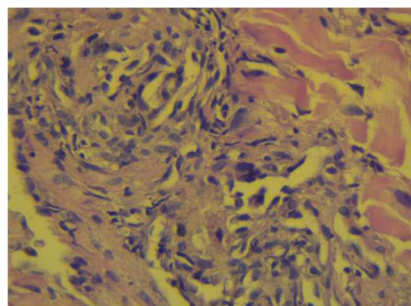


Figure 7

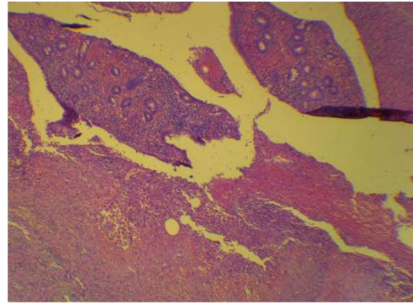


Figure 8

Discussion:

Amyand Hernia is the inguinal hernia that contained Appendix. It differs from De Garengeot's hernia, in which the appendix is the content of the femoral hernia.⁴

Amyand hernia is usually in the right inguinal hernia due to the closeness of the cecal appendix to the right inguinal region. Still, it was also reported on the left side, especially in cases with mobile cecum or situs inversus.⁴

1ST: PATHOPHYSIOLOGY:

Amyand Hernia is a rare condition, and even more uncommon is the occurrence of an inflamed appendix within it. This rarity prompts speculation regarding the possible causes.

Several factors can contribute to the condition of an Amyand hernia without appendicitis. A key factor is a congenital patent processus vaginalis, which can create a pathway for the appendix to herniate into the inguinal canal⁴. This is especially true if the appendix is long, with a lengthy mesentery, bringing it physically closer to the inguinal region.

Regarding appendicitis in the context of an Amyand hernia, it can be caused by multiple factors, all of which ultimately lead to bacterial overgrowth, translocation, and colonization, resulting in acute appendicitis. These factors include chronic stress and inflammation from the hernia, which can lead to adhesions and increase the risk of incarceration. Additionally, compression of the appendix's blood supply at the hernia neck—either externally, due to abdominal wall contraction or repeated failed reductions, or internally, from increased intra-abdominal pressure—can contribute to appendicitis. Another contributing factor is obstruction of the appendix lumen by a fecalith.^{4, 8, 9, 10, 11, 12}

More studies are required to fully understand the pathophysiological pathways behind the emergence of this uncommon illness.

2ND: MANAGEMENT:

The rarity of this condition also leads to a lack of clear guidelines for managing such cases, creating challenges in both diagnosis (requiring a broad range of suspicion) and determining the appropriate surgical approach. ¹ This highlights the need for further reporting similar cases to advance clinical understanding and improve patient outcomes. The primary goal of this case report and literature review was to contribute to the existing knowledge.

As of the current state of knowledge, in 2007, Losanoff and Basson suggested a scheme of management depending on their classification, as follows ¹³:

Losanoff and Basson Management Scheme ¹³	
Type 1	Reduction following by mesh repair
Type 2	Appendectomy through the incision of hernia with anatomical repair
Type 3	Appendectomy through laparotomy incision with anatomical repair of the hernia
Type 4	Appendectomy regardless off the incision type with further workup, without repair

Despite that scheme, by reviewing the literature of cases with Amyand hernia, we came across different surgical approaches.

CONTROVERSIES:

Starting with the Uninflamed Appendix, Type 1 of Amyand Hernia: Prophylactic Appendectomy or Not?

In 2015, Morales-Cárdenas, A. reported a type 1 Amyand hernia case, which, despite its chronicity for 6 years, was managed by reduction and mesh repair. ¹⁴

Also, in 2021, Elgazar, A. reported similar cases with adhesions. Although adhesiolysis was done, it was also managed by reduction and mesh repair. ¹⁵

On the other hand, we found the following reports:

In 2019, Holmes, K. reported an 88-year-old patient who had been complaining for only 6 weeks hernia was found to be a type 1 Amyand hernia. He was operated electively and ended by appendectomy with mesh repair, and the justification was due to chronic inflammation with adhesions. ¹⁶

Although Losanoff and Basson, in 2007, stated that prophylactic appendectomy might be considered in young patients because elderly patients rarely have appendicitis in the remaining time in their life ¹³, in 2020, Kakodkar P also reported a similar case managed with the same management for also an 85-year-old patient and the justification was due to the adhesion of appendix by a fibroblastic band to the sac and, importantly, due to the advanced age, with concern to avoid future emergent surgeries that may carry higher risk for such patients. ¹⁷

In 2021, Khalid, H. also reported a type 1 Amyand hernia with the same management. The difference was the patient's young age (28 years old), and although the hernia was chronic (since 8 years), the complaint of discomfort was since 2 weeks. The justification for the appendectomy was due to a congested appendix after adhesiolysis. ¹⁸

Also, in 2021, Edison Fernando Angamarca-Angamarca reported a type 1 Amyand hernia in a 57-year-old patient with an emergency presentation for 24 hours. Although they mentioned the concerns of the against opinion to appendectomy with the conversion of surgical type from clean to contaminated, the decision was depended on Modified Rikki's Classification, which is almost the same as Losanoff and Basson classification except for adding a 5th class, which is about appendix within an incisional hernia, which state of appendectomy in young patients with mesh repair. ⁴

Lastly, in 2022, Regmi, B. U. also reported a type 1 Amyand hernia in a 62-year-old patient for 4 months and was operated the same as the previous reports. The justification was also due to the adhesions with a fibrotic band, and the claim was that this was according to the Losanoff and Basson classification. ¹²

Interestingly, in 2021, Fezoulidi, G. reported an incidental finding of type 1 Amyand hernia in a 61-year-old patient with computed tomography of his abdomen, and it was not operated because the patient was not complaining of it. ¹

At the end of this point, our understanding from the Losanoff and Basson classification is that type 1 is managed by reduction and mesh repair, and prophylactic appendectomy is controversial but may be considered in young patients. However, many reports showed surgeons' concerns regarding appendix conditions, especially if manipulation was done by adhesiolysis.

2nd Point, Type 2 of Amyand Hernia: Mesh Repair or Not? And Laparoscopic Approach or Open Approach?

Irrespective of the Losanoff and Basson classification in managing type 2 of Amyand hernia ¹³, we found in the literature that there are reports about cases managed by appendectomy with mesh repair. For example, Ciftci, F. in 2015 ¹⁰, Velimezis, G. in 2017 ¹¹, Lenart, E. K. ¹⁹ and Shaban, Y.

²⁰ both were in 2018. All of the previously mentioned authors had cases of acute presentation with a broad age group from the 20th to the 70th, and the findings in all of them were acute appendicitis; in fact, Ciftci, F. reported about 2 cases; the first one was also gangrenous, but as the rest of the reported cases with no perforation, spillage, free fluid nor pus.

On the other hand, some reports followed the Losanoff and Basson classification ¹³, as Bamberger P. K. in 2001 ²¹ reported about a case of Amyand hernia in a port site in the inguinal region, although that appendix was only indurated. There was no spillage or free fluid, but it was managed by appendectomy, with defect closure, and the surgical wound closed in layers. In an alternative situation, D'Alia, C. in 2003 ²², reported a case with Amyand hernia presented with acute sitting and erythematous skin, and intraoperative findings were gangrenous appendicitis, cecum, ascending colon with a loop of ileum. It was managed by appendectomy, washing, drain, anatomical shouldice repair due to contaminated field, and washing again with a second subcutaneous drain applied. Also, in 2021, Caruso, G. ⁹, reported a case of an 80-year-old patient with multiple comorbidities presented with acute illness with an erythematous skin over incarcerated hernia, and the intraoperative findings were gangrenous appendicitis, cecum, and pus. The case was managed as the previous one, but instead of Shouldice repair, Bassini repair was accomplished with also toilette of the surgical field associated with a second subcutaneous drain applied, and interestingly, all the procedure was done under local anesthesia.

In the previous two cases, the contamination was within the inguinal canal and did not spread into the intrabdominal cavity or to the abdominal wall, although the skin was indurated. So, we may consider them type 2 of Amyand hernia.

The laparoscopic approach is alternative surgical management for Amyand hernia, and using a Mesh is an essential part of the laparoscopic procedure and needs to be selective according to the Losanoff and Basson classification. ¹³

In line with the Losanoff and Basson classification in the management of type 2 Amyand Hernia ¹³, in 2011, Yagnik V. D. ²³ reported a case of type 2 Amyand hernia, but it was associated with mesenteric adenopathy, blighted ovum, gestational sac, and free fluid. Because of the contaminated procedure, the decision was to do an appendectomy along with ovum dilation and evacuation. And the case was booked for transabdominal preperitoneal (TAPP) repair with mesh after 16 weeks. Another case reported by Choi, C. C., in 2024 ²⁴, about type 2 Amyand hernia for an elderly patient (71-year-old) but it was associated with pus, although the appendix was not perforated but inflamed, and also due to the contamination, the decision was to perform laparoscopic appendectomy with staged TAPP repair with mesh after 8 weeks.

We understand from the previous two reports that the laparoscopic approach is a solid option. However, mesh is refuted as a standard element in laparoscopic repair in a contaminated field due to the high risk of infection.

Also, in 2020, there were two reports. Garagliano, J. M.²⁵ reported a type 2 Amyand hernia with a trial of laparoscopic appendectomy and hernia repair, but the reduction was not successful, so the case converted to open, and the repair was an anatomical repair by Bassini technique, although there was no perforation, spillage, free fluid nor pus. Samsami, M.²⁶, also reported a similar case with similar management, an appendectomy with Bassini repair. Although the appendectomy was done through laparoscopy, the justification of conversion was due to the severe inflammation and congestion of the peritoneum at the inguinal area, regardless of the absence of perforation, spillage, free fluid, or pus.

From the previous two reports, we understand that the conversion from laparoscopic to open management was mainly based on surgeon experience or preference.

On the other hand, in 2021, Naranjo, A. C., & Zárate, A. C.²⁷, reported about an elderly patient (64-year-old) presented with acute presentation of type 2 Amyand hernia that was managed successfully by laparoscopic appendectomy and TAPP repair with mesh in the same operation. Also, in 2022, Probert, S.²⁸ reported that an 11-year-old patient with type 2 Amyand hernia was successfully treated by laparoscopic appendectomy. And the only reason not to do TAPP with mesh repair was the small size of the defect.

The key point in the previous two reports was that there was no mention of perforation, spillage, free fluid, or pus, although the appendix was inflamed in each one.

3rd Point, Type 3 of Amyand Hernia: Laparotomy or Usual groin incision?

According to the Losanoff and Basson classification, if the Amyand hernia was associated with the contamination reached the intraabdominal cavity or abdominal wall, it is considered Type 3, and management mandates laparotomy incision. Regardless of the previous principle, Ahmed, K. in 2017²⁹ reported about a case presented with abdominal wall abscess in the groin site. During incision and drainage, Amyand hernia was encountered with a small bowel, cecum, and perforated appendix as the contents, with a considerable amount of pus, that was not extending into the peritoneal cavity. The case was managed by wash, appendectomy, and surgical closure only by approximation (Plication) of the inguinal canal, leaving the abdominal wound open for secondary closure.

What was understood from the previous report was that if the contamination reached the abdominal wall, there is still a chance to be managed through regular groin incision, as long as the intraabdominal cavity was not involved.

In our case, following the SCARE guidelines, we reported acute complicated appendicitis within the right inguinal hernia sac, classified as type 2 Amyand hernia, in a 27-year-old male with a history of bilateral inguinal hernia. The decision was laparoscopic appendectomy, followed by staged hernia repair.⁶

There are significant similarities between the current case and previous reports, with patients presenting symptoms like severe abdominal pain, fever, and local signs of peritonitis due to an inflamed appendix in the inguinal hernia sac.

Patients with Amyand hernia and acute appendicitis require an emergency appendectomy, regardless of the surgical approach—whether laparoscopic or open. We prefer the laparoscopic approach for several reasons, including better visualization of the inguinal hernia and appendix, which enables precise diagnosis and surgical planning.⁸ Furthermore, as demonstrated in the case study, laparoscopy is less intrusive, leading to fewer postoperative complications, reduced discomfort, shorter hospital stays, and quicker recovery.⁷

Conclusion:

The previous 3 points of controversies reflect the need to establish a new scheme of management depending on more publications such as this case report, and this concern was also reported by Losanoff and Basson.¹³

References:

1. Fezoulidi, G., Argyrouli, V., Adamopoulos, E., Makridis, K. G., Zourntou, S. E., & Fezoulidis, I. V. (2021). Amyand's hernia: presumptive diagnosis by CT and literature review. *Radiology case reports*, 16(4), 911–915.
2. Amyand, C. (1736) 'Viii. of an inguinal rupture, with a pin in the appendix coeci, incrusted with stone; and some observations on wounds in the guts', *Philosophical Transactions of the Royal Society of London*, 39(443), pp. 329–342.
3. Ivanschuk, G., Cesmebasi, A., Sorenson, E. P., Blaak, C., Loukas, M., & Tubbs, S. R. (2014). Amyand's hernia: a review. *Medical science monitor : international medical journal of experimental and clinical research*, 20, 140–146.
4. Angamarca-Angamarca, E.F., Arévalo-Wazhima, C. and Matute-Sánchez, T.C. (2021) 'Hernia de amyand. Reporte de Caso y Revisión de la literatura actual', *Case reports*, 7(2), pp. 43–51.

5. Losanoff, J. E., & Basson, M. D. (2008). Amyand hernia: a classification to improve management. *Hernia : the journal of hernias and abdominal wall surgery*, 12(3), 325–326.
6. Sohrabi, C., Mathew, G., Maria, N., Kerwan, A., Franchi, T., Agha, R. A., & Collaborators (2023). The SCARE 2023 guideline: updating consensus Surgical CAse REport (SCARE) guidelines. *International journal of surgery (London, England)*, 109(5), 1136–1140.
7. Di Saverio, S., Podda, M., De Simone, B., Ceresoli, M., Augustin, G., Gori, A., Boermeester, M., Sartelli, M., Coccolini, F., Tarasconi, A., De' Angelis, N., Weber, D. G., Tolonen, M., Birindelli, A., Biffl, W., Moore, E. E., Kelly, M., Soreide, K., Kashuk, J., Ten Broek, R., ... Catena, F. (2020). Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. *World journal of emergency surgery : WJES*, 15(1), 27.
8. Manatakis, D.K. *et al.* (2021) 'Revisiting amyand's hernia: A 20-year systematic review', *World Journal of Surgery*, 45(6), pp. 1763–1770. doi:10.1007/s00268-021-05983-y.
9. Caruso, G., Toscano, C., Evola, G., Benfatto, S. A. M., Reina, M., & Reina, G. A. (2021). Gangrenous appendicitis in Amyand's hernia: Surgical approach under local anesthesia. Case report and review of the literature. *International journal of surgery case reports*, 79, 215–218. (15)
10. Ciftci, F., & Abdulrahman, I. (2015). Incarcerated amyand hernia. *World journal of gastrointestinal surgery*, 7(3), 47–51. (18)
11. Velimezis, G., Vassos, N., Kapogiannatos, G., Koronakis, D., Perrakis, E., & Perrakis, A. (2017). Incarcerated recurrent inguinal hernia containing an acute appendicitis (Amyand hernia): an extremely rare surgical situation. *Archives of Medical Science*, 13(3), 702-704. (20)
12. Regmi, B. U., Bhat, P. S., Bohara, S., Malla, S., Rayamajhi, J., Karki, S., Adhikari, U., & Rawal, S. B. (2022). Amyand hernia; a case report on serendipitous intra-operative diagnosis. *Annals of medicine and surgery (2012)*, 81, 104554. (22)
13. Losanoff, J. E., & Basson, M. D. (2007). Amyand hernia: what lies beneath--a proposed classification scheme to determine management. *The American surgeon*, 73(12), 1288–1290.
14. Morales-Cárdenas, A., Ploneda-Valencia, C. F., Sainz-Escárrega, V. H., Hernández-Campos, A. C., Navarro-Muñiz, E., López-Lizarraga, C. R., & Bautista-López, C. A. (2015). Amyand hernia: Case report and review of the literature. *Annals of medicine and surgery (2012)*, 4(2), 113–115.
15. Elgazar, A., Awad, A. K., Mandal, D., Faddah, R. M., Elder, Z., & Elseidy, S. A. (2021). Sliding Amyand's hernia: a case report and review of literature. *Journal of surgical case reports*, 2021(7), rjab288.
16. Holmes, K., & Guinn, J. E. (2019). Amyand hernia repair with mesh and appendectomy. *Surgical case reports*, 5(1), 42.

17. Kakodkar, P., Neo, W. X., Khan, M. H. T., Baig, M. N., & Khan, T. (2020). An Incidental Discovery of Amyand's Hernia: A Case Study and Literature Review on Its Intraoperative Management. *Cureus*, 12(12), e11858.
18. Khalid, H., Khan, N. A., & Aziz, M. A. (2021). Amyand's hernia a case report. *International journal of surgery case reports*, 86, 106332.
19. Lenart, E. K., Rountree, K. M., & Sheth, A. R. (2018). Amyand Hernia with Incarcerated Acute Appendicitis. *The American surgeon*, 84(9), e439–e440.
20. Shaban, Y., Elkbuli, A., McKenney, M., & Boneva, D. (2018). Amyand's hernia: A case report and review of the literature. *International journal of surgery case reports*, 47, 92–96.
21. Bamberger P. K. (2001). Revisiting Amyand's hernia in the laparoscopic era. *Surgical endoscopy*, 15(9), 1051.
22. D'Alia, C., Lo Schiavo, M. G., Tonante, A., Taranto, F., Gagliano, E., Bonanno, L., Di Giuseppe, G., Pagano, D., & Sturniolo, G. (2003). Amyand's hernia: case report and review of the literature. *Hernia : the journal of hernias and abdominal wall surgery*, 7(2), 89–91.
23. Yagnik V. D. (2011). Amyand hernia with appendicitis. *Clinics and practice*, 1(2), e24.
24. Choi, C. C., Taylor, D., Tokhi, A., & Rafique, M. (2024). Amyand's hernia with concurrent appendicitis: A case of interval laparoscopic herniorrhaphy and literature review. *International journal of surgery case reports*, 118, 109601.
25. Garagliano, J. M., Jaramillo, J. D., Kopecky, K. E., & Knowlton, L. M. (2020). Amyand hernia: considerations for operative approach and surgical repair. *Trauma surgery & acute care open*, 5(1), e000466.
26. Samsami, M., Sayadi, S., Qaderi, S., & Zebajadi Bagherpour, J. (2020). A case report of appendicitis within an Amyand's hernia: A surprising finding in diagnostic laparoscopy. *International journal of surgery case reports*, 77, 507–509.
27. Naranjo, A. C., & Zárate, A. C. (2021). Hernia de Amyand con Apendicitis aguda no complicada: Presentación de un caso y tratamiento quirúrgico. *Cirugía Andaluza*, 32(4), 514-516.
28. Probert, S., Ballanamada Appaiah, N. N., Alam, A. S., & Menon, N. J. (2022). Amyand's Hernia With Concurrent Appendicitis: A Case Report and Review of the Literature. *Cureus*, 14(2), e22110. <https://doi.org/10.7759/cureus.22110>
29. Ahmed, K., Hakim, S., Suliman, A. M., Aleter, A., El-Menyar, A., Mustafa, S. A., Zarour, A., & Al-Thani, H. (2017). Acute appendicitis presenting as an abdominal wall abscess: A case report. *International journal of surgery case reports*, 35, 37–40.