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OPEN MESH PREPERITONEAL GROIN HERNIA REPAIR

*1Witia Ade Ansari, 1,2Sri Putri Handayani, 1,3Dita Febriana, 4,5Deviani Utami, 5Ahmad Wirawan

*1Faculty of Medicine, University of Jambi, Indonesia
2General Practitioner, Bhayangkara Jambi Hospital, Indonesia
3 General Practitioner, Erni Medika General Hospital, Jambi, Indonesia
4 General Practitioner, Abdul Moeloek Regional Hospital, Indonesia
5Faculty of Medicine, University of Sriwijaya, Indonesia

Correspondence Author:
witiaade@gmail.com

ABSTRACT

Introduction: *Surgeons are currently debating the best method for inguinal hernia repair, with a focus on minimizing recurrences and addressing chronic pain. Laparoscopic approaches, especially those incorporating preperitoneal mesh placement, offer potential benefits by avoiding close proximity to nerves in the inguinal canal and reducing pain.*

Methods: *The researchers in this study followed the 2020 Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines to ensure that their work met the required standards. This was done to ensure the precision and reliability of the conclusions derived from the research.*

Result *Our search produced 11 results. After looking at the titles and summaries, we found several papers that fit our criteria. At first, we excluded few articles because they were written in review and case report style. But after reading the full papers carefully, we included five papers in our final analysis. These papers included prospective randomized three-arm study with intention to treat analysis and various retrospective studies.*

Conclusion: *The study recommends the open preperitoneal approach for inguinal hernia repair, citing lower recurrence rates and reduced midline laparotomy instances, especially beneficial in cases involving intestinal resection. Additionally, a comparison between Transrectus Sheath Preperitoneal (TREPP) and Transinguinal Preperitoneal (TIPP) approaches reveals comparable chronic pain rates, with TIPP favored for learning curve-associated recurrences and superior short-term pain outcomes in TREPP, highlighting the importance of individualized surgical choices. A comparison between Totally Extraperitoneal (TAPP) and Mesh Plug (MP) procedures for bilateral primary inguinal hernia reveals TAPP as a feasible, safe, and less painful option, with lower chronic pain rates and favorable long-term outcomes. The choice between TAPP and MP depends on individual considerations such as operative time, postoperative pain, and anesthesia preferences.*

Keywords: *Groin hernia, herniorrhaphy, open mesh, preperitoneal repair.*

INTRODUCTION

The optimal approach for inguinal hernia repair remains a subject of ongoing debate among surgeons, with a focus on minimizing recurrences and addressing chronic pain. New randomized clinical studies continue to explore the most effective repair methods, considering factors such as mesh placement in relation to nerves[1]. Laparoscopic inguinal hernia repair has shown advantages over open anterior techniques, particularly in reducing early and chronic pain. The key distinction lies in the dissection plane and mesh placement. [2]

In open anterior repairs, dissection through the inguinal canal places the mesh close to nerves, potentially contributing to chronic postoperative pain. Conversely, preperitoneal mesh placement, whether through laparoscopic or open techniques, involves positioning the mesh behind the muscles of the abdominal wall in the preperitoneal plane, avoiding close proximity to nerves and structures in the inguinal canal. This approach may offer benefits in terms of chronic pain, as nerves are only present in the most lateral part of the field, often protected by fatty tissue.[2,3]

While numerous open preperitoneal techniques exist, with some added post-Cochrane review, choosing the optimal procedure requires careful consideration. This study aims to describe open preperitoneal repairs, emphasizing techniques and published clinical evidence. Inguinal hernia repair is a common procedure globally, and the choice between unilateral repair approaches, especially considering the posterior mesh placement, remains a topic of significant discussion.[4]

Several open posterior approaches, including Transrectus Preperitoneal repair (TREPP), Open Preperitoneal repair (OPP), and the Kugel repair, allow for preperitoneal mesh placement. However, comparative data to guide recommendations are currently insufficient. The potential disadvantage of open posterior repairs involves the risk of violating both anterior and posterior planes, but certain techniques, like TREPP, OPP, and the Kugel repair, spare the anterior plane while facilitating posterior mesh placement. Anesthetic choice becomes a differentiating factor between open posterior and minimally invasive inguinal hernia repair. While MIS repair often requires general anesthesia, open posterior mesh repairs can often be performed with local anesthesia and intravenous sedation, leading to improved short-term outcomes. Limited studies on TREPP/OPP show promising outcomes, with no significant differences in recurrence rates or complications compared to MIS approaches.[2-4]

The primary objective of conducting a systematic review is to examine and consolidate the existing body of literature related to this specific surgical approach. The review seeks to offer a detailed understanding of the various open preperitoneal techniques employed in the repair of groin hernias. This involves thoroughly summarizing the surgical methods and approaches utilized in these procedures, providing a comprehensive overview for readers and practitioners. This systematic review also aims to highlight both the potential advantages and disadvantages associated with open mesh preperitoneal groin hernia repair. Special attention is given to anatomical dissection, mesh placement, and the impact on postoperative pain. This nuanced analysis serves to inform surgeons and healthcare professionals about the intricacies and considerations associated with choosing this specific approach.

METHODS

Protocol

The researchers in this study followed the 2020 Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines to ensure that their work met the required standards. This was done to ensure the precision and reliability of the conclusions derived from the research.

Criteria for Eligibility

To be considered in this study, eligible articles had to adhere to specific criteria. They were required to be English-language research papers concentrating on open mesh preperitoneal groin hernia repair. These studies needed to satisfy the following conditions: publication dates post-2018 falling within the designated timeframe for this systematic review. Articles falling under categories such as editorials, lacking a DOI, previously published review articles, or duplicating content from prior journal publications were excluded from the evaluation process.

Search Strategy

We conducted a comprehensive literature search using PubMed journal database, focusing on studies published from 2019 to 2024. The search terms employed were as follows ("Open"[All Fields] AND ("medical subject headings"[MeSH Terms] OR ("medical"[All Fields] AND "subject"[All Fields] AND "headings"[All Fields]) OR "medical subject headings"[All Fields] OR "mesh"[All Fields]) AND ("preperitoneal"[All Fields] OR "preperitoneally"[All Fields]) AND ("groin"[MeSH Terms] OR "groin"[All Fields] OR "groins"[All Fields]) AND ("herniorrhaphy"[MeSH Terms] OR "herniorrhaphy"[All Fields] OR ("hernia"[All Fields] AND "repair"[All Fields]) OR "hernia repair"[All Fields])) AND (2018:2024[pdat])

Inclusion and exclusion criteria

The studies included had specific criteria: (1) they needed to be original research related to open mesh preperitoneal groin hernia repair; (2) they could be Randomized Controlled Trials (RCTs) or observational studies (cohort or case-control studies); (3) relevant data had to be accessible. On the other hand, certain studies were excluded if they: (1) were ongoing or lacked available data; (2) were duplicates, in which case the most recent article was selected; (3) were not in English.

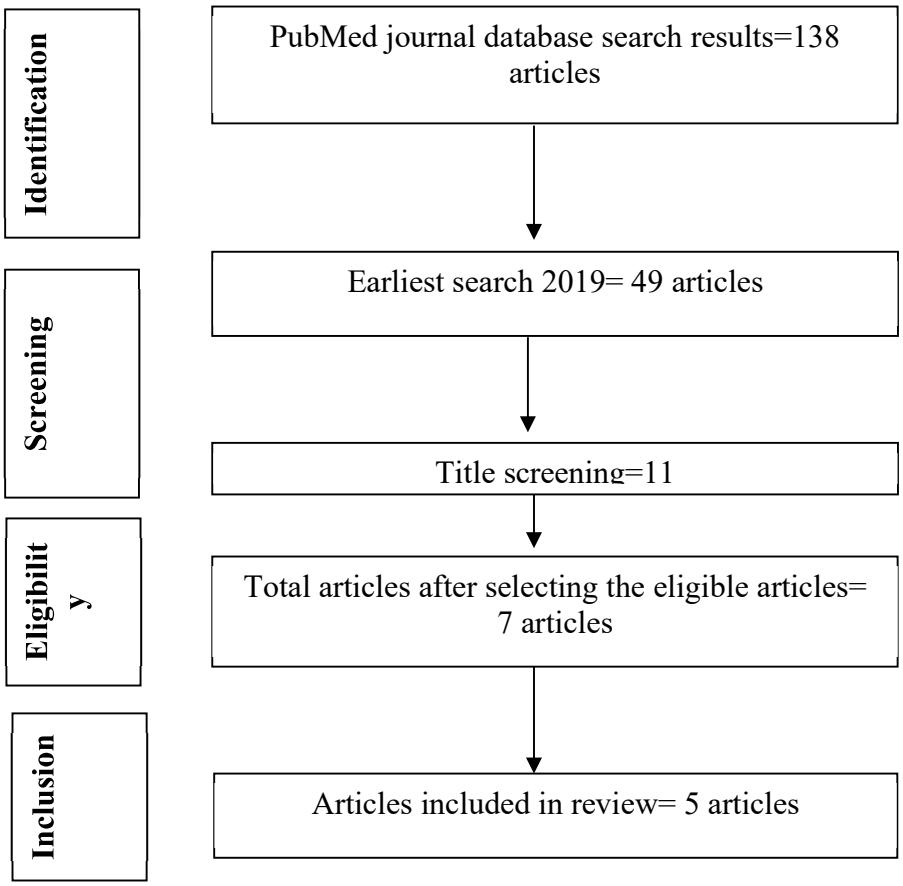

Figure 1. Article search flowchart

Data Retrieval

The authors conducted a thorough examination of relevant studies, specifically selecting those that met precise inclusion criteria. They focused on original, unpublished papers in English to ensure a refined and high-quality selection. The analysis covered essential information, such as study particulars, authors, publication dates, locations, and research methodologies, aligning with the study's objectives.

Author	Origin	Method	Sample Size	Result
Elsabagh A et al., 2019.[5]	Australia	Retrospective study	In a total of 435 operated case.	A total of 435 cases were operated, recorded, analyzed and included in the study. 93% were males, mean age 59 and mean operative time 35 minutes. Patients were seen in the clinic 4 weeks postoperatively, patients with late complications were referred by the GP. Complication were acute urinary retention 3.9%, hematoma 3%, seroma 2.7%, infection was 0.9%, recurrence 2.7%, chronic pain 0.2%.
Rodrigues-Gonçalves et al., 2022.[6]	Spain	retrospective cohort study	A total of 316 patients met the inclusion criteria.	The most widely used surgical techniques were open preperitoneal mesh repair (34%) and mesh plug (34%), followed by Lichtenstein (19%), plug and patch (7%) and tissue repair (6%). Open preperitoneal mesh repair was associated with lower rates of recurrence ($p = 0.02$) and associated laparotomies ($p < 0.001$). Complication and 90-day mortality rate was similar between the techniques. Multivariable analysis identified patients aged 75 years or older (OR, 2.08; 95% CI, 1.14–3.80; $p = 0.016$) and preoperative bowel obstruction (OR, 2.11; 95% CI, 1.20–3.70; $p = 0.010$) as risk factors for complications and Comprehensive Complication Index ≥26.2 as risk factor for 90-day mortality (OR, 44.76; 95% CI, 4.51–444.59; $p = 0.01$). Female gender was the only risk factor for recurrence.
Bökkerink et al., 2021.[&]	Netherlands.	A retrospective study.	Clinical trial randomly assigning 800 patients to	Baseline characteristics were comparable in both groups. Pain was less often present after TREPP at 2 weeks and 6 months, but CPIP at rest at 1 year was comparable: 1.9% after TREPP vs 1.4% after TIPP, P ¼ 0.535). The overall recurrence rate was

			either a TREPP or a TIPP operation.	higher in the TREPP group, 8.9% vs 4.6%, P ¼ 0.022). Corrected for a learning curve for TREPP, no significant difference could be assessed (TREPP 5.7% and TIPP 4.8%, P ¼ 0.591).
Takayama et al., 2020.[8]	Japan	Retrospective study.	107 patients with bilateral primary inguinal hernia.	In the TAPP group, the operation time was significantly longer (103 vs 91 minutes; P = .019). The postoperative complication rate was not significantly different between the two groups. One patient (1.0%) in the TAPP group and five patients (4.3%) in the MP group suffered recurrence (P = .30). Postoperative groin pain was not significantly different (14% in the TAPP group vs 31% in the MP group; P = .065), but more patients required analgesics in the MP group (4.1% vs 17%; P = .036). The long-term outcomes, according to a questionnaire, were not significantly different between the two groups. The median follow-up period was 22 (range, 0.4-52) months in the TAPP group and 40 (range, 0.5-108) months in the MP group (P < .001).
Gupta S et al., 2021.[9]	India	Prospective randomized three-arm study.	Total of 121 patients were included in the study.	A total of 121 patients were included in the study with 41 patients in TAPP (Group 1) and 40 each in TEP (Group 2) and OMH (Group3) group. All the 3 groups were comparable in terms of demographic profile, hernia characteristics, intra-operative and early post-operative outcomes. Significant improvement was found in most of the domains of BMSFI score in the study population (p value < 0.001) with no intergroup difference. There was significant increase of anti-sperm antibody level in OMH group as compared to TAPP and TEP (p = 0.001), however, the levels were within normal limit.

RESULT

Our search produced 11 results. After looking at the titles and summaries, we found several papers that fit our criteria. At first, we excluded few articles because they were written in review and case report style. But after reading the full papers carefully, we included five papers in our final analysis. These papers included prospective randomized three-arm study with intention to treat analysis and various retrospective studies.

This retrospective study conducted at ARH's surgical unit focused on patients who underwent pre-peritoneal repairs with polypropylene mesh material from 2010 to 2015. The procedures were exclusively performed by two senior general surgeons, and only first-time presentations of groin hernias were included, excluding recurrent cases. Patients were routinely followed up at six weeks, discharged to general practitioners for further follow-up. Late complications managed by GPs were referred back to the surgical clinic. Electronic hospital records were reviewed, including demographics, hospital stay, and complications. [5]

Results revealed 435 pre-peritoneal repairs on 378 patients, primarily male (93%) with a mean age of 59 years. Operating time averaged 35 minutes, with 83% conducted as day cases. Hernia types included direct (49%), indirect (41.6%), Pantaloon (5.7%), Inguinoscrotal (3.3%), and Femoral (0.2%). Common complications included acute urinary retention (3.9%), hematoma (3%), seroma (2.7%), and surgical site infection (0.9%). Clinically detected recurrence occurred in 2.7% of cases, with a mean time of 5 years from repair. Chronic pain affected 0.2%, referred to chronic pain service, and no mortality was directly linked to hernia repair. [5]

A retrospective single-center cohort study by Rodrigues-Gonçalves et al in 2022 investigated adult patients who underwent emergency groin hernia repair for incarceration or strangulation at Vall d´Hebron University Hospital between January 2010 and December 2018. The study included 316 patients identified from a prospective database, excluding those under 18 years and those with elective surgery after hernia content reduction. Data were collected through a retrospective review, encompassing demographic details, clinical information, operative specifics, and short and long-term outcome measures. [6]

Of the 316 patients, all emergency groin hernia repairs were performed through an open approach, with 206 (65.2%) having an anterior approach and 110 (34.8%) an open preperitoneal approach. Mesh repair was performed in 296 patients (93.67%). The most common complications were acute urinary retention, hematoma, and seroma. Postoperative complications occurred in 48.1% of cases, with 14.8% classified as major. Thirteen patients required surgical reintervention for various complications, and the 90-day mortality rate was 8.5%. No significant differences were found between surgical approaches or repair techniques for complications or mortality. [6]

The median follow-up period was 13.31 months, revealing a recurrence rate of 8.5%. Patients with an open preperitoneal approach had a lower recurrence rate than those with an anterior approach. Mesh plug repair was associated with a higher

recurrence rate. Chronic postoperative inguinal pain was reported by 7 out of 99 patients who responded to the telephone interview, with no significant differences based on surgical approach or technique. Multivariate analysis identified age ≥75 years and preoperative bowel obstruction as risk factors for postoperative complications. For 90-day mortality, a CCI ≥26.2 was identified as a significant risk factor. In terms of recurrence, only the female gender was identified as a risk factor. Overall, this study provides valuable insights into emergency groin hernia repair outcomes, identifying key factors influencing complications, mortality, and recurrence. [6]

The ENTREPPMENT trial, a prospective multicenter single-blinded clinical trial, randomly assigned 800 patients to undergo either a TREPP or a TIPP operation for groin hernias. This trial follows the TULIP trial, which established TIPP as superior to Lichtenstein. The web-based block-randomization process, stratified for the center, ensured unbiased allocation. The trial, registered as ISRCTN 18591339, was approved by the Medical Research Ethics Committee Arnhem-Nijmegen (file number 2012/060). [7]

From February 2014 to February 2017, 800 patients were randomly allocated to TREPP (n=400) and TIPP (n=400). Baseline characteristics were comparable, confirming proper randomization. Inguinal hernias were symptomatic in 92.2% of patients, and hernia-specific characteristics were similar between TREPP and TIPP. Perioperative results revealed small differences in operation duration and incision length, with both techniques having similar complications and postoperative recovery times. [7]

One-year outcomes indicated no significant difference in chronic postoperative inguinal pain (CPIP) between TREPP and TIPP (7.2% vs. 7.9%). Groin numbness was less frequent after TREPP. Sensory disturbances and health status parameters showed no clinically relevant differences. The recurrence rate was higher in TREPP compared to TIPP (8.9% vs. 4.6%), particularly early in the postoperative phase, suggesting a learning curve effect. When considering surgeon experience, recurrence rates were low for both techniques. [7]

This retrospective study included 107 patients with bilateral primary inguinal hernia treated between January 2008 and December 2016. Ethical approval was obtained, and patients underwent either Transabdominal Preperitoneal Repair (TAPP) or Mesh Plug (MP) procedures. Before December 2012, all patients received open hernia repair. TAPP inclusion criteria were age under 80 years and an Eastern Cooperative Oncology Group (ECOG) performance status of 0 or 1. TAPP patients were diagnosed in the outpatient department, and contralateral occult hernias were not repaired during TAPP. Surgical and postoperative outcomes were analyzed. [8]

The TAPP group (n=49) exhibited a significantly longer operation time (103 vs. 91 minutes) and less estimated blood loss (3.3 vs. 9.3 mL) compared to the MP group (n=58). No intraoperative complications were observed. Postoperative complication rates, including seroma and bleeding, did not significantly differ between the groups. No chronic pain was reported. Recurrence rates were 1.0% in TAPP and 4.3% in MP (P = .30). Postoperative hospital stay was longer in the MP group, with 26% staying more than 3 days. Groin pain at 2-3 weeks showed no significant difference (14% TAPP vs. 31% MP), but more MP patients required analgesics (4.1% vs. 17%). Long-term outcomes revealed no significant differences in satisfaction, pain, numbness, and discomfort between TAPP and MP groups. Ten patients (TAPP=1, MP=9) died from unrelated causes. Questionnaire responses were obtained from 93 patients (96.0%), and the median follow-up period was 22 months for TAPP and 40 months for MP. [8]

This prospective randomized study, employing an intention-to-treat analysis, was conducted in a single surgical unit of a tertiary care hospital. The research spanned from July 1, 2017, to March 30, 2019, involving 292 consecutive patients screened for inguinal hernia. A CONSORT diagram details the exclusion of 171 patients due to either not meeting inclusion criteria (155 patients) or not providing consent (16 patients). The remaining 121 patients were randomized into three groups: TAPP (41 patients), TEP (40 patients), and open group (OMH) (40 patients). [9]

Demographic profiles and hernia characteristics were comparable among the three groups. The mean age of the study population was 36.8 ± 9.03, with a mean BMI of 22.3 ± 1.6. Immediate post-operative complications did not significantly differ between the groups, with minimal occurrences of superficial surgical site infection, testicular pain, and scrotal hematoma. Follow-up assessments were conducted at 1 week, 6 weeks, and 3 months, with a mean follow-up time of 17.2 months. Sexual function scores showed statistically significant improvement from preoperative scores to 3 months postoperatively in various domains, including sexual drive, ejaculation, overall satisfaction, and problem assessment. However, no statistically significant differences were observed when comparing the TAPP, TEP, and OMH groups or laparoscopic vs. open approaches. [9]

Anti-sperm antibody (ASA) levels increased postoperatively, reaching statistical significance in the OMH group. However, TAPP and TEP groups did not show a significant rise in ASA, and all values remained within the normal range. Semen analysis revealed significant improvements in various parameters postoperatively, with no statistically significant differences between the three groups or laparoscopic vs. open approaches. [9]

Seroma development at 4 weeks was comparable among the three groups, resolving spontaneously without requiring aspiration. No recurrences were reported during the study period. The mean pain score on the Visual Analog Scale (VAS)

at 3 months showed no significant differences between TAPP, TEP, and OMH groups, and none of the patients complained of chronic groin pain in any group. While laparoscopy exhibited a lower mean pain score at 3 months compared to open repair, it did not reach statistical significance. [9]

DISCUSSION

Inguinal hernia repair is among the most prevalent procedures in general surgery, with incidence rates ranging from 10 per 100,000 in the United Kingdom to 28 per 100,000 in the United States. Accounting for over 75% of abdominal wall hernias, inguinal hernias pose a lifetime risk of 27% for men and 3% for women. In England alone, more than 70,000 inguinal hernia repairs were conducted in 2001 to 2002. While various repair techniques exist, the Lichtenstein tension-free open mesh repair is widely regarded as the gold standard, particularly in Australian surgical practice. An alternative open approach, introduced by Robert Kugel in Washington, involves a posterior (pre-peritoneal) repair, offering a mechanical advantage by placing the mesh on the side of the abdominal wall experiencing higher pressure. This technique, performed through a small oblique incision, exposes the pre-peritoneal space and allows for the placement of monofilament polypropylene mesh, combining the benefits of open and minimal access procedures.[10] A recent systematic review by Andresen et al.[11] indicated that open pre-peritoneal repair yields outcomes comparable to the standard anterior approach, with a recurrence rate of around 2% as reported in the literature.[5]

In the current study, notable advantages favoring open preperitoneal repair over the anterior approach were identified. These advantages encompassed a reduced necessity for associated midline laparotomies and a lower recurrence rate. Notably, in cases where potential intestinal resection was anticipated, such as femoral hernia or prolonged incarceration, the frequently employed techniques included open preperitoneal repair, mesh plug, and tissue repair. Independent factors associated with postoperative complications were identified as age ≥75 years and preoperative intestinal obstruction. A significant association was observed between a Comprehensive Complication Index (CCI) score ≥26.2 and increased 90-day mortality, while female gender correlated with hernia recurrence.[6]

Examining short-term outcomes within our series, no discernible differences were noted between groups based on the surgical approach concerning postoperative complications or hospital stay length. However, when comparing repair techniques, tissue repair exhibited a higher CCI® compared to mesh repairs. This heightened severity of postoperative complications in the tissue repair group may be linked to a higher incidence of contaminated surgeries, a greater frequency of necrotic hernia content, and intestinal resections. These findings align with existing literature and underscore the safety of mesh repairs in emergency settings. [6]

On another note, the preperitoneal mesh repair, despite having a higher proportion of bowel resections, was associated with fewer midline laparotomies in our study. This is noteworthy given that midline laparotomy in emergency groin hernia repair can reach up to 53.1%, as reported, and has been identified as a prognostic factor for postoperative morbidity. Intriguingly, our data suggests that the need for an additional midline laparotomy and the decision to perform a non-mesh repair were not influenced by the initial approach, whether open preperitoneal or anterior. [6]

Moreover, the open preperitoneal method demonstrated significantly lower rates of recurrence, both in terms of approach and techniques. Our recurrence rate of 8.5%, predominantly after mesh plug repair, underscores the need to avoid this technique in line with current clinical guidelines. The multivariate analysis highlighted female gender as the sole risk factor for recurrence after emergency groin hernia repair, a trend consistent with prior data. The comprehensive exposure of the myopectineal orifice afforded by the open preperitoneal technique makes it particularly attractive in emergency settings, enabling the identification of all potential hernias in the inguinofemoral region. [6]

The study reported a relatively low incidence of chronic postoperative inguinal pain (2.2%), with no significant differences based on the type of approach or repair technique. This contrasts with a wide range of 0.7% to 75% reported in open hernia mesh repairs, possibly attributed to the high number of elderly patients, as chronic postoperative inguinal pain tends to decrease with age. While various open surgical techniques aim to place the mesh into the preperitoneal space, limited studies have reported results for the open preperitoneal approach in emergency groin hernia repair. The study attests to the effectiveness and safety of open preperitoneal repair using a posterior approach in the challenging scenario of incarcerated/strangulated groin hernia. The reported morbidity rate of 48.1%, major complications of 14.8%, and mortality of 8.5% are notably higher than in other similar studies. This discrepancy is likely influenced by the inclusion of a substantial number of elderly patients with high comorbidity in our series. Notably, patients older than 75 years and those with preoperative bowel obstruction emerged as independent risk factors for postoperative morbidity, emphasizing the importance of elective inguinal hernia repair, especially in high-risk individuals. The study introduces the use of CCI® as a risk scale, revealing its utility in assessing morbidity in high-risk patients with the likelihood of multiple complications. Overall, these findings underscore the critical role of timely elective inguinal hernia repair, particularly for vulnerable populations. [6]

The ENTREPPMENT trial aimed to investigate whether there is a lower incidence of chronic postinguinal pain (CPIP) following Totally Retained Ejaculated Preperitoneal (TREPP) repair compared to Totally Implantable Prosthetic Preperitoneal (TIPP) repair, involving the randomization of 800 patients. Despite the established nature of open surgery with a posterior route for preperitoneal mesh placement, the TREPP method gained popularity for aligning with Reinpold's

recommendations. The trial demonstrated a short operation time, swift recovery, and low complication rates for both techniques. While continuous CPIP was low and not significantly different after TREPP versus TIPP operations, postoperative pain and persisting numbness at two weeks and six months were more frequent after TIPP. The unexpectedly high recurrence rate after TREPP may be attributed to a learning curve effect.[7]

This trial, with a level of evidence (LoE) of 1b, confirms previously promising results after TREPP and favorable outcomes after TIPP surgery. Retrospective TREPP studies reported CPIP rates ranging from 1.7% to 5.3% and recurrence rates between 1.2% and 3.9%, with varying follow-up durations. Comparatively, evidence on TIPP surgery, mainly against Lichtenstein's technique, demonstrated CPIP rates below 5%, recurrence rates around 3%, and faster recovery. The ENTREPPMENT trial reported persisting numbness rates after TREPP (15.3%) and TIPP (10.6%), whereas Lichtenstein ranged from 12.5% to 51.0%, though data remain limited.

Literature comparison with the ENTREPPMENT trial is challenging due to TIPP technique modifications, diverse pain definitions, and flawed follow-up. Nevertheless, clinically relevant pain incidences after both TREPP and TIPP in this trial were deemed low. Secondary outcomes fell within the expected range, except for the elevated recurrence rates, which, when adjusted for surgeon's experience, aligned with reported literature ranges. Surgeon experience's impact on outcomes was noted in the TEP technique, emphasizing the importance of proficiency.[7]

The trial's hypothesis of less chronic pain, stemming from avoiding intraoperative nerve damage, was not substantiated. While neuropathy is associated with CPIP, factors like mesh type, inflammatory response, and fibrotic processes contribute to the complex, unknown role of these influencers. The CPIP incidence after TIPP in the ENTREPPMENT trial was lower than in the TULIP trial, potentially influenced by increased experience and ongoing awareness within the research group. [7]

Distinctly, lateral recurrences were more common than medial ones after open preperitoneal techniques, contrasting with recurrence patterns in Lichtenstein's and endoscopic procedures. This difference may be attributed to the difficulty of dissecting Bogros' space compared to Retzius' space, potentially exacerbated by the Polysoft mesh's recoil ring interruption. A learning curve effect for recurrences, especially with the TREPP technique, was observed, prompting further studies on the optimal number of supervised procedures and strategies to mitigate harm during the learning phase. [7]

This study aimed to compare the clinical outcomes of Totally Extraperitoneal (TAPP) and Mesh Plug (MP) procedures for bilateral primary inguinal hernia, focusing on surgical, short-term, and long-term outcomes. The TAPP procedure was conducted under general anesthesia, while the MP procedure was performed under local anesthesia. A study by Dimitrios et al, comparing TAPP versus MP repair under different anesthetic methods, revealed a lower chronic pain incidence for the TAPP group, with no significant differences in other short- and long-term complications. The anesthesia method did not appear to impact postoperative outcomes. The TAPP group exhibited a significantly longer operative time, but postoperative complications were similar in both groups. More patients in the MP group required analgesics at 2-3 weeks postoperatively, suggesting TAPP as a feasible, safe, and less painful procedure.[8]

European Hernia Society guidelines recommend Lichtenstein and endoscopic procedures for unilateral hernia repair, and from a socioeconomic perspective, an endoscopic procedure for the active working population, particularly for bilateral hernia repair. The MP technique, developed in 1993, is technically simple to learn and perform. Some studies favored MP repair over Lichtenstein repair in terms of postoperative pain, patient quality of life, shorter operation duration, and hospital stay, while both methods exhibited similar recurrence and complication rates. MP has been widely used, especially in Japan. A prospective study comparing TAPP and MP for unilateral inguinal hernia demonstrated that MP was faster, more cost-effective, technically easier, and resulted in fewer complications, both short- and long-term, along with a reduced recurrence rate. [8]

However, few studies have compared TAPP with MP for bilateral inguinal hernia. This study is the first to compare TAPP with MP for bilateral primary inguinal hernia, summarizing data from five studies comparing TAPP and open techniques for bilateral inguinal hernia. The open procedures included preperitoneal prosthetic repair through a vertical midline incision, Shouldice repair, Lichtenstein repair, and MP in this case. Overall, the TAPP group had slightly longer operative procedures, influenced by the learning curve and surgeon experience. Despite differences in complication definitions, complication rates, except for recurrence, were comparable between the two groups. [8]

Chronic pain, a significant complication of inguinal hernia repair, was evaluated in this study, revealing a lower incidence with the laparoscopic approach. TAPP and MP patients reported low chronic pain rates at 2.1% and 4.0%, respectively, with no severe pain reported. Recurrence rates for both TAPP (1.0%) and MP (4.3%) were favorable compared to published results. Adjustments in mesh placement in TAPP procedures were made to address recurrences. Disability time showed earlier resumption of normal activity in the TAPP group, although not statistically significant. Postoperative pain at 2-3 weeks was higher in the MP group, with more patients requiring analgesics, possibly influenced by anesthesia type. [8]

Long-term complications focused on recurrence, chronic pain, numbness, and discomfort, with patient satisfaction reported as comparable between TAPP and MP groups. Overall, TAPP did not increase complication and recurrence rates, and the resumption of work activities occurred earlier. The study concluded that both TAPP and MP procedures are effective options for bilateral primary inguinal hernia repair, with individual considerations such as operative time, postoperative pain, and anesthesia preferences influencing the choice between the two techniques. [8]

Laparoscopic repair has become the preferred method for managing groin hernias, as indicated by recent IEHS guidelines. However, the EHS guidelines still recognize open Lichtenstein's mesh repair as the gold standard. Techniques such as Totally Extraperitoneal (TEP), Transabdominal Preperitoneal (TAPP), and Open Mesh Hernia (OMH) repair have been standardized, with randomized control trials demonstrating comparable recurrence rates for these groin hernia repair methods. While these procedures have been well-studied in terms of recurrence rates, there is an increasing focus on understanding their impact on sexual and testicular functions, as well as patients' overall quality of life.[9]

Studies have explored sexual dysfunction as a common complaint among inguinal hernia patients, often attributed to factors like preoperative pain, dragging sensations, and cord vessel engorgement during sexual activity. Some studies, including our previous research, have compared testicular function and hormonal levels following open and laparoscopic groin hernia repair. Inguinal, genital, or ejaculatory pain is reported in a small percentage of men after groin hernia repair. [9]

A study by Isil et al.[12] compared the effects of Totally Extraperitoneal (TEP) and Lichtenstein hernia (LH) repairs on men's sexual function and quality of life, finding that TEP repair showed better results at the 7th and 30th day evaluations, but this advantage diminished by the 90th post-operative day. The Danish hernia database study reported dysejaculation in 0.1% of patients and various levels of pain during sexual activity in a percentage of patients. Our study, utilizing the Brief Male Sexual Function Inventory (BMSFI), showed significant improvement in all domains of sexual function, particularly sexual drive and overall satisfaction, at 3 months postoperatively. TAPP, TEP, and OMH techniques demonstrated comparable effects on sexual functions.[9]

One less studied surrogate marker of testicular function is sperm count and anti-sperm antibody levels. Experimental studies have suggested that handling cord structures during surgery may lead to anti-sperm antibody development, potentially impacting fertility. Stula et al. reported an increase in anti-sperm antibody levels and testicular resistance index (RI) at 3 months follow-up in TAPP repair, with a higher change in the open method compared to TAPP. In our study, anti-sperm antibody levels increased postoperatively, especially in the OMH group, while TAPP and TEP groups did not show a significant rise. All values remained within the normal range of anti-sperm antibody. [9]

Peeters et al. reported a decrease in sperm motility following laparoscopic mesh repair, but this effect ceased to exist at a 1-year follow-up. In our study, semen analysis parameters, including volume, total sperm concentration, sperm count, and vitality, improved significantly postoperatively. Progressive motility slightly decreased, but the change was not statistically significant. This contradicts findings by Peeters et al. and Dong et al., who suggested that hernia repair with mesh has no significant effect on male fertility. [9]

CONCLUSION

In conclusion, open pre-peritoneal mesh repair in the rural Western Australian setting demonstrates safety with a low complication rate comparable to published studies. This minimally invasive approach, devoid of the need for specialist laparoscopic equipment and with lower costs, offers additional mechanical advantages and yields favorable postoperative outcomes. The study suggests that the open preperitoneal approach is associated with lower recurrence rates and reduced midline laparotomy instances, making it a suitable choice, especially in cases involving intestinal resection to avoid additional morbidities related to midline laparotomies. Notably, mesh plug repairs exhibited a higher recurrence rate, while other anterior approaches proved safe and effective in emergency groin hernia repair, allowing surgeons to exercise discretion in choosing the approach based on individual cases.

Furthermore, the randomized comparison between Transrectus Sheath Preperitoneal (TREPP) and Transinguinal Preperitoneal (TIPP) approaches revealed low and comparable rates of chronic pain. While both techniques demonstrated favorable outcomes, TIPP was favored for learning curve-associated recurrences, while TREPP showed superior short-term pain outcomes. This trial did not conclusively identify an explicit advantage for either technique. Additionally, in the context of bilateral primary inguinal hernia repair, Transabdominal Preperitoneal (TAPP) outperformed mesh plug (MP) repair, displaying superior results in terms of postoperative pain and reduced medication usage for pain relief without increasing complication and recurrence rates.

Lastly, whether open or laparoscopic (TEP or TAPP), inguinal hernia repair in this study led to improvements in sexual functions and fertility indices. The findings highlight the significance of preoperative counseling, allowing for a nuanced choice of repair based on the available expertise in a given medical center.

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