

17. TAPP vs. TEP

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The two most common techniques for laparoscopic inguinal hernia repair are the transabdominal preperitoneal (TAPP) technique and the totally extraperitoneal (TEP) technique. Although in the end both techniques are used to place mesh in the preperitoneal space to cover the entire myopectineal orifice, they differ in how access to that space is obtained.

With the TAPP approach, the peritoneal cavity is entered, the peritoneum is incised horizontally, and the preperitoneal space is developed, gaining access to the space of Retzius and Bogros. Mesh is placed to cover the entire myopectineal orifice, and the peritoneal flap is then closed with either suture, staples, or tacks. Conversely, with the TEP repair, a dissecting balloon is placed into the preperitoneal space at the level of the umbilicus. The balloon is inflated, which potentiates the preperitoneal space. The surgeon then works within the confines of this space to place the mesh, similar to the TAPP approach. At the conclusion, the preperitoneal space is desufflated and it collapses upon itself.

The Arguments for TAPP or TEP

Since, ultimately, the hernia recurrence rates are the same, the debate as to which approach is best is largely predicated upon notions of differences in cost, operative time, intraoperative complications, and postoperative pain. There have been three prospective, randomized, controlled trials comparing TAPP and TEP; thus, the majority of the data are from prospective, nonrandomized, comparative trials of the two techniques. The following section will explore some of the arguments made in favor of one technique or the other and investigate what the available literature shows.

Learning Curve

Argument: TAPP Is Easier to Learn than TEP

The learning curve for any surgical procedure is surgeon specific. Historically, most have learned the TAPP technique first, and then transitioned to the TEP repair after some experience. In one study of TAPP repairs, complications and recurrences decreased after the first 50 patients [1]. Another group performing TEP saw their complication and recurrence rate drop dramatically after their first 100 cases, while their conversion rate only decreased after 700 cases, and operative times were halved after the first 1,000 cases [2]. If we assume that operative time is a surrogate marker for technical mastery, a Cochrane database review summarized that inexperienced operators (up to 20 procedures) had an operative time of 70 min for TAPP and 95 for TEP. With experience (30–100 procedures), the estimated duration was 40 min for TAPP and 55 min for TEP [3]. These data suggest that TAPP is in fact easier to learn. Perhaps, this is due to the fact that the surgeon has a much wider field of view during TAPP and can see both inside the preperitoneal and intraperitoneal space maintaining orientation. This may allow for easier manipulation of the hernia sac and the intraperitoneal contents, compared to the tight working space and trocar configuration constraints of the TEP repair.

Operative Time

Argument: TEP is quicker to perform since the balloon dissector does the dissection, and in the end, there is no peritoneal flap requiring closure.

In an early randomized controlled trial of TEP ($n=24$) versus TAPP ($n=28$), there was an insignificant 6-min time advantage in favor of TAPP [4]. Other nonrandomized studies appear to show a slight time advantage in favor of the TAPP repair as well [3]. Two more recent prospective trials did not demonstrate a time difference whatsoever [5, 6].

Conversion

Argument: TEP often requires conversion to TAPP.

Due to the nature of the techniques, a TEP is typically converted to TAPP or open, while a TAPP is converted to open. Conversion with TEP will occur when too large a tear is created in the peritoneum and in TAPP when there is an inability to adequately develop or prepare the preperitoneal space for mesh placement. Patients with prior preperitoneal space surgery,

particularly prior mesh repairs, may have a higher conversion rate, and consideration should be given to performing the hernia repair in a TAPP fashion from the outset. In historical prospective randomized trials, TEP has been associated with a higher conversion rate [7–9]. A more recent randomized trial showed no conversions in any of their TAPP or TEP cases [5]. Conversion is clearly a matter of experience and likely decreases as a surgeon becomes more facile with one or both techniques.

Cost

Argument: TEP is associated with higher supplies costs since it requires an expensive pneumatic balloon dissector to create the preperitoneal space.

The interpretation of cost data is unreliable, as the figures are country-specific and unique to each institution performing the surgery. The need for a balloon dissector is not absolute with TEP, and the dissection can be performed manually. In one single randomized trial, balloon dissection was compared to CO₂-supported trocar dissection, and there appeared to be no difference in morbidity or recurrence rate, although balloon dissection was associated with a lower need for conversion to TAPP and a mean 8-min time advantage [10]. With reusable trocars and balloonless manual dissection, the cost of a TEP repair can be significantly reduced. Another factor to consider is the use of a fixation construct such as a stapler, tacking device (metallic or absorbable), or fibrin sealant. At least one of these products is often used in laparoscopic inguinal hernia repair and is associated with a significant cost regardless of TAPP or TEP approach. Two recent randomized trials of TAPP versus TEP failed to demonstrate a cost difference between the techniques [5, 6].

Intraoperative Complications

Argument: TAPP is associated with higher rates of vascular and visceral injuries and port-site hernias.

To date, three studies have reported vascular injuries, one actually demonstrated a higher injury rate in TEP [11] while the other two showed no difference [12, 13]. Two comparative trials reported a higher rate of visceral injury with TAPP compared to TEP, albeit the incidence was less than 1% in both series [7, 8]. Several studies have reported on port-site hernia rate, and it appears that TAPP has a higher incidence, upward of 3.7% [7].

In a large study on bowel obstruction after inguinal hernia repair, multivariate analysis demonstrated that TAPP had a relative risk of 2.79 compared to 0.57 with TEP [14]. Although the study was unable to

determine the etiology of the bowel obstruction (hernia vs. adhesive), the data is compelling, nevertheless. Knowledge of adhesions of the omentum or bowel to metallic tacks or staples, as well as sutures is well-known. It is more likely that patients undergoing TAPP repair have their peritoneal flap closed with a fixation construct, predisposing TAPP patients to the potential sequelae of adhesions, such as bowel obstruction, or worse, construct-bowel erosion. Newer absorbable fixation constructs have become available, yet it is too early to determine whether there is an adhesion advantage to their use and the associated cost may make them prohibitive for routine use.

TEP is associated with peritoneal tears which collapse the preperitoneal space, making the operation lengthier, more laborious, and possibly requiring conversion to TAPP for completion. Peritoneal tears during TEP are commonplace, particularly with reoperative inguinal hernia repair. Although they are related to surgeon experience, they are easily managed by ligation of the tear or placement of an intraperitoneal Veress needle to decompress the pneumoperitoneum. This complication does in fact increase operative time by a mean of 20 min and is associated with an eightfold increase in the rate of conversion to TAPP [15]. Whether the tear should be closed at all due to the potential for bowel obstruction or mesh adhesion bears mention. To that effect, two studies have reported no complications after 16-month [16] and 4-year [15] follow-up in patients in whom peritoneal tears were not closed.

Pain

Argument: TAPP is associated with higher rates of vascular and visceral injuries and port-site hernias. TEP is associated with less pain since no peritoneal flap is opened and hence the only fixation constructs needed are the ones placed into the mesh if any are used at all.

Fixation constructs may or may not have an impact on symptoms of pain after the repair, as the data are conflicting. One recent prospective randomized trial found no difference in pain between TAPP and TEP. The TAPP group had tack mesh fixation and sutured peritoneal closure, while the TEP group had no mesh fixation [6]. Another randomized trial avoided the use of mesh fixation in both groups, and the TAPP group's peritoneal flap was sutured closed. This study found TAPP to be more painful at 1 h, 24 h, and 3 months postoperative [5]. If there is a slight pain difference, it may be transient, as one prospective study demonstrated a higher incidence of postoperative pain with TAPP

compared to TEP at 1 month, but not at 6 months or 1 year. In that study, 18.1% of TAPP patients had >10 tacks placed, while 2.3% of the TEP patients had >10 tacks placed. Additionally, a subgroup analysis demonstrated less pain at all time points in TAPP patients with <10 tacks compared to those with >10 tacks [17].

If number of tacks used is proportional to the degree of pain then perhaps avoiding tacks or staples altogether can help eliminate pain. The current data suggest that nonmesh fixation in TEP, although not associated with a decrease in pain, is safe, cheaper, and does not result in an increased rate of recurrence [18]. Nonmesh fixation studies in TAPP are lacking; however, one randomized trial compared fibrin sealant versus staples for mesh fixation during TAPP while the peritoneal flap was sutured closed. No difference in recurrence rate or postoperative pain was noted between the two fixation methods [19].

Summary

In summary, the TAPP technique is easier to learn, yet is associated with an overall low but higher risk of visceral injury and port-site hernia compared to TEP. Surgeon preference will always drive technique choice, as both are equally effective at treating hernia disease.

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