

Laparoscopic Versus Open Inguinal Hernia Repair

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KEYWORDS

Inguinal • Hernia surgery • Laparoscopic • Endoscopic • Mesh

KEY POINTS

- The laparoscopic approach to inguinal hernia surgery is a safe and reliable method with a similar recurrence rate as the open tension-free mesh repair.
- Because the laparoscopic approach shows clear advantages with regard to less chronic postoperative pain and numbness, fast return to normal activities, and a decrease in the incidence of wound infection and hematoma, it should be considered an appropriate approach for inguinal hernia surgery.
- The choice between the transabdominal preperitoneal (TAPP) procedure and the totally extraperitoneal (TEP) procedure should be based on patient and surgeon characteristics, because there is no evidence of superiority between either techniques.
- The use of lightweight mesh, with glue fixation (in TAPP procedures) or nonfixation (in TEP procedures), can achieve excellent results in the setting of a proficient surgeon.

Surgery has reached such a level of improvement that nothing more can be expected.

—Jean Nicholas Marjolin, 1828

Since the last publication, in 2008, of the *Surgical Clinics of North America* hernia edition, many important guidelines and meta-analyses concerning inguinal hernia surgery have been published.¹ One important contribution came from the European Hernia Society, when they published their guidelines for inguinal hernia repair in 2009,² followed by the International Endohernia Society in 2011.³ Several prominent governmental agencies, including the Agency for Healthcare Research and Quality in the United States,⁴ have recently reported evidence-based medicine guidelines dealing with the problem of hernia surgery and management.⁵

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Why has hernia surgery continued to be such a vexing problem for surgeons across the world? Although it is a common disease, with approximately 1 million procedures performed annually in the United States and close to 20 million repairs worldwide, achieving excellent long-term results with a low recurrence rate and avoidance of chronic groin pain remains difficult when closely studied.^{2,3,6-10} The lack of consensus in the literature as to the optimum repair technique or prosthetic mesh to insure a long-term durable result is also surprising.²⁻⁴

Although Marjolin thought that surgery had reached its ideal state in 1828, it is likely true that in groin surgery there will always be improvements in techniques and materials that address the changing spectrum of this disease. Even with the significant effort of evidence-based medicine to provide clear guidelines, it is conceivable that one answer will never suffice for all of groin surgery. This article focuses on common questions related to inguinal hernia surgery and tries to provide answers based on available published literature.

SHOULD ALL HERNIAS BE REPAIRED?

Since the conflicting results from the reports of watchful waiting from Fitzgibbons and colleagues¹¹ and O'Dwyer and colleagues in 2006,¹² there have been mounting data that not all hernias must be repaired promptly. There are data supporting that mildly symptomatic or asymptomatic men can be observed in a safe way without having major complications. With long-term follow-up, however, most of the patients during observation develop symptoms and likely require surgery if waiting long enough.^{13,14} Their outcomes are not worse than those undergoing immediate repair.

Some groups of patients can be observed safely with a low probability of developing symptoms and necessity for repair.¹⁵ A recent review of patients from the watchful waiting trial¹⁶ showed that there are some risk factors that can help predict which patients will develop symptoms during observation and will ask for surgery. These patients probably should be considered early in their disease for surgical treatment. Factors identified include patients who have pain with strenuous activities, chronic constipation, or prostatism; married patients; and healthy individuals (American Society of Anesthesiologists class 1 vs class 2).

What is clear since the early results from O'Dwyer and colleagues and Fitzgibbons and colleagues is that what should drive the timing for surgery is not the risk of incarceration or strangulation (what is a common sense for surgeons in the past that should be considered as the main indication for surgery in hernia patients) but rather the change in quality of life that the presence of a hernia brings to a patient.^{11,12} In an effectiveness review conducted by the Agency for Healthcare Research and Quality,⁴ the long-term quality of life was better in patients repaired versus watchful waiting patients.

The authors' groups have used these results to manage patients as follows. Elderly patients with minimally symptomatic hernias are observed on an annual basis until symptoms develop. If they remain asymptomatic, surgery is not offered. In younger patients with asymptomatic or minimally symptomatic hernias, clear instructions as to the symptoms of incarceration are delineated, and often elective repair is encouraged.

DO ALL PATIENTS NEED A MESH REPAIR?

The concept of a tension-free hernia repair is widely accepted in inguinal hernia surgery, and the use of mesh is considered standard of care. Many studies have documented a 50% to 75% reduction in recurrence rates with the addition of mesh to an inguinal hernia repair. With the use of a mesh, most studies report recurrence rates

in the 2% to 5% range with long-term follow-up. There is also evidence of quicker return to work (overall hazard ratio of 0.81, 95% CI 0.73–0.91, $P < 0.001$) and of lower rates of persisting pain (overall odd ratio of 0.36, 95% CI 0.29–0.46; $P < 0.001$), after mesh repair.^{17–21}

ARE ALL OPEN HERNIA REPAIRS EQUAL?

The European Union Trialists Collaboration did not find differences in recurrence or persistent pain for open mesh hernia repair based on mesh placement technique.¹⁹ These results recently were consolidated by several investigators,^{22–25} showing similar results for all open repairs regarding recurrence rates and postoperative complications when performed in experienced hands.

ARE ALL LAPAROSCOPIC INGUINAL HERNIA REPAIRS SIMILAR?

The individual merits of a laparoscopic TEP approach versus a TAPP approach are heavily debated. In both approaches, the operative site remains the same: the peritoneal space. In TAPP, the space is accessed intraperitoneally. In TEP, the space is accessed at the umbilicus in the retrorectus location. This space can be created by a special device (for example, a balloon dissector) or with blunt dissection.

Despite the general belief that the TAPP procedure is easier to teach and learn, there is no level 1 evidence in the literature to support this contention.^{3,26,27} One of the inherent advantages of a TAPP procedure is to obtain an intraperitoneal view to ease anatomic structure identification.

A Cochrane review in 2005 stated that at that time there were insufficient data to allow conclusions to be drawn about the relative effectiveness of TEP approaches compared with TAPP approaches.²⁸ Almost 10 years later,⁴ even with a multitude of articles dealing with this issue, there seems to be no definitive answer for this question.^{2–4} Both procedures have similar results in quality of life, short-term and long-term pain, and recurrences.^{4,29} Like most surgical procedures, in experienced hands, they are equally effective.

One of the major concerns of laparoscopic inguinal hernia repair is cost. In 2005, there was a health assessment analysis of a large randomized controlled trial, which reported that a TEP procedure is less costly (in the range of hundreds of dollars) than a TAPP procedure, but both are more expensive than an open repair. One of the most important points of this article was that the investigators not only considered direct costs (in which the laparoscopic approach was more expensive) but also evaluated societal costs, such as productivity. With that analysis and because many laparoscopic patients returned to activity faster and with less chronic pain, the societal costs were equivalent.³⁰ One of the most important conclusions of this systematic review is that for bilateral inguinal hernias, the laparoscopic approach is more cost effective and has better outcomes regarding quality of life than open surgery.

There are small specific concerns that varies between randomized clinical trials and meta-analyses regarding the incidence of minor complications,³¹ such as seroma formation (at 7 days 32.5 % in TEP \times 16.2 % in TAPP, $p < 0.001$) and cord edema 7 days 12.6 % in TEP \times 29.6 % in TAPP.^{32,33} In a recent population based-study with more than 4500 patients, there were more complications in the TEP group (intraoperative complications - TEP 1.9% vs TAPP 0.9%, $p = 0.029$ and postoperative complications - TEP 2.3% vs TAPP 0.8%, $p = 0.003$).³⁴ In a small subset of patients, a TEP procedure can be performed under regional anesthesia, and this can be an advantage in some clinical settings.³ Another concern is that a TEP procedure can always be converted to a TAPP procedure before a definitive transition to open surgery is necessary,

when some complications occur during surgery.³ Major injuries to intrabdominal organs that were reported with early experience of TEP surgery are more related to laparoscopic surgery issues and not the laparoscopic repair of inguinal hernias.³⁵

The authors' conclusion is that a laparoscopic repair of an inguinal hernia can be repaired with either a TAPP or a TEP approach, and this decision is likely made based on surgeon preference and expertise rather than evidenced-based medicine.^{3,35}

IS THE LAPAROSCOPIC APPROACH BETTER THAN OPEN SURGERY FOR PRIMARY INGUINAL HERNIA REPAIR?

Early studies comparing both approaches had the bias of including tension-free laparoscopic repairs, with sutured tension repairs in the open group; thus, the better results achieved with laparoscopic approach could be attributed to the presence of mesh, not to the laparoscopic approach.³⁶

The first meta-analysis where open repairs were stratified based on mesh and suture repair was the Cochrane review in 2003³⁷; this article showed that laparoscopic repair was associated with major complications that were unusual with the open repair (bowel perforation and iliac vessel injury) but consistently showed an earlier return to daily activities, a lower incidence of chronic pain and paresthesia, and a recurrence rate better than open surgery with tension but equal to tension-free open surgery. Operative time was slightly higher in the laparoscopic group.

One of the most important articles recently questioning the benefit of a laparoscopic approach is the Veterans Affairs Cooperative Study.³⁸ Despite exhibiting less post-operative pain and return to work on average a day earlier, the laparoscopy group patients had worse outcomes than the conventional open group regarding morbidity and recurrence. In this level 1A study, after comparing patients with primary hernias, the results showed that recurrence in patients undergoing laparoscopic surgery was higher (10.1%) than in the conventional group (4.9%); complications were also significantly higher in the laparoscopic group (39% × 33.4%). When examined critically, some important factors should be taken into account when using this information in clinical practice. For example, when stratified by surgeons who had performed more than 250 laparoscopic hernia procedures, the results become similar, reinforcing the need that laparoscopic hernia surgeons should perform it on a regular basis, not just intermittently. Another important aspect of this article is that the complication and recurrence rates for both procedures were higher than in other series in the literature. This series likely represents, however, real-life results, when all of these procedures are performed outside high-volume centers. This article highlights that a laparoscopic inguinal hernia repair can be a technically demanding procedure; however, if surgeons are committed to ascending the learning curve, excellent results can be obtained.

There is no doubt that the endoscopic approach is safe and feasible,³⁹ and it seems that recurrence and complication rates are associated with the learning curve of the procedure.^{3,26,40} In most of the available literature, the laparoscopic procedure shows a small decrease in length of stay^{8,41,42} although this is not universal.⁴³⁻⁴⁵ Chronic pain and numbness are significantly reduced by the endoscopic approach,^{8,32,34,41,46-50} and quality of life is higher in all groups tested.^{29,50} Wound infection rates and the occurrence of seroma and hematoma have all been consistently less common with the endoscopic approach.^{4,8,29,32,34,41,46-50}

Laparoscopic procedures were associated with a longer operative time^{29,51} and major complications, such as great vessels or bowel injuries. These major complications are attributable, however, to the learning phase of this procedure.^{3,29}

One adjuvant factor supporting the decision to perform a laparoscopic repair is the possibility of evaluating the contralateral side for occult hernias. In addition, the laparoscopic approach affords surgeons the ability to use an appropriately sized prosthetic to cover the entire myopectineal orifice.⁵² Nevertheless, the potential advantages of treating occult hernias have never been evaluated in prospective randomized trials.

It is important to raise again the issue of costs. There are several series that have shown that despite higher direct costs, the laparoscopic repair seems cost effective from a societal perspective due to early return to normal activities and low incidence or recurrence of groin pain, even for a unilateral inguinal hernia repair.^{42,47,51,53,54} Nevertheless, cost is a limitation for full acceptance of this procedure as routine.^{41,55–57}

For bilateral inguinal hernia, there have been sufficient data since 2005 to choose the procedure as the first option in this setting.^{2,3,29}

SHOULD LAPAROSCOPIC SURGERY BE DENIED TO ELDERLY PATIENTS?

Some surgeons deny the opportunity of the laparoscopic approach in older patients because of the fear of general anesthesia and potential complications in this age group. Evidence shows that the laparoscopic procedure is safe, with similar outcomes to open tension-free mesh repair in older adults, even with the addition of general anesthesia.⁵⁸ Some articles report that laparoscopic inguinal hernia repair confers a significantly shorter duration of pain and recovery time, with no increase in complications in this subset.^{59,60} For elderly patients, laparoscopy is a viable alternative to open repair. There is some evidence that complications are slightly higher in nonagenarians and careful preoperative work-up should be done in these patients when a laparoscopic approach is used.⁶¹ Therefore, in healthy elderly patients who can tolerate general anesthesia, the authors' groups offer laparoscopic repair.

ARE RECURRENCES BETTER TREATED WITH THE LAPAROSCOPIC APPROACH?

The European Hernia Society states in their guidelines that the endoscopic approach should be preferable in a recurrence when an anterior approach was done prior.²

More recent studies confirm that statement, showing that the results for laparoscopic repair in terms of chronic pain and recurrence are superior.^{62–66} Some meta-analyses have challenged this statement,^{67–69} specifically when comparing open preperitoneal inguinal repair with the laparoscopic approach.

Perhaps the most reasonable approach to repairing a recurrent inguinal hernia is to use the space that has not been violated in the past. This concept is based on the assumption that a surgeon is competent in both repair techniques.^{2,3}

WHICH MESH SHOULD BE USED FOR THE LAPAROSCOPIC PROCEDURE?

There are a wide variety of prosthetic materials available to hernia surgeons to repair an inguinal hernia. In the authors' opinion, each product has its own unique advantages and disadvantages, and one product will never address the wide spectrum of inguinal hernia disease. One of the most basic classification systems for mesh material is the weight of the material. There remain conflicting results as to whether heavy-weight material versus lightweight material provides any clinically measurable advantage. Several meta-analyses have been performed and have failed to provide a clear advantage to the lightweight products.⁷⁰

When evaluating only open surgery, the evidence suggests that there is no risk for increased recurrence and that there is a significant reduction in the incidence of

chronic groin pain as well as risk of developing other groin symptoms, like foreign body sensation,^{71,72} particularly in the short-term postoperative period.^{73,74}

For laparoscopic surgery, although recurrence rates have been similar with both types of mesh, differences regarding other outcomes are not easily demonstrated. The results are conflicting, with some investigators showing similar long-term and short-term postoperative outcomes,⁷⁵ whereas others show improved results for lightweight mesh obtained with open surgery,⁷⁶ in terms of reducing the incidence of chronic groin pain, groin stiffness, and foreign body sensations.⁷⁷ Based on this analysis, the authors routinely use lightweight mesh in young, healthy, and thin active adults to avoid groin pain and foreign body sensation; however, in obese elderly patients, heavyweight options are considered.

IS MESH FIXATION NECESSARY?

There are reasonably high-quality data that indicate mechanical fixation is not necessary in the TEP procedure⁷⁸ and that the number of tackers can be associated with an increasing incidence of pain.⁴³ In a recent meta-analysis, without increasing the risk of early hernia recurrence, the nonfixation of mesh in TEP seems a safe alternative that is associated with fewer costs and shorter operative time and hospital stay for selected patients.^{79,80} Surgeons should consider nonfixation on a case-by-case basis; likely, those patients with large direct hernias should have some form of fixation, whereas those with small indirect defects likely do not require fixation if a large piece of mesh is used.

The use of glue for mesh fixation is comparable with tacker mesh fixation in terms of operative time, postoperative pain, postoperative complications, length of hospital stay, and risk for hernia recurrence. It also has been shown to reduce the risk for developing chronic groin pain.^{77,81-83}

Self-adhesive meshes specially designed for laparoscopic use are appearing on the market and have shown promising results in terms of reducing pain without changing recurrence patterns.^{84,85}

SUMMARY

The laparoscopic approach to inguinal hernia surgery is a safe and reliable method. In this extensive literature review, it seems that the laparoscopic approach has a similar recurrence rate compared with open tension-free mesh repair and that other outcomes should guide surgeons in choosing the most appropriate approach. Some of these important aspects include the incidence of chronic pain and numbness. Because the laparoscopic approach has shown clear advantages regarding less chronic postoperative pain and numbness, fast return to normal activities, and a decrease in the incidence of wound infection and hematoma, it should be considered an appropriate approach for inguinal hernia surgery. These results can only be achieved if a surgeon is proficient in the technique, has a clear understanding of the anatomy, and performs it on a regular basis. It is also important to consider the volume of laparoscopic repairs likely necessary to become proficient. If the laparoscopic approach is used only for recurrent or bilateral repairs, it is unlikely that the learning curve will be overcome. The choice between the TAPP or TEP procedure should be based on patient and surgeon characteristics, because there is no evidence of superiority between either technique. The use of lightweight mesh, with glue fixation (in TAPP procedures) or nonfixation (in TEP procedures) can achieve excellent results in the setting of a proficient surgeon.

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