Albanian Journal of Trauma and Emergency Surgery (2024) 8/1: 1371-1376
DOI: 10.32391/ajtes.v8i1.381

OPEN ACCESS JOURNALS

REVIEW ARTICLES

The Benefit of Open Rives-Stoppa Procedure in Complex Incisional Hernia.

Bledi Masati [1*], Asfloral Haxhiu [2], Marsel Dhima [3], Tomi Punmira [3], Gentian Zikaj [4], Alfred Ibrahimi [5], Agron Dogjani [1,6]

Received: 31 December 2023 / *Accepted:* 15 January 2024 / *Published online:* 20 January 2024
This article is published with open access at ***https://journal.astes.org.al***

Abstract

Introduction: Ventral hernia is one of the most common general surgical pathologies. An incisional hernia will develop in 10–15% of patients with an abdominal incision, and the risk increases to up to 23% in those who develop surgical site infections.

Ventral hernia repairs are mostly elective (90%) procedures, but the repair methods are highly variable.

Popularized in Europe by Rives and Stoppa, the neuromuscular technique has proven to be very effective, with a 94.2% probability of having the lowest odds for recurrence and a 77.3% probability of having the lowest odds for SSI.

The study aimed to evaluate our experience at a secondary care center performing Rives-Stoppa repair for abdominal ventral and incisional hernias.

Materials and Methods: Between April 2019 and August 2021, 46 patients in the practice at a secondary regional hospital, Teni Konomi, Korce, Albania, underwent a Rives-Stoppa incisional hernia repair.

Results: There were 14 (31%) males and 32(69%) females (age range 31-75).

Most incisional hernias were midline xiphoid-pubic incision and supraumbilical, with several subcostals (2 right and 1 left) hernias**.** Most incisional hernias were symptomatic and evident on the physical exam during the repair. In four cases, the hernia sac was incarcerated at the presentation time.

Conclusion: The Rives-Stoppa technique has excellent long-term results and low morbidity in patients with large primary or recurrent incisional hernias. It is the gold standard for most surgeons.

Keywords: Incisional Hernia, Mesh polypropylene, abdominal wall surgery, Rives-Stoppa Procedure

Original article, no submission or publication in advance or in parallel

* ***Corresponding author:***
Bledi Masati. MD. PhDc.
✉ *bledi_masati@hotmail.com*

1 *Service of General Surgery, University Hospital of Trauma, Tirana, ALBANIA*
2 *Service of General Surgery.Regional Hospital "Ihsan Cabej" Lushnje, ALBANIA*
3 *Service of Anesthesiology and Intensive Care Unit. Regional Hospital "Teni Konomi" Korca, ALBANIA*
4 *Department of Burns and Plastic Surgery, University Hospital Center" Mother Theresa" Tirana, ALBANIA*
5 *Department of Anaesthesia, University Hospital Center, "Mother Teresa "Tirana, ALBANIA*
6 *Department of Surgery, Faculty of Medicine, University of Medicine of Tirana, ALBANIA*

Introduction

Hernia repair surgery is one of the most common operations in general surgery. Incisional hernias often complicate abdominal operations.[1]

Incisional hernia commonly reported incidence varies from 2 to 20%. [2, 3] This percentage may be as high as 69% in high-risk groups with long-term follow-up. [3] The presence of an incisional hernia is associated with significant morbidity and has a considerable impact on patients' overall quality of life [4]

Complications of incisional hernias include infection, ulceration, incarceration of viscera, and small bowel obstruction. [5]

Patients also experience discomfort and a cosmetically unpleasing bulge at the incision site. Successful repair of

incisional hernias continues to be challenging. Primary suture closure of incisional hernias results in recurrence rates of 31%-58%. [6, 7]

The addition of prosthetic mesh implants has been shown to decrease the incidence of recurrence by 8%-10%. [7]

Various operative techniques for incisional hernia repair use only subway (intramuscular or extra fascial) or underlay (intraperitoneal or subfascial). [8] On multiple treatment analyses, retro-rectus was ranked as the best mesh placement option with a high probability of being the best treatment. [9]

Retrorectus repair (Rives-Stoppa) had a 94.2% probability of having the lowest odds for recurrence and a 77.3% probability of having the lowest odds for surgical site infection (SSI). [10]

We elected to use the European Hernia Society (EHS) classification as simple, practical, and user-friendly. It divides hernias into primary and incisional (secondary) and subdivides them by anatomical location and size. Incisional hernias are also categorized by recurrence in a binary fashion. (Tables 1-2) [11, 12]

Midline	Sub-xiphoidal		M1
	Epigastric		M2
	Umbilical		M3
	Infra-umbilical		M4
	Suprapubic		M5
Lateral	Subcostal		L1
	Flank		L2
	Iliac		L3
	Lumbar		L4
Recurrent Incisional Hernia		Yes	No
Length (cm)			
Width (cm)	< 4cm: W1 4–10cm: W2 > 10cm: W3		

Table 1: Incisional Hernia Classification. [12]

The length of the hernia defect is defined as the most significant vertical distance between the most cranial and the most caudal margin of the hernia defect. In case of multiple hernia defects from one incision, the length is between the cranial margin of the most cranial defect and the caudal margin of the most caudal defect. (Figure 1) [13]

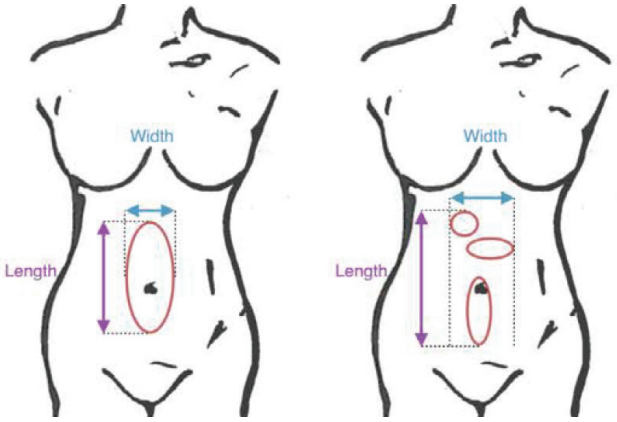

Figure 1. Measuring the defect size

Disadvantages include complexity, long operative times, and the possibility of chronic abdominal pain.[7]

The sublay technique, which requires the use of the mesh, was made famous by Jean Rives and Rene Stoppa in the late 1980s, dissecting a retromuscular plane between the muscle bellies and the posterior aponeurosis of the abdominal rectus muscles provides a vascularized space where the mesh can be placed and frees the muscles for a tension-free closure of the musculoaponeurotic flap in the midline (Figure 1), thus reconstructing the anatomy of the abdominal wall [14].

In adults, the Rives-Stoppa neuromuscular technique (RSRT) is considered the technique of choice when it comes to repairing > 5 cm midline hernias [15].

Short description of Technique: Given the size of the hernia defect and the presence of symptoms such

Medial			**Lateral**		
M1	Subxiphoidal	xiphoid to 3 cm caudally	**L1**	Subcostal	between the costal margin and a horizontal line 3 cm above the umbilicus
M2	Epigastric	3 cm below the xiphoid to 3 cm above the umbilicus	**L2**	Flank	lateral to the rectal sheath in the area 3 cm above and below the umbilicus
M3	Umbilical	3 cm above to 3 cm below the umbilicus	**L3**	Iliac	between a horizontal line 3 cm below the umbilicus and the inguinal region
M4	Infraumbilical	3 cm below the umbilicus to 3 cm above the pubis	**L4**	Lumbar	laterodorsal to the anterior axillary line
M5	Suprapubic	pubic symphysis to 3 cm cranially			

Table 2: M & L Zones for Incisional Hernia Classification [12]

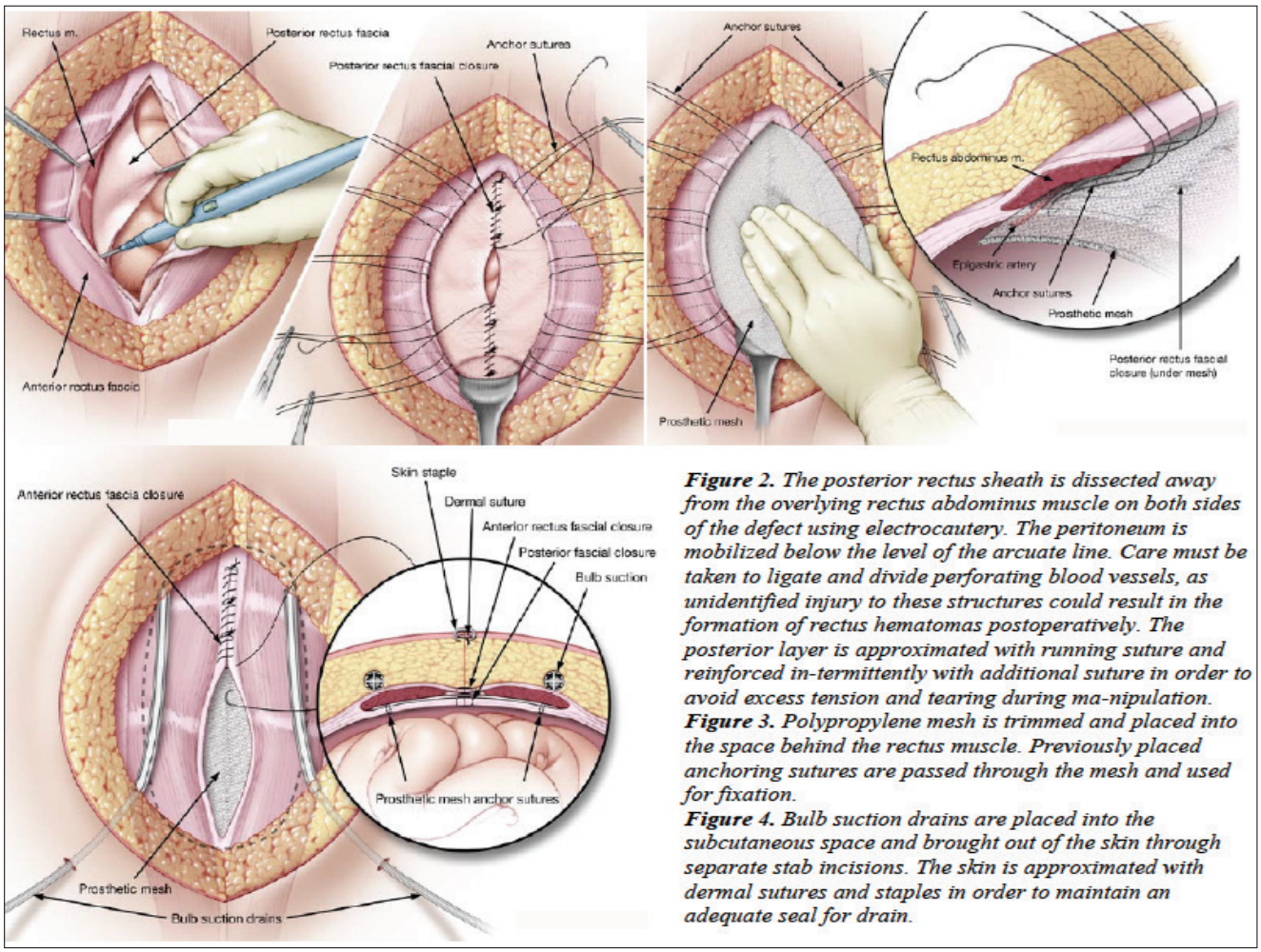

Figure 2. *The posterior rectus sheath is dissected away from the overlying rectus abdominus muscle on both sides of the defect using electrocautery. The peritoneum is mobilized below the level of the arcuate line. Care must be taken to ligate and divide perforating blood vessels, as unidentified injury to these structures could result in the formation of rectus hematomas postoperatively. The posterior layer is approximated with running suture and reinforced in-termittently with additional suture in order to avoid excess tension and tearing during ma-nipulation.*
Figure 3. *Polypropylene mesh is trimmed and placed into the space behind the rectus muscle. Previously placed anchoring sutures are passed through the mesh and used for fixation.*
Figure 4. *Bulb suction drains are placed into the subcutaneous space and brought out of the skin through separate stab incisions. The skin is approximated with dermal sutures and staples in order to maintain an adequate seal for drain.*

as abdominal pain and local discomfort, surgical repair was decided upon. The hernia defect is accessed through a midline incision in the previous scar, and the hernial sac is dissected into the annulus, separating it from the subcutaneous cellular tissue (fig. 2).[7] The hernial sac was opened using an adhesiolysis, and the abdominal cavity and fascial defect were explored. The rectus muscles were later displaced on both sides of the hernia ring. A longitudinal cut was performed on the back wrap during muscle exposure across the defect. (fig. 3). [7]

A retromuscular plane was dissected below the rectus muscle, detaching the posterior sheath from the belly of the muscle. Dissection extended laterally to the perforating branches of the inferior epigastric vessels was identified and followed 3cm above and below the aponeurotic defect. (fig. 2, 4).[7]

A first plane was reconstructed by closing the peritoneum and the posterior sheath of the rectus muscle in the midline.

A planar polytetrafluoroethylene mesh was placed over this, stretching it across the new neuromuscular space (Fig. 4). An aspiration drain was placed at this level. Finally, the muscle flap and the anterior rectus muscle sheath were sutured in the midline, with a tension-free closure that allows for the anatomy of the abdominal wall to be reconstructed.

Basic principles of the Rives-Stoppa neuromuscular technique include A) Longitudinal incision on the posterior sheath of the rectus muscle. B) Dissection of a retromuscular plane between the muscle belly and the posterior sheath. C) Closure of the posterior sheath in the midline (red arrow) with mesh placement on this plane and closure of the anterior musculoaponeurotic flap (black arrow)

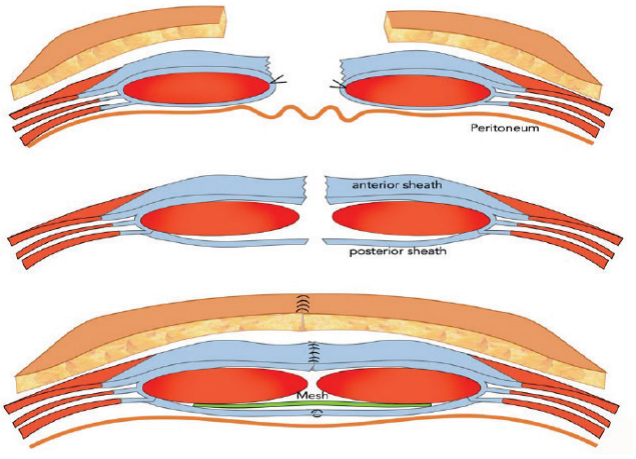

Figure 4. Basic principles of Rives-Stoppa retromuscular technique

Materials and Methods

A descriptive retrospective study was conducted at a secondary regional hospital, Teni Konomi, Korce in Albania, from April 2019 to August 2021were recorded all the data for patients who presented to our hospital and underwent inguinal hernia repair in our hospital under the conditions of hernia surgery.

Results

Our study included 46 patients, 14 (31%) males and 32(69%) females (age range 31-75). (Tab. 3)

Age	Frequency	Percentage
24-34	6	6.51
35-44	8	17.4
45-54	18	39.1
55-64	10	21.7
65-74	4	8.7

Table 3 Age distribution

Location		Frequency	Percentage
MEDIAL		43	93.4
M1	Epigastric	33	71.7
M2	Umbilical	10	21.7
LATERAL		3	6.51
L1	Subcostal Right	2	4.34
L1	Subcostal left	1	2.17
CLINICAL FINDING			
Evident on Physical Exam.		42	91.3
Incarcerated		4	8.7

Table 4. Incisional Hernia characteristics

Most incisional hernias were midline xiphoid-pubic incision and epigastric, with several subcostals (2 right and 1 left) hernias**.** (Tab. 4) At the time of repair, in most cases, 42(91.3%) incisional hernias were asymptomatic and evident on physical exam, and in four cases (8.7%), incisional hernias were symptomatic and incarcerated at admission to the ED. The prosthetic material used was polypropylene, and the prosthesis size ranged from 8x8 cm to 30x30 cm. Polypropylene mesh has the advantage of allowing rapid incorporation on both sides of the mesh.

We start the surgery with a laparotomy as the patient presents with a midline incisional hernia. After that, we dissect the subcutaneous tissues until we identify the incisional sac. In most cases, we opened the sac to determine its content, and we found greater omentum, but also, in one case (2.17%), a small bowel was found incarcerated. In one case (2.17%), it presented as intestinal occlusion, and the transverse colon was found.

Due to adhesion formation, the incisional sac should be left intact. This also improves postoperative comfort for the patient.

The following surgical step involves exposing the neuromuscular pre-fascial space, which is approached through a longitudinal dissection of the rectus sheath along its entire length.

We later continue the dissection on an avascular space to reach the lateral border of the rectus muscle, thus achieving posterior separation of the components.

Then, we start creating the new abdominal wall and closing the fascial defect by reappropriating the posterior rectus sheath using continuous absorbable sutures Vicryl® 2.0.

Tension was minimal, and the posterior rectus fascia was closed in all patients.

We used polypropylene mesh (Betatech Polymesh®) placed retro muscular, anchored on rectus muscles' lateral borders using nonabsorbable monofilament Prolen 1.0 sutures.

Then, we continuously close the anterior rectus sheath on nonabsorbable monofilament prolen 1.0 sutures. In all the cases, we left two bulb suction drains between the anterior rectus sheath and the skin. The skin was closed routinely.

All patients tolerated the procedure well, with no intraoperative complications. We had two cases (4.34%) of perioperative complications. In one case (2.17%), a patient suffered nosocomial pneumonia, which was readmitted and treated with antibiotics venously.

The other patient developed rectus hematoma, which was treated conservatively with no need for drainage. Two patients (4.34%) developed seromas, and one (2.17%) developed wound hematoma. None of the patients developed deep or superficial wound infections. Hospital discharge typically occurred on postoperative day 5.

There is no evidence that any of these patients developed a recurrent incisional hernia.

Discussion

The open Rives-Stoppa procedure has emerged as a popular option for repairing complex incisional hernias, particularly those characterized by large defects, significant tissue weakness, or previous failures. [16, 17]

The benefits of the Rives-Stoppa technique are:

Low Recurrence Rate: Yaghoobi Notash, A. et al., in their study, demonstrate a remarkably low recurrence rate for the Rives-Stoppa procedure, ranging from 0.3% to 28%, significantly lower than other techniques for complex hernias. This can be attributed to its meticulous anatomical reconstruction and favorable mesh placement. [18]

Versatility: The Rives-Stoppa approach adapts well to various hernia sizes and complexities. Sneiders D. et al.

reported that separating the posterior and anterior rectus sheaths allows the placement of a large mesh under the muscle, providing secure reinforcement regardless of the defect size. [19]

Tissue Preservation: Verheij E. et al. show that, unlike some techniques that require extensive tissue removal, the Rives-Stoppa procedure emphasizes preserving native tissues. This minimizes potential complications like wound infections and seroma formation.[20]

Restoration of Anatomy: Molina Caballero, A. Y., et al. found that by reconstructing the natural layers of the abdominal wall, the Rives-Stoppa technique aims to restore normal muscle function and improve long-term stability, potentially reducing pain and discomfort. [21]

Considerations:

Technical Difficulty: The Rives-Stoppa procedure demands high surgical expertise due to its meticulous dissection and reconstruction steps. Surgeons require specialized training and experience to ensure optimal outcomes.[17]

Longer Operative Time: Compared to more straightforward techniques, the Rives-Stoppa procedure typically takes longer. This can be a factor for patients with certain medical conditions or poor surgical candidates.

Mesh-Related Complications: As with any mesh-based repair, potential complications like infection, seroma formation, and mesh erosion exist. Careful mesh selection, meticulous surgical technique, and proper follow-up care are crucial in minimizing these risks.

When to Consider the Rives-Stoppa Procedure:

Large or complex incisional hernias: The Rives-Stoppa procedure offers a robust repair with proven durability for defects exceeding 10cm or those with significant tissue weakness.

Previous failed repairs: In cases where other techniques have failed to achieve long-term success, the Rives-Stoppa approach can provide a definitive solution.

Patients with good tissue quality: The procedure relies on sufficient healthy tissue for appropriate dissection and closure.

Beyond this discussion, further points to consider could include:

Recent advancements and modifications of the Rives-Stoppa technique include composite meshes or laparoscopic assistance.

Cost-effectiveness comparisons with other hernia repair techniques.

The impact of patient factors like comorbidities and lifestyle habits on surgical outcomes.

By considering these points and engaging in open discussions with healthcare professionals, patients with complex incisional hernias can make informed decisions about the most suitable repair approach for their needs.

Conclusion

The open Rives-Stoppa procedure offers a compelling option for treating complex incisional hernias, exhibiting low recurrence rates, versatility, and anatomical restoration. However, its technical complexity and potential drawbacks necessitate careful patient selection and meticulous surgical execution by experienced surgeons.

The Rives-Stoppa technique has excellent long-term results and low morbidity in patients with large primary or recurrent incisional hernias. It is the gold standard for most surgeons.

The Rives-Stoppa technique preserves the functionality and integrity of the abdominal wall, factors considered crucial for effectively repairing abdominal wall defects by the separation of components technique.

The Rives-Stoppa technique employs mesh as reinforcement, which is generally believed to decrease recurrence rates, as described previously.

Funding: No funding or grants from any other funding agencies in the public, commercial, or not-for-profit sectors were received.

Data availability statements: Data sharing does not apply to this article as no datasets were generated or analyzed during the current study.

Disclosure statement: All authors declare that they have no conflicts of interest. No relevant or minor financial relationships exist between relatives, next of kin, and external companies.

References

1. Conze J, Klinge U, Schumpelick V. Hernias. In: Holzheimer RG, Mannick JA, editors. Surgical Treatment: Evidence-Based and Problem-Oriented. Munich: Zuckschwerdt; 2001. Available from: https://www.ncbi.nlm.nih.gov/books/NBK6888/
2. Le Huu Nho R, Mege D, Ouaïssi M, Sielezneff I, Sastre B. Incidence and prevention of ventral incisional hernia. J Visc Surg. 2012 Oct;149(5 Suppl):e3-14. doi: 10.1016/j.jviscsurg.2012.05.004 Epub 2012 Nov 9. PMID: 23142402.
3. Harji D, Thomas C, Antoniou SA, Chandraratan H, Griffiths B, Henniford BT, Horgan L, Köckerling F, López-Cano M, Massey L, Miserez M, Montgomery A, Muysoms F, Poulose BK, Reinpold W, Smart N; NoSTRA HarMoNY. A systematic review of outcome reporting in incisional hernia surgery. BJS Open. 2021 Mar 5;5(2):zrab006. doi: 10.1093/bjsopen/zrab006 PMID: 33839746; PMCID: PMC8038267.
4. van Ramshorst GH, Eker HH, Hop WC, Jeekel J, Lange JF. Impact of incisional hernia on health-related quality of life and body image: a prospective cohort study. Am J Surg. 2012 Aug;204(2):144-50. doi: 10.1016/j.amjsurg.2012.01.012 Epub 2012 May 10. PMID: 22579232.

5. Hope WW, Tuma F. Incisional Hernia. [Updated 2023 Jun 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK435995/
6. Köckerling F. Recurrent Incisional Hernia Repair-An Overview. Front Surg. 2019 May 14;6:26. Doi: 10.3389/fsurg.2019.00026 PMID: 31139632; PMCID: PMC6527885.
7. Nau, P., J., Clark, C., Fisher, M., Walker, G., Needleman, B., Ellison, E. & Muscarella, P. (2010). Modified rives-stoppa repair for abdominal incisional hernias. *Health*, **2**, 162–169. doi: 10.4236/health.2010.22024.
8. Issa M, Noureldin K, Elgadi A, Abdelaziz A, Badawi M, Makram M. Evaluation of the Sublay Mesh Repair Outcomes in Different Types of Ventral Hernia. Cureus. 2021 Dec 21;13(12):e20590. doi: 10.7759/cureus.20590 PMID: 35103166; PMCID: PMC8777263.
9. Chowdari GA, Chetty Y V N, Bm N. A Comparative Study of Retrorectus Mesh Placement Versus Properitoneal Mesh Placement in Open Repairs of Ventral Hernias. Cureus. 2023 Sep 15;15(9):e45277. doi: 10.7759/cureus.45277 PMID: 37846234; PMCID: PMC10576854.
10. Hartog FPJD, Sneiders D, Darwish EF, Yurtkap Y, Menon AG, Muysoms FE, Kleinrensink GJ, Bouvy ND, Jeekel J, Lange JF. Favorable Outcomes After Retro-Rectus (Rives-Stoppa) Mesh Repair as Treatment for Noncomplex Ventral Abdominal Wall Hernia, a Systematic Review and Meta-analysis. Ann Surg. 2022 Jul 1;276(1):55-65. doi: 10.1097/SLA.0000000000005422 Epub 2022 Feb 18. PMID: 35185120.
11. Korenkov M, Paul A, Sauerland S, et al. Classification and surgical treatment of incisional hernia. Langenbeck's Arch Surg. 2001;386(1):65-73.
12. Muysoms F, Miserez M, Berrevoet F, et al. Classification of primary and incisional abdominal wall hernias. Hernia. 2009;13(4):407-414.
13. Bougard, H., Coolen, D., de Beer, R., Folscher, D., Kloppers, JC., Koto, MZ., Reimers, GB., Sofianos, C., Oodit, R. The Hernia Interest Group (HIG) of the South African Society of Endoscopic Surgeons (SASES) November 2016 South African journal of surgery SAJS VOL. 54 NO. JUL 3 2016 https://www.sohah.org/wp-content/uploads/2019/10/Guidelines-for-the-Management-of-Ventral-Hernias.pdf
14. Stoppa, R. E., Warlaumont, C. R., Verhaeghe, P. J., Romero, E. R., & M'Balla-N'Di, C. J. (1986). Prosthetic repair in the treatment of groin hernias. *International surgery*, *71*(3), 154–158
15. Muse, T. O., Zwischenberger, B. A., Miller, M. T., Borman, D. A., Davenport, D. L., & Roth, J. S. (2018). Outcomes after Ventral Hernia Repair Using the Rives-Stoppa, Endoscopic, and Open Component Separation Techniques. *The American Surgeon*, *84*(3), 433–437.
16. Al-Tai AH. Evaluation of "sublay" and "onlay" mesh hernioplasty techniques of ventral hernia repair. *Indian J Public Health Res Dev.* 2019;10:327–331. https://www.researchgate.net/publication/331613715_Evaluation_of_Sublay_and_Onlay_Mesh_Hernioplasty_Techniques_of_Ventral_Hernial_Repair [Google Scholar]
17. Bauer, J., Harris, M., Gorfine, S. *et al.* Rives-Stoppa procedure for repair of large incisional hernias: experience with 57 patients. *Hernia* **6**, 120–123 (2002). https://doi.org/10.1007/s10029-002-0071-3
18. Yaghoobi Notash, A., Yaghoobi Notash, A., Jr, Seied Farshi, J., Ahmadi Amoli, H., Salimi, J., & Mamarabadi, M. (2007). Outcomes of the Rives-Stoppa technique in incisional hernia repair: ten years of experience. *Hernia: the journal of hernias and abdominal wall surgery*, *11*(1), 25–29. https://doi.org/10.1007/s10029-006-0141-z
19. Sneiders, D., Yurtkap, Y., Kroese, L. F., Jeekel, J., Muysoms, F. E., Kleinrensink, G. J., & Lange, J. F. (2019). Anatomical study comparing medialization after Rives-Stoppa, anterior component separation, and posterior component separation. *Surgery*, *165*(5), 996–1002. https://doi.org/10.1016/j.surg.2018.11.013
20. Verheij, E., Bezdjian, A., Grolman, W., & Thomeer, H. G. (2016). A Systematic Review on Complications of Tissue Preservation Surgical Techniques in Percutaneous Bone Conduction Hearing Devices. *Otology & neurotology: official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*, *37*(7), 829–837. https://doi.org/10.1097/MAO.0000000000001091
21. Molina Caballero, A. Y., Pérez Martínez, A., & Goñi Orayen, C. (2021). Abdominal hernia repair using the Rives-Stoppa technique: an abdominal reconstruction. Eventroplastia abdominal con técnica de Rives-Stoppa: reconstruyendo un abdomen. *Cirugia pediatrica : organo oficial de la Sociedad Espanola de Cirugia Pediatrica*, *34*(3), 164–167.