

Outcomes Following Transabdominal Preperitoneal Hernioplasty: A Retrospective Study of 288 Consecutive Cases

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ABSTRACT

Aim: Surgical management of inguinal hernia (IH) through laparoscopic approaches is becoming increasingly common in surgical practice. However, there is still controversy regarding the indications and techniques used, such as totally extraperitoneal (TEP) or transabdominal preperitoneal (TAPP) repair. The purpose of this study was to evaluate the short- and long-term postoperative outcomes of TAPP hernioplasty in a series of 288 cases.

Materials and methods: A consecutive series of 288 patients who underwent laparoscopic TAPP repair between January 2006 and December 2019 were included. The inclusion criteria consisted of patients with a symptomatic bilateral hernia, recurrent hernia, suspicion of occult IH, and unilateral hernia for whom the procedure was specifically requested. Demographic data, operative details, and postoperative outcomes were registered.

Results: A total of 524 TAPP repairs were included in the study. The median operative time was 100 minutes for bilateral hernias and 75 minutes for unilateral hernias. The postoperative morbidity rate was 4.8%, and no mortalities were recorded. The median follow-up period was 21 (6–60) months. The recurrence rate at 60 months was 3.24%, and the incidence of chronic postoperative pain was 0.2%. Recurrence and neuritis were mainly associated with polyester meshes.

Conclusion: Transabdominal preperitoneal is a safe and effective surgical option for managing IHs, provided that patients and meshes are carefully selected.

Clinical significance: Nonpolyester meshes and nontraumatic fixation are associated with better outcomes.

Keywords: Inguinal hernia, Transabdominal preperitoneal, Transabdominal preperitoneal patch plasty.

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INTRODUCTION

Inguinal hernia (IH) is a common surgical pathology, with a lifetime incidence of 27–43% in men and 3–6% in women.¹ Each year, over 20 million patients require IH repair, making hernioplasty one of the most frequent surgical procedures.^{2,3} Currently, two main surgical options are considered as follows: Open free-tension mesh repair (Lichtenstein) and laparoscopic techniques. The application of laparoscopy for groin hernia management began in the early 1990s, and since then, laparoscopy has gained acceptance among abdominal wall surgeons.^{4–7}

The laparoscopic techniques of transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) repair have followed parallel development, with ongoing controversy over which technique is the best in terms of low risk of complications, ease of learning, fast recovery, reproducible results, and cost-effectiveness.^{2,8} Both laparoscopic approaches have become alternatives to open mesh IH repair, and the International Endohernia Society (IEHS) recognizes them as acceptable options for primary IH treatment.^{9–11}

Recurrence rate and the incidence of chronic postoperative pain are the primary concerns when evaluating the effectiveness of these techniques. Mesh tension-free hernioplasty, whether open or laparoscopic, has been shown to be efficient in reducing recurrence rates and chronic postoperative pain compared to traditional open repair.^{12,13} Additionally, randomized comparative trials have demonstrated the advantages of laparoscopy, including

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less early postoperative pain, faster recovery, and reduced chronic pain compared to open surgery.^{2,14}

The TEP repair offers the advantage of avoiding the peritoneal cavity and peritoneal closure but has a steep learning curve and is associated with complications such as port-site hernias and visceral

injuries. Transabdominal preperitoneal, on the contrary, allows for the assessment of bilateral hernia defects and the detection of occult contralateral hernias.^{15,16} Transabdominal preperitoneal has shown similar outcomes to TEP and open hernia repair techniques in terms of postoperative pain, hospital stay, and recurrence rate comparable to the Lichtenstein technique.¹⁷

The objective of this study was to evaluate the postoperative and long-term results of the TAPP approach in patients with IH.

MATERIALS AND METHODS

A protocolized program for laparoscopic IH treatment was initiated in January 2006. From December 2019, a total of 288 patients underwent surgery using the TAPP technique. The inclusion criteria for this study were bilateral IH, recurrent hernia, suspicion of occult contralateral IH, and patient-specific requests. Patients unfit for general anesthesia, those with strangulated hernia, and those with giant scrotal hernia were excluded. Demographic data, American Society of Anesthesiologists (ASA) classification, comorbidities, number of previous hernia repairs, type of hernia, and recurrence type of hernia were recorded. Short-term outcomes such as median operative time, intraoperative complications, postoperative pain, postoperative complications, and median postoperative stay were monitored. Long-term outcomes included hernia recurrence and chronic pain. Follow-up visits were scheduled at one, six, twelve, and twenty-four months after surgery, and additional visits were arranged as per the patient's request or their primary care physician.

Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 25.0 (SPSS Inc., Chicago, Illinois, USA). Demographics, perioperative data, operation details, length of hospital stay, morbidity, and mortality outcomes were presented as numbers and percentages for qualitative variables, and as medians and interquartile ranges (IQRs) for quantitative variables.

This study involved the use of data from clinical records. To ensure proper handling of information, data were treated confidentially and anonymously in accordance with the Spanish Organic Law 15/1999 of 13 December 1999 on Personal Data Protection [late-onset Pompe disease (LOPD)]. All methods were performed in compliance with the guidelines and regulations established by the Declaration of Helsinki (1964, revised in 1983) on biomedical research involving humans, the Spanish Royal Decree 1090/2015 of 4 December, which regulates clinical trials with drugs, the Research Ethics Committees with drugs, and the Spanish Registry of Clinical Studies. Informed consent was obtained from all patients, and ethical approval was granted by the Ethics Committee of Valladolid University (No. PI 20-1963).

RESULTS

A total of 524 procedures were performed, consisting of 473 primary hernias and 51 recurrent hernias. The demographic features and characteristics of the hernias are presented in Table 1. The median age of the patients was 58 (49–67) years. Inguinal hernias were predominantly observed in males (95.1% vs 4.9%), and right-sided hernias were slightly more common than left-sided hernias (51% vs 49%). The most frequent hernia presentation was L2 (32.1%), followed by M1–M2 (28.6%) (Table 2).

The median operative time for unilateral hernias was 75 minutes (55.0–100.0), while for bilateral hernias, it was 110 (90.0–130.0) minutes. No major intraoperative complications occurred, and the overall morbidity rate was 4.8%, with no recorded mortalities.

Table 1: Demographics and preoperative parameters

Female	14 (4.9%)
Male	274 (95.1%)
Mean age (years)	58 (49–67)
Bilateral hernia	225 (85.9%)
Unilateral hernia	23 (4.4%)
Recidivated hernia	51 (9.7%)
ASA I	124 (43.2%)
ASA II	139 (48.1%)
ASA III	23 (8.0%)
ASA IV	2 (0.7%)
Previous abdominal surgery	51 (17.6%)

Table 2: Operative data

Right hernia	267 (51.0%)
Left hernia	257 (49.0%)
L1	82 (15.6%)
L2	175 (33.4%)
L3	94 (18%)
M1–M2	156 (29.8%)
M3	16 (3%)
F	1 (0.2%)
Mean operative time for unilateral IH	75 (55.00–100.0) minutes
Mean operative time for bilateral IH	110 (90.0–130.0) minutes

Table 3: Postoperative outcomes

Mean hospital stay: Days (range)	1.0 (1.0–2.0)
Overall 30-day morbidity	23 (4.4%)
Hematoma	13 (2.5%)
Seroma	6 (1.1%)
Wound infection (port site)	2 (0.4%)
Umbilical port hernia	2 (0.4%)
Recurrence	17 (3.2%)
Chronic postoperative pain	10 (1.9%)

There were no conversions to open repair. The median length of hospital stay was 1 (1.0–2.0) day. The following four different types of meshes were utilized: Polytetrafluoroethylene (PTFE) (2), polyester (225), polypropylene (PPL) (66), and polyvinylidene (PVDF) (231). Mesh fixation was accomplished with tacks in 81.2% (426) of cases and with glue (N-butyl-2 cyanoacrylate + methacryloisolfolane) in 18.7% (98). Peritoneal closure was initially performed with tacks or staples and later with absorbable barbed sutures in 74.4% (385) of cases.

The average follow-up period was 21 (6.0–60.0) months, which included 80% of the patients. The 5-year follow-up was completed by 26.5% of the patients. The postoperative outcomes are presented in Table 3. Major complications (Clavien–Dindo IIIa) occurred in two patients (0.36%). In the early postoperative period, the most common complications were hematoma (2.50%, 13 cases)

and seroma formation (1.10%, 6 cases), all of which were resolved with conservative management. Two patients experienced wound infections (0.40%), and two developed a port-site hernia (umbilical port). No mesh-related infections were recorded. In terms of long-term outcomes, the recurrence rate was 3.2% (17 cases), and the rate of chronic postoperative pain was 1.9% (10 cases).

All recurrences were reoperated using the open Lichtenstein technique, except for three cases that were repaired using the laparoscopic approach. The majority of recurrences were detected between 6 and 16 months after surgery.

DISCUSSION

Inguinal hernia repair is a widely performed surgical procedure that is significantly more common in men, occurring 9–12 times more frequently than women.^{1,17} This gender distribution was also observed in our cohort, with 95% of the patients being male and 5% female.

Despite the increasing use of minimally invasive techniques, the open approach remains the predominant method for laparoscopic IH repair.¹² Several factors contribute to this preference. First, the laparoscopic approach involves a different surgical technique with unique anatomical references, requiring surgeons to acquire specific skills and undergo a learning curve, particularly for the preperitoneal approach.¹⁸ Second, concerns regarding safety, complications, operative times, and cost still exist, limiting the widespread adoption of laparoscopic repair among abdominal wall surgeons.¹⁹

The primary objectives of abdominal wall surgery currently focus on improving outcomes and enhancing the patient's quality of life by minimizing surgical and postoperative complications while maintaining a favorable cost-benefit ratio.²⁰

The initial priority in IH repair remains accurate diagnosis and identification of the hernia defect. In our study, we utilized the classification proposed by the IEHS to achieve this goal.²¹

Approximately 95% of IHS can be diagnosed through a basic physical examination, which should include an assessment of both groins. It is estimated that 70% of IHS are initially asymptomatic but may become symptomatic within 5 years.² However, the diagnostic approach for IH has evolved over time, with the increasing utilization of imaging techniques such as ultrasound scans, and in specific cases, computed tomography (CT) or magnetic resonance imaging (MRI).²

As part of our routine preoperative workup, we included an ultrasound scan, especially considering that 18% of patients (52 patients) showed suspicion of a hidden contralateral hernia. These findings align with data reported by other authors.²² In cases where doubts persist and ultrasound results are negative or inconclusive, further imaging modalities such as MRI or CT can be considered.

An important aspect to consider is the management of recurrent IH, which was observed in 9.73% of patients (51 patients) in our cohort. The optimal technique for hernia repair, particularly in cases of recurrent IH, remains a subject of concern in the modern era of hernia surgery.¹² Recurrent IH has an incidence greater than 10%,²³ but this rate drops below 1% when tension-free prosthetic hernioplasty is utilized.²⁴

Diagnosing recurrent IH is slightly more complex, particularly when establishing the correct anatomical classification. In our cohort, all recurrences were classified as the M type. Recurrence

poses a challenge for surgeons due to technical difficulties associated with scar tissue, which hinders the identification of anatomical landmarks and results in a high re-recurrence rate ranging from 5 to 30%.²⁵ In such cases, imaging studies play a crucial role,¹⁷ and the laparoscopic approach is highly recommended.^{2,12}

However, there are situations where the laparoscopic approach is not recommended, including complex hernias (such as scrotal or incarcerated hernias), hernias following radical prostatectomy, and recurrences after TAPP/TEP procedures.² Despite these criteria, the IEHS suggests that TAPP and TEP may be considered as treatment options for complicated hernias if performed by experienced laparoscopic or endoscopic hernia repair surgeons.¹⁰ In our series, we chose to exclude complex cases from the laparoscopic approach.

The TAPP technique carries a risk of serious, life-threatening complications.² Similarly, to other authors,^{2,11} we paid special attention to potential intraoperative complications, particularly in situations involving previous abdominal surgery, specifically the inframesocolic approach, where adhesions may be present. In our cohort, 17.6% of patients had undergone previous abdominal surgery, and no complications were reported. In complex cases, imaging studies, such as CT or MRI, can aid in the appropriate planning of the procedure. However, for complex cases, it may be preferable to switch to an open repair technique.¹¹

No intraoperative complications occurred, resulting in an overall morbidity rate of 4.8% and no fatalities. These findings support the safety of the procedure, as emphasized by other authors.²⁶

The TAPP technique is associated with the most common immediate postoperative complications, namely seroma and hematoma, with reported incidences of approximately 10 and 3%, respectively.^{2,10} Various aspects of the technique, such as the fixation method and case selection (particularly large and medial hernias), have been identified as independent risk factors for seroma formation.^{2,27} In our study, we observed a low incidence of complications as follows: About 2.4% (13 cases) for hematomas and 1.1% (6 cases) for seromas. These complications were mainly associated with the use of polyester meshes (69.2% of hematomas and 100% of seromas) and tacks (69.2 and 50%, respectively). However, when glue was used for fixation, the incidence of these complications decreased (15.0% of hematomas and 16.70% of seromas), which contrasts with data published by other authors who reported a higher incidence of seroma with glue fixation.²⁷

Long-term complications of hernioplasty include hernia recurrence and chronic pain.²⁰ Our recurrence rate was 3.2% (17 cases), which is consistent with findings from other laparoscopic series and open prosthetic repair studies.^{2,22} A higher incidence of recurrence was observed with polyester meshes (9 out of 17 patients, 52.9%). In terms of the fixation technique, 7 recurrences were associated with glue, 5 with tacks, and 5 with absorbable tacks. These findings align with those reported by other authors.²⁸

There is a discrepancy regarding the timing of postoperative recurrence. Some authors suggest that recurrences primarily occur within the first 2 years,²⁹ while in other series, most recurrences were observed between 5 and 10 years or even later.²³ In our cohort, we achieved a median follow-up of 21 months, with 26.5% of patients being followed up between 60 and 120 months.

Postoperative chronic pain is a common complication of hernioplasty, with an incidence of approximately 11% and a negative

impact on the patient's quality of life.³⁰ Factors contributing to the presence of postoperative chronic pain include mechanical injury caused by mesh fixation using nails, tacks, or medical adhesive, as well as nerve stretching due to mesh fixation.²⁶

In our study, we employed various methods of fixation and recorded 10 cases (1.9%) of chronic postoperative pain. Among these cases, 60.7% involved the use of polyester meshes and fixation was performed using tacks in all instances. Therefore, our findings are consistent with those of other authors who found that glue fixation is associated with a lower incidence of chronic postoperative pain.³¹

We have reached the conclusion that TAPP is a secure and effective technique for IH repair, provided that patients and mesh selection are done adequately. However, we observed that recurrence and chronic postoperative pain were more prevalent among patients with polyester meshes.

It is important to acknowledge several limitations of this study. First, we did not have a control group consisting of patients undergoing TEP laparoscopic repair or an open approach group. Additionally, the group of patients treated with glue fixation was relatively small.

Clinical Significance

Nonpolyester mesh and atraumatic fixation are associated with better outcomes with respect to recurrence and chronic postoperative pain.

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REFERENCES

- Kingsnorth A, LeBlanc K. Hernias: Inguinal and incisional. *Lancet* 2003;362(9395):1561–1571. DOI: 10.1016/S0140-6736(03)14746-0.
- Hernia Surge Group. International guidelines for groin hernia management. *Hernia* 2018;22(1):1–165. DOI: 10.1007/s10029-017-1668-x.
- Rutkow IM. Demographic and socioeconomic aspects of hernia repair in the United States in 2003. *Surg Clin North Am* 2003;83(5):1045–1051. DOI: 10.1016/S0039-6109(03)00132-4.
- Ger R, Monroe K, Duvivier R, et al. Management of indirect inguinal hernias by laparoscopic closure of the neck of the sac. *Am J Surg* 1990;159(4):370–373. DOI: 10.1016/s0002-9610(05)81273-5.
- Arregui ME, Davis CJ, Yucel O, et al. Laparoscopic mesh repair of inguinal hernia using a preperitoneal approach: A preliminary report. *Surg Laparosc Endosc* 1992;2(1):53–58. PMID: 1341501.
- McKernan JB, Laws HL. Laparoscopic repair of inguinal hernias using a totally extraperitoneal prosthetic approach. *Surg Endosc* 1993;7(1):26–28. DOI: 10.1007/BF00591232.
- Novitsky YW, Czerniach DR, Kercher KW, et al. Advantages of laparoscopic transabdominal preperitoneal herniorrhaphy in the evaluation and management of inguinal hernias. *Am J Surg* 2007;193(4):466–470. DOI: 10.1016/j.amjsurg.2006.10.015.
- McCormack K, Wake BL, Fraser C, et al. Transabdominal pre-peritoneal (TAPP) versus totally extraperitoneal (TEP) laparoscopic techniques for inguinal hernia repair: A systematic review. *Hernia* 2005;9(2):109–114. DOI: 10.1007/s10029-004-0309-3.
- EU Hernia Trialists Collaboration. Laparoscopic compared with open methods of groin hernia repair: Systematic review of randomized controlled trial. *Br J Surg* 2008;87(7):860–867. DOI: 10.1046/j.1365-2168.2000.01540.X.
- Bittner R, Arregui ME, Bisgaard T, et al. Guidelines for laparoscopic (TAPP) and endoscopic (TEP) treatment of inguinal hernia [International Endohernia Society (IEHS)]. *Surg Endosc* 2011;25(9):2773–2843. DOI: 10.1007/s00464-011-1799-6.
- Bittner R, Schwarz J. Inguinal hernia repair: Current surgical techniques. *Langenbecks Arch Surg* 2012;397(2):271–282. DOI: 10.1007/s00423-011-0875-7.
- Takata MC, Duh QY. Laparoscopic inguinal hernia repair. *Surg Clin N Am* 2008;88(1):157–178. DOI: 10.1016/j.suc.2007.10.005.
- EU Hernia Trialists Collaboration. Repair of groin hernia with synthetic mesh: Meta-analysis of randomized controlled trials. *Ann Surg* 2002;235(3):322–332. DOI: 10.1097/00000658-200203000-00003.
- Pokorny H, Klingler A, Schmid T, et al. Recurrence and complications after laparoscopic versus open inguinal hernia repair: Results of a prospective randomized multicenter trial. *Hernia* 2008;12(4):385–389. DOI: 10.1007/s10029-008-0357-1.
- Wake BL, McCormack K, Fraser C, et al. Transabdominal pre-peritoneal (TAPP) vs totally extraperitoneal (TEP) laparoscopic techniques for inguinal hernia repair. *Cochrane Database Syst Rev* 2005;2005(1):CD004703. DOI: 10.1002/14651858.CD004703.pub2.
- Bittner R, Schwarz J. Primary unilateral not complicated inguinal hernia: Our choice of TAPP, why, results and review of literature. *Hernia* 2019;23(3):417–428. DOI: 10.1007/s10029-019-01959-z.
- Poelman MM, van den Heuvel B, Deelder JD, et al. EAES Consensus Development Conference on endoscopic repair of groin hernias. *Surg Endosc* 2013;27(10):3505–3519. DOI: 10.1007/s00464-013-3001-9.
- Miller HJ. Inguinal hernia. Mastering the anatomy. *Surg Clin North Am* 2018;98(3):607–621. DOI: 10.1016/j.suc.2018.02.005.
- Zendejas B, Onkendi EO, Brahmabhatt RD, et al. Long-term outcomes of laparoscopic totally extraperitoneal inguinal hernia repairs performed by surgical trainees. *Am J Surg* 2011;201(3):379–383. DOI: 10.1016/j.amjsurg.2010.08.019.
- Li W, Sun D, Sun Y, et al. The effect of transabdominal preperitoneal (TAPP) inguinal hernioplasty on chronic pain and quality of life of patients: Mesh fixation versus non-fixation. *Surg Endosc* 2017;31(10):4238–4243. DOI: 10.1007/s00464-017-5485-1.
- Miserez M, Alexandre JH, Campanelli G, et al. The European hernia society groin hernia classification: Simple and easy to remember. *Hernia* 2007;11(2):113–116. DOI: 10.1007/s10029-007-0198-3.
- Dreifuss NH, Peña ME, Schlottmann F, et al. Long-term outcomes after bilateral transabdominal preperitoneal (TAPP) repair for asymptomatic contralateral inguinal hernia. *Surg Endosc* 2021;35(2):626–630. DOI: 10.1007/s00464-020-07425-7.
- Shulman AG, Amid PK, Lichtenstein IL. The safety of mesh repair for primary inguinal hernias: Results of 3019 operations from five diverse surgical sources. *Am Surg* 1992;58(4):255–257. PMID: 1586085.
- Köckerling F, Koch A, Lorenz R, et al. How long do we need to follow-up our hernia patients to find the real recurrence rate? *Front Surg* 2015;2:24. DOI: 10.3389/fsurg.2015.00024.
- Itani KMF, Fitzgibbons RJ, Awad SS, et al. Management of recurrent inguinal hernias. *J Am Coll Surg* 2009;209(5):653–658. DOI: 10.1016/j.jamcollsurg.2009.07.015.
- Köckerling F, Bittner R, Jacob DA, et al. TEP versus TAPP: Comparison of the perioperative outcome in 17,587 patients with a primary unilateral inguinal hernia. *Surg Endosc* 2015;29(12):3750–3760. DOI: 10.1007/s00464-015-4150-9.
- Köckerling F, Bittner R, Adolf D, et al. Seroma following trans-abdominal patch hernioplasty (TAPP): Incidence, risk factors, and

- preventive measures. *Surg Endosc* 2018;32(5):2222–2231. DOI: 10.1007/s00464-017-5912-3.
28. Shah NS, Fullwood C, Siriwardena AK, et al. Mesh fixation at laparoscopic inguinal hernia repair: A meta-analysis comparing tissue glue and tack fixation. *World J Surg* 2014;38(10):2558–2570. DOI: 10.1007/s00268-014-2547-6.
29. Liem MS, van Duyn EB, van der Graaf Y, et al. Recurrences after conventional anterior and laparoscopic inguinal hernia repair: A randomized comparison. *Ann Surg* 2003;237(1):136–141. DOI: 10.1097/0000658-200301000-00019.
30. Palmqvist E, Larsson K, Anell A, et al. Prospective study of pain, quality of life and the economic impact of open inguinal hernia repair. *Br J Surg* 2013;100(11):1483–1488. DOI: 10.1002/bjs.9232.
31. Wang M, Tian M, Zhao X, et al. Effectiveness and safety of n-butyl-2-cyanoacrylate medical adhesive for noninvasive patch fixation in laparoscopic inguinal hernia repair. *Surg Endosc* 2013;27(10):3792–3798. DOI: 10.1007/s00464-013-2970-z.