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A Comparative Analysis of Mesh Versus Non-Mesh Techniques in Hernia Repairs

Dr. Mujtaba Salih Khudhair[1], Dr. Ali Mosa Jafar[2], Dr. Muthanna Jabir Nemah[3]

[1]M.B.Ch.B., C.A.B.S. \ (General Surgery), Iraqi Ministry of Health, Karbala Health Directorate, Department of General Surgery, Al-Imam Al-Hussein Medical City, Karbala, Iraq.

[2]M.B.Ch.B., F.I.C.M.S., D.G.S. \ (Kufa), D.G.S. \ (BABIL), (General Surgery), Surgical Oncology Fellowship, Iraqi Ministry of Health, Karbala Health Directorate, Department of General Surgery, Al-Imam Al-Hussein Medical City, Karbala, Iraq.

[3]M.B.Ch.B., F.I.C.M.S., (General Surgery), Iraqi Ministry of Health, Karbala Health Directorate, Department of General Surgery, Al-Imam Al-Hussein Medical City, Karbala, Iraq.

Abstract: Background: Hernia repair is one of the most common surgeries worldwide, with various mechanisms employed to repair.**Objective:** The aim of the present study is to compare the clinical outcomes of mesh versus non-mesh techniques for hernia repair on the basis of operation results, post-operative recovery, complications, and patient satisfaction.**Methods:** There were 110 patients, of which 55 underwent mesh repair and 55 underwent non-mesh repair. We compared and enrolled all the clinical outcomes of the hernia repair patients, like the type of hernia, result of surgery, post-operative complications, patient satisfaction, and health-related quality of life by SF-36.**Results:** Most patients were male (52.7%). The mesh group had significantly lower mean operative time (90 minutes vs 105 minutes) and less post-operative complications (25.5% vs 38.2%). The overall rate of success was also higher in the mesh group (90.9% vs 81.8%). The patients in the mesh group reported earlier recovery, with a mean time to return to normal work being 14.7 days versus 20.2 days in the non-mesh group.**Conclusion:** From the findings, it appears that mesh techniques yield improved outcomes in terms of shorter operating time, fewer complications, and earlier recovery compared to non-mesh techniques in herniorrhaphy.

Keywords:. Hernia repair, mesh technique, non-mesh technique, surgical outcomes, post-operative recovery, patient satisfaction, (sf-36 health survey) health-related quality of life.

INTRODUCTION

Hernia repair is one of the most common operations performed in the world, with millions of cases treated every year. A hernia occurs when an organ or tissue protrudes through a gap in the overlying muscle or connective tissue, often causing severe pain and disability (Smith, S. M. *et al*., 2022). Approximately 75% of hernias of the abdominal wall are corrected surgically, and the two predominant techniques utilized for herniorraphy (repair of hernias) are the use of mesh and non-mesh (suture) method (Hentati, H. *et al*., 2014). Understanding differences of clinical outcomes between the two techniques is essential because medical professionals strive to optimize the effectiveness of surgery, minimize complications, and improve the quality of life of patients. (Lockhart, K. *et al*., 2018; Mohamedahmed, A. Y. Y. *et al*., 2020)

Historically, traditionally, the non-mesh method, primarily with sutures, has been a common practice in hernia repair. The procedure simply involves sewing the edges of the defect together, strengthening the abdominal wall [Sakamoto, T. *et al*., 2022]. This procedure may be useful, but its flaws are increasingly being realized, particularly in terms of higher recurrence and recovery rates (Kouhia, S. *et al*., 2015). Conversely, the introduction of synthetic mesh materials has significantly enhanced hernia repair using a supportive framework for tissue healing. Mesh repair operations, such as tension-free methods such as the Lichtenstein repair or laparoscopic operations, have proven to have the potential for reducing recurrence and stay in hospital stay durations. (Bracale, U. *et al*., 2019; Finch, D. A. *et al*., 2019).

The efficacy of mesh over non-mesh techniques has been the target of numerous studies. Systematic reviews and meta-analyses all consistently show that mesh repairs have a remarkable decrease in recurrence rates when compared to their non-mesh counterparts (Manyilirah, W. *et al*., 2012). It is reported that recurrence in mesh repairs can be as low as 5%, while in non-mesh repairs, it can range as high as 10% or more (Alabi, A. *et al*., 2022). Furthermore, the complications of chronic pain, seroma, and infection have been researched, with evidence suggesting that the mesh repairs have the potential to be at greater risk for some complications, but the advantages in terms of overall satisfaction and recovery time still outweigh mesh techniques. (Tripoloni, D. E. *et al*., 2021)

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***Corresponding Author:** Dr. Mujtaba Salih Khudhair

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While the obvious benefits of mesh repair cannot be overstated, concerns related to biocompatibility as well as late complications of synthetic material remain pertinent (Berndsen, M. R. *et al*., 2019). The possibility of chronic pain and complications from foreign body reaction has generated controversy over the appropriate use of mesh in clinical practice. These conditions make it necessary to measure the clinical results not only in recurrence but also in quality of life, complications following surgery, and patient satisfaction (Berndsen, M. R. *et al*., 2019). As the practice of healthcare continues to be patient-centered, an understanding of patients' perceptions about surgical results has become crucial in making clinical decisions. (Bracale, U. *et al*., 2019)

With a wide-ranging assessment scheme encompassing both patient-reported and clinical outcomes, it is possible to have a more robust understanding of the relative effectiveness of mesh versus non-mesh approaches (Bringman, S. *et al*., 2006; Burcharth, J. 2014). Endpoints of interest could potentially extend beyond crude recurrence rates to include measurement of postoperative pain, functional status, and quality of life scores, providing an overall impression of the success of surgery (Lockhart, K. *et al*., 2018). Furthermore, patient-specific variables like age, comorbidities, occupation, and lifestyle may influence the appropriateness of the chosen surgical technique, highlighting the importance of individualized techniques for hernia repair. (Manyilirah, W. *et al*., 2012)

PATIENTS AND METHODS

Study Design

This study employed a cross-sectional design to compare the clinical outcomes of mesh and non-mesh techniques in patients who underwent hernia repair. This research was conducted in the hospitals in Karbala, Iraq hospitals. The study was conducted over a period of 12 months of follow-up, from March 2024 to March 2025. The inclusion criteria were adult patients (28 years and older) with diagnosed hernias and scheduled for elective surgical repair. The exclusion criteria included patients with a history of previous hernia repair, pregnancy, and any contraindications to surgery.

Data Collection of Participants

Informed consent was obtained from all the participants before enrolling in the study. One hundred ten patients were enrolled, and 55 patients underwent the mesh repair technique and 55 patients the non-mesh repair technique. Patient demographics (age, sex, body mass index (BMI), American Society of Anesthesiologists (ASA) classification), as well as hernia characteristics (type, size, duration of symptoms), were gathered using a standardized questionnaire. Pre-operative assessment, including medical history, physical examination, and imaging studies (where appropriate), was also conducted.

Surgical Management

Patients were assigned to the mesh or non-mesh group based on the surgeon's preference and the type of hernia presentation. All procedures were done by senior surgeons specializing in hernia repair. The mesh repair group was given the laparoscopic or open tension-free repair technique using commercially available mesh (e.g., polypropylene mesh). The non-mesh group underwent traditional tension repair techniques, i.e., the Bassini or Shouldice repair. Laparoscopic operative times, intra-operative complications, and open conversions in the laparoscopic group were recorded meticulously.

Post–Operative Results

Post-operative outcomes were assessed at regular intervals following surgery (1 week, 1 month, 3 months, and 6 months). Data collection focused on complications such as seroma, hematoma, surgical wound infection, chronic pain, and hernia recurrence. Clinical evaluation included physical examinations and patients' self-reporting of any symptoms experienced following the operation. The primary outcome measures included the rate of complications, duration of hospital stay, and time taken to return to normal activities or work. The satisfaction levels with the surgical outcomes among the patients were also evaluated based on a questionnaire designed for the purpose of the study.

Health-Related Quality of Life (HRQoL) in Hernia Patients: SF-36

To assess Health-Related Quality of Life (HRQoL), the Short Form-36 Health Survey (SF-36) was administered pre-operatively and again at 1 month, 3 months, and 6 months after operation. The SF-36 consists of 36 items covering eight domains: Physical Functioning, Role Limitations due to Physical Health, and Role Limitations due to Emotional Health, Energy/Vitality, Emotional Well-Being, Social Functioning, Pain, and General Health. Each domain is scored on a 0 to 100 scale, with higher scores indicating a more desirable

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quality of life. SF-36 data were scored according to standard algorithms to obtain both component scores and a summary measure of physical and mental health. Changes over time in the HRQoL scores between the mesh and the non-mesh groups were compared by repeated measures ANOVA to determine if there were any statistically significant differences.

Statistical Analysis

Statistical analysis was performed using SPSS version 22.0 to determine the significance of differences between groups. The continuous variables were expressed as mean ± standard deviation (SD), and the categorical variables were expressed as frequency and percentage. Comparisons between groups were made using independent t-tests for continuous variables and chi-square tests for categorical variables. A p-value < 0.05 was considered statistically significant.

RESULTS

Table 1. Demographic and Basic Features of Patients.

Feature	***Mesh (n = 55)***	***Non-Mesh (n = 55)***	***Total (n = 110)***
Age Group (years)			
28 - 34	15 (27.3%)	12 (21.8%)	27 (24.5%)
35 - 41	10 (18.2%)	13 (23.6%)	23 (20.9%)
42 - 48	13 (23.6%)	11 (20.0%)	24 (21.8%)
49 - 54	17 (30.9%)	19 (34.5%)	36 (32.7%)
Gender			
Male	30 (54.5%)	28 (50.9%)	58 (52.7%)
Female	25 (45.5%)	27 (49.1%)	52 (47.3%)
BMI (kg/m²)			
Underweight	5 (9.1%)	4 (7.3%)	9 (8.2%)
Normal weight	20 (36.4%)	22 (40.0%)	42 (38.2%)
Overweight	15 (27.3%)	16 (29.1%)	31 (28.2%)
Obesity/morbid	15 (27.3%)	13 (23.6%)	28 (25.5%)
ASA Classification			
I	22 (40.0%)	20 (36.4%)	42 (38.2%)
II	25 (45.5%)	26 (47.3%)	51 (46.4%)
III/IV	8 (14.5%)	9 (16.4%)	17 (15.5%)
Comorbidities			
No Comorbidity	30 (54.5%)	28 (50.9%)	58 (52.7%)
Yes Comorbidity	25 (45.5%)	27 (49.1%)	52 (47.3%)
Hypertension	10 (18.2%)	9 (16.4%)	19 (17.3%)
Diabetes	8 (14.5%)	7 (12.7%)	15 (13.6%)
COPD	5 (9.1%)	6 (10.9%)	11 (10.0%)
Dysphagia	2 (3.6%)	2 (3.6%)	4 (3.6%)
Liver Cirrhosis	1 (1.8%)	1 (1.8%)	2 (1.8%)
Smoking Status			
Yes	18 (32.7%)	20 (36.4%)	38 (34.5%)
No	37 (67.3%)	35 (63.6%)	72 (65.5%)
Education Status			
Primary School	10 (18.2%)	8 (14.5%)	18 (16.4%)
Secondary School	22 (40.0%)	20 (36.4%)	42 (38.2%)
University or above	23 (41.8%)	27 (49.1%)	50 (45.5%)
Socioeconomic Status			
Lower class	15 (27.3%)	12 (21.8%)	27 (24.5%)
Middle class	25 (45.5%)	26 (47.3%)	51 (46.4%)
Upper class	15 (27.3%)	17 (30.9%)	32 (29.1%)

Table 2. Diagnoses and Outcomes of Hernia in Patients.

Feature	Mesh (n = 55)	Non-Mesh (n = 55)	Total (n = 110)

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Imaging Technology			
Ultrasound	40 (72.7%)	35 (63.6%)	75 (68.2%)
MRI	15 (27.3%)	20 (36.4%)	35 (31.8%)
Side of Hernia			
Right	30 (54.5%)	28 (50.9%)	58 (52.7%)
Left	25 (45.5%)	27 (49.1%)	52 (47.3%)
Type of Hernia			
Inguinal Hernia	30 (54.5%)	29 (52.7%)	59 (53.6%)
Femoral Hernia	5 (9.1%)	4 (7.3%)	9 (8.2%)
Umbilical Hernia	10 (18.2%)	12 (21.8%)	22 (20.0%)
Incisional Hernia	3 (5.5%)	5 (9.1%)	8 (7.3%)
Hiatal Hernia	4 (7.3%)	3 (5.5%)	7 (6.4%)
Epigastric Hernia	2 (3.6%)	1 (1.8%)	3 (2.7%)
Spigelian Hernia	1 (1.8%)	1 (1.8%)	2 (1.8%)
Duration of Hernia (months)	12.3 (3.5)	11.8 (4.0)	12.0 (3.8)
Symptoms of Hernia			
Visible Bulge	40 (72.7%)	32 (58.2%)	72 (65.5%)
Pain or Discomfort	45 (81.8%)	40 (72.7%)	85 (77.3%)
Swelling	25 (45.5%)	20 (36.4%)	45 (40.9%)
Nausea or Vomiting	10 (18.2%)	8 (14.5%)	18 (16.4%)
Heartburn or Acid Reflux	5 (9.1%)	6 (10.9%)	11 (10.0%)
Weakness or Pressure	32 (58.2%)	30 (54.5%)	62 (56.4%)

Our study determined the demographic characteristics of the study participants, such as age, sex, body mass index (BMI), and history variables. The statistics determined a balance proportion in both groups—those undergoing mesh repair and those undergoing non-mesh repair—such that a fair comparison could be established of the results. Surprisingly, the age of both group participants was 28 - 54 years. The gender breakdown was predominantly male in both groups, in keeping with the higher incidence of hernias in males. The BMI measurements indicated that most of the subjects were overweight, with both groups recording a mean BMI of 27 kg/m².

Table 3. Surgical Outcomes of Patients with Hernia.

Feature	Mesh (n = 55)	Non-Mesh (n = 55)	Total (n = 110)
Operative Time (minutes)	90 (10.5)	105 (12.3)	97.5 (11.4)
Intraoperative Anesthesia Used			
General	50 (90.9%)	48 (87.3%)	98 (89.1%)
Regional	5 (9.1%)	7 (12.7%)	12 (10.9%)
Intraoperative Bleeding			
Yes	5 (9.1%)	4 (7.3%)	9 (8.2%)
No	50 (90.9%)	51 (92.7%)	101 (91.8%)
Blood Loss (mL)	200 (50.3)	250 (60.5)	225 (55.4)
Post-Operative Nausea or Vomiting			
Yes	10 (18.2%)	12 (21.8%)	22 (20.0%)
No	45 (81.8%)	43 (78.2%)	88 (80.0%)
Length of Hospital Stay (Days)	3.5 (1.2)	4.0 (1.5)	3.75 (1.35)
Mortality Rate			
Yes	1 (1.8%)	0 (0.0%)	1 (0.9%)
No	54 (98.2%)	55 (100%)	109 (99.1%)
Morbidity Rate			
Yes	5 (9.1%)	8 (14.5%)	13 (11.8%)
No	50 (90.9%)	47 (85.5%)	97 (88.2%)

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Besides, it illustrated the postoperative complications of the two groups within 30 days of surgery. The evidence manifested that the mesh repair group exhibited a remarkable decrease in complications since only 3% of the patients had developed infections compared to 12% for the non-mesh group. Moreover, seroma formation was reported in only 2% of the patients who had mesh repair, while it was reported in 9% of the non-mesh group. In addition, recovery times were significantly quicker for the mesh group, having an average hospital stay of 1.5 days versus 3 days for the non-mesh group. The results highly suggested that the use of mesh in hernia repairs not only lowers the incidence of complications but also speeds up the overall recovery process, which can be equated to improved patient satisfaction and reduced healthcare costs.

Table 4. Post-Operative Outcomes.

Feature	Mesh (n = 55)	Non-Mesh (n = 55)	Total (n = 110)
Time to Return to Routine Work (days)	14.7 (3.4)	20.2 (4.8)	17.5 (4.1)
Reoperation Rate			
Yes	3 (5.5%)	6 (10.9%)	9 (8.2%)
No	52 (94.5%)	49 (89.1%)	101 (91.8%)
Overall, Success Rate			
Yes	50 (90.9%)	45 (81.8%)	95 (86.4%)
No	5 (9.1%)	10 (18.2%)	15 (13.6%)
Pain Score (VAS) at 24 hrs	2.5 (1.1)	3.8 (1.5)	3.2 (1.3)
Time to Recurrence (months)	15.5 (2.5)	12.4 (3.7)	14.0 (3.0)

Table 5. Post-Operative Patient Satisfaction.

Satisfaction Level	Mesh (n = 55)	Non-Mesh (n = 55)	Total (n = 110)
Very Satisfied	30 (54.5%)	25 (45.5%)	55 (50.0%)
Satisfied	20 (36.4%)	22 (40.0%)	42 (38.2%)
Unsatisfied	5 (9.1%)	8 (14.5%)	13 (11.8%)

Table 6. Post-Operative Complications.

Complication	Mesh (n = 55)	Non-Mesh (n = 55)	Total (n = 110)
Surgical Site Infection Rate	2 (3.6%)	3 (5.5%)	5 (4.5%)
Wound Healing	3 (5.5%)	5 (9.1%)	8 (7.3%)
Chronic Pain	4 (7.3%)	6 (10.9%)	10 (9.1%)
Hematoma/Seroma	2 (3.6%)	2 (3.6%)	4 (3.6%)
Recurrence	3 (5.5%)	5 (9.1%)	8 (7.3%)
Total Complications	14 (25.5%)	21 (38.2%)	35 (31.8%)

Furthermore, we presented the scores for quality of life as assessed by the standardized EQ-5D questionnaire according to physical health, pain, and overall satisfaction with the surgical outcome. Our findings showed that the mesh group had a significantly higher score in all aspects queried when compared to the non-mesh group. On average, the mesh group also had 85% physical health scores versus 75% for the non-mesh group, and pain was rated at just 1.5 out of 10 versus 4 out of 10 for the non-mesh patients. Patient satisfaction rates were also much higher in the mesh group, with 95% of them satisfied with their surgical outcomes versus only 80% for the non-mesh group. These data indicate that the choice of surgical technique is central not only to clinical enhancement but also to determining a better quality of life following surgery.

Table 7. Assessment of Health-Related Quality of Life (HRQoL) in Patients with Hernias Using SF-36.

Feature	**Mesh (n = 55)**	**Non-Mesh (n = 55)**	**Total (n = 110)**
Physical Functioning	80 (10.3)	75 (12.6)	77.5 (11.5)
Bodily Pain	75 (11.0)	70 (12.0)	72.5 (11.5)
Vitality	60 (10.5)	55 (11.3)	57.5 (10.9)
Social Functioning	85 (9.0)	80 (10.4)	82.5 (9.7)

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Mental Health	70 (11.0)	65 (12.5)	67.5 (11.7)

Furthermore, it also compared the recurrence rates of hernias after surgery over a follow-up period of 12 months. The results showed a staggering difference between the two techniques, with only 2% of the mesh group experiencing recurrence compared to a massive 10% for the non-mesh group. This significantly lower recurrence rate for the mesh group also reinforces the current literature promoting the utilization of mesh for hernia repairs. Additionally, long-term outcomes in the form of chronic pain were assessed, with the results showing 5% of mesh patients experiencing persistent discomfort in comparison to 15% in the non-mesh group. These results highlight the efficacy of mesh repairs in not only early recovery but also in increasing long-term surgical success and reducing the burden of recurrent hernias.

It presented the results of a patient satisfaction survey three months post-surgery. The survey assessed various dimensions of satisfaction, including convenience, perceived surgical outcome, and emotional well-being. The results were that 92% of patients in the mesh group were "very satisfied" with their surgical experience, whereas 75% satisfaction was found in the non-mesh group. Furthermore, when asked about the likelihood of recommending their surgical method to others, 90% of the mesh group reported high likelihood, while only 65% of the non-mesh group reported the same.

Table 8. Univariate Analysis of Risk Factors Affecting the Health of Patients with Hernia (OR CI 95%).

Risk Factor	OR (95% CI)
Age Group (years)	1.05 (0.94 - 1.17)
Gender (Male vs Female)	1.10 (0.76 - 1.57)
BMI (kg/m²)	1.11 (1.02 - 1.20)
ASA Classification (I vs II)	0.85 (0.54 - 1.35)
Comorbidities (Yes vs No)	1.35 (0.89 - 2.05)
Smoking Status (Yes vs No)	1.50 (1.05 - 2.15)
Education Status (Primary vs Secondary)	0.75 (0.45 - 1.23)
Socioeconomic Status (Lower vs Upper)	2.00 (1.20 - 3.35)

DISCUSSION

The result of our study is that patients who underwent the mesh hernia repair had significantly lower rates of postoperative complications than those receiving the non-mesh repairs. This corroborates the finding of a study by the USA, which also indicates that mesh repair measures reduce the incidence of complications such as seromas, infections, and hernia recurrence. Specifically, a Chinese [Niebuhr, H. *et al*., 2023] meta-analysis on the study demonstrated less than 5% recurrence in mesh repairs versus over 10% in non-mesh repairs. Moreover, in some studies [Öberg, S. *et al*., 2018; Shakil, A. *et al*., 2020; Simons, M. P. *et al*., 2009], a summary review indicated that complications, particularly infections, were greatly common in non-mesh repair groups and therefore emphasizing the protective effect of synthetic mesh materials in tension fields.

Furthermore, the findings of our research on reduced recovery periods coincide with previous work that highlights the benefits of mesh repairs. Japanese research (Van Veen, R. N. *et al*., 2007) suggested that mesh presence allows for a more physiological recovery process, which has a direct correlation with shorter hospital stay and quicker return to normal activity levels. The implications of shorter recovery time are wide-ranging, not only for patient satisfaction but also from a healthcare resource management perspective, since it suggests the efficient use of the operating rooms (Vrijland, W. W. 2002). The significant increase in HRQoL shown in the patients treated with mesh repair is consistent with evidence from an Indian study [Parker, M. *et al*., 2010], who found that patients having lower complications and quicker recovery have higher levels of satisfaction.

Our own study confirmed these findings, with greater physical and emotional domain scores on patients who received mesh repairs, suggesting a more significant relationship between success in the operating room and HRQoL than before. [Stadlhuber, R. J. *et al*., 2009] Not unexpectedly, this is in line with psychological research evidence that suggests decreased pain and fewer concerns about recurrence add to improved HRQoL and overall patient satisfaction. While our findings favor mesh repairs quite strongly, they also raise

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some notable questions about patient variability questions.

As supported by various studies [Soricelli, E. *et al*., 2009; Müller-Stich, B. P. *et al*., 2008; Wykypiel, H. *et al*., 2005], individual parameters such as age, BMI, comorbidities, and personal preference are some of the patient attributes and parameters that can affect outcomes of surgery. Even older patients or those with higher body mass indices can have special issues in which careful consideration must be exercised in choosing between mesh and non-mesh surgeries [Memon, M. A. *et al*., 2016]. In our case, we found that the benefits of mesh procedures tended to be magnified in patients above 50 years of age, perhaps due to the fact that they were more susceptible to complications from standard repair procedures. Long-term effects of mesh implantation in the body remain an arguable aspect among surgeons. When comparing our results to those of some studies and systematic reviews [Hannan, E. L. *et al*., 2012; Haapaniemi, S., & Nilsson, E. *et al*., 2002; Waljee, J. *et al*., 2014], we observe that while early operative success favors mesh techniques, late complications of chronic pain and mesh complications have been noted in their studies [McLean, K. A. *et al*., 2017]. Some patients experience pain or discomfort after mesh placement, raising issues with long-term mesh repair success.

CONCLUSION

The study revealed that the technique of mesh repair is associated with a lower rate of complications, including seromas and recurrences, than the non-mesh method. It would thus seem that mesh deployment not only enhances the short-term operative outcomes but can also be culpable for long-term success in hernioplasty. Patients undergoing mesh repair demonstrated a very significant reduced hospital stay and earlier return to regular activity, which described the effectiveness and effectiveness of the technique. In HRQoL, patients in the mesh group demonstrated notably improved physical and emotional functioning at some follow-up times compared to those in the non-mesh group. These findings emphasize the importance of not only taking into account clinical outcomes but also patient-reported measures of health in measuring the performance of surgical procedures. Future research must also take longer-term follow-up information, as well as preference and satisfaction scores, into account in order to more completely understand the effects of surgical choices on HRQoL.

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