

Use of polypropylene mesh as the sole resource for correction of complex ventral hernias in a public hospital

Abstract

Background: there is no single consensus in the literature on the definition and classification of complex hernias. They are characterized by a set of factors related to the patient, the surgical technique used and the clinical scenario. This case series aims to demonstrate that, for the majority of complex hernias, the use of a polypropylene mesh associated with an appropriate surgical technique may be sufficient to achieve excellent results.

Methods: this is a cross-sectional study, with observational and retrospective analysis of 34 patients who underwent surgery to treat complex hernias from July 2020 to January 2025. The variables analyzed included type of admission to the service, sex, age, comorbidities, preoperative preparation, imaging exams, surgical technique used and complications.

Results: the medical records of 34 patients were reviewed and included, with a predominance of males and an average age of 59 years, 41% of whom were obese. The main way of accessing the service was through elective surgery, and all patients underwent abdominal computed tomography. Preoperative preparation was carried out on an individual basis, considering the patient's clinical condition, their risk factors and the proposed surgical treatment, including, in some cases, the use of progressive pneumoperitoneum. In most procedures, the technique of separating muscle components was necessary to close the midline. No serious complications, such as death or abdominal compartment syndrome, were recorded.

Conclusion: incisional hernias represent a major therapeutic challenge, requiring multidisciplinary support and careful choice of the most appropriate surgical technique for closing the abdominal wall. The use of polypropylene mesh, when associated with an appropriate surgical technique, has proven to be a viable and effective option. However, centralizing these cases in SUS reference centers could optimize the use of limited resources and, above all, guarantee adequate treatment for these patients.

Keywords: hernia, abdominal, hernia, ventral, incisional hernia, abdominal wall reconstruction, meshes

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Abbreviations: HV, ventral hernias; HI, incisional hernias; HP, primary hernias; SUS, Unified Health System; CT, computed tomography; PPP, previous progressive pneumoperitoneum; TAR, transversus abdominis release

Introduction

Ventral hernias represent a protrusion of intra-abdominal contents through a defect in the abdominal wall and may be congenital or acquired. These changes are relatively common in surgical practice and can cause pain, discomfort, functional limitation and, in more serious cases, complications such as incarceration or strangulation.

Although many hernias can be treated with conventional techniques, a relevant subgroup is classified as complex ventral hernia, whose definition still lacks consensus in the literature. This complexity may result from a set of factors, including location and size of the hernial defect, condition of the soft tissues, the patient's previous clinical status, surgical scenario and other aspects.¹ The majority of ventral hernias (VH) classified as complex occur in patients with incisional hernias (IH), which result from weakening of the abdominal wall due to previous surgical incisions. However, they can also be primary hernias (PH), when formed by natural defects in the abdominal wall,

in areas of structural fragility that cannot withstand increased intra-abdominal pressure.

Ventral hernias affect up to 5% of the population and are among the most common complications of abdominal surgery. It is estimated that up to 30% of patients develop a symptomatic hernia within two years of open abdominal surgery.² These hernias are associated with a high rate of morbidity and significantly impact patients' quality of life.

Many of these patients wait for years in line at the Unified Health System (SUS), facing delays in treatment due to the technical complexity of the procedure and the scarcity of resources, such as double-sided screens.

This case series aims to demonstrate that, for the majority of complex hernias, the use of polypropylene mesh associated with an appropriate surgical technique may be sufficient to achieve excellent results (Figure 1).

Material and methods

The cross-sectional study, with observational and retrospective analysis of 34 patients who underwent surgery to treat complex hernias, from July 2020 to January 2025. The inclusion criteria

applied were patients admitted to the surgery service of Hospital Municipal Lourenço Jorge – RJ, with a diagnosis of complex ventral hernia (incisional and primary). In addition, information was searched in the Service's own database (Trello) and in patient records (Carioca Record).



Figure 1 Incisional hernias of patients monitored by the service.

Complexity factors included hernia defects measuring 10 cm and above, location of the hernia in the midline and beyond, large hernia volumes, loss of residence, need for a component separation technique, associated soft tissue status and chance of recurrence. The variables evaluated include type of admission to the service, sex, age, comorbidities, preoperative preparation, use of imaging, surgical technique used and complications.

Results

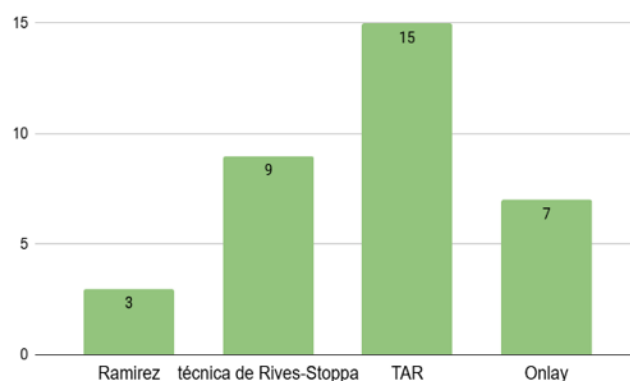
The 34 patient records were reviewed and included, 55% male and 45% female. The average age was 59 years, concentrating between 32 and 84 years. Of the comorbidities, obesity stood out in 41%.

The main form of admission to the service was elective, through the outpatient clinic. However, 10 patients were admitted on an emergency basis, three with intestinal subocclusion, three with drainage of skin secretion and four with abdominal pain. All of them underwent abdominal computed tomography (CT) and were operated on by the same routine team at the service.

Preoperative preparation was carried out individually, considering the patient's clinical condition, risk factors and proposed surgical treatment. This includes everything from intestinal preparation in cases of subocclusion to the treatment of wounds in patients with infection, as well as more prolonged preparations, such as progressive pneumoperitoneum (PPP) for those who have lost their domain. All patients underwent glycemic control, a high-protein diet with supplementation and, when available, respiratory physiotherapy.

In most cases, it was necessary to use the muscle component separation technique to achieve midline closure. Among the procedures performed, three used the anterior separation technique (Ramirez), 15 the posterior separation technique (TAR – Transversus Abdominis Release) and nine were corrected with a retromuscular mesh (Rives-Stoppa technique). In addition, seven with primary

closure associated with the use of onlay mesh. All patients underwent open surgery, use of a closed aspiration drain (Porto-vac) and elastic abdominal belt after the procedure (Graph 1).



Graph 1 Relationship of number of surgical techniques x number of patients.

There were no serious complications, such as death or abdominal compartment syndrome. The complications presented were: seroma, hematoma, partial skin dehiscence, atelectasis and pneumonia. To date, there have been no reoperations or recurrences (Figure 2).

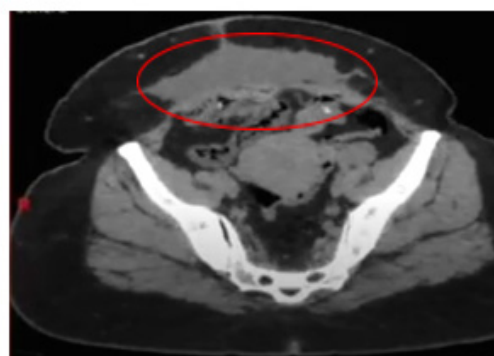


Figure 2 Postoperative abdominal tomography with presence of retained seroma.

Discussion

The demographic profile of the sample analyzed is similar to that in the literature, with a predominance of males, although the difference is not as pronounced as in other types of hernias. Factors such as obesity and underlying health conditions can also influence prevalence in both sexes.³

The average age of patients who develop incisional hernias generally ranges between 50 and 70 years, although they can occur in younger individuals, especially those who have undergone abdominal surgery. In the study in question, a prevalence of 59 years was observed in accordance with the literature.

Comorbidities play a significant role in the development and severity of complex hernias. Some of the most common comorbidities associated with this type of hernia include obesity, diabetes mellitus, smoking, corticosteroid use, chronic lung and cardiovascular diseases. In the research, the predominance of obesity is seen as the main risk factor for patients. Obesity has a well-documented impact on complications following incisional hernia repair, including wound necrosis, SSI, reoperation, and hernia recurrence.⁴

Elective patients were encouraged to lose weight preoperatively, with a calorie deficit diet and stimulation of physical activity, however, there was a low level of commitment among patients mainly due to the lack of specialized nutritional guidance, limitations in physical activities due to cardiomotor conditions and the hernia itself that restricts movement due to its volume and the decrease in the strength of the CORE muscles.

Furthermore, during hospitalization, patients received a high-protein diet with supplementation (IMPACT) at least 7 to 14 days beforehand, aiming to improve surgical results and recovery. Studies suggest that protein supplementation can help increase muscle mass and strength, which is particularly important in patients with complex hernias, who often experience muscle weakness.⁵ However, the present study did not aim to investigate the relationship between this intervention and hernia correction, and it is essential to carry out additional and specific investigations to elucidate this association.

All patients underwent a noncontrast total abdominal computed tomography scan as part of surgical planning. CT is capable of determining the size and content of the hernia, the volume of the hernia sac and the proximity of the hernia in relation to bony structures.⁶ In this way, it provides crucial information that guides the need for preoperative or intraoperative interventions to increase the compliance and volume of the abdominal cavity, in addition to helping to define the approximate size of the mesh, the best position for its placement and fixation methods (Figure 3).



Figure 3 Preoperative abdominal tomography showing removal of the rectus abdominis for surgical planning.

CT was considered the best option in this case due to its availability in the hospital unit in question and the ease of reevaluation of the images by the surgical team at later times. Furthermore, a reliable correlation was observed between the images obtained and the findings of the physical examination and operative procedures.

It is important to highlight that computed tomography (CT) was an essential tool in the evaluation of patients, allowing the classification of those with loss of domain and the need for prior progressive pneumoperitoneum (PPP) programming.⁶ Based on the images obtained, patients who met the criteria underwent peritoneal catheter implantation in the surgical center, using a deep venous access catheter available at the hospital (in the case of this study). Although the existing literature offers limited evidence on the critical evaluation of the PPP⁷ technique, especially regarding the ideal duration, insufflation frequency and insufflation volume, in our case, patients underwent gas filling for a period of 10 to 14 days before final hernia repair, with volume varying between 500 and 1000 ml/day (Figure 4 & 5).



Figure 4 Preoperative abdominal tomography, showing a distance >10 cm between the rectus abdominis, with a volume of hernial content >25% of the volume of the abdominal cavity. Area of the hernia defect in blue.



Figure 5 Preoperative abdominal tomography after 10 days of PPP, showing rectification of the rectus abdominis (red arrows), increased abdominal cavity volume (blue dotted area), and the presence of a deep venous catheter in the left hypochondrium, in the abdominal cavity (green arrow). These factors demonstrate the effectiveness of PPP.

The progressive pneumoperitoneum (PPP) technique is indicated when primary fascial closure is not possible due to the size of the hernia and/or loss of domain, or when the abrupt reintroduction of the hernia into the peritoneal space could lead to serious consequences, such as abdominal compartment syndrome.⁶

In this study, 58% of patients underwent the technique, which showed significant benefits, such as increasing abdominal space for surgery and did not develop compartment syndrome. Only one patient had subcutaneous emphysema as a complication associated with the use of PPP. Thus, the benefits of this approach outweighed the complications, being essential for closing the patients' abdominal wall (Figure 6).



Figure 6 Abdominal and hernia volume before and after PPP at 10 days and after hernioplasty.

Abdominal wall closure techniques ranged from the simplest, such as the use of onlay mesh, to the most complex, and in most cases, it was necessary to separate the components. Less complex techniques were chosen for patients with simpler conditions, such as anterior component separation, using the Ramirez technique. In the most severe cases, subsequent separation of components was indicated, using the Rives-Stoppa and TAR (Transversus Abdominis Release) techniques.

The objective of separating components is to allow closure of the defect without generating excessive tension in the tissues. Ramirez, in 1990, described that performing myofascial release of the rectus abdominis muscles, through an incision along the aponeurosis of the external oblique muscle at its insertion into the rectus sheath bilaterally, facilitates the closure of the abdominal wall with controlled residual tension (Figure 7).²

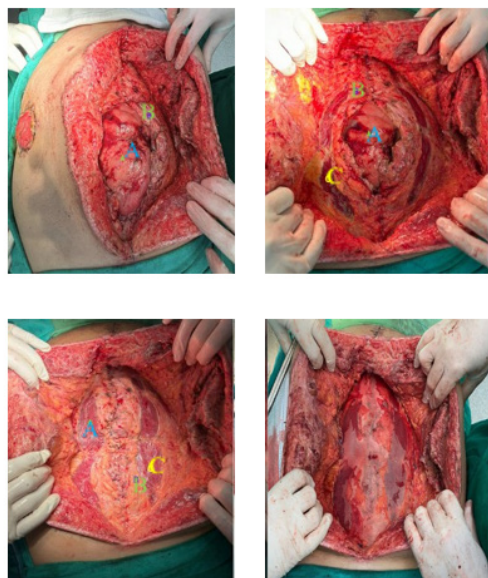


Figure 7 Separation of the anterior component, with a relaxing incision. A- hernial content. B- anterior rectus abdominis aponeurosis. C- rectus abdominis.

Recent studies, including cohorts and meta-analyses,⁴ conclude that hernia recurrence rates are lower when the mesh is placed in the retrorectal position compared to the onlay position. The Rives-Stoppa technique was used in some cases and can increase the flap by up to 10 cm when the rectus muscle is separated from its envelope in the posterior rectus sheath. However, the extent of medialization is limited by the rib cage, close to the xiphoid bone, and by the iliac crest with the inguinal ligament, close to the pubis (Figure 8).

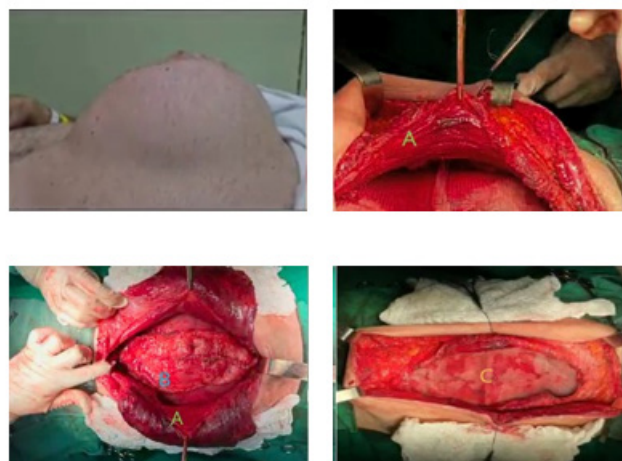


Figure 8 Posterior component separation (Rives-Stoppa). A) rectus abdominis muscle. B) posterior blade of the internal oblique. C) polypropylene mesh in the retromuscular space.

The posterior access technique through TAR offers the advantage of creating a vast retromuscular plane, providing a large area for mesh placement between two preperitoneal layers. Mesh in this plane covers hernias close to bony structures and non-median defects. Substantial mesh reinforcement in the visceral bag improves CORE stability.

Furthermore, in hernias outside the midline, such as lumbar, parastomal or subcostal, release may be more challenging, as the aponeurosis of the external oblique muscle may be part of the hernia and already be compromised.⁸ However, liberation, although more difficult, is not impossible.

Among the disadvantages, the greatest technical difficulty, prolonged surgical time and the need for experience on the part of the surgeon to correctly follow the technical precepts essential to obtaining better results stand out. For this study, it was decided to maintain the same surgical team, made up of professionals experienced in performing more complex techniques. The use of posterior component separation techniques, including the use of TAR, is in line with the literature, especially in cases of large hernias that require greater mesh overlap, such as Kocher and lumbar hernias with close contact to bone structures (Figure 9).⁹ All repairs were performed using medium-weight (30x30 cm), medium-porosity, non-absorbable polypropylene mesh, currently available through the Brazilian Unified Health System (SUS). This mesh is inexpensive, widely available in most hospitals, and offers adequate conditions for hernia repair.¹⁰⁻¹⁴

In the study patients, the entire hernia contents were reduced, facilitating hernioplasty. Furthermore, the hernia sac can be used as additional protection during peritoneal closure, preventing direct contact of the mesh with the viscera. Although they are often of low severity, some complications are relatively expected after incisional hernia repair. Among them, the seroma, retained hematoma and partial dehiscence of the surgical wound stand out, which were compatible with those present in the study. Respiratory complications, such as atelectasis and pneumonia, can also occur, especially due to the presence of important comorbidities in the patients in question, such as obesity and major surgery. These events, although generally self-limited or manageable with conservative measures, require strict clinical monitoring to prevent progression to more complex conditions.

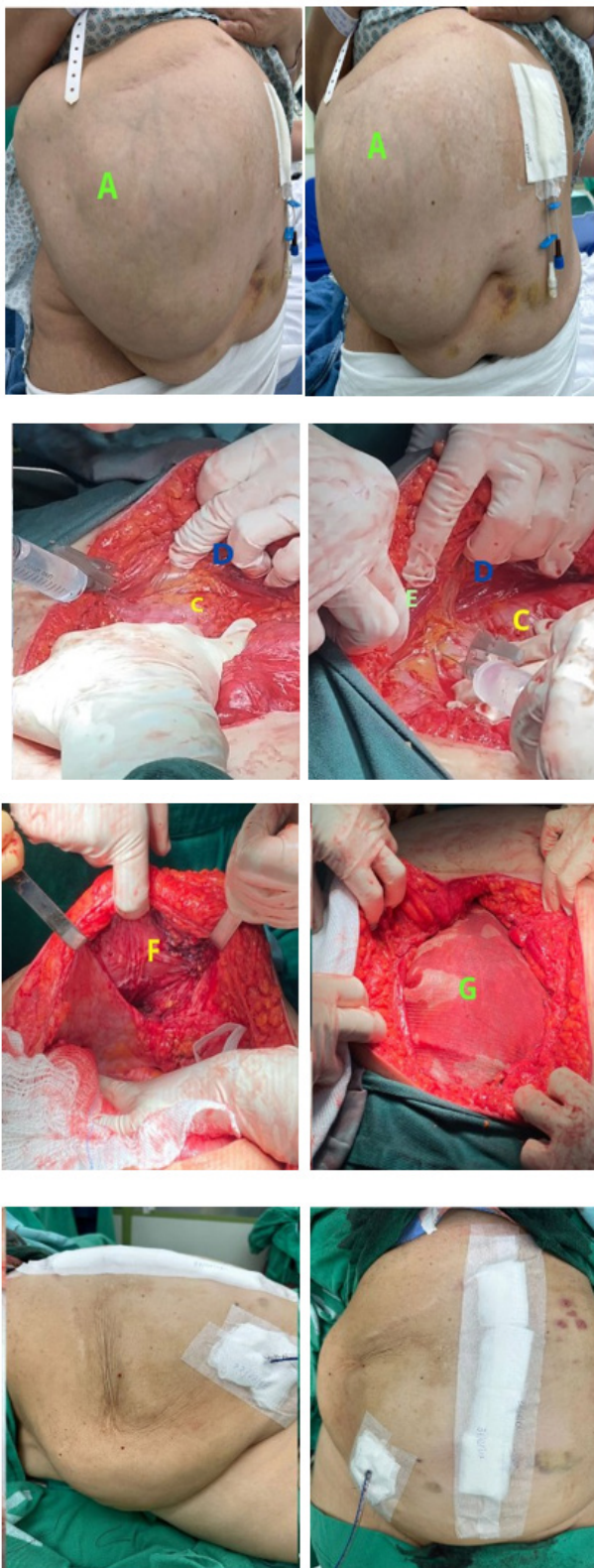


Figure 9 Surgery with TAR technique. A) Kocher incisional hernia. B) PPP catheter. C) Transverse muscle. D) Posterior layer of the internal oblique muscle. E) Neurovascular bundle. F) Extensive hernia defect. G) Preperitoneal sublay mesh. H) Final result of surgical correction with the presence of a Hemovac drain in the dead space in the hernia topography.

Furthermore, one of the most relevant complications is the recurrence of the hernia, which can occur even after correction using mesh. This recurrence is related to factors such as obesity, surgical site infection, poor tissue quality, technical failures in the procedure and connective tissue diseases. Follow-up of these patients is still insufficient to assess the long-term recurrence rate. However, the initial evaluation, up to six months after surgery, has been very positive, with a high level of patient satisfaction, who reported a significant improvement in quality of life.¹⁵⁻¹⁷

Conclusion

Incisional hernias are difficult to treat and require multidisciplinary support, including pre- and postoperative nutritional monitoring, as well as the selection of the appropriate technique for abdominal wall closure.

These techniques have revolutionized the complex surgical approach to ventral hernias, both median and lateral. However, their execution requires specialized training and in-depth anatomical knowledge. Poorly performed surgery can result in irreversible damage, including permanent damage to the innervation of the abdominal wall and the development of serious complications. The use of polypropylene mesh, when combined with an appropriate surgical technique, has proven to be a viable and effective option. Nevertheless, centralizing these cases in SUS referral centers could optimize the use of limited resources, train a greater number of surgeons, and, most importantly, ensure appropriate treatment for these patients.

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Conflicts of interest

All authors declare that they have no conflicts of interest.

References

- Slater NJ, Van der Kolk M, Hendriks T, et al. Criteria for definition of a complex abdominal wall hernia. *Hernia*. 2013;18(1):7-17.
- Henriksen NA, Bisgaard T, Assaadzadeh S, et al. Primary ventral and incisional hernias: comprehensive review. *BJS Open*. 2024;9(1):zrae145.
- Ramos F, Oliveira PG, Leão N, et al. Epidemiological profile of patients with incisional hernias. *ABCD Arq Bras Cir Dig*. 2007;565:230-233.
- Sanders DL, Kingsnorth AN, Greenberg JA, et al. Midline incisional hernia guidelines: the European Hernia Society. *Br J Surg*. 2023;110(12):1732-1768.
- Piccoli M, Bersigotti M, D'Amore L, et al. "Complex abdominal wall" management: evidence-based guidelines of the Italian Consensus Conference. *Updates Surg*. 2018;71(2):255-272.
- Barbosa C. Predictive factors for complexity in abdominal wall hernias: a literature scope review. *Rev Col Bras Cir*. 2024;51: e20243670.
- Allart K, Sabbagh C, Regimbeau JM. Intraperitoneal catheter introduction for pre-operative progressive pneumoperitoneum for abdominal hernia with loss of domain (Goni-Moreno technique). *J Visc Surg*. 2020;157(4):335-340.

8. Wegdam JA, van Steensel S, Bökkérink WJ, et al. Systematic review of transversus abdominis release in complex abdominal wall reconstruction. *Hernia*. 2018;23(1):5–15.
9. Zolin SJ, Fafaj A, Krpata DM. Transversus abdominis release (TAR): what are the real indications and where is the limit? *Hernia*. 2020;24(2):333–340.
10. Shmelev A, Ortega AE, Carbonell A, et al. Surgeon volumes: preserving appropriate surgical outcomes in higher-risk patient populations undergoing abdominal wall reconstruction. *Surg Endosc*. 2023;37(10):7582–7590.
11. Fonseca LM, Vasconcelos AM, Santos VF, et al. Complex ventral hernias - series of cases treated with realization of preoperative progressive pneumoperitoneum. *Relato de caso*. 2019;5(1):1–3.
12. Grove TN, Hope W, Kao AM, et al. Perioperative optimization in complex abdominal wall hernias: Delphi consensus statement. *BJS Open*. 2021;5:zrab082.
13. Elstner KE, Tacey M, Read J, et al. Preoperative progressive pneumoperitoneum revisited. *Front Surg*. 2021;8:754543.
14. Oprea V, Gheorghe Radu V, Moga D. Transversus abdominis muscle release (TAR) for large incisional hernia repair. *Chirurgia*. 2016;111(6):535.
15. Claus C, Marchiori E, Abreu FP, et al. DECOMP Report: Answers surgeons expect from an abdominal wall imaging exam. *Rev Col Bras Cir*. 2022;49.
16. Oprea V, Constantin V, Ciobanu G, et al. The influence of transversus abdominis muscle release (TAR) for complex incisional hernia repair on the intra-abdominal pressure and pulmonary function. *Hernia*. 2021;25(6):1601–1609.
17. Fonseca LM, Vasconcelos AM, Santos VF, et al. Complex ventral hernias - series of cases treated with realization of preoperative progressive pneumoperitoneum. *Relatos de Casos Cir*. 2019;5(1):1–3.