Section: General Surgery

Original Research Article

COMPARATIVE EVALUATION OF LAPAROSCOPIC INGUINAL HERNIA REPAIR WITH VERSUS WITHOUT MESH FIXATION: A PROSPECTIVE RANDOMIZED STUDY AT A TERTIARY CARE CENTRE

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ABSTRACT

Background: Laparoscopic inguinal hernia repair using mesh has become a standard approach owing to reduced postoperative pain and faster recovery compared with open techniques. However, the necessity of routine mesh fixation during laparo-endoscopic repair remains controversial, as fixation may increase operative time, cost, and risk of chronic groin pain without clearly reducing recurrence. This study was designed to compare clinical outcomes of laparoscopic inguinal hernia repair performed with mesh fixation versus without mesh fixation at a tertiary care centre.

Materials and Methods: A total of 108 patients with unilateral primary inguinal hernia were randomized into two groups: Group A (n=54) underwent laparoscopic repair with mesh fixation, and Group B (n=54) underwent repair without mesh fixation. All patients underwent standardized transabdominal preperitoneal (TAPP) repair using a polypropylene mesh. Patients were followed for 12 months. Primary outcomes included chronic postoperative groin pain and hernia recurrence. Secondary outcomes included operative time, postoperative pain scores, complications, length of hospital stay, and time to return to normal activities.

Results: Baseline demographic and clinical characteristics were comparable between groups. Operative time and early postoperative pain scores were significantly higher in the mesh fixation group ($p<0.05$). The non-fixation group demonstrated shorter hospital stay and earlier return to normal activities. Chronic groin pain at 12 months was more frequent in Group A, while hernia recurrence rates were low and comparable between both groups, with no statistically significant difference.

Conclusion: Laparoscopic inguinal hernia repair without mesh fixation is a safe and effective alternative to routine fixation in selected patients, offering comparable recurrence rates with reduced postoperative pain and faster recovery.

Keywords: Laparoscopic inguinal hernia repair, Mesh fixation, non-fixation technique, Chronic groin pain, Hernia recurrence.

INTRODUCTION

Inguinal hernia repair is one of the most commonly performed general surgical procedures worldwide, with more than 20 million groin hernia operations performed annually. Modern management emphasizes durable repair with minimal postoperative pain and fast recovery, goals that have driven widespread adoption of laparoscopic approaches such as transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) repair.[1] A central technical controversy in laparo-endoscopic repair is whether the prosthetic mesh must be mechanically fixed to the abdominal wall to prevent displacement and recurrence, or whether careful preperitoneal placement without fixation is sufficient for most primary defects.

Proponents of non-fixation argue that when an appropriately sized mesh is properly deployed with adequate overlap of the myopectineal orifice and complete parietalization of the cord, the risk of clinically significant mesh migration is low and routine fixation may be unnecessary; avoiding fixation can reduce operative time, device cost and the risk of fixation-related complications such as nerve entrapment and chronic groin pain.[1-3] Conversely, advocates of routine fixation contend that fixation provides mechanical security particularly in large defects or poor tissue planes and may reduce early migration risk in selected patients. This balance between preventing recurrence and minimizing chronic pain has been the subject of randomized trials and systematic reviews in the last two decades.

Recent high-quality evidence has increasingly supported selective rather than routine fixation. A comprehensive meta-analysis of randomized controlled trials reported that non-fixation was associated with lower early postoperative pain, shorter operative time and reduced urinary retention, while showing no increase in recurrence for hernia orifices smaller than 4 cm.[2,4] Similarly, a TAPP-specific meta-analysis demonstrated no significant difference in recurrence between fixation and non-fixation, with modest pain benefits favouring non-fixation at midterm follow-up.[3] Earlier randomized trials and pooled analyses reached concordant conclusions: routine traumatic fixation (tackers/staples) does not confer clear recurrence benefit but may increase postoperative discomfort and resource use.[5,6]

In consideration, current guideline recommendations and contemporary evidence support a tailored approach: ensure meticulous dissection and correct mesh sizing/placement as the primary determinants of success, and reserve fixation for defects or situations judged at higher risk for mesh displacement. This study therefore compares clinical outcomes of laparoscopic inguinal hernia repair with and without mesh fixation at our tertiary centre to contribute additional trial-level data on recurrence, pain, and recovery.

MATERIALS AND METHODS

This prospective, randomized comparative study was conducted in the Department of General Surgery at Kamineni Institute of Medical Sciences, Narketpally from June 2024 to September 2025. A total of 108 patients diagnosed with unilateral primary inguinal hernia were enrolled and randomized 1:1 into two groups (54 patients per group). Group A cases were managed with laparoscopic inguinal hernia repair with mesh fixation and group B with laparoscopic inguinal hernia repair without mesh fixation.

Inclusion criteria:

Cases aged between 8-75 years, Clinically and radiologically confirmed with unilateral primary inguinal hernia, ASA physical status I–III and willing to participate were included.

Exclusion criteria

Cases with bilateral or recurrent inguinal hernia, large scrotal hernia, history of lower abdominal surgery, bleeding disorders, pregnancy, active infection, allergic to mesh material or fixation devices, intraoperative conversion to open surgery and not willing to participate were excluded.

Written informed consent was obtained from study participants and study protocol was approved by the institutional ethics committee of KIMS, Narketpally. Randomization was performed using a computer-generated sequence with allocation concealment through sealed opaque envelopes. Surgeons were aware of the group assignment; however, postoperative assessments were carried out by an independent observer blinded to the intervention. All patients were undergone standard preoperative evaluation including history, physical examination, routine blood investigations and radiological investigations.

All patients underwent laparoscopic transabdominal preperitoneal (TAPP) repair under general anesthesia by experienced surgeons. A standardized lightweight polypropylene mesh (approximately 10×15 cm) was placed in the preperitoneal space in all cases. In Group A, the mesh was fixed using tackers, whereas in Group B, the mesh was placed without fixation. Peritoneal closure was performed in all patients as per standardized protocol. Intraoperative information including Duration of surgery, anesthesia time, type of hernia, defect size, laterality, number and type of fixation devices, intraoperative complications, need for conversion to open, and any deviations from protocol.

The primary outcomes were chronic postoperative groin pain, assessed using the Visual Analog Scale (VAS) at 3 and 12 months, and hernia recurrence within 12 months. Secondary outcomes included operative time, early postoperative pain, postoperative complications, length of hospital stay, and time to return to normal activities. Patients were followed at 1 week, 1 month, 3 months, 6 months, and 12 months postoperatively.

Statistical analysis: The collected data was analysed by SPSS v.26.0. Continuous variables were represented in summarized as mean, standard deviation and compared using Student's t-test and categorical variables using Chi-square test. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 108 patients with unilateral primary inguinal hernia were enrolled and randomized equally into two groups i.e. group A with laparoscopic inguinal hernia repair with mesh fixation (n=54) and group B without mesh fixation (n=54).

Table 1: Baseline demographic and clinical characteristics of study participants

Variable	Group A (n=54)	Group B (n=54)	p-value
Age (years)	46.8±12.4	45.9±11.8	0.71
Gender			
Male	44	46	0.74
Female	10	08	
BMI (kg/m²)	23.6 ± 2.9	23.2 ± 3.1	0.48
ASA grade			
Grade I	22	20	0.89
Grade II	26	28	
Grade III	06	06	

Table 2: Intraoperative characteristics.

Parameter	Group A	Group B	p-value
Operative time (minutes)	64.5 ± 9.8	56.2 ± 8.6	<0.001
Intraoperative complications	2 (3.7%)	1 (1.9%)	0.56
Conversion to open surgery	-	-	-

Table 3: Postoperative pain scores by VAS.

Time interval	Group A	Group B	p-value
	Mean ± SD	Mean ± SD	
6 hours	5.2 ± 1.1	4.1 ± 1.0	<0.001
12 hours	4.6 ± 1.2	3.7 ± 1.1	<0.001
24 hours	3.9 ± 1.1	3.1 ± 1.0	0.002
48 hours	2.8 ± 0.9	2.5 ± 0.8	0.09
72 hours	1.9 ± 0.6	1.8 ± 0.5	0.42

Table 4: Postoperative complications among study groups.

Complications	Group A		Group B		p-value
	Number	Percentage	Number	Percentage	
Seroma	06	11.1%	03	5.6%	0.29
Hematoma	03	5.6%	01	1.9%	0.31
Surgical site infection	02	3.7%	01	1.9%	0.56
Urinary retention	02	3.7%	02	3.7%	1.00
Total complications	13	24.1%	07	13%	0.14

Table 5: Recovery parameters.

Parameter	Group A	Group B	p-value
Duration of hospital stay (days)	2.4 ± 0.7	1.9 ± 0.6	<0.001
Return to normal activities (days)	9.6 ± 2.3	7.8 ± 2.1	<0.001

Table 6: Chronic postoperative groin pain

Follow-up	Group A	Group B	p-value
3 months	10 (18.5%)	4 (7.4%)	0.04
12 months	6 (11.1%)	2 (3.9%)	0.04

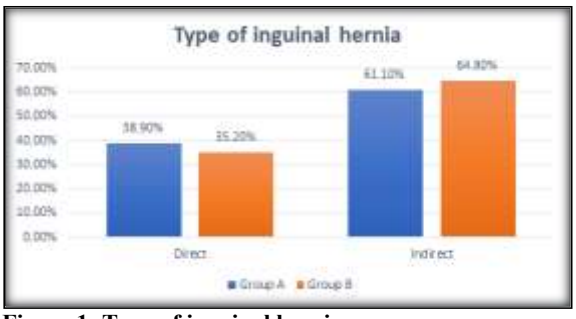

Figure 1: Type of inguinal hernia.

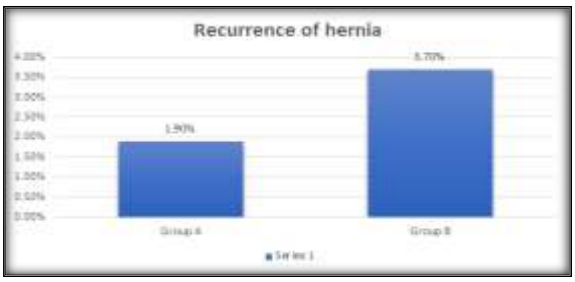

Figure 2: Recurrence of hernia at 12 months between study groups.

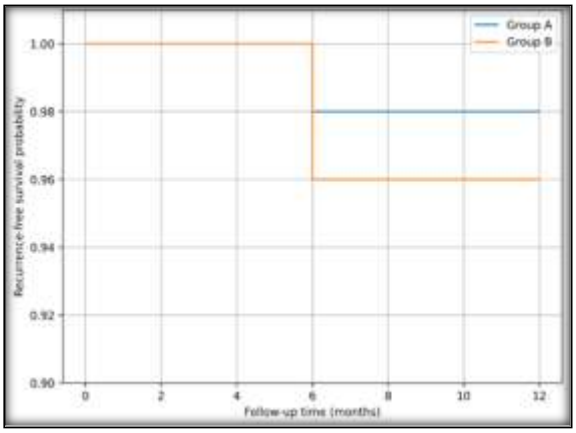

Figure 3: Kaplan-Meier curve showing recurrence-free survival between study groups.

Both study groups demonstrated high recurrence-free survival throughout follow-up. In the mesh fixation group, one recurrence was observed, resulting in a recurrence-free survival probability of 98% at 12 months. In the non-fixation group, two recurrences were noted, with a recurrence-free survival probability of 96% at 12 months. The difference between the groups was not statistically significant ($p>0.05$), indicating comparable recurrence outcomes irrespective of mesh fixation [Figure 3].

DISCUSSION

This randomized study comparing laparoscopic inguinal hernia repair with mesh fixation (Group A) versus without fixation (Group B) adds to a growing body of evidence that carefully placed, unfixed mesh provides outcomes comparable to those achieved with mechanical fixation while reducing early morbidity. International guidance emphasises that appropriate dissection, correct mesh size and adequate overlap of the myopectineal orifice are central to minimizing recurrence after laparo-endoscopic repair; fixation is not universally required and may be considered selectively for large defects or recurrent/bilateral hernias.[7] Our findings low and comparable 12-month recurrence rates with slightly higher early pain and longer operative times in the fixation group align closely with this current consensus.

Several recent systematic reviews and meta-analyses focused on TAPP and TEP techniques have reached similar conclusions. Zhang et al. pooled randomized trials of TAPP and found no significant difference in recurrence between non-fixation and fixation, while non-fixation was associated with lower pain at later timepoints (6 months) and similar rates of seroma or infection.[8] Kobayashi and colleagues, in a comprehensive laparo-endoscopic meta-analysis, reported that mesh non-fixation did not increase recurrence and may improve return to daily activities again highlighting that non-fixation is an effective option when the mesh is properly placed.[9] Dong et al.'s meta-analysis restricted to TEP trials likewise showed shorter operative time, lower 24-hour pain scores and no increase in recurrence with unfixed mesh.[10] Together, these high-quality summaries suggest that non-fixation confers modest perioperative advantages without compromising early oncologic (recurrence) outcomes.

Older trials and earlier meta-analyses also support this interpretation. A meta-analysis by Sajid et al. concluded that, across randomized trials, non-fixation and fixation were comparable for operation time, postoperative complications, chronic groin pain and recurrence risk.[11] The randomized clinical trial by Moreno-Egea et al. also found no clinical advantages from routine fixation and noted higher cost with fixation.[12] A large Swedish Hernia Registry analysis demonstrated that standard polypropylene mesh without fixation had low reoperation risk, while certain combinations of lightweight meshes and fixation methods were associated with worse outcomes; this indicates that mesh type interacts with fixation choice and should inform decision making.[13]

Mechanistically, fixation has been advocated to prevent mesh migration and therefore recurrence, yet radiologic and intraoperative studies have not consistently demonstrated clinically meaningful mesh displacement after proper placement, arguing that fixation may be unnecessary in properly executed repairs.[8,9] Conversely, fixation devices can cause nerve entrapment and local tissue trauma plausible contributors to the well-described association between fixation and increased early postoperative pain or neuropathic symptoms in some series.[8-10] Our data, which show higher early VAS scores in Group A and a higher rate of chronic groin pain, mirror these mechanistic insights.

Clinical applicability and limitations must be emphasized. Non-fixation appears safe for small to moderate primary inguinal hernias when the mesh adequately covers the myopectineal orifice; most RCTs and meta-analyses included predominantly small defects and short to midterm follow-up.[8-10] The safety of non-fixation in large defects (>3-4 cm), recurrent hernias, or in poor preperitoneal dissection remains less certain; guidelines advise individualized fixation in such circumstances.[7] Additionally, follow-up duration in many trials is limited to 1-2 years; longer follow-up is essential to detect later recurrences. Our 12 month recurrence data are reassuring but do not exclude late failures.

Finally, surgeon experience and technique are critical confounders. Laparoscopic hernia repair has a known learning curve; inadequate dissection or suboptimal mesh deployment are more likely contributors to recurrence than the absence of fixation.[8,9] Therefore, uptake of a non-fixation strategy should be accompanied by attention to technique, surgeon training, and selection of appropriate mesh types.

CONCLUSION

In conclusion, non-fixation of mesh in laparoscopic inguinal hernia repair appears to be a cost effective, patient-friendly approach without compromising surgical outcomes in selected patients. However, mesh fixation may still be justified in specific situations such as large defects, recurrent hernias, or poor tissue quality, where the risk of mesh displacement may be higher. Further multicentric studies with larger sample sizes and longer follow-up are recommended to validate these findings and to establish clear, evidence-based guidelines for selective mesh fixation in laparoscopic inguinal hernia repair.

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