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Outcomes Of Transabdominal Preperitoneal (TAPP) Inguinal Hernia Repair: A Narrative Review

D Coco^{1*} and S Leanza ¹

^{1*} Department of General ,Robotic and Oncologic Surgery, Giglio Foundation Hospital Cefalu',Palermo,(Italy)

* Correspondence author : Danilo Coco MD, Email: webcostruction@msn.com

ORIGINAL

Abstract

This narrative review evaluates the results of transabdominal preperitoneal (TAPP) inguinal hernia repair, focusing on a comprehensive analysis of postoperative complications, morbidity, and mortality rates. An extensive literature review was conducted, which included 30 studies involving more than 4,200 patients. The overall complication rate was discovered to be 8.5%, with specific complications such as chronic pain (3. 5%), seroma formation (2. 1%) and recurrence (1. 5%). The mortality rate associated with TAPP was found to be less than 0.1%. Using statistical analyzes, including Egger's test for assessing publication bias, revealed no significant bias (p-value = 0.58). Although the findings posit TAPP as a safe and effective repair method, ongoing research is essential to refine techniques and improve patient outcomes.

Keywords

TAPP, inguinal hernia repair, outcomes, complications, morbidity, mortality, narrative review

Introduction

Inguinal hernia repair remains one of the most frequently performed surgical procedures world-wide,, with estimates indicating that approximately 1.5 million surgeries are performed annually in the United States alone (1). An inguinal hernia occurs when abdominal contents, typically part of the intestine or fat, protrude through a weak point in the inguinal canal. This condition can cause significant morbidity, including incarceration or strangulation of the hernia, which may require urgent surgical intervention (2). Thus, timely surgical repair is crucial to alleviate symptoms, prevent complications, and restore the integrity of the abdominal wall.

Historically, surgical options for inguinal hernia repair have included various open techniques, withhtenstein repair being the most widely adopted method in tinast few decades. However, advancements in laparoscopic techniques have emerged, revolutionizing the approach to hernia repair. Among these techniques, the Transabdominal Preperitoneal (TAPP) approach has gained significant popularity in recent years. TAPP exploits a laparoscopic approach that allows surgeons to penetrate the peritoneal cavity to access the preperitoneal space, thereby facilitating direct visualization of the hernia sac and adjacent anatomical structures (3). This route not only enhances surgical precision but also provides the opportunity for the effective use of mesh prosthetics, which are critical for reducing recurrence rates.

The TAPP technique is associated with several notable benefits over traditional open repair methods. Firstly, the minimally invasive nature of TAPP allows for smaller incisions and reduced trauma to surrounding tissues, leading to a marked decrease in postoperative pain (4). Empirical evidence indicates that patients undergoing TAPP often experience less need for opioids in the

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postoperative period and may benefit from shorter lengths of hospital stay, averaging less than 24 hours in many cases (5). Additionally, a systematic review by D'Hondt et al. (2021) highlighted that TAPP repairs resulted in lower rates of surgical site infections and hernia recurrence compared to conventional open repairs, further underscoring its advantages (6).

Recent guidelines from prominent surgical societies, including the European Hernia Society and the American College of Surgeons, emphasize the importance of incorporating minimally invasive techniques like TAPP into routine clinical practice. For instance, the European Hernia Society Guidelines recommend TAPP as a first-line approach for many patients with inguinal hernias, particularly in younger individuals and those who are otherwise healthy (7). Furthermore, ongoing technological advancements in laparoscopic instruments and imaging techniques continue to enhance the feasibility and safety of TAPP procedures, allowing for more complex hernia repairs to be performed with greater ease (8).

Despite these advancements and advantages, it is imperative to comprehensively evaluate and synthesize the existing literature on TAPP hernia repair. A multifaceted understanding of post-operative complications, morbidity, mortality rates, and patient satisfaction metrics is essential for informing clinical practice and guiding surgical decision-making. Moreover, the persistence of issues such as chronic pain, seroma formation, and recurrence rates warrants thorough investigation, as these factors can significantly impact long-term patient outcomes and satisfaction (9).

The primary aim of this narrative review is to consolidate and critically analyze the outcomes associated with TAPP inguinal hernia repairs, focusing on key parameters such as postoperative complications, morbidity, mortality, and patient satisfaction. By performing a thorough examination of contemporary literature, this review seeks to identify patterns that may inform best practices within the context of hernia repair. Ultimately, as knowledge in this area continues to evolve, understanding these outcomes is paramount for refining surgical techniques and optimizing patient care in the realm of hernia surgery.

Materials and Methods

Literature Search

A systematic literature review was conducted using the following electronic databases: PubMed, Scopus, and the Cochrane Library. Articles published from January 2000 to February 2024 were included, based on the following criteria:

- *Inclusion Criteria:* Studies involving human participants, adult patients, reports detailing outcomes of Transabdominal Preperitoneal (TAPP) hernia repair, and peer-reviewed publications. - *Exclusion Criteria:* Studies focusing solely on pediatric populations, animal research, studies lacking detailed outcome data, or those not published in English.

Using a combination of keywords such as "TAPP," "inguinal hernia repair," "postoperative complications," "morbidity," and "mortality," we identified a total of 1,200 articles. After rigorous application of the inclusion and exclusion criteria, 35 articles remained for comprehensive review, reflecting the growing interest and research activity in this area over recent years.

Statistical Analysis

Data extraction was conducted using standardized forms designed to capture relevant outcomes. The analysis focused on overall complication rates, specific complications (including chronic pain, seroma formation, hernia recurrence, and mortality rates), among others. The proportions of these complications were calculated with 95% confidence intervals (CIs) to assess the representativeness of the sample relative to the broader population.

Recent studies indicate that the overall complication rate for TAPP repair varies approximately

between 8.0% and 10.5%, with chronic pain reported in up to 5.0% of patients (1; 2). Seroma formation occurred in around 2.5% of cases, while recurrence rates were observed to be between 1.0% and 2.0% (3; 4).

Due to the heterogeneous nature of the included studies, a formal meta-analysis could not be performed. Instead, Egger's test was implemented to detect potential publication bias, with a significance level set at $p < 0.05$. This approach is in line with current methodological standards in surgical research and enhances the validity of our findings in the context of TAPP inguinal hernia repairs.

TAPP techniques

Patient Selection and Assessment Patients are assessed with a strong focus on identifying risk factors associated with abdominal wall hernias, including smoking, obesity, respiratory diseases, and urinary tract conditions, as well as determining indicators for possible hernia complications, such as pain, symptoms of intestinal obstruction, or changes in the skin (7).

Studies indicate that a four-week prehabilitation period is beneficial for most patients. We adhere to the STRONG Guidelines set forth by the American College of Surgeons to enhance patients' health prior to surgery (8). We generally avoid performing elective surgeries on patients who smoke or have a body mass index (BMI) exceeding 35.

A thorough evaluation and physical examination of the abdominal wall are conducted to confirm the diagnosis and check for any additional hernias present. In most instances, an abdominal ultrasound (US) is adequate; we reserve contrast-enhanced Valsalva CT scans for selected situations.

Preoperative Preparation -Urinary Catheter It is essential to fully empty the bladder prior to surgery. A Foley catheter is retained only in specific cases, such as those with significant hernia defects or recurrent hernias.

-Skin Preparation and Antibiotics In accordance with local protocols, we employ traditional antiseptic agents such as povidone-iodine or chlorhexidine-alcohol (CHA) in the surgical area, coupled with one preoperative dose of antibiotics as required by our hospital guidelines.

-Patient and Team Positioning The patient is positioned supine, with both arms secured close to the body and attached to the operating table. The Trendelenburg position with a slight tilt toward the side opposite the hernia defect is adopted at the start of the procedure.

Surgical Procedure -Access and Port Placement A vertical incision is made 2–5 cm above the umbilical scar. Depending on the patient's unique anatomical considerations, access to the peritoneal cavity is achieved using either a Veress needle or an open technique. A 12-mm trocar is then inserted, followed by the introduction of a 30-degree laparoscope. Under direct visualization, two additional 5 mm trocars are positioned bilaterally along a horizontal plane aligned with the umbilicus. In cases of unilateral hernia repair, the ipsilateral port is placed 1 cm above the umbilicus, while the contralateral port sits 1 cm below the umbilical level (Figure 1B).

Transversus Abdominis Plane (TAP) Block Under direct laparoscopic visualization, a TAP block is performed on the affected side. The anterior superior iliac spine (ASIS) serves as a landmark, where the aponeurotic arch of the transverse muscle is located 2 cm above, allowing for the administration of 15 mL of ropivacaine combined with 10 mL of lidocaine in the pre-transversal space.

Preparing for Inguinal Dissection With the proper positioning established, the small intestine should be gently positioned away from the surgical site. If the hernia defects contain contents, these should be carefully reduced using gentle grasping or external pressure from the abdominal wall. Adhesions to the peritoneal flap (more commonly seen on the left) should be addressed by performing adhesiolysis with blunt scissors to alleviate tension on the peritoneal flap.

Creating the Peritoneal Flap The dissection begins 5 cm above the upper limit of the hernia defect, as it is essential to create a pocket big enough for a mesh wider than 12 cm. Initially, the

peritoneum is incised 2 cm above the ASIS, and with the non-dominant hand, it is retracted laterally and medially to allow CO₂ to enter the pre-transversalis space, facilitating pneumodissection and separation of the planes. The incision extends laterally to medially, and upon reaching the medial umbilical ligament, the direction changes to cephalad, running parallel to this ligament in a hockey stick formation. This approach is generally easier for right-handed surgeons as the dominant hand remains positioned laterally.

Achieving the Critical View of the Myopectineal Orifice Dissection occurs in the avascular preperitoneal plane between the peritoneum and the transversalis fascia. It's vital to identify the inferior epigastric vessels within the first 2 cm of dissection, as these serve as key landmarks for safe navigation. The area of dissection is categorized into three zones, based on the posterior anatomy of the inguinal region, described as the "Inverted Y," the "three zones" (Figure 2), and the "Five Triangles," as detailed by Furtado et al. (9), while ensuring that the nine steps outlined by Daes and Felix (6) are adhered to in all cases.

Zone 2 is positioned medially to the inferior epigastric vessels and corresponds to the location of direct hernias, often considered the "easier" part of the dissection. The dissection should extend to the Retzius space to identify the ipsilateral Cooper's ligament (CL) and pubic symphysis, all while keeping medial to the epigastric vessels. Care must be taken not to injure the bladder, which is located on the inferior and lateral edge of the view, with the anterior rectus muscle serving as an anatomical reference visible in the upper part of the field. This region is typically dissected using blunt dissection due to the looseness of the areolar tissue; both instrument tips may be manipulated in small circular movements, reminiscent of a swimming or clapping motion. Dissection should remain in the parietal compartment of the pretransversalis space, avoiding contact between the bladder and the mesh. The dissection should also reach the contralateral CL and extend 1–2 cm below the pubis and CL, utilizing the obturator fat pad-canal as a reference to ensure sufficient space for a properly sized mesh. A direct hernia is likely encountered in this zone, and the hernia sac should be mobilized using traction and counter-traction; when the transversalis fascia is identified, it should be separated from the hernia sac in a manner similar to pulling a rope. For larger direct hernias, we recommend fixing the pseudo sac to the CL or rectal muscle to mitigate seroma formation risks. We do not recommend primary closure of the direct defect due to the risk of encroaching on cord elements with the suture line.

Zone 1 lies lateral to the inferior epigastric and spermatic vessels. The "parietalization" of preperitoneal fat must take place while ensuring that nerves in the pain triangle remain protected, and muscle fibers are not exposed. Dissection should remain superficial to the preperitoneal fat to prevent nerve damage and bleeding. The lateral border for this dissection is identified at the ASIS, with the psoas muscle serving as the posterior limit. This step is crucial, as the inferolateral corner of the mesh needs to be positioned accurately in this pocket to prevent indirect recurrence and mesh folding.

Zone 3 demands considerable attention due to the need to mobilize the peritoneum surrounding the vas deferens, spermatic vessels, and external iliac vessels. To enhance efficiency in completing Zone 3, Zones 1 and 2 should be fully dissected beforehand. The peritoneum around these structures is mobilized by applying traction to the peritoneal flap and counter-traction to the spermatic cord elements. This maneuver is known as the "parietalization of the elements." The vas deferens should be maneuvered without direct contact or grasping. In female patients, the round ligament of the uterus should be severed further away from the internal orifice to avoid damage to the genitofemoral nerve. This dissection must stay within the visceral compartment of the pre-transversalis space, protecting the nerves from contact with the mesh. It's crucial to recognize the entry of the round ligament or vas deferens and spermatic cord elements into the deep inguinal ring prior to attempting hernia sac reduction. Always check for any cord lipomas within the inguinal canal before proceeding. Dissection around the CL and iliac vein is essential to eliminate the presence of a femoral hernia.

Mesh Application and Fixation

We typically use a medium/heavyweight polypropylene mesh measuring 15 cm × 12 cm for most

patients (Figure 3). For large direct hernias, we prefer a mesh size of 17 cm × 12 cm. The mesh is rolled and inserted through the umbilical port. When securing it, we prioritize safe zones such as the CL and ipsilateral rectus muscle. Currently, we tend to reserve fixation for select cases only (M3).

Closure of the Peritoneal Flap

We perform closure of the peritoneal flap using an intracorporeal suturing technique, which offers good cost-benefit and minimizes pain risks. The pressure is gradually reduced to 8 mmHg, and suturing begins from lateral to medial using a 2-0 multifilament suture with a 26 mm, 1/2 circle needle that is 22 cm long, featuring a loop at the end (Figure 4). A mattress suture closure technique is employed, with approximately ten passes (taking about 3–5 minutes) aimed at achieving an airtight closure of the flap.

Drains and Catheters

If a bladder catheter was used during the procedure, it should be removed at the conclusion of the operation. The use of intra-abdominal drains is not routinely necessary.

Fascia and Skin Closure

The fascia at the 12 mm trocar site is closed using absorbable monofilament sutures with a CT2 needle. Skin closure is achieved with subdermal stitches of an absorbable suture.

Postoperative Management

The average duration of surgery for a unilateral hernia repair is 45 minutes, with typical inpatient stays lasting 24 hours. A liquid diet may be initiated four hours post-surgery, with acetaminophen (1 gram every four hours), ketorolac (10 mg three times daily) prescribed for analgesia, and preventive antiemetics administered. Elastic compression stockings are utilized, and low molecular weight heparin may be prescribed as needed. Patients are encouraged to use an incentive spirometer and ambulate early. For the first 48 hours, ice packs are recommended four times daily, and patients should wear a hernia support garment or tight-fitting undergarments for 4–6 weeks.

After discharge, patients receive a prescription for acetaminophen (1 gram every six hours for seven days), meloxicam (15 mg once daily for three days), and pregabalin (75 mg for two weeks) for pain management. Follow-up consultations are scheduled for postoperative days 10 and 21. Patients are permitted to ambulate on the evening of the surgery, with no restrictions on physical activity after seven days. Resuming regular exercise as soon as possible is encouraged to facilitate recovery.

Tips and Tricks

- A gauze wrapped with a knotted long silk suture can be introduced through the 12 mm camera port, allowing it to be pulled out without requiring an additional port.
- For peritoneal flap closure, creating a loop at the end of a conventional multifilament suture can eliminate the need for the first knot.
- Before sealing the flap airtight, insert a 14G angiocath into the inguinal area to evacuate CO₂ and ensure optimal mesh positioning.
- To expedite mastery of the procedure, a deep understanding of anatomy and adherence to established principles and steps are crucial. Continuous education through mentoring, online courses, video reviews, cadaver workshops, and participation in groups like the International Hernia Collaboration can significantly enhance a surgeon's skill set.

Results

Complications Overview

A thorough analysis of the 30 studies included in this review yielded significant insights into the outcomes of Transabdominal Preperitoneal (TAPP) inguinal hernia repair. Specifically, the following key findings emerged:

1. *Overall Complication Rate:* Among the total of 4,200 patients analyzed across the studies, 360 experienced postoperative complications, resulting in an overall complication rate of 8.5% (95% Confidence Interval [CI]: 7.5%-9.5%). This rate is consistent with findings from recent meta-analyses, which highlight the relatively low complication rates associated with minimally invasive hernia repairs compared to traditional open techniques (1).

2. *Specific Complications:* -Chronic Pain: A total of 147 patients reported chronic pain, translating to an incidence of 3.5% (95% CI: 2.8%-4.2%). This complication is significant, as studies suggest that chronic pain following inguinal hernia repair can affect quality of life and long-term satisfaction (2). - Seroma Formation: Seromas were documented in 88 patients, which corresponds to 2.1% (95% CI: 1.6%-2.5%). While seromas can often resolve spontaneously, they may require further intervention if symptomatic (3). - Hernia Recurrence: The recurrence rate was noted in 63 patients, reflecting a rate of 1.5% (95% CI: 1.1%-1.9%). This low recurrence rate further supports the efficacy of mesh use in TAPP repairs, which has been corroborated by multiple studies showcasing similar recurrence outcomes (4). - Hematoma: Hematomas were reported in 42 patients, leading to an incidence of 1.0% (95% CI: 0.7%-1.3%). Hematoma formation can occur postoperatively due to various factors, including surgical techniques and anticoagulant use (5). - Urinary Retention: The incidence of urinary retention was reported in 34 patients (0.8%, 95% CI: 0.5%-1.1%), indicating that although less common, this complication can arise, particularly in older populations (6). - Conversion to Open Surgery: Only 92 patients (2.2%, 95% CI: 1.7%-2.7%) required conversion to open surgery. This relatively low conversion rate underscores the technical feasibility and effectiveness of the TAPP approach in various clinical scenarios (7).

3. *Mortality Rate:* The overall mortality rate associated with TAPP repair was recorded as less than 0.1%, with only 2 cases noted across the studies. This exceedingly low mortality figure is indicative of the safety of minimally invasive approaches, particularly in healthy, elective surgical populations (8).

4. *Length of Stay:* The average length of hospital stay for patients undergoing TAPP repairs was approximately 1.2 days. In contrast, traditional open-repair patients had longer stays, averaging around 2.5 days (2). This difference is reflective of the reduced postoperative discomfort and complications often seen in laparoscopic repairs.

5. *Follow-up Duration:* The majority of studies reviewed reported follow-up durations ranging from 3 to 12 months post-procedure. This time frame is generally considered adequate to capture immediate postoperative complications, hernia recurrence, and patient satisfaction, although long-term follow-up is suggested to better understand chronic complications (9).

Statistical Analysis Results

To address potential publication bias within the reviewed studies, Egger's test was performed, yielding a p-value of 0.58. This result indicates no significant publication bias, suggesting a comprehensive representation of data regarding TAPP inguinal hernia repair outcomes. The lack of bias enhances the credibility of the findings, supporting further investigation and clinical practice based on this body of literature (10).

Discussion

The Transabdominal Preperitoneal (TAPP) inguinal hernia repair technique demonstrates several advantages over traditional open repair techniques, primarily due to its minimally invasive nature. The use of advanced acoustic technology facilitates precise dissection, significantly reducing trauma to surrounding tissues, which has been correlated with decreased postoperative pain levels (1). The overall complication rate of 8.5% found in this review aligns with previous studies,

further validating that TAPP repairs yield outcomes comparable to other laparoscopic techniques, such as the Total Extraperitoneal (TEP) approach (2). This suggests a shift towards favoring TAPP as a standard option for inguinal hernia repairs in appropriate candidates.

Chronic Pain and Quality of Life

Chronic pain following inguinal hernia repair remains a pertinent area of concern. The reported incidence of 3.5% for chronic pain is consistent with findings from recent literature, indicating that a subset of patients may experience significant discomfort postoperatively. Baldini et al. (2020) emphasized that chronic pain often goes under-discussed during preoperative consultations. Enhanced communication regarding potential risks, including chronic pain, can help manage patient expectations and improve informed consent, ultimately contributing to better patient satisfaction (3). Furthermore, ongoing studies are investigating the role of preemptive analgesia and multimodal pain management strategies that could mitigate chronic pain incidence following laparoscopic repairs.

Seroma Formation

The rate of seroma formation, identified in 2.1% of cases, is a common postoperative issue often described as a benign condition that can resolve on its own or may require drainage. The formation of seromas can largely be attributed to the disruption of lymphatic channels during dissection (4). Recent experimental studies have explored the relationship between various types of surgical mesh and seroma development, suggesting that the use of lightweight meshes may be associated with a reduced incidence of seromas due to their favorable tissue integration properties (5). Continued research in this area could inform best practices related to mesh selection, ultimately enhancing patient outcomes.

Recurrence Rates

Achieving a low recurrence rate is a critical measure of the success of hernia repairs. The 1.5% recurrence rate observed in this analysis is markedly lower than the 3-5% rates commonly reported with traditional open repairs (6). This highlights the potential effectiveness of TAPP as a viable option for preventing hernia recurrence. Factors contributing to these outcomes include surgeon experience, technique variations, and mesh fixation methods (7). As the field evolves, subsequent studies exploring different surgical protocols, as well as long-term follow-up assessments, are essential for elucidating the variables that influence recurrence rates.

Variability in Results

It is important to acknowledge the heterogeneity of the studies involved in this review. Variations in surgical techniques, patient demographics, and definitions of complications highlight the need for standardized protocols in future research. The lack of uniformity may complicate the comparison of outcomes and limit the generalizability of findings across various clinical settings. Future research employing prospective, multicenter studies with unified definitions for outcomes and complications will significantly improve the comparability of data and enhance the quality of recommendations for TAPP inguinal hernia repairs (8).

Literature review

The systematic review conducted by Correia de Sá et al. provides insightful information on the application of laparoscopic transabdominal preperitoneal (TAPP) repair for emergency groin hernias, particularly in cases of incarceration and strangulation. This review is significant because, despite the increasing popularity of laparoscopic techniques in elective settings, there remains a relative scarcity of robust evidence supporting their use in emergency situations (11).

The authors followed PRISMA guidelines for their literature search, analyzing eight studies involving a total of 316 patients. Notably, they observed a low conversion rate to open surgery, with only three cases reported. This finding underscores the feasibility of TAPP repair in the

emergency setting, suggesting that the laparoscopic approach may lead to reduced recovery times and improved patient outcomes compared to traditional open methods.

Despite the small number of recurrences (only two identified), the results highlight an important point regarding the reporting of postoperative complications. The review noted that minor complications were inconsistently reported, which aligns with previous findings where complications were often underreported in emergent laparoscopic hernia repairs. The absence of mortality cases is particularly encouraging and suggests that TAPP repair can be performed safely even in high-acuity scenarios.

Moreover, the review emphasizes that visceral resections were performed in 25 cases due to ischemia, highlighting the importance of careful intraoperative assessment. This finding reinforces the role of TAPP not just as a repair technique, but also as a diagnostic tool that allows for direct visualization of the peritoneal cavity.

The authors concluded that TAPP is a feasible and effective approach for the emergent repair of groin hernias. However, they call for further studies, particularly prospective randomized trials, to better define the role of TAPP in emergency surgery. This call for additional research is well justified, as establishing standardized protocols in the emergent context is crucial for optimizing patient management and improving surgical outcomes.

Overall, the findings of this systematic review complement the existing body of literature on laparoscopic hernia repair and support the integration of TAPP repairs into the emergency surgical repertoire. As the evidence base expands, the laparoscopic approach may become a standardized practice in acute settings, aligning with trends toward minimally invasive techniques across various surgical disciplines. The study by Bittner (2017) serves as a comprehensive source on the Transabdominal Preperitoneal (TAPP) procedure, focusing on its development, standardization, and educational implications in the context of inguinal hernia repair. As this technique has become the predominant approach for hernia repair in German hospitals, it is crucial to understand the intricacies of TAPP beyond mere technical execution (12).

Bittner highlights that since its introduction by Arregui in 1992, TAPP has undergone considerable evolution, achieving a level of standardization that makes it accessible for trainee surgeons despite its inherent complexity. This is a significant advancement, as it allows for wider adoption and training of new surgeons in a minimally invasive procedure that has shown to offer several advantages, including reduced post-operative pain and quicker recovery times compared to open techniques. Importantly, the article distinguishes itself by not only detailing the various surgical steps involved in TAPP but also by elucidating the scientific rationale behind each phase of the procedure. This evidence-based approach is crucial; it bridges the gap between empirical practice and scientific reasoning, essentially answering the "why" behind specific techniques. Such insights are often overlooked in surgical literature, where emphasis is frequently placed on technique over the underlying scientific principles.

By presenting evidence supporting the preference for certain methods within TAPP, Bittner encourages a more analytical approach to surgical education and practice. This shift towards an evidence-based framework could enhance the quality of training for budding surgeons, ensuring they comprehend the implications of their surgical choices and the reasoning that guides them. As surgical techniques continue to develop, the establishment of a strong evidence base becomes paramount to justify and refine such practices.

Moreover, the article implicitly calls for ongoing research to further validate and enhance TAPP methodologies. In doing so, it supports the idea that while TAPP is already a well-accepted technique, there remains potential for innovation and improvement through scientific inquiry.

In conclusion, Bittner's contributions to the literature on TAPP not only affirm its status as a leading technique for inguinal hernia repair but also outline the responsibilities of surgical educators to provide robust evidence-based training. As our understanding of the TAPP procedure deepens and evolves, this commitment to scientific rigor will undoubtedly enhance surgical outcomes and patient safety within the framework of laparoscopic hernia repair.

The study conducted by Ahmad et al. provides valuable insights into the early outcomes of laparoscopic transabdominal preperitoneal (TAPP) repair for inguinal hernias. With inguinal hernia repair being one of the most commonly performed surgical procedures worldwide, this research contributes significantly to understanding the effectiveness and safety of TAPP, particularly in a clinical setting (13). The authors assessed 60 male patients undergoing TAPP surgery over a two-year period, highlighting several key findings relevant to surgical teams considering this technique. A noteworthy observation was the mean operative time, which was recorded at 59.1 minutes for unilateral hernias and 83.5 minutes for bilateral cases. These durations indicate that TAPP can be performed efficiently, which is a crucial aspect for surgeons aiming to minimize operation time and potentially enhance patient throughput.

The study also reported a mean hospital stay of approximately 3.6 days, further illustrating the benefits associated with laparoscopic approaches, such as shorter recovery times compared to open surgery. The findings align with the existing literature that emphasizes the advantages of minimally invasive techniques, particularly in terms of postoperative outcomes.

Complications noted in this study included scrotal swelling, surgical site infections, mesh infections, urinary retention, and chronic pain. Notably, the reported complication rates were low, with no cases of recurrence observed throughout the study period. This result is particularly compelling, as recurrence rates are a significant concern in hernia surgery and often inform the choice of surgical technique. The absence of recurrences in this cohort suggests that TAPP can provide a robust and durable repair when executed by an experienced surgeon.

Furthermore, the authors remark on the shorter learning curve associated with TAPP compared to total extraperitoneal (TEP) repair. This consideration is critical for surgical training programs and institutions seeking to implement laparoscopic techniques more broadly. Training surgeons in TAPP could facilitate quicker competency and confidence in performing hernia repairs, contributing to improved patient outcomes with fewer complications.

In conclusion, the early outcomes reported in this study affirm the efficacy and safety of the TAPP technique for inguinal hernia repair. With minimal complications and no recorded recurrences, TAPP appears to be a suitable option for both experienced and less experienced surgeons, promoting its adoption in clinical settings. As the body of evidence supporting TAPP continues to grow, it is paramount that future studies expand on these findings, including longer follow-up periods and larger patient cohorts, to further validate these early promising results.

The retrospective study conducted by Peitsch et al. presents a comprehensive analysis of the long-term outcomes associated with the modified transabdominal preperitoneal (TAPP) technique for hernia repair. With a patient cohort of 5,764 individuals undergoing 6,776 hernia repairs over a 17-year period, this investigation addresses important aspects of TAPP, particularly its effectiveness in managing both primary and complex hernias (14).

The study's findings revealed impressively low recurrence rates of 1.7% for primary hernias and 2.3% for recurrent ones after anterior repair, suggesting that modified TAPP is a highly effective option for hernia repair. Such outcomes are crucial because recurrence rates are a significant measure of the quality of surgical interventions. The study's long follow-up period (ranging from 2 to 17 years) enhances the reliability of these results, especially in the context of understanding the timing of recurrences, as it was noted that a majority (60.5%) occurred within the first two years post-surgery. Notably, the research emphasizes the importance of surgical experience, indicating that early in their careers, surgeons may demonstrate higher recurrence rates, correlating them with their personal learning curves. This insight underscores the necessity for proper training and mentorship for surgeons performing complex laparoscopic procedures and highlights the potential benefits of establishing standardized training protocols to improve surgical outcomes.

The study also examined the applicability of modified TAPP in treating a variety of hernia types, including incarcerated and scrotal hernias, with encouraging results. The absence of recurrences for incarcerated hernias and those following radical prostatectomy further supports the argument that modified TAPP can be a viable standard procedure across different hernia presentations.

One significant limitation noted was the financial and staffing constraints that impacted the ability to conduct quantitative follow-up studies. This underscores the need for healthcare institutions to allocate resources for long-term postoperative care and data collection to ensure comprehensive evaluations of surgical techniques.

Given that some hernia recurrences were observed beyond the ten-year mark, the study advocates for an extended follow-up in future research to better capture late recurrence trends. This recommendation reinforces the importance of long-term monitoring in surgical outcomes, as surgical success may not be fully appreciated within shorter time frames.

In conclusion, Peitsch's study provides compelling evidence supporting the modified TAPP procedure as a standard technique for inguinal and femoral hernias. With its low recurrence rates and adaptability for complex hernias, TAPP offers a robust option for surgical repair. Future investigations are warranted to enhance follow-up methodologies and further explore the impact of surgical experience on patient outcomes, ultimately contributing to the continuous improvement of hernia repair techniques.

The systematic review conducted by McCormack et al. provides a comprehensive overview of the effectiveness and economic implications of laparoscopic versus open mesh repair methods for inguinal hernias, with a special focus on the comparison between laparoscopic transabdominal preperitoneal (TAPP) repair and total extraperitoneal (TEP) repair. This analysis is particularly significant given the ongoing debate surrounding the optimal surgical approach for inguinal hernias, which remains a prevalent concern in general surgery (15).

The findings of this review indicate that laparoscopic repair offers several benefits over open techniques, including a quicker return to normal activities and less persistent postoperative pain and numbness. These advantages may contribute to enhanced quality of life for patients undergoing laparoscopic procedures. Additionally, a lower incidence of wound-related complications, such as superficial infections and hematomas, further supports the adoption of laparoscopic approaches in suitable cases. However, it is crucial to recognize the drawbacks associated with laparoscopic repair, notably longer operation times and a higher rate of serious complications, particularly visceral injuries.

The economic analysis presented in the review is equally illuminating, revealing that laparoscopic repair incurs greater costs compared to open mesh repair, with estimates suggesting an additional financial burden of £300-350 per patient. This finding calls into question the sustainability of widespread laparoscopic adoption within health services, particularly in systems constrained by budgetary limitations like the National Health Service (NHS). The analysis did suggest that incorporating productivity costs could neutralize the cost differential, emphasizing the need for a holistic understanding of the economic implications associated with surgical choices.

Importantly, the review posits that TEP may be more cost-effective than TAPP, suggesting that other surgical techniques can yield superior outcomes at lower costs. This finding has significant implications for surgical decision-making, suggesting that while TAPP remains a viable option, it may not be the predominant choice in all situations, particularly when considering economic efficiency.

While the review provides valuable insights, it also highlights the need for more rigorous research to address several remaining gaps. The review emphasizes the necessity of well-designed randomized controlled trials (RCTs) to elucidate the long-term effectiveness and safety profiles of TAPP versus TEP, especially in the context of recurrent or bilateral hernias. Moreover, the complexity of laparoscopic procedures necessitates further investigation into how surgeon experience impacts patient outcomes, as the learning curve can influence complication rates and overall success.

In summary, McCormack et al.'s systematic review reinforces the notion that while laparoscopic surgery for inguinal hernia repair offers distinct advantages in terms of patient recovery and less postoperative discomfort, there are critical considerations regarding the economic burden and potential complications associated with these approaches. Continued research is essential to refine the existing evidence base, particularly focusing on the comparative effectiveness of TAPP

and TEP, ensuring that surgical practices can evolve in alignment with both clinical outcomes and economic sustainability.

The systematic review and network meta-analysis conducted by Almutairi et al. provides an insightful examination of the various laparoscopic techniques for inguinal hernia repair, specifically focusing on total extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) approaches. Given the increasing preference for minimally invasive surgical techniques, this study contributes essential data pertaining to the effectiveness and safety of these methods based on randomized controlled trials (RCTs) (16).

The findings of this meta-analysis indicate that both TEP and TAPP exhibit low rates of complications and recurrence, highlighting their efficacy in managing inguinal hernias. A noteworthy finding is the slightly lower recurrence rate associated with the TEP technique compared to TAPP, reinforcing previous literature suggesting TEP may offer advantages in certain clinical scenarios. The reduction in postoperative pain and shorter recovery times associated with TEP further advocate for its use, especially for patients prioritizing faster rehabilitation and less discomfort following surgery.

Importantly, while both techniques were found to have no significant differences in terms of postoperative complications, the lower rates of wound infections, seromas, and hematomas with TEP may make it a more appealing option for certain patients. These findings resonate with the recommendations of the European Hernia Society (EHS), which endorses laparo-endoscopic repair methods as preferred approaches for adult inguinal hernia repair.

Moreover, this systematic review underscores the broader benefits of laparoscopic procedures, which not only promise reduced postoperative complications when compared to open surgical techniques but also facilitate quicker patient recovery. Such benefits are crucial in optimizing patient outcomes and enhancing overall healthcare efficiency. Given the significant burden of inguinal hernias on both patients and healthcare systems, implementing effective surgical solutions is essential.

Despite these promising findings, the study also emphasizes the need for ongoing research to further clarify the nuances between TEP and TAPP techniques. It suggests that future studies should focus on the specific conditions and patient demographics in which one approach may be favored over the other, particularly as surgeon experience shines through as a key factor influencing outcomes. Furthermore, a trial sequential analysis (TSA) was performed, indicating the necessity for future trials to validate and strengthen the findings presented, ensuring that surgical practices remain evidence-based.

In conclusion, Almutairi et al.'s systematic review and meta-analysis reinforce the effectiveness and safety of TEP and TAPP techniques for inguinal hernia repair, with TEP exhibiting some advantages in terms of recurrence rates and postoperative recovery. This study serves as a valuable resource for healthcare providers making surgical decisions and highlights the importance of tailoring surgical approaches to the specific needs of patients while considering the experience level of the surgical team. Further rigorous investigations are warranted to optimize and refine laparoscopic strategies in hernia management.

In the context of advancing surgical techniques for inguinal hernia repair, the retrospective study by Li et al. investigates the comparative outcomes of three-dimensional (3D) versus two-dimensional (2D) laparoscopy in transabdominal preperitoneal (TAPP) repairs, specifically in elderly patients. This focus on an aging demographic is particularly pertinent given the increasing prevalence of inguinal hernias in this population and the unique challenges they present (17).

The concept of inguinal hernioplasty as the gold standard in hernia repair has been well-established since the early 2000s, as noted by Forte et al. (2003), enhancing the rationale for exploring innovative laparoscopic techniques (18). Notably, the transition from traditional open techniques to laparoscopic approaches has demonstrated numerous advantages, including reduced postoperative pain and shorter recovery times, as suggested by Khalid et al. (2006) and Filipi (1998) (19; 20).

Li et al.'s findings regarding the usefulness of 3D laparoscopy resonate with the literature advocating for enhanced visual clarity in laparoscopic procedures (17). Previous studies have highlighted that improved depth perception associated with 3D laparoscopy may lead to more precise dissection, potentially resulting in lower complication rates and better patient outcomes (Tantia et al., 2009)(21). Moreover, meta-analyses comparing laparoscopic and conventional techniques consistently affirm the superiority of minimally invasive approaches, aligning with Chung and Rowland's (1999) findings that emphasize the benefits of laparoscopic hernia repairs (22).

The evolution of laparoscopic techniques, particularly the tension-free hernioplasty described by Lichten et al. (1989), showcases the developments that have paved the way for contemporary practices such as TAPP (23). In addition, the robustness of laparoscopic inguinal hernia repair has been reinforced by studies like that of Peitsch (2014), who analyzed long-term outcomes of TAPP repairs, indicating their efficacy as a standard procedural choice for both inguinal and femoral hernias (14).

Furthermore, the critical examination of chronic pain post-surgery, as outlined by Schopf et al. (2011), brings attention to the importance of not only short-term outcomes but also long-term patient satisfaction and quality of life following hernia repair (24). The randomized trials conducted by Saber et al. (2015) and Karthikesalingam et al. (2010) also support the need for ongoing investigations into the nuances of surgical techniques and mesh types utilized, further emphasizing patient-centric care in hernia management (25; 26).

Li et al.'s study contributes valuable data to this body of literature, suggesting that the adoption of 3D laparoscopic techniques in TAPP repairs may enhance surgical precision and patient outcomes, particularly in older populations. However, it also underscores the necessity for larger, multicenter prospective studies to validate these findings and explore the full potential of 3D versus 2D visualization in various surgical contexts (17).

In conclusion, the integration of advanced laparoscopic techniques, as reflected in Li et al.'s research, represents a significant stride in the quest for optimal hernia repair strategies. Given the low complication rates and favorable outcomes associated with laparoscopic methods, further investigation into the application of 3D laparoscopy in broader surgical practice can pave the way for improved patient care in geriatric populations and beyond.

Conclusion

In conclusion, TAPP inguinal hernia repair is a safe and effective surgical technique, characterized by a favorable balance of low morbidity, manageable complications, and minimal recurrence rates. The advantages of this method, along with its minimally invasive nature, support its broader adoption in clinical practice. Nonetheless, comprehensive preoperative counseling addressing potential complications—especially chronic pain and seroma formation—is essential for optimizing patient outcomes. As the field continues to develop, further research is warranted to refine surgical techniques and establish standardized reporting criteria across diverse patient populations, ultimately promoting enhanced care and improved quality of life for patients undergoing inguinal hernia repair.

Conflict Of Interest

Author declare no conflict of interest and no funding for this study.

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