

Laparoscopic Inguinal Hernia Repair by TEP Approach Using Self-Retaining Mesh: A Prospective Study of Postoperative Outcomes in Terms of Recurrence and Chronic Pain

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Abstract

Background: Laparoscopic Totally Extraperitoneal (TEP) repair has become a preferred technique for inguinal hernia repair due to reduced postoperative pain, early recovery, and low recurrence rates. Conventional mesh fixation methods may contribute to postoperative neuralgia. Self-retaining meshes such as Progrid™ eliminate the need for fixation and may improve outcomes.

Objectives: To evaluate postoperative outcomes, particularly recurrence and chronic groin pain, in patients undergoing laparoscopic TEP inguinal hernia repair using self-retaining mesh.

Methods: This prospective observational study included 2,544 patients undergoing TEP inguinal hernia repair between June 2016 and June 2024. Patients with uncomplicated inguinal hernias were included. Operative details, postoperative recovery, complications, chronic pain, and recurrence were assessed during follow-up ranging from 70 days to 8 years.

Results: The majority of patients were male, with a male-to-female ratio of 20:1 and age range of 45–65 years. Unilateral hernias were present in 821 patients and

bilateral in 191. Primary hernias accounted for 2,041 cases, while 504 were recurrent. Mean operative time ranged from 25–45 minutes for unilateral repairs and 40–55 minutes for bilateral repairs. No intraoperative complications or conversions occurred. Hospital stay averaged 3–4 days, and most patients resumed normal activity within one week. Early postoperative complications occurred in three patients. Chronic pain beyond three months was not observed. Only one recurrence was noted during follow-up. No mesh-related complications were reported.

Conclusion: Laparoscopic TEP repair using self-retaining mesh is a safe and effective technique associated with minimal postoperative morbidity, negligible chronic pain, and extremely low recurrence rates.

Keywords: Inguinal Hernia, Totally Extraperitoneal Repair, TEP, Progrid Mesh, Self-Fixating Mesh, Chronic Groin Pain, Recurrence

Introduction

Inguinal hernia repair is one of the most frequently performed operations in general surgery worldwide. It

represents a significant burden on healthcare systems due to its high prevalence and the need for surgical intervention to prevent complications. The lifetime risk of developing an inguinal hernia is estimated to be approximately 27% in men and 3% in women. Because of this high incidence, even small improvements in surgical technique can have substantial public health implications. Historically, tissue-based repairs such as Bassini, Shouldice, and McVay techniques were widely practiced. Although effective, these methods were associated with significant tension on tissues and higher recurrence rates. The introduction of prosthetic mesh revolutionized hernia surgery by enabling tension-free repair. Lichtenstein's tension-free mesh repair subsequently became the gold standard for open inguinal hernia repair.

Despite excellent outcomes with open mesh repair, postoperative pain, wound complications, and delayed return to activity remained concerns. The advent of minimally invasive surgery led to the development of laparoscopic approaches to inguinal hernia repair. Among these, Transabdominal Preperitoneal (TAPP) and Totally Extraperitoneal (TEP) techniques are the most widely used. Both techniques place mesh in the preperitoneal space, thereby reinforcing the myopectineal orifice. The TEP approach is particularly attractive because it avoids entry into the peritoneal cavity. Avoidance of peritoneal violation reduces the risk of intra-abdominal injury, postoperative adhesions, and port-site hernias. Additionally, TEP repair is associated with less postoperative pain and faster recovery compared to open repair.

Laparoscopic TEP repair has gained increasing acceptance as a preferred approach for bilateral and recurrent inguinal hernias. It also allows simultaneous treatment of occult contralateral hernias. Furthermore,

cosmetic outcomes are superior due to smaller incisions. However, the procedure is technically demanding and requires a significant learning curve. One of the critical steps in TEP repair is proper placement and fixation of the mesh. Conventional fixation methods include tacks, staples, or sutures. These devices secure the mesh but may increase operative cost and operative time. More importantly, fixation devices have been implicated in postoperative complications.

Nerve injury is one of the most significant concerns associated with mesh fixation. The ilioinguinal, iliohypogastric, and genitofemoral nerves are particularly vulnerable during fixation. Injury to these nerves can result in chronic groin pain, numbness, or neuralgia. Chronic postoperative pain following inguinal hernia repair can severely affect quality of life. It may limit physical activity and occupational performance. In some cases, chronic pain requires long-term analgesic therapy or re-operation. Therefore, strategies to minimize nerve injury are of paramount importance. Another drawback of fixation devices is the risk of vascular injury, particularly to the inferior epigastric vessels. Mesh migration and inadequate fixation are additional concerns in conventional methods.

To address these issues, self-retaining or self-fixating meshes have been developed. These meshes incorporate resorbable microgrips or hooks that anchor the mesh to surrounding tissues without the need for tacks or sutures. ProGrip™ mesh is one such self-retaining mesh made of lightweight polypropylene with polylactic acid microgrips. The microgrips provide immediate fixation while gradually resorbing over time. This design aims to maintain mesh stability during the critical healing period. Elimination of fixation devices theoretically reduces nerve trauma and chronic pain. It may also shorten

operative time and reduce costs associated with disposable fixation tools.

Several studies have suggested that self-fixating meshes provide outcomes comparable or superior to conventional fixation. Reduced postoperative pain scores and faster recovery have been reported. However, concerns remain regarding mesh handling, positioning, and potential folding during deployment. Adequate preperitoneal space creation is essential to allow proper mesh placement. Long-term data on recurrence and chronic pain with self-retaining meshes are still evolving. Therefore, large prospective studies with extended follow-up are valuable. The success of any hernia repair technique is judged primarily by recurrence rates and postoperative morbidity. Chronic groin pain has emerged as a major determinant of patient satisfaction. Modern hernia surgery aims not only for durable repair but also for improved quality of life. Early return to normal activity is particularly important in the working population. Minimizing hospital stay and complications further enhances cost-effectiveness. Laparoscopic TEP repair with self-retaining mesh has the potential to fulfill these objectives. However, outcomes may vary depending on surgeon experience and patient selection.

In developing countries, resource considerations also influence surgical decision-making. Techniques that reduce operative time and hospital stay can improve patient throughput. Additionally, avoidance of expensive fixation devices may reduce overall treatment costs. Safety remains paramount, particularly in high-volume centers. Large-scale prospective data from such settings provide valuable real-world evidence. The present study was conducted in a tertiary care center over an eight-year period. It evaluates postoperative outcomes in patients undergoing laparoscopic TEP inguinal hernia repair using self-retaining mesh. Particular emphasis was placed

on recurrence and chronic groin pain. Secondary outcomes included operative time, complications, and recovery profile.

By analyzing a large cohort with long follow-up, this study aims to contribute meaningful evidence regarding the effectiveness of self-retaining mesh in TEP repair. The findings may help refine surgical practice and guide future research. Ultimately, improving outcomes in inguinal hernia repair can significantly enhance patient quality of life.

Materials and Methods

This prospective observational study was conducted at a tertiary care center over eight years, from June 2016 to June 2024. A total of 2,544 patients undergoing laparoscopic TEP inguinal hernia repair were included. Adult patients with uncomplicated inguinal hernia were eligible for inclusion. Patients with strangulated or obstructed hernias or unfit for general anesthesia were excluded.

TEP repair was performed under general anesthesia using a standard three-port technique. Self-retaining mesh was placed in the preperitoneal space without additional fixation.

Results

A total of 2,544 patients underwent laparoscopic TEP inguinal hernia repair during the study period. The majority of patients were male, reflecting the known higher prevalence of inguinal hernia in men. The male-to-female ratio was approximately 20:1. Patients were predominantly in the age group of 45–65 years. This age distribution corresponds to the peak incidence of symptomatic inguinal hernia requiring surgical intervention. Most patients presented with a reducible groin swelling without signs of obstruction or strangulation.

Unilateral hernias were more common than bilateral hernias. Unilateral involvement was observed in 821 patients, whereas bilateral hernias were present in 191 patients. The right side was slightly more frequently affected than the left. Primary hernias constituted the majority of cases. A total of 2,041 patients had primary hernias. Recurrent hernias accounted for 504 cases, many of which had previously undergone open repair. Inclusion of recurrent cases demonstrates the applicability of TEP repair in this subgroup.

Indirect hernias were more common than direct hernias. A total of 652 patients had indirect hernias, while 551 had direct hernias. Some patients had combined or pantaloon hernias. Preoperative imaging was not routinely required in uncomplicated cases. Diagnosis was primarily clinical. All procedures were performed under general anesthesia.

Two types of mesh were used during the study period. Conventional polypropylene mesh was used in 1,341 cases. Progrid self-retaining mesh was used in 1,203 cases. Mesh placement was achieved in the preperitoneal space after adequate dissection. No additional fixation was applied in cases using self-retaining mesh. Proper unfolding of the mesh was ensured before desufflation.

Mean operative time for unilateral repair ranged from 25 to 45 minutes. Bilateral repairs required slightly longer operative times, ranging from 40 to 55 minutes. Operative time decreased over the study period, reflecting the learning curve. No intraoperative complications such as bowel injury or major vascular injury were encountered. There were no conversions to open surgery. Hemostasis was satisfactory in all cases.

Postoperative recovery was generally smooth. The mean hospital stay ranged from 3 to 4 days. Most patients were mobilized on the day of surgery or the following day. Oral intake was resumed within a few hours

postoperatively. Analgesic requirements were minimal. Most patients resumed normal daily activities within one week.

Early postoperative complications were rare. Only three patients developed minor complications, such as seroma or superficial wound issues. These were managed conservatively without surgical intervention. No cases of deep infection were observed. There were no mesh infections requiring removal. Urinary retention occurred in a few elderly patients but resolved with temporary catheterization.

Pain assessment revealed low postoperative pain scores. Most patients reported mild discomfort rather than significant pain. Chronic groin pain beyond three months was not observed in this cohort. This finding suggests a potential advantage of avoiding fixation devices. No cases of neuralgia requiring long-term medication were reported.

During follow-up ranging from 70 days to eight years, only one recurrence was documented. This recurrence occurred in a patient with a large direct hernia. No additional surgeries were required in the remaining patients. Long-term outcomes were therefore highly satisfactory. No mesh migration or shrinkage was detected clinically.

No mesh-related complications such as foreign body sensation or chronic infection were noted. Cosmetic outcomes were excellent in most cases. Patient satisfaction was high. Overall, laparoscopic TEP repair using self-retaining mesh demonstrated favorable perioperative and long-term results.

Discussion

The present study demonstrates that laparoscopic TEP repair using self-retaining mesh is associated with excellent clinical outcomes. The large sample size and extended follow-up strengthen the reliability of these

findings. Inguinal hernia repair aims to achieve durable repair with minimal morbidity. Modern surgical practice also emphasizes rapid recovery and improved quality of life. Laparoscopic techniques have contributed significantly toward these goals.

TEP repair offers the advantage of avoiding intraperitoneal entry. This reduces the risk of bowel injury and postoperative adhesions. Compared with TAPP repair, TEP may have a lower incidence of intra-abdominal complications. However, it is technically more demanding. Adequate training and experience are essential for safe performance. In this study, no conversions or major complications occurred, indicating a high level of surgical expertise.

One of the key innovations evaluated in this study is the use of self-retaining mesh. Conventional fixation methods have been implicated in chronic groin pain. Nerve injury due to tacks or sutures is a recognized cause of postoperative neuralgia. Eliminating fixation devices may therefore reduce this risk. The absence of chronic pain in this cohort supports this hypothesis. Similar findings have been reported in other studies evaluating self-fixating meshes.

Operative time is an important consideration in high-volume centers. Avoiding fixation devices can shorten the procedure. Reduced operative time also decreases anesthesia exposure. In the present study, operative times were within acceptable ranges and improved over time. This reflects both the efficiency of the technique and the surgeon's learning curve.

The extremely low recurrence rate observed in this study is noteworthy. Only one recurrence occurred among more than two thousand patients. Adequate mesh size and proper placement are crucial factors in preventing recurrence. Self-retaining mesh provides broad coverage of the myopectineal orifice. The microgrips ensure stable

positioning during the healing phase. Gradual resorption of the microgrips minimizes long-term foreign body reaction.

Postoperative recovery was rapid in most patients. Early mobilization and return to normal activity are important benefits of minimally invasive surgery. Reduced postoperative pain facilitates early ambulation. Short hospital stay also reduces healthcare costs. These advantages are particularly relevant in resource-limited settings.

The low incidence of complications further supports the safety of this technique. Seroma formation was minimal and resolved without intervention. Absence of mesh infection is encouraging, as infection often necessitates mesh removal. Careful surgical technique and patient selection likely contributed to these favorable outcomes.

Recurrent hernias pose a greater technical challenge than primary hernias. The inclusion of recurrent cases in this study demonstrates the versatility of TEP repair. Preperitoneal placement of mesh avoids scarred anterior tissues. This approach is especially useful after previous open repair.

Despite the encouraging results, certain limitations should be acknowledged. This was an observational study without randomization. Pain assessment relied primarily on clinical evaluation rather than standardized scoring systems. Long-term follow-up, although extensive, was not uniform for all patients. Future randomized controlled trials would provide stronger evidence.

Overall, the findings suggest that self-retaining mesh is a valuable advancement in laparoscopic hernia surgery. It combines the benefits of tension-free repair with reduced risk of fixation-related complications. Wider adoption of this technique may improve patient outcomes globally.

Conclusion

Laparoscopic TEP inguinal hernia repair using self-retaining mesh is a safe and effective procedure with minimal postoperative morbidity, negligible chronic pain, and very low recurrence rates.

Laparoscopic TEP inguinal hernia repair has emerged as a highly effective minimally invasive technique. The present study demonstrates that the use of self-retaining mesh further enhances its outcomes. By eliminating the need for fixation devices, this approach reduces the risk of nerve injury and chronic pain. The procedure was safe and reproducible across a large cohort of patients. No major intraoperative complications or conversions were observed.

Postoperative recovery was rapid, with most patients resuming normal activity within one week. Hospital stay was short, reflecting minimal surgical trauma. Early complications were rare and manageable without invasive intervention. Importantly, chronic groin pain beyond three months was not encountered. This finding is particularly significant because chronic pain is one of the most debilitating sequelae of hernia surgery.

The recurrence rate in this study was extremely low. Durable repair was achieved even in recurrent hernia cases. Adequate mesh coverage and stable positioning are likely responsible for this success. The self-retaining properties of the mesh ensured effective fixation during tissue integration. Absence of mesh-related complications further supports its safety.

From a cost perspective, avoiding fixation devices may reduce overall procedural expenses. Shorter operative time and hospital stay also contribute to cost-effectiveness. These advantages are especially relevant in high-volume public hospitals. Patient satisfaction was high due to minimal pain, early recovery, and good cosmetic outcomes.

The results of this study support the routine use of self-retaining mesh in laparoscopic TEP repair. Surgeons experienced in TEP technique can adopt this approach with confidence. However, proper training and adherence to surgical principles remain essential. Large randomized studies would be useful to confirm these findings.

In conclusion, laparoscopic TEP repair using self-retaining mesh is a safe, effective, and patient-friendly procedure. It offers minimal postoperative morbidity, negligible chronic pain, and very low recurrence rates. This technique represents a significant advancement in modern hernia surgery and should be considered a preferred option for suitable patients.

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