Long term outcomes of mesh versus non-mesh repair in inguinal hernia surgery: a systematic review of randomized case controlled study

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ABSTRACT

Inguinal hernia repair is a commonly performed surgical operation that is extensively conducted on a global scale. This study comprehensively investigates the enduring results of employing mesh versus non-mesh repair techniques in inguinal hernia surgery. The data was obtained by an extensive search of internet databases, such as Google Scholar, ColumbiaDoctors, and PubMed/MEDLINE. The search specifically targeted randomized controlled trials (RCTs) that were published in English. The review examined seven relevant trials, which were evaluated for recurrence rates, postoperative discomfort, and other clinical outcomes. The findings suggest that the use of mesh surgery is superior in preventing hernia recurrence compared to non-mesh repair, without any notable disparities in postoperative complications or discomfort. Research has demonstrated that the utilization of lightweight (LW) mesh can effectively decrease chronic pain and enhance the speed of recovery. However, because to discrepancies in study designs, surgical procedures, and patient demographics, additional consistent and comprehensive research is necessary to improve therapeutic regimens. Additional research should prioritize the investigation of these constraints, specifically in relation to extended-term results and the influence of surgical proficiency on improving clinical judgment and patient welfare.


INTRODUCTION

An inguinal hernia is the most commonly diagnosed type of hernia. It is estimated that one third of males will be diagnosed with an inguinal hernia at some point in their lifetime. The age distribution has two distinct peaks, with the
maximum occurrence observed during childhood and in those aged 50 years and above. The diagnosis is often made by doing a clinical examination of a mass in the inguinal region, although in some cases, patients may exhibit symptoms of intestinal blockage. Inguinal hernia repair is the exclusive and conclusive treatment, and it is also one of the most often conducted surgical procedures. Typically, it is carried out as a voluntary operation under local, spinal, or general anesthesia (Berndsen et al., 2019). Hernias are the abnormal protrusions of an entire or partial organ through the bodily wall that typically encloses it. Groin hernias consist of inguinal hernias (96%) and femoral hernias (4%), and frequently cause symptoms such as discomfort. They are highly prevalent, with a projected lifetime risk of 27% in men. At times, these conditions may arise as urgent situations with consequences such bowel imprisonment, obstruction, and strangling. Surgical repair is the ultimate cure for all hernias, with inguinal hernia repair being a frequently done surgical surgery. Hernioplasty, which involves the use of mesh, and herniorrhaphy, which does not utilize mesh, are both regularly performed procedures. However, there is a growing preference for mesh repairs in wealthier countries (Lockhart et al., 2018).

Male individuals are more prone to developing inguinal hernias. While the diagnosis of hernias in men can be easily determined through physical examination, women often require ultrasonography for accurate diagnosis. Ultrasonography is a useful tool for investigating probable causes of groin pain, such as recurrent hernia, surgical complications following treatment, or other conditions including groin mass or hydrocele. Magnetic resonance imaging (MRI) exhibits superior sensitivity and specificity compared to ultrasonography. Herniography, a procedure that entails the injection of contrast media into the hernial sac, may be employed in specific individuals. Laparoscopic repair is linked to a shorter recovery period, earlier return to normal daily activities, reduced pain, and decreased rates of recurrence compared to open repair (Shakil et al., 2020). Inguinal hernia surgeries are the most commonly performed surgeries in the DACH region, with a total of 300,000 procedures conducted each year across Germany, Austria, and Switzerland. Despite the expressed political intent and the growing legislative push to reduce the use of expensive inpatient care by doing more outpatient procedures, outpatient treatment has been relatively insignificant in the DACH region. The governing bodies of the specialized organizations, namely the German Hernia Society (DHG), the Surgical Working Group Hernia (CAH of the DHG), the Austrian Hernia Society (ÖHG), and the Swiss Working Group Hernia Surgery (SAHC), are actively addressing this issue (Niebuhr et al., 2023). Recurrence following surgery for inguinal hernia is a significant clinical issue, and various factors that increase the likelihood of recurrence, such as surgical technique, re-recurrence, and family history, have been found. There is a lack of research on non-technical patient-related factors that affect the likelihood of a hernia recurring following surgery (Burcharth, 2014).

**METHODOLOGY**

Data Search Strategy

A systematic and thorough search approach was utilized to locate pertinent research on Long term Outcomes of Mesh Versus Non-Mesh Repair in Inguinal Hernia Surgery. We conducted a thorough search of the following electronic databases: Google Scholar, ColumbiaDoctors, PubMed/MEDLINE. In order to successfully combine search terms, the search strategy comprised a combination of keywords and medical topic headings (MeSH) linked to Hernia, Inguinal hernia, mesh repair, hernia surgery, and non-mesh repair. The search results were filtered and limited based on language, study design, and publication type. The search parameters were limited to peer-reviewed research and articles published in the English language. To find more research that met the inclusion criteria, the reference lists of pertinent papers and systematic reviews were manually searched.

<table>
<thead>
<tr>
<th>Category</th>
<th>Keywords/MeSH Phrases</th>
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<tr>
<td>Hernia</td>
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Source: the authors

Inclusion Criteria:

Included were studies that fulfilled the following criteria:

- Studies evaluating inguinal hernia
- Studies that offer in-depth information regarding Mesh Versus Non-Mesh Repair in Inguinal Hernia Surgery
RESULTS AND DISCUSSION

7 pertinent studies in all that matched the inclusion requirements for this systematic review were found using the systematic search approach. 4 of 7 researches particularly examined Mesh Repair in inguinal hernia, while the remaining three studies concentrated on the Non mesh repair. Table 2 provides a summary of the features and major conclusions of these investigations.
Research studies and analysis have shown that using mesh for inguinal hernia repair is more effective than non-mesh repair, as it has lower recurrence rates. Long-term follow-up is the sole dependable method for assessing recurrence rates following hernia surgery. The median duration of follow-up was 128 months for non-mesh repair and 129 months for mesh repair. The hernia recurrence rates after a period of 10 years were 17% and 1% respectively (P = 0.005). 50% of the recurrences occurred within a 3-year follow-up period. No significant link was found between hernia recurrence and factors such as age, surgeon’s level of experience, contralateral hernia, obesity, history of pulmonary disease, constipation, or prostate disease. Mesh repair is superior to non-mesh hernia repair even after a decade. Recurrence rates can be underestimated because recurrences might still occur for a period of up to 10 years following surgery (Van Veen et al., 2007). The most effective approach for repairing inguinal hernias has not yet been established. The recurrence rate for non-mesh techniques ranges from 0.2 to 33 percent. The efficacy of tension-free mending using prosthetic mesh has yet to be verified. A total of 300 patients were randomly assigned, with 11 being excluded. The three-year recurrence rates showed a significant difference: 7% for non-mesh repair (n = 143) and 1% for mesh repair (n = 146) (P = 0.009). There were no disparities observed in clinical indicators, quality of life, and expenses. The use of mesh in primary inguinal hernia repair is more effective than non-mesh treatment in preventing hernia recurrence and is also cost-efficient. There were no differences in postoperative complications, discomfort, and quality of life across the groups (Vrijland et al., 2002).

A comparative study was conducted to assess the results of hernia repair using the non-mesh (Desarda) and mesh (Lichtenstein) techniques in Black African patients. The study focused on evaluating immediate postoperative discomfort, time taken to resume normal walking, duration of the operation, and occurrence of complications. This single-center randomized controlled trial enrolled a total of 101 people, with 51 in the Lichtenstein arm and 50 in the Desarda arm. The outcome measures were assessed at intervals of 1–2 hours, 3 days, 7 days, and 14 days. The study’s statistical power was determined to be 80%, with a confidence interval (CI) of 95%. A two-sided P-value of less than 0.05 was regarded to indicate statistical significance. There was no significant difference in the average pain score between the two treatment groups on the third day after surgery. The pain scores were 3.33 ± 1.75 for the Lichtenstein group and 2.73 ± 1.64 for the Desarda group, with an effect size of 0.59 (−0.088–1.272). On the seventh day after surgery, the pain scores were 1.31 ± 1.19 for the Lichtenstein group and 1.31 ± 1.34 for the Desarda group, with an effect size of 0.00 (−0.509–0.509). There was no observed difference in the average day when normal walking resumed. There was a notable disparity in terms of the duration of the operation, with the Desarda repair being significantly shorter. The study’s findings indicate that the Desarda technique has a comparable impact to the Lichtenstein method in terms of influencing the first clinical outcomes of hernia repair. Nevertheless, the operator in this investigation demonstrated that the Desarda repair necessitates a considerably shorter duration of surgery (Manyilirah et al., 2011).

A randomized research investigated the potential long-term advantages of using lightweight (LW) polypropylene mesh in reducing chronic pain and inflammation following inguinal hernia repair. A total of six hundred male individuals with a main unilateral inguinal hernia were randomly assigned to undergo either Lichtenstein repair using a normal polypropylene mesh or Lichtenstein repair using a LW mesh at one of six medical centers. The patients were unaware of the type of mesh they were given. A postoperative clinical examination was conducted and a pain questionnaire was filled out three years following the surgery. Out of the 590 males who underwent surgery, 243 out of 294 in the regular mesh group and 251 out of 296 in the LW mesh group were evaluated in the clinic. This evaluation took place a median of 37 months (with a range of 30–48 months) after the hernia repair procedure. Each group had nine cases of recurrent hernias. Patients who received LW mesh experienced reduced pain during examination, less pain when transitioning from lying to sitting, fewer various groin issues,
and reported less frequent awareness of the mesh compared to patients who received standard mesh. The utilization of LW mesh in Lichtenstein hernia repair did not have an impact on the recurrence rates. However, it did enhance certain aspects of pain and suffering three years post-surgery (Bringman et al., 2006).

The Shouldice approach exhibits superior recurrence rates compared to alternative suture repairs, making it highly recommended for non-mesh inguinal hernia repair. Desarda has recently proposed a novel tissue restoration procedure, which has been evaluated in experiments comparing it to the Lichtenstein technique. A study utilized network meta-analysis to analyze randomized controlled trials published on tissue repair, specifically comparing the Lichtenstein, Desarda, and Shouldice procedures. The parameters to be evaluated are operative time, recurrence rate, complications (general, intraoperative, and surgical site occurrences), VAS score on postoperative day 1, numbness, chronic pain, and return to daily activities. Fourteen randomized controlled trials (RCTs), with a total of 2791 patients, met the criteria for inclusion and were chosen for the final analysis. The anchored indirect treatment comparison revealed that Desarda's technique had a considerably reduced operative time (mean difference: -12.9 minutes; 95% confidence interval: -20.6 to -5.2) and a faster recovery (mean difference: -6.6 days; 95% confidence interval: -11.7 to -1.4). The results of intraoperative complications, early postoperative discomfort, seroma/hematoma, hydrocele and infection rates, recurrence, numbness, and persistent pain were comparable between the two groups. The Desarda hernia repair is a viable option for primary inguinal hernia repair when a non-mesh technique is preferred. It offers reproducibility and faster recovery after surgery, making it a valuable alternative to the Shouldice procedure (Bracale et al., 2019).

After undergoing inguinal hernia procedures, approximately 10%–12% of individuals experience chronic pain. There is a suggestion that reducing the amount of foreign material could potentially reduce pain. If the incidence of persistent discomfort decreases following repairs, specific hernias may be treated without the use of mesh. There were a total of 23 randomized controlled trials (RCTs) including 5,444 subjects. The duration of follow-up ranged from 0.5 to 10 years, with a median of 1.4 years. Twenty-one studies provided data on the crude rates of chronic pain. When taking into account moderate and severe pain, the prevalence of discomfort after non-mesh repairs and mesh repairs were comparable. The median prevalence of pain after non-mesh repairs was 3.5% (ranging from 0% to 16.2%), while the median prevalence of pain after mesh repairs was 2.9% (ranging from 0% to 27.6%). Both the meta-analyses and the network meta-analysis found that there was no discernible disparity in chronic pain rates when comparing non mesh repairs with open- and laparoscopic mesh repairs. Mesh can be utilized without any concern of exacerbating chronic discomfort (Öberg et al., 2018). Prior to reaching a definitive conclusion about the lack of benefits of non-mesh procedures in relation to chronic pain, it is imperative to conduct a randomized controlled trial (RCT) that particularly examines chronic pain following non-mesh repair in young patients with lateral hernias. The study should prioritize pain as the main endpoint and ideally have sufficient power to examine both recurrence and chronic pain. Pain evaluations should be conducted using validated pain questionnaires no earlier than 6 months after the surgery. According to the study's highest ranking (SUCRA) and its lower recurrence rate compared to other non-mesh approaches, the Shouldice repair appears to be the most promising non-mesh repair method (Simons et al., 2009).

Limitations

The studies exhibited notable variations in terms of design, sample sizes, methodology, and durations of follow-up, making comparisons more intricate. The outcomes were influenced by variations in surgical techniques and the proficiency of the surgeon, specifically with the rates of recurrence and the existence of concurrent medical problems. The lack of ongoing monitoring periods has hindered a comprehensive understanding of the long-term effectiveness, particularly in relation to chronic pain and relapses. The generalizability and reliability of the conclusions were additionally impeded by the heterogeneity of the patient population and the uneven documentation of outcomes. Several studies were affected by potential reporting bias and lack of blinding, leading to additional bias. The variations in healthcare procedures across different regions and the overwhelming emphasis on male patients severely limit the relevance and effectiveness for wider populations, particularly ladies. The omission of pertinent data may have resulted from the lack of studies undertaken in languages other than English. The evolution of mesh technology and the emphasis on particular mesh types may not fully align with contemporary practices, hence diminishing its utility. In order to improve the comparison of long-term results between mesh and non-mesh repairs in inguinal hernia surgery, future studies should give priority to examining these limitations.

**CONCLUSION**

Surgical repair of an inguinal hernia with mesh has been found to be more effective in the long run compared to non-mesh repair, especially in reducing the likelihood of the hernia recurring. The evaluated studies demonstrate the
substantial advantages of mesh repair, such as reduced rates of recurrence and similar outcomes in postoperative discomfort. However, differences in study methods, surgical procedures, and patient traits highlight the need for more consistent and comprehensive studies, despite the advantages indicated earlier. Additional research should specifically prioritize the investigation of these constraints, with a particular emphasis on long-term results, persistent pain, and the influence of surgical proficiency. Implementing this approach would generate a more comprehensive and accurate evaluation, leading to enhanced medical decision-making and ultimately superior results for patients receiving surgical intervention for inguinal hernias.

REFERENCES


