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Primary abandon-of-the-sac technique in laparoscopic inguinoscrotal hernia repair: A retrospective comparative study

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Abstract

BACKGROUND: Laparoscopic inguinoscrotal hernia repair is a challenging procedure. The surgeon must perform large dissections to reduce the hernial sac, although he has the alternative technique of leaving the sac at the deep inguinal orifice level from the beginning.

OBJECTIVE: We aimed to determine the postoperative morbidity of laparoscopic inguinoscrotal hernia repair with the primary abandon-of-the-sac (PAS) technique and to compare it with complete dissection and reduction (CD). Operative times were compared as a secondary outcome.

METHODS: A retrospective analysis was conducted between January 2021 and May 2022. The minimum follow-up was 3 months. Postoperative morbidity and operative times in the PAS group were analyzed and compared with those in the CD group.

RESULTS: Seventy-eight patients were evaluated. The mean follow-up was 5 months (range, 3–18 months). PAS was performed in 15 patients, while the remaining 63 patients underwent CD. There were no significant differences in demographic and hernia characteristics. An overall morbidity of 30.7% was recorded. No statistical differences were observed in postoperative morbidity between the PAS group and the CD group (33.3% vs. 30.1%; $P = 0.81$). No statistical differences were found in terms of seromas (13.3% vs. 9.5%; $P = 0.662$), hematomas (6.6% vs. 9.5%; $P = 0.727$), or hydrocele (13.3% vs. 11.1%; $P = 0.808$). No recurrence or chronic pain was observed during the study period. Finally, a significantly shorter median operative time was recorded in the PAS group (50 vs. 80 min; $P = 0.0026$).

CONCLUSION: The PAS technique is safe and feasible for the management of inguinoscrotal hernias. In our series, comparable morbidity rates were found when comparing it with CD. The benefit of the PAS technique is a significant reduction in operative time, despite the fact that it requires more postoperative ultrasounds.

Keywords:
Abandon-of-the-sac, inguinoscrotal hernia, laparoscopic surgery

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Introduction

Inguinal hernia repair is the most frequently performed surgical procedure in the General Surgery Department. Since its introduction in the 1990s, the laparoscopic approach has become widely accepted due to the benefit of being minimally invasive.[1–5]

Inguinoscrotal hernia repair remains a challenge for surgeons. Its complexity lies in the technical difficulty of reducing large visceral contents, the extensive dissection of the sac respecting and preserving the vessels and elements of the spermatic cord, and the need to perform extensive peritoneal flaps for the placement of a large mesh, with the main aim to avoid hernia recurrence. The

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main complication associated with this type of hernia is scrotal hematoma, followed by seroma, hydrocele, chronic pain, and testicular ischemia, among others.[6]

Primary abandon-of-the-sac (PAS) has appeared as a technical alternative in inguinoscrotal hernia repair to avoid extensive dissection and, consequently, reduce the possibility of scrotal hematoma. Although its technical feasibility is accepted, it has been suggested that the release and abandonment of the sac in the inguinal canal predisposes to the development of hydrocele or chronic seroma.[7,8] These complications are usually considered as the natural postoperative course of PAS. Hence, this morbidity has led to a lack of use of the PAS technique. Currently, there is limited data that determines PAS morbidity rates or that compares its results with complete dissection and reduction (CD) of the sac.

The aim of our study was to determine the postoperative morbidity rate of laparoscopic inguinoscrotal hernia repair with the PAS technique and compare it with complete sac dissection and reduction (CD). As a secondary outcome, the operative times of both procedures were compared.

Materials and Methods

A retrospective analysis of a prospectively maintained database was conducted, including all patients who underwent laparoscopic inguinoscrotal hernia repair between January 2021 and May 2022 at a single center, where the trans-abdominal preperitoneal (TAPP) approach was systematically used. All male patients older than 18 years diagnosed with unilateral or bilateral indirect inguinoscrotal hernias that could be managed using this approach were included. Patients with direct or recurrent hernias were excluded.

The following hernia size classification was used:

- T1: Small direct or indirect funicular hernia.
- T2: Hernia that exceeds the superficial inguinal orifice without reaching the scrotum.
- T3: Inguinoscrotal hernia.

Thus, T1 and T2 hernias were excluded, and only T3 hernias were considered for our study. The PAS technique was avoided in sliding hernias. In cases where the hernia could not be manually reduced, laparoscopic reduction was carried out before selecting the repair technique.

Two surgical techniques were used for inguinoscrotal hernia management:

1. Laparoscopic inguinal hernia repair with PAS: The peritoneum is opened from the obliterated umbilical ligament to the anterior superior iliac spine, bordering the deep inguinal ring where the sac is projected in a "pirate patch" [Figure 1]. After separating the sac from the remaining peritoneum, it is abandoned in the inguinal canal and scrotum. Then the procedure continues with an extensive flap dissection according to the standard technique, respecting the surgical principles and critical vision of the myopectineal orifice.[9] After hemostasis is verified, a polypropylene mesh is placed to cover indirect defects and others. The size of the mesh systematically is 16 × 13 centimeters, although it can vary by 1 cm based on the patient's size. Then it is fixed with traumatic fixation means, and the peritoneum is closed with a self-retaining barbed suture. At this point, it is important to have enough dissected flaps in order to avoid tight sutures.
2. Laparoscopic inguinal hernia repair with CD: The peritoneum is opened using the same anatomical limits as described above. The hernia sac is dissected and reduced by separating it from the cord structures that run through the inguinal canal. Once the sac has been reduced, the same steps of flap dissection, mesh placement, fixation, and closure of the peritoneum as described above are followed.

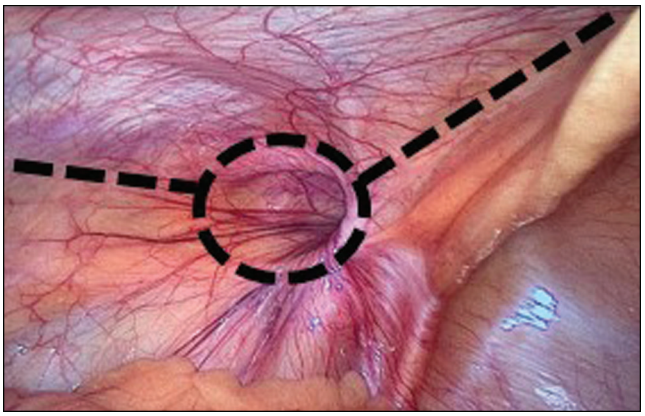

Figure 1: Section of the peritoneum in the primary abandon-of-the-sac technique

The decision on which technique to perform was at the discretion of the attending surgeon based on each individual case. Operative times were recorded in all cases. The preoperative evaluation, anesthetic technique, and postoperative care were the same for all patients. Ultrasonography (US) was performed in cases of scrotal abnormalities or pain during a physical examination, when considered appropriate by each surgeon.

Demographic data, ASA score, and history of previous abdominal surgeries were analyzed. The minimum follow-up period for the patients was 3 months. Patients were seen for clinical examination on postoperative days 7, 30, 90, 180, and 365.

Complications were divided into three groups:

1. Intraoperative events (resolved with technical maneuvers and without repercussions in the postoperative period of the patients).
2. Intraoperative complications.
3. Postoperative complications.

In the evaluation, the number of patients with complications, not the mere sum of complications, was considered. On the other hand, the severity of the complications was defined according to the Clavien-Dindo[10] classification:

1. Minor complications: Grades 1–2.
2. Major complications: Grades 3–4.

Based on these parameters, postoperative morbidity in the PAS and CD groups was analyzed and compared. The ethical approval was obtained by the local Ethics Committee of the British Hospital of Buenos Aires. Due to the retrospective nature of this study, the Ethics Committee waived the requirements for written informed consent. However, all patients signed the surgical consent form.

Statistical analysis was performed with the Graph Pad Prism 7.01 program. To compare the results, Chi-square and Fischer tests were used. Continuous variables were expressed as mean with standard deviation or median with interquartile range (IQR). Categorical variables are expressed as *N* and/or percentages. A result was considered significant at $P < 0.05$.

Clinical trial registry

This work is a retrospective analytical study. No clinical trials were involved.

Results

Overall, 78 patients diagnosed with T3 inguinoscrotal hernia underwent repair surgery during the study period. The mean age was 59 years, the mean BMI was 27.3, ASA I/II scores predominated (91%), and 41% of the patients had a history of previous abdominal surgeries.

Table 1: Demographic data and hernia characteristics

Characteristics	Total (*n* = 78)	PAS (*n* = 15)	CD (*n* = 63)	*P*
Age (year), mean (SD)	59 (16)	62 (15)	58 (16)	0.27
BMI (kg/m^2), mean	27.3	27	27.3	0.67
ASA, *n* (%)				
I/II	71 (91)	14 (93.3)	57 (90.4)	0.72
III/IV	7 (9)	1 (6.7)	6 (9.6)	0.72
History of previous abdominal surgeries, *n* (%)	32 (41)	7 (46.6)	25 (39.6)	0.62
Hernia characteristics				
Right hernias, *n* (%)	44 (56.4)	9 (60)	35 (55.5)	0.75
Left hernias, *n* (%)	26 (33.3)	3 (20)	23 (36.5)	0.22
Bilateral hernias, *n* (%)	8 (10.2)	3 (20)	5 (7.9)	0.16
Mean ring size in cm^2 (SD)	3.7 (0.7)	3.6 (0.8)	3.7 (0.7)	0.79

PAS: primary abandon-of-the-sac; CD: complete dissection; SD: standard deviation; BMI: body mass index

PAS was performed in 15 patients, while the remaining 63 patients underwent CD. There were no differences in the demographic characteristics between both groups [Table 1], as well as no differences in hernia characteristics.

The mean follow-up of the patients was 5 months (range, 3 to 18 months) [Table 2]. Follow-up US was performed in 60% of the PAS group and in 21% of the CD group ($P = 0.0023$). An overall morbidity of 30.7% was observed [Table 3], including seroma in 10.2%, hematoma in 8.9%, and hydrocele in 11.5%. All of them were minor complications; therefore, no reoperations were required.

In the PAS group, the postoperative morbidity rate was 33.3%, which was slightly higher than that in the CD group (30.1%), with no statistically significant difference ($P = 0.81$). Higher rates of seroma (13.3% vs. 9.5%; $P = 0.662$) and hydrocele (13.3% vs. 11.1%; $P = 0.808$) were seen in the PAS group, although this difference was not statistically significant. On the other hand, a lower rate of hematoma (6.6% vs. 9.5%; $P = 0.727$) was registered in the PAS group. During the study period, no cases of recurrence or chronic pain beyond 3–6 months were observed. Finally, a significantly shorter median operative time was recorded in the PAS group compared to the CD group (50 vs. 80 min; $P = 0.0026$).

Table 2: Surgical time and follow-up

Time and follow up	Total (*n* = 78)	PAS (*n* = 15)	CD (*n* = 63)	*P*
Surgical time (min), median (IQR)	70 (53–90)	50 (50–70)	80 (60–100)	0.0026
Follow-up (months), mean (SD)	5.1 (2.9)	4.8 (1.6)	5.2 (3.1)	0.76
Follow-up US, *n* (%)	22 (28.2)	9 (60)	13 (21)	0.0023

IQR: interquartile range

Table 3: Postoperative morbidity

Morbidities	Total (*n* = 78)	PAS (*n* = 15)	CD (*n* = 63)	*P*
Seroma, *n* (%)	8 (10.2%)	2 (13.3%)	6 (9.5%)	0.662
Hematoma, *n* (%)	7 (8.9%)	1 (6.6%)	6 (9.5%)	0.727
Hydrocele, *n* (%)	9 (11.5%)	2 (13.3%)	7 (11.1%)	0.808
Recurrence, *n* (%)	0 (0%)	0 (0%)	0 (0%)	–
Chronic pain, *n* (%)	0 (0%)	0 (0%)	0 (0%)	–
Total morbidity, *n* (%)*	24 (30.7%)	5 (33.3%)	19 (30.1%)	0.81
I–II	24 (30.7%)	5 (33.3%)	19 (30.1%)	
III–IV	0 (0%)	0 (0%)	0 (0%)	0.81

*Morbidity according to Clavien-Dindo Classification[10]

Discussion

Inguinoscrotal hernia management poses an important challenge, regardless of the surgical approach used. Doubtful reducibility of the hernia components, dissection of a large hernia sac, and a large abdominal wall defect left after hernia sac reduction are factors that require an important therapeutic effort with great risks. The applicability of the laparoscopic approach for this type of hernia has been debated for many years.[1–7]

At this point, we wonder if using a technical variant of the CD of the sac, such as PAS, may have favorable results so that it can be applied systematically. Currently, there are few publications on this topic, and most of them compare CD with partial transection (PT) of the sac. Li *et al*.[11] compared PT to CD in a randomized prospective study of 70 patients. Their results showed a significant reduction of surgical times in the PT group, with no significant differences in length of hospital stay or seroma and other complication rates (seroma: 11.4% in PT and 14.3% in CD). These results are similar to those found in our series; however, in their analysis, most patients had direct or small hernias (T1–T2), and only a few cases with inguinoscrotal hernias (T3) were included. On the other hand, Ruze *et al*.[8] also analyzed and compared these groups in a randomized prospective study of 159 patients and found that the seroma rate was significantly higher while operative times were similar in the PT group compared to the CD group. It is important to mention that PT, the alternative technique to CD used in these publications, is not the same as the PAS technique. PT requires some dissection of the hernia sac, which implies further local tissue trauma.

Morrel *et al*.[12] analyzed a series of 26 patients who underwent PAS and found a 7.6% seroma rate but no other complications, concluding that PAS is a possible technical alternative for the treatment of inguinoscrotal hernias. Nevertheless, in this study, no CD control group was used.

In our series, the overall morbidity rate for the PAS group was 33.3%, comparable with the overall morbidity rate in the CD group [Table 3]. Although seroma (13.3%) and hydrocele (13.3%) rates in the PAS group were slightly higher than in the CD group, this difference was not statistically significant. Studies evaluating the applicability of the laparoscopic approach in the treatment of inguinoscrotal hernias report seroma rates of 8%–10.5%, similar to the rate found in our series (10.2%).[6,7] Moreover, we observed a lower rate of hematoma in the PAS group (6.6% vs. 9.5%) than in the CD group, although this difference was not significant. We believe that this low hematoma rate is due to the preservation of the hernia sac in the inguinal canal, which avoids local tissue trauma.

No recurrences occurred in either of the groups analyzed in our series. Follow-up US of the groin was performed in 60% of the PAS and 21% of the CD group, accounting for 28.2% of the whole series. The difference between both groups is significant, but each surgeon indicated the study according to the findings in follow-up visits if physical examination was insufficient to confirm a possible complication.

When comparing operative times between both groups, a significant difference was found. In the PAS group, the median operative time was 50 min (range, 50–70) compared to 80 min (range, 60–100) in the CD group. The decrease in operative time has a direct impact on the outcome of the procedure as it reduces patient anesthetic exposure, prevents weariness of the surgical team, and diminishes the potential risk of spermatic cord damage during its manipulation.

A limitation of the study is that, due to its retrospective nature, a potential selection bias may have occurred since the decision whether to perform PAS or CD was made at the discretion of each surgeon during the procedure. The intraoperative indication of PAS may have been due to a stiffer hernia sac or a more difficult peritoneum dissection. Besides, the sample size was not large enough due to the short period of time in which we evaluated these repair techniques. The difference in the follow-up US request rate may be related to a loss of follow-up for the patients. However, 60% of the patients in the PAS group underwent a follow-up US, and only 13% of the cases of hydrocele in this group were diagnosed by this method. The other 40% of PAS patients in whom US was not performed remained asymptomatic during postoperative examinations.

We believe that our study has three strengths:

1. It is the first study to compare the outcomes of the use of PAS and CD in the treatment of inguinoscrotal hernias, with a special focus on the incidence of seroma in each group. In this study, we did not find any evidence for the concept that hydrocele, or chronic seroma, is the natural postoperative course of PAS.
2. We observed that PAS is feasible as postoperative morbidity is not increased, and the technique even has advantages in terms of shorter operative time and better management of difficult cases.
3. Our results show that the use of prospective randomized protocols is ethically feasible to demonstrate the safety of new surgical trends.

In conclusion, this study shows that for the management of inguinoscrotal hernias, PAS is associated with similar morbidity rates compared to CD. In addition, the use of PAS leads to a reduction in operative time and

technical difficulty when treating large hernias and diminishes the risk of damaging the cord structures. Although prospective randomized studies with long-term follow-ups are needed to confirm our results, PAS may be systematically performed in the treatment of inguinoscrotal hernias.

Author contributions

All authors contributed to the study's conception and design. Material preparation, data collection, and analysis were performed by Ramiro Arrechea Antelo and Victoria Scasso. The first draft of the manuscript was written by Ramiro Arrechea Antelo and Pablo Medina. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Ethical policy and institutional review board statement

Our study procedures were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration. The ethical approval was carried out by the local Ethics Committee of the British Hospital of Buenos Aires (No. 13828, dated on April 3, 2024).

Declaration of patient consent

Due to the retrospective nature of this study, the Ethics Committee waived the requirements for written informed consent. However, all patients signed the surgical consent form.

Data availability statement

The datasets generated during and/or analysed during the current study are not publicly available due to patients identity protection and institutional policies but are available from the corresponding author on reasonable request.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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