

# A Comparative Study of Mesh Fixation and Non-Fixation in Open Inguinal Hernia Repair

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## Abstract

**Objective:** To compare mesh fixation and non-fixation in open inguinal hernia repair concerning operative time, hospital stay, and post-operative complications.

**Methodology:** This clinical experimental study was conducted from January to June 2022, at the Department of General Surgery, Pakistan Institute of Medical Sciences, Islamabad. A total of 100 patients aged 18 - 60 years with unilateral inguinal hernia scheduled for repair were selected using probability sampling method. Patients with bilateral, recurrent, obstructed hernias were excluded. The participants were randomly assigned to two groups: mesh fixation (n=50) and non-fixation (n=50). Outcomes assessed included operative duration, hospital stay, post-operative pain, scrotal swelling, wound infection, and recurrence. Data analysis was performed using SPSS version 22.

**Results:** The mean patient age was 39.86±8.52 years, with a male predominance (95 males, 5 females). The mean operative time was significantly shorter in the non-fixation group (68.36±4.77 min) compared to the fixation group (91.04±6.29 min, p=0.00). Similarly, the mean hospital stay was shorter in the non-fixation group (1.10±0.30 days) compared to the fixation group (2.12±0.33 days, p=0.000). Post-operative pain was also significantly lower in the non-fixation group (2.46±0.65) compared to the fixation group (4.92±0.60, p=0.000). No significant difference in recurrence rates was observed between the two groups.

**Conclusion:** Non-fixation of mesh in inguinal hernia repair offers advantages such as reduced operative time, shorter hospital stay, and lower post-operative pain without increasing the risk of recurrence.

**Keywords:** Inguinal hernia, mesh fixation, non-fixation, post-operative pain, operative time, hospital stay, recurrence

## Introduction

Inguinal hernia, a common surgical issue that many practitioners encounter constitutes 75% of all abdominal hernias, and are more frequently observed in males than females.<sup>1,2</sup> The condition often requires surgical intervention, and advancements in surgical techniques have significantly improved

the outcomes for patients undergoing hernia repair. Inguinal hernia repair is a common surgical procedure. Both open and laparoscopic techniques employ a prosthetic mesh to achieve tension-free repair.

Globally, approximately twenty million inguinal hernia surgeries are performed annually. However, 8-16% of these patients experience chronic pain post-surgery.<sup>3</sup> There are various surgical methods to address inguinal hernias, broadly categorized into open inguinal hernia repair and laparoscopic inguinal hernia repair, with the former being more commonly practiced. The use of mesh in these repairs has gained popularity as it significantly reduces recurrence rates.<sup>4</sup>

Inguinal hernia mesh repair without fixation offers several advantages over mesh fixation, including significantly lower surgical costs, similar post-operative complications, hospital stays, operative times, and no increase in recurrence rates.<sup>5</sup> This is because, after 24 to 48 hours post-surgery, the mesh is primarily held in place by the local inflammatory response rather than the fixation device. While mesh fixation is widely used to prevent recurrence, it often leads to complications such as chronic groin pain.<sup>6</sup>

Mesh fixation remains a controversial issue and there is difference of opinion among surgeons. The comparison of mesh fixation and non-fixation in inguinal hernia repair reveals nuanced outcomes regarding postoperative pain, recurrence rates, and operational efficiency.<sup>7</sup> Studies indicate that both techniques yield similar postoperative pain levels, but non-fixation may lead to higher recurrence rates and chronic pain over time.<sup>8</sup> In contrast, while non-fixation may offer operational advantages, the potential for increased recurrence necessitates careful consideration of surgical technique and patient-specific factors.<sup>9</sup>

This study aims to compare mesh fixation and non-fixation in open inguinal hernia repair within our setting, focusing on operative time, hospital stay, and post-operative complications such as pain, wound infection, scrotal edema, and recurrence rates. While most existing studies focus on laparoscopic approaches,<sup>10</sup> open method mesh repair is more commonly used in our country, necessitating an evaluation of the effectiveness and benefits of the non-fixation mesh repair technique in open inguinal hernia repair compared to the fixation method.

**Methodology**

This clinical experimental study was conducted over six months, from January 2022, to June 2022, at the Department of General Surgery, Pakistan Institute of Medical Sciences (PIMS), Islamabad after taking ethical approval from the institute (F.1-1/2015/ERB/SZAMU/720). All patients aged 18 to 60 years admitted to the general surgery ward with a diagnosis of unilateral inguinal hernia, classified as American Society of Anaesthesiologists (ASA) physical status I or II, and scheduled for elective open inguinal hernia repair were included in the study after obtaining informed consent. Patients with recurrent hernia, bilateral hernias, complicated hernias (e.g., strangulated, incarcerated) and patients with coagulopathies or other systemic diseases contraindicating surgery were excluded.

Patients were selected through probability convenient sampling and randomly assigned to two groups of 50 each using the lottery method. The Fixation Group (FG) underwent open inguinal hernia repair with mesh fixation, while the Non-Fixation Group (NFG) underwent the procedure without mesh fixation. In FG, the surgical procedure involved standard Lichtenstein tension-free hernioplasty. The mesh was fixed using non-absorbable sutures at multiple points to ensure its stability and prevent

migration, while in NFG, the mesh was placed over the defect without sutures. The inherent local inflammatory response was relied upon to secure the mesh in place postoperatively.

All data were collected using a standardized proforma, assessing operative time, hospital stay, post-operative pain, scrotal swelling, wound infection, and recurrence. Operative time was recorded in minutes from skin incision to closure, while hospital stay was measured in days following surgery. Post-operative pain was evaluated on the first post-operative day using a visual analog scale (VAS). Scrotal swelling was documented as present or absent based on post-surgical observation. Wound infection was identified by the presence of erythema, discharge, or fever within 30 days post-surgery. Recurrence was assessed through clinical examination at follow-up visits conducted at 1, 3, and 6 months.

**Results**

All patients with uncomplicated open inguinal hernia repair were discharged after 24hours by the consultant.

The mean age of the patients was 39.86±8.52 years. There were 95 males and 5 females. The baseline characteristics of the study population are presented in Table I.

**Table 1:** Baseline Characteristics of Study Groups

Characteristics	Non fixation group (n=50)	Fixation group (n=50)	p value
Age (years)	40.12±8.74	39.60±8.30	0.786
Gender			
Male	47	48	0.793
Female	03	02	
BMI (kg/m2)	27.67±4.46	26.39±4.87	0.180
ASA status			
I	15	22	0.17
II	35	28	
Side of hernia			
Right	25	45	0.43
Left	08	22	
Type of hernia			
Direct	06	09	0.28
Indirect	41	44	
Operative Time (minutes)	68.36±4.77	91.04±6.29	0.00
Hospital stay (days)	1.10±0.30	2.12±0.33	0.00

**Table 2:** Comparison of Postoperative Pain in Both Groups

	N	Non fixation Group	Fixation Group	p value
Age (years)				
21 - 40	53	2.46 ± 0.70	4.96 ± 0.51	0.00
41 - 60	47	2.45 ± 0.58	4.86 ± 0.69	0.00
Side of hernia				
Right	70	2.46 ± 0.64	4.65 ± 0.67	0.00
Left	30	3.13 ± 0.74	5.10 ± 0.48	0.00
Type of hernia				
Direct	15	2.00 ± 0.00	4.66 ± 0.57	0.008
Indirect	85	2.47 ± 0.65	4.93 ± 0.60	0.00
ASA				
I	67	2.73 ± 0.79	4.96 ± 0.57	0.00
II	33	2.34 ± 0.53	4.86 ± 0.63	0.00
BMI				
< 30	39	2.63 ± 0.76	4.85 ± 0.58	0.00
> 30	61	2.35 ± 0.55	4.96 ± 0.61	0.00

**Table 3:** Comparison of Postoperative Scrotal Swelling in Both Groups

	N	Non fixation Group	Fixation Group	p value
Age (years)				
21 - 40	53	01	01	0.69
41 - 60	47	01	03	0.40
Side of hernia				
Right	70	01	02	0.19
Left	30	00	01	0.50
Type of hernia				
Direct	15	00	00	----
Indirect	85	01	03	0.30
ASA				
I	67	00	02	0.41
II	33	01	01	0.62
BMI				
< 30	39	00	02	0.00
> 30	61	01	01	0.74

**Table 4:** Comparison of :Postoperative Wound Infection in Both Groups

	N	Non fixation Group	Fixation Group	p value
Age (years)				
21 - 40	53	00	00	----
41 - 60	47	02	03	0.21
Side of hernia				
Right	70	02	02	0.35
Left	30	00	01	0.50
Type of hernia				
Direct	15	00	01	0.50
Indirect	85	01	03	0.30
ASA				
I	67	01	02	0.38
II	33	01	01	0.62
BMI				
< 30	39	00	02	0.40
> 30	61	01	02	0.34

## Discussion

In this study, our aim was to evaluate the effectiveness of mesh repair without fixation in open inguinal hernia repair compared to the fixation method. The motivation for this comparison arises from the fact that while many studies focus on laparoscopic techniques, open mesh repair remains predominantly practiced in our country.<sup>11</sup> Thus, it is essential to establish the efficacy and advantages of non-fixation mesh repair in open inguinal hernia surgeries.<sup>12</sup> There are several known risk factors for inguinal hernia formation, such as advanced age, male sex, lower body mass index, abnormalities in matrix metalloproteinase, patent processus vaginalis, chronic obstructive pulmonary disease, and prostatectomy history.

Despite the fact that male sex is a well-established predictor of inguinal hernia, previous research has not established whether there is a sex-specific risk factor. Evidence showed that males have a much higher prevalence of inguinal hernias than females<sup>13</sup> which is similar to this study where 95% were males and 5% were female patients with inguinal hernias. (Table I) Inguinal hernias are much more common in men than in women, with lifetime risks of 27% and 3%, respectively.<sup>14</sup>

Inguinal hernias are more common in older age group, as in this study more patients are older than 40 years of age (Table 1). Yen HC et al reported that the majority of inguinal hernias (67.9%) occurred in people over 65, and 90.5% of cases were in men.<sup>15</sup> According to another report, the prevalence of inguinal hernias is 5% in the lowest age group (25–34 years old) and 45% in men 75 years of age and beyond.<sup>16</sup>

There is a relatively high risk of complications after hernia repair, such as postoperative pain, wound seroma/haematoma, wound infection, urinary retention and recurrence. This study evaluates the postoperative complication between the two groups. A study from India indicates that non-fixation of the mesh offers significant cost benefits without increasing postoperative complications or recurrence rates. The study suggests that the local inflammatory process rather than the fixation device primarily holds the mesh in place post operative.<sup>17</sup>

Our study's findings align with these observations, showing that non-fixation of the mesh significantly reduces operative time and hospital stay. The mean operative time for the non-fixation group was substantially lower than that for the fixation group. Similarly, patients in the non-fixation group

experienced shorter hospital stays compared to those in the fixation group. These outcomes are critical as they imply faster recovery and reduced healthcare costs.<sup>18</sup>

Post-operative pain, a crucial factor influencing patient quality of life and recovery, was also notably lower in the non-fixation group. (Table 2) This finding is consistent with previous studies, such as by Lv Y et al., which reported that patients undergoing non-fixation mesh repair experienced less postoperative pain compared to those with mesh fixation. Reduced postoperative pain can significantly enhance patient comfort and satisfaction, making non-fixation an attractive option for inguinal hernia repair.<sup>19</sup> Additionally, research by Acar et al., from Turkey highlighted that while mesh fixation is common to prevent hernia recurrence, it can lead to chronic groin pain, a significant postoperative complication.<sup>6</sup> Another study provides strong evidence that mesh non-fixation does not increase recurrence rates and may reduce chronic pain in laparoscopic inguinal hernia repair.<sup>20</sup> The same principles could be applied to open inguinal hernia repair, encouraging further research into whether non-fixation is a viable option to improve patient outcomes.

Regarding postoperative complications, our study found no significant difference in wound infection rates between the two groups. (Table 4) This outcome is corroborated by other studies which also reported similar infection rates for both fixation and non-fixation technique. The comparable infection rates suggest that the non-fixation technique does not compromise the procedure's safety concerning this particular complication.<sup>21</sup>

Scrotal edema, another postoperative complication, showed no significant difference between the groups in our study. (Table 3) This aligns with the findings of studies such as those by Kumar et al., which also observed no substantial difference in scrotal edema incidence between fixation and non-fixation groups. Thus, the non-fixation approach does not increase the risk of this complication.<sup>22</sup>

One of the most critical outcomes to consider in hernia repair is the recurrence rate. Our study found no significant difference in hernia recurrence rates between the fixation and non-fixation groups. This result is in line with the findings of other studies which reported similar recurrence rates for both techniques.<sup>23,24</sup> This parity in recurrence rates underscores the effectiveness of the non-fixation method in maintaining long-term repair integrity.

In summary, non-fixation of the mesh in open inguinal hernia repair offers significant advantages over mesh fixation, including reduced operative time, shorter hospital stays, and lower postoperative pain. The rates of wound infection, scrotal edema, and hernia recurrence are comparable between the two techniques, indicating that non-fixation does not compromise the procedure's safety or effectiveness. These findings support the adoption of non-fixation mesh repair as a preferable approach in open inguinal hernia surgeries, providing benefits to both patients and healthcare systems.<sup>25</sup>

### Limitations

Our study has few limitations, including a short follow-up period of six months, which may be insufficient to assess long-term recurrence and complications. The small sample size of 100 patients and the significant gender imbalance (95 males, 5 females) may limit the generalizability of our findings. The lack of blinding introduces potential bias in subjective outcomes such as post-operative pain. Additionally, certain methodological details, including the type of anesthesia used, surgeon experience, and pain assessment scale, have not been specified. Furthermore, post-discharge complications

were not reported. Lastly, the study does not include a cost-effectiveness analysis, which could have further strengthened its clinical relevance.

This study demonstrates that non-fixation of mesh in open inguinal hernia repair is associated with shorter operative time, reduced hospital stay, and lower post-operative pain compared to mesh fixation. However, both techniques show similar recurrence rates, making non-fixation a preferable option for reducing immediate post-operative morbidity.

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