

# Vermiform Appendix Incarcerated in Spigelian Aponevrosis Defect (VAISAD hernia)

**Irene Fiume**

Department of General, Oncologic and Vascular Surgery Azienda Ospedaliera Ospedali Riuniti Marche Nord Pesaro, Piazzale Cinelli n.4, 61121 PU Italy.

**Corresponding Author:** Irene Fiume, Department of General, Oncologic and Vascular Surgery Azienda Ospedaliera Ospedali Riuniti Marche Nord Pesaro, Piazzale Cinelli n.4, 61121 PU Italy. E-mail: [irene.fiume@virgilio.it](mailto:irene.fiume@virgilio.it)

**Received Date:** May 31, 2022; **Accepted Date:** June 30, 2022; **Published Date:** July 07, 2022

**Citation:** Irene Fiume. (2022) Vermiform Appendix Incarcerated in Spigelian Aponevrosis Defect (VAISAD hernia) *J. Surgical Case Reports and Images* 5(4); DOI: [10.31579/2690-1897/117](https://doi.org/10.31579/2690-1897/117)

**Copyright:** © 2021, Irene Fiume, This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

## Abstract

Spigelian hernia (SH) is infrequent accounting less than 2% of all abdominal hernias. The presence of vermiform appendix within the hernial sac is of further peculiarity. While the authors who first described inguinal hernia containing the appendix (Amiand's hernia) and femoral hernia containing the appendix (De Garengot's hernia) are well known and their name was given to the disease, SH containing the vermiform appendix has no specific name.

This study provides a literature search on this topic and a review of the available case reports is conducted. A description of a clinical case of an incarcerated SH in which the vermiform appendix was located within the hernial sac is presented with attached the video of its mini-invasive surgical treatment.

Based on literature findings, an attempt is made to give a specific name to this condition (Vermiform Appendix Incarcerated in Spigelian Aponevrosis Defect) using the acronym VAISAD hernia, in such a way so that it can be specifically and easily searched. Moreover, a classification of its severity and related complications, similarly to what was done for Amiand's hernia, is carried out in order to establish the optimal approach in the surgical treatment case by case.

**Keywords:** spigelian hernia; vermiform appendix; chronic appendicitis; appendectomy; laparoscopic intraperitoneal onlay mesh repair

## Introduction

Spigelian hernia (SH) is the protrusion of the abdominal content or peritoneum through a congenital or acquired defect of the anterior abdominal wall fascia in correspondence of the Spigelian aponevrosis, along the semilunar line. Mostly, these hernias lie in the SH belt [1] in

which, the weakest area is at the intersection between the semilunar and semicircular line, as the posterior rectus sheath is no longer present. The "weak triangular area" is delimited laterally by the semilunar line, superiorly by the semicircular line and, inferiorly, by the deep inferior epigastric vessels [1], above the Hesselbach's triangle. A representation of the SH site is shown in the figure 1.

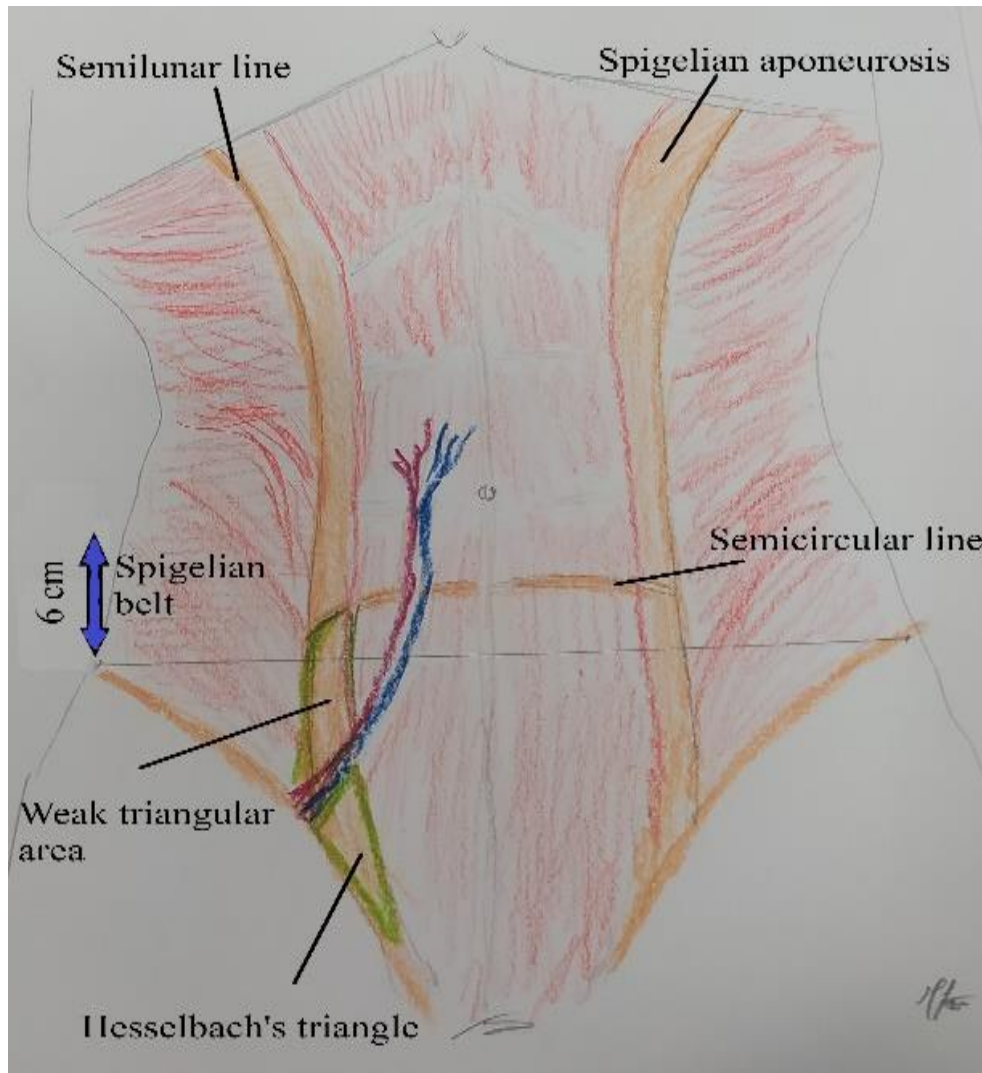


Figure 1. Representation of the SH site.

### Anatomical definitions

**Spigelian aponeurosis:** part of the aponeurosis of the transverse abdominal muscle between the linea semilunaris laterally and the lateral edge of the rectus muscle medially.

**Linea semilunaris:** a vertical, curved structure that runs along the lateral edges of the rectus abdominis muscle in the anterior abdominal wall. It is the site of the union where the tendons of the lateral abdominal muscles (the external oblique, the internal oblique and the transversus abdominis muscles) meet the sheath surrounding the rectus abdominis muscle, also known as the rectus sheath. Linea semilunaris runs between the cartilage of the ninth rib and the pubic tubercle bilaterally. The ninth ribs are farther apart from each other when compared to the pubic tubercles, which are closer together, giving the linea semilunaris its curved shape [2].

**Spigelian belt:** a transverse zone of 6 cm located above the interspinal plane.

**Semi circular line:** also known as arcuate line or line of Douglas, marks the caudal end of the posterior lamina of the aponeurotic rectus sheath. This line is found in the infraumbilical area and represent the anatomical transition, inferior to which, all the aponeurotic layers of the abdominal muscles, except the transversalis fascia, pass simultaneously

anterior to the rectus abdominis muscle. At the caudal side of the semicircular line, the posterior side of the rectus abdominis muscle is covered only by the transversalis fascia and the peritoneum.

**Rectus sheath:** fibrous compartment that contains both the rectus abdominis muscles and the pyramidalis muscle that extends from the inferior costal margin and the costal cartilages of fifth to ninth ribs to the pubic crest. The fascial coverings of the external oblique, internal oblique, and transversus abdominis muscles comprise the rectus sheath [3].

**Hesselbach's triangle:** limited by the inferior epigastric vessels, the rectus abdominis muscle and the inguinal ligament.

### Epidemiology

SH is rare and account for only 0.1%-2% of occurrence. However the risk of incarceration and strangulation is high due to the small size of the fascial defect [1, 4]. The hernia sac consists of extraperitoneal fat and peritoneum. Occasionally, the extraperitoneal fat is preceded by remnant bands from the transversalis fascia. Usually, SH contains small bowel or omentum. However, multiple intra-abdominal organs have been reported to have been found in the SH as large bowel, stomach, gallbladder, Meckel diverticulum, ovary, testis, leiomyoma of the uterus, and even

bladder [1]. The involvement of appendix has also been described in various case reports [5-19] (table 1).

Author	Year	Intraoperative finding	Treatment
Martín-Mattar[5]	2020	Necrotic appendicitis	Transverse incision: appendectomy and hernioplasty with suture of aponeurosis of the external oblique muscle and sublay mesh placement of Prolene®
Page[6]	2020	None	Conservative management for patient's preference
Sobrado[7]	2020	Intraperitoneal appendix in previous liver transplantation	Open appendectomy and hernia repair with polypropylene mesh below the external oblique fascia
Anand[8]	2020	Necrotic and perforated appendix with surrounding purulence	Exploratory laparotomy revealing the distal end of the appendix going through the abdominal defect into the hernial sac. Due to the difficulty in grasping, a counterincision was made over the area of the defect. The hernia sac was exposed and opened and appendectomy was performed
Karkocha[9]	2019	Left sided spigelian hernia containing caecum with appendix and ileum	Left pararectal incision: the content of the sac was discharged into the peritoneal cavity; appendectomy and hernioplasty with an onlay Prolene® mesh placement were performed.
Cox[10]	2017	Perforation of appendix at the base of the cecum and faecal contamination	Open appendectomy, debridement of necrosed subcutaneous tissue; the hernial defect was closed with 2/0 Vicryl® by direct approximation of the muscle. The subcutaneous cavity was left open and packed with solfadien-impregnated gauze, being formally closed 24 hours later
Ramírez-Ramírez[11]	2017	Appendicitis with abscess and necrotizing fasciitis of the abdominal wall in recurrent Spigelian hernia (previous hernioplasty with mesh)	Appendectomy and abscess drainage, mesh removal and direct hernioplasty
Xu[12]	2017	Appendix	Laparoscopic appendectomy, sac resection and open repair
Peeters[13]	2016	Incarcerated appendix	Appendectomy. Hernia repair was deferred by two months carrying out an open repair by primary fascial suturing reinforced with a synthetic mesh
Bevilacqua[14]	2016	Incarcerated appendix	Exploratory laparoscopy highlighting a dilated, hyperemic appendix at the base of the cecum and herniating through the Spigelian fascia. As the appendix was not reducible with gentle traction, a counter incision was placed over the right lower quadrant to perform appendectomy
Thomas[15]	2013	Normal appendix within the hernia sac	Open appendectomy and closure of the peritoneum. The hernial defect was closed by direct approximation of the muscle and the external oblique aponeurosis
Reinke[16]	2010	Incarcerated appendix	Laparoscopic appendectomy and excision of hernia sac. The hernia was repaired primarily with nonabsorbable monofilament sutures and buttressed with a biological mesh underlay
Thomasset[17]	2010	Ischaemic appendix and a knuckle of small bowel	Transverse incision: the hernial sac was opened, the appendix was resected and the small bowel, which was viable, was reduced. The small muscular defect was approximated in two layers using polydioxanone (PDS).
Carr[18]	1998	Incarcerated Crohn's appendicitis	Exploratory laparoscopy and open repair
Nauta[19]	1986	Incarcerated appendix with a portion of cecum	Transverse laparotomy: right colectomy with closure of the abdominal wall fascia in layers.

## Clinical case report

75 year old man, BMI 24.9 kg/m<sup>2</sup>

**Comorbidity:** diabetes mellitus, benign prostatic hyperplasia

Previous surgery: open right inguinal herna repair, open repair of strangulated left side SH with the hernia sac containing sigmoid loop with infarcted appendices epiploicae, subsequently laparoscopic left side SH repair with intraperitoneal mesh placement (IPOM) for recurrence

The patient presented to general surgery facility complaining right abdominal pain and discomfort. Physical examination demonstrated mild tenderness and a bulging of the right side. Abdominal ultrasound revealed an incarcerated SH containing vermiform appendix. Abdominal CT scan confirmed the ultrasound diagnosis and ruled out other abdominal disease.

## Surgical technique

The patients underwent laparoscopy with placement of three trocars (a 5 mm sovraumbilical trocar for the telescope, a 10 mm trocar in left flank for the introduction of the stapler and the mesh, and a 5 mm trocar in ipogastrum) avoiding the area of the previous repair of the left SH. The hernia defect containing the incarcerated appendix was visualized. After being reduced into the abdominal cavity, the appendix appeared congested and covered by the thickened hernial sac but there were no sign of ischaemia and purulent peritonitis. Appendectomy and resection of the sac were then performed and the defect was addressed clearing off the peritoneum and the preperitoneal adipous tissue up to 5-6 cm from the edges. The defect was measured by the introduction of a sterile ruler (the size of the defect was less than 2 cm). No closure of the defect was carried out. An expanded polytetrafluoroethylene mesh (*Gore® Dualmesh®*, W.L. Gore & Assoc., Flagstaff, AZ, USA) was shaped of adequate size in order to obtain an overlap of about 5 cm per side and introduced into the abdominal cavity. The pneumoperitoneum was reduced to 8-9 mmHg and the fixation of the mesh was obtained using laparoscopic tackers and cyanoacrylat glue. A careful inspection of the deep ring and the identification of the angle of doom and the triangle of pain was done before fixation of the tacks to avoid injury to the testicular vessels, duct deferens, inferior epigastric vessels, iliac vessels, (the structures of the inverted Y) and the lateral cutaneous nerve of the thigh, the femoral branch of the genitofemoral nerve and the femoral nerve (crossing the triangle of pain). The cyanoacrylat glue was used to fix the part of the mesh closest to the internal inguinal ring. No intraoperative or postoperative complications occurred and the discharge was on day 2. Pathological examination revealed a chronic appendicitis.

## Discussion points

1) SHs often have a narrow fascial defect and may be intra-parietal hernias, meaning that the hernial content may not lie below the subcutaneous fat but penetrate between the muscles of the abdominal wall [20]. Therefore, these hernias may be misdiagnosed at clinical examination and have an increased risk of incarceration and strangulation. Laparoscopic exploration, when feasible, is fundamental to evaluate the inflammation degree and the possibility of carrying out a mini-invasive treatment.

2) SHs may be primitive or secondary to previous trocar insertion [21, 22]. In the present case, four years earlier, the patient had undergone laparoscopic IPOM repair for recurrent left side SH. It is difficult to say if the right side SH was primitive or secondary to previous trocar insertion as the skin scar was barely visible.

3) In emergency setting, the risk of wound infection must be carefully considered before mesh positioning. In this case, we used the IPOM repair with an expanded polytetrafluoroethylene mesh given the absence of any abdominal effusion and phlegmonous appendicitis.

4) The IPOM method is the most popular type of repair among the laparoscopic methods of SH repair, including trans-abdominal preperitoneal mesh (TAPP) and totally extra-peritoneal mesh (TEP) placement. IPOM technique is usually a quick procedure and less demanding. However, tack fixation may result in disastrous drawbacks [23, 24]. In particular, it is necessary to consider the risk of damage of anatomical vascular and nervous structures surrounding the internal inguinal ring given its proximity to the Spigelian belt. Therefore, before positioning of the tacks, a careful inspection of the inguinal region and the identification of the anatomical landmarks, Hasselbach triangle, triangle of pain and triangle of doom, is mandatory. As was shown in a previous report of the Literature, the technique to partially fix the mesh with cyanoacrylat glue was adopted, in order to reduce the number of tacks near the inguinal ring and the epigastric vessels [25].

5) The approximation of the hernia defect was not carried out for two reasons: the small size of the defect and consequently the low risk of post-operative seroma, and to avoid tension and alteration of the muscle-tendon dynamics of the abdominal wall at this level in close proximity to the internal inguinal ring. Furthermore, because of the anatomic nature of SH, the abdominal wall is stable and provides reasonable support after the incorporation of a mesh [26, 27].

6) The presence of vermiform appendix within the hernial sac is peculiar. The presence of vermiform appendix within the inguinal hernia is named Amyand's hernia after, in 1735, Amyand described the first case of incarcerated inguinal hernia, containing a perforated appendix, in an 11-year-old boy [28]. Femoral hernia containing the appendix was named De Garengéot hernia after Rene Jacques Croissant De Garengéot first described in 1731 a case of femoral hernia, containing a non-inflamed appendix [29]. Although rare entity, a classification of Amyand's hernia have been described in order to improve management [30]. This last point of discussion is precisely aimed at underlining the importance of giving a name to the SH containing appendix. The search for scientific literature on the subject would become rapid and immediate allowing to obtain all the necessary information on the optimal management of this uncommon pathology.

This pathological condition could be indicated with the acronym VAISAD (vermiform appendix in Spigelian aponevrosis defect).

The table 2 presents a classification proposal on the basis of the severity of inflammation of the vermiform appendix incarcerated in the SH and on its reducibility into the abdominal cavity by laparoscopic traction.

Type	State of appendix
1a	Normal-slightly congested, reducible
1b	Normal-slightly congested, not reducible
2a	Phlegmonous appendicitis, reducible
2b	Phlegmonous appendicitis, not reducible



3a	Perforated appendicitis with extra luminal coprolites, reducible
3b	Perforated appendicitis with extra luminal coprolites, not reducible
4a	Appendicular abscess or inflammatory mass with ileocecal involvement need for extensive resection, reducible
4b	Appendicular abscess/inflammatory mass with ileocecal involvement need for extensive resection, not reducible

**Table 2.** VAISAD hernia classification

The type a is amenable of mini-invasive treatment if feasible, while the type b requires open treatment or conversion to laparotomy. Mesh repair is safe only in type 1 (in absence of contamination). In the setting of contamination a tailored approach is indicated balancing the risks and benefits of the use and the type of the mesh.

## References

- Skandalakis PN, Zoras O, Skandalakis JE, Mirilas P. (2006). Spigelian hernia: surgical anatomy, embryology, and technique of repair. *Am Surg.* 72:42-48.
- Nassereddin A, Sajjad H. (2021). Anatomy, Abdomen and Pelvis, Linea Semilunaris. In: StatPearls. Treasure Island (FL): StatPearls Publishing.
- Sevensma KE, Leavitt L, Pihl KD. Anatomy, Abdomen and Pelvis, Rectus Sheath. (2021). In: StatPearls. Treasure Island (FL): StatPearls Publishing.
- Rankin A, Kostusiak M, Sokker A. (2019). Spigelian hernia : case series and review of the literature. *Vis Med.* 35:133-136.
- Martín-Mattar A, Isarraraz-Flores R, Ávila JP. (2020). Hernia de Spiegel y apendicitis aguda necrosada. Un reporte de caso. *Cir.* 88:782-786.
- Page D, Hendaheba R. (2020). An incarcerated Spigelian hernia with the appendix in the sac passing through all layers of the abdominal wall: an unusual cause for chronic right iliac fossa pain. *J Surg Case Rep.*
- Sobrado LF, Ernani L, Waisberg DR, et al. (2020). First case report of spigelian hernia containing the appendix after liver transplantation: Another cause for chronic abdominal pain. *Int J Surg Case Rep.* 72:533-536.
- Anand R, Rahesh J, Ciubuc J, et al. (2020). Gangrenous appendicitis contained within a Spigelian hernia. *Proc (Bayl Univ Med Cent).* 34:104-106.
- Karkocha D, Lech G, Jankowski M, et al. (2019). Left-sided Spigelian hernia with non typical hernial sac content. *Pol Przegl Chir.* 91:47-49.
- Cox MJ, Adiamah A, Chowdhury A, et al. (2017). Rare and unusual case of perforated appendicitis in a Spigelian hernia. *BMJ Case Rep.*
- Ramírez-Ramírez MM, Villanueva-Sáenz E. (2017). Rare hernias with atypical content: Apropos of a Spigelian hernia with acute appendicitis. *Rev Gastroenterol Mex.* 82:181-182.
- Xu L, Dulku G, Ho R. (2017). A rare presentation of Spigelian hernia involving the appendix. *Eur J Radiol Open.* 4:141-143.
- Peeters K, Huysentruyt F, Delvaux P. (2017). An unusual presentation of an incarcerated Spigelian hernia. *Acta Chir Belg.* 117:312-314.
- Bevilacqua M, Ahmed S, Miller M, et al. (2016). Case of Spigelian hernia with incarcerated appendix. *J Radiol Case Rep.* 10:23-28.
- Thomas MP, Avula SK, England R, et al. (2013). Appendicitis in a Spigelian hernia: an unusual cause for a tender right iliac fossa mass. *Ann R Coll Surg Engl.* 95:66-68.
- Reinke C, Resnick A. (2010). Incarcerated appendix in a Spigelian hernia. *J Surg Case Rep.* 10:3.
- Thomasset SC, Villatoro E, Wood S, et al. (2010). An unusual Spigelian hernia involving the appendix: a case report. *Cases J.* 3:22.
- Carr JA, Karmy-Jones R. (1998). Spigelian hernia with Crohn's appendicitis. *Surg Laparosc Endosc.* 8:398-399.
- Nauta RJ, Heres EK, Walsh DB. (1986). Crohn's appendicitis in an incarcerated spigelian hernia. *Dis Colon Rectum.* 659-661.
- Srivastava KN, Agarwal A. (2015) Spigelian hernia: a diagnostic dilemma and laparoscopic management. *Indian J Surg.* 77:35-37.
- Ussia A, Imperato F, Schindler L, et al. (2017). Spigelian hernia in gynaecology. *Gynecol Surg* 14:8.
- Kamel A, Abdallah N, El-Sandabesee D. (2012). Spigelian hernia following laparoscopy. *J Obstet Gynaecol.* 32:310-311.
- Barnes TG, McWhinnie DL. (2016). Laparoscopic Spigelian Hernia Repair: A Systematic Review. *Surg Laparosc Endosc Percutan Tech.* 26:265-270.
- Wilson P, Hickey L. (2019). Laparoscopic transabdominal preperitoneal (TAPP) groin hernia repair using n-butyl-2-cyanoacrylate (Liquiband@Fix8™) for mesh fixation and peritoneal closure: learning experience during introduction into clinical practice. *Hernia.* 23:601-613.
- Moreno-Egea A, Campillo-Soto Á, Morales-Cuenca G. (2015). Which should be the gold standard laparoscopic technique for handling Spigelian hernias? *Surg Endosc.* 29:856-862.
- Barnes TG, McFaul C, Abdelrazeq AS. (2014). Laparoscopic transabdominal preperitoneal repair of spigelian hernia-closure of the fascial defect is not necessary. *J Laparoendosc Adv Surg Tech A.* 24:66-71.
- Fernández-Moreno MC, Martí-Cuñat E, Pou G, et al. (2018). Intraperitoneal Onlay Mesh Technique for Spigelian Hernia in an Outpatient and Short-Stay Surgery Unit: What's New in Intraperitoneal Meshes? *J Laparoendosc Adv Surg Tech A.* 28:700-704.
- Amyand C. (1835). Of an inguinal rupture, with a pin in the appendix coeci, incrusted with stone, and some observations on wounds in the guts. *Philosophical Transactions.* 39:1735-1736.
- dG RJC. (1731). Traite des operations de chirurgie. Paris: Huart. 369-371.
- Losanoff JE, Basson MD. (2008). Amyand hernia: a classification to improve management. *Hernia.* 12:325-326.



This work is licensed under Creative Commons Attribution 4.0 License

To Submit Your Article Click Here:

**Submit Manuscript**

**DOI: [10.31579/2690-1897/117](https://doi.org/10.31579/2690-1897/117)**

**Ready to submit your research? Choose Auctores and benefit from:**

- fast, convenient online submission
- rigorous peer review by experienced research in your field
- rapid publication on acceptance
- authors retain copyrights
- unique DOI for all articles
- immediate, unrestricted online access

At Auctores, research is always in progress.

Learn more <https://www.auctoresonline.org/journals/journal-of-surgical-case-reports-and-images->