

Research Article**COMPARATIVE STUDY OF INGUINAL HERNIA MESH REPAIR WITH CONVENTIONAL PROLENE VERSUS TITANIUM SKIN STAPLES FOR FIXATION****Dr. Venkatesh¹, Dr. Ramesh C Sagar², Dr. Asif³***Dr. Venkatesh, Postgraduate student dept of general surgery RIMS Raichur**Dr. Ramesh c sagar , Associate professor; Dept. Of general surgery RIMS Raichur**Dr. Asif, Assistant professor Dept. Of general surgery RIMS Raichur***Corresponding Author: Dr. Asif****Received: 09-08-2025/ Revised: 27-08-2025/Accepted Date: 05-09-2025****ABSTRACT****Background:**

Inguinal hernia is one of the most common general surgical procedures performed worldwide. The Lichtenstein tension-free mesh repair is the current standard. However, the traditional method using polypropylene sutures for mesh attachment tends to take longer and can cause more postoperative pain. Titanium skin staples have been suggested as a quicker and equally effective option.

Objective:

To compare the results of mesh fixation using traditional prolene sutures and titanium skin staples in inguinal hernia repair. This comparison focuses on operative time, postoperative pain, and recovery.

Methods:

A prospective comparative study took place over two years at a tertiary care hospital with 76 patients who had primary inguinal hernias. Participants were split into two groups of 38. Group A had mesh fixation with conventional 2-0 prolene sutures, while Group B had fixation with titanium skin staples. We measured operative duration, postoperative pain using Visual Analogue Scale (VAS) scores on days 1, 2, 30, 90, and one year post-surgery, and length of hospital stay. We analyzed data using SPSS software, applying Chi-square and t-tests when necessary.

Results:

The average operating time was significantly shorter in Group B (40.63 ± 6.30 min) compared to Group A (45.92 ± 6.99 min, $p = 0.001$). Postoperative pain scores were significantly lower in Group B on days 1, 2, and 30 ($p = 0.001$ each). However, the differences at three months and one year were not significant ($p > 0.05$). The average hospital stay was also shorter in the staple group (1.84 ± 0.55 days) compared to the suture group (2.53 ± 0.80 days, $p = 0.001$). There were no notable differences in wound infection, seroma, or recurrence between the groups.

Conclusion:

Using titanium skin staples for mesh fixation in Lichtenstein hernioplasty significantly cuts down operative time and early postoperative pain without raising complication rates. Therefore, staple fixation is a safe, efficient, and patient-friendly alternative to traditional prolene sutures.

Keywords: Inguinal hernia, Mesh repair, Titanium staples, Prolene suture, Lichtenstein hernioplasty, Postoperative pain.

INTRODUCTION

A hernia is when part of an organ pushes through a weak spot in the wall of its cavity [1]. Inguinal hernias make up about 75% of all abdominal wall hernias, and they mostly affect men [2]. The lifetime risk of developing an inguinal hernia is about 27% for men and 3% for women [3].

The Lichtenstein tension-free mesh repair is the standard method for open inguinal hernia repair because it has a low recurrence rate and is easy to perform [4]. Traditionally, the mesh is secured with non-absorbable polypropylene sutures. However, this method can lengthen the surgery time and increase the risk of nerve pain after surgery due to irritation from the needle [5,6].

Skin staples, first used for surgical fixation by Egger et al. in 1994, offer a quick, secure, and even way to attach the mesh [7]. Titanium is well-known for its good compatibility with the body and resistance to rust, making it widely used in surgical implants, including staples for mesh fixation [8]. Some studies suggest that using staples can shorten surgery time and reduce postoperative pain, but the evidence is still limited and mixed [9–11].

Since there is not much data comparing titanium skin staples and traditional prolene sutures for open inguinal hernia repair in Indian populations, this study aimed to assess and compare their clinical outcomes.

AIMS AND OBJECTIVES

Aim:

To compare how well mesh fixation works using regular prolene sutures versus titanium skin staples in open inguinal hernia repair.

Objectives:

1. To find the average operative time for both fixation methods.
2. To measure postoperative pain using the Visual Analogue Scale (VAS).
3. To check for recurrence and postoperative complications during a one-year follow-up.

MATERIALS AND METHODS

Study Design: A hospital-based prospective comparative study conducted over two years.

Study Setting: Department of General Surgery, [Name of Hospital], India.

Sample Size: A total of 76 patients were included, divided into two equal groups (n = 38 each). The sample size was estimated using the formula $n = 4p(1-p)/e^2$, assuming a prevalence of 70% and a precision of 15%.

Inclusion Criteria:

- Patients 18 years and older.
- Primary inguinal hernia (both direct and indirect).
- Patients fit for elective surgery and providing informed consent.

Exclusion Criteria:

- Recurrent or complicated hernias (strangulated, obstructed).
- Patients unfit for surgery due to other health issues.
- Patients unwilling to participate.

Ethical Considerations:

The study was approved by the Institutional Ethics Committee, and informed consent was obtained from all participants.

Surgical Technique:

All patients underwent standard Lichtenstein tension-free mesh hernioplasty under spinal anesthesia. Polypropylene mesh was placed and fixed either with 2-0 prolene sutures (Group A) or titanium skin staples (Group B). Postoperative pain relief, antibiotics, and wound care were standardized for all patients.

Outcome Measures:

- Operative time: measured from mesh preparation to completion of skin closure.
- Postoperative pain: assessed using 100 mm VAS on postoperative days 1, 2, 30, 90, and 1 year.
- Hospital stay: duration from surgery to discharge.
- Recurrence: checked at 3-month intervals up to 1 year.

Statistical Analysis:

Data were entered into Microsoft Excel and analyzed using SPSS v25.0. Continuous variables were expressed as mean $\pm$ SD, and categorical data as percentages. Student's t-test and Chi-square tests were used, with $p < 0.05$ considered statistically significant.

RESULTS

Table 1. Distribution according to age

Age Group (years)	Frequency	Percentage
<25	5	6.6

26–35	8	10.5
36–45	23	30.3
46–55	17	22.4
56–65	16	21.1
>65	7	9.2
Total	76	100

Figure 1: Bar chart showing distribution according to age. The majority of cases were between 36–45 years, reflecting the higher prevalence among middle-aged individuals.

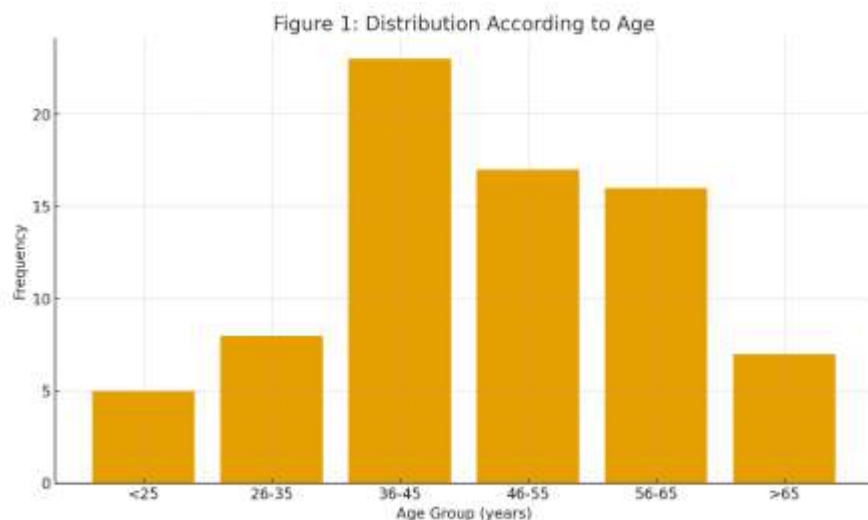


Table 2. Comparison of mean age between groups

Group	Mean $\pm$ SD (years)	<i>p</i> -value
Prolene (A)	46.34 $\pm$ 13.22	0.319
Staple (B)	49.29 $\pm$ 12.35	—

No significant age difference existed between groups, confirming baseline comparability.

Figure 2: Box plot comparing mean age between groups.

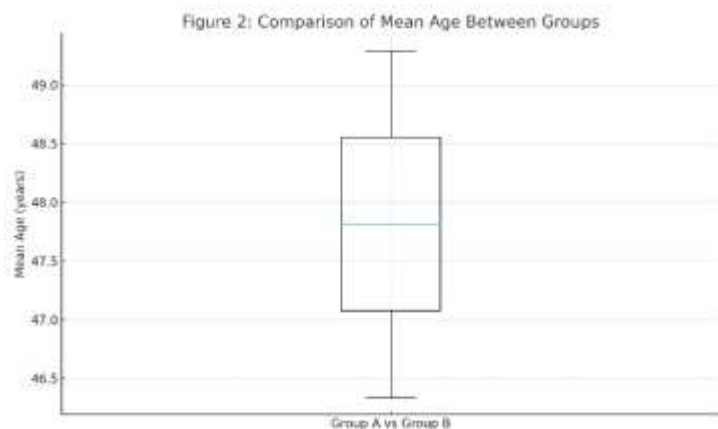


Table 3. Distribution according to hernia side

Side	Frequency	Percentage
Right	40	52.6
Left	23	30.3
Bilateral	13	17.1
Total	76	100

Right-sided hernias predominated in both groups ($p = 0.896$).

Figure 3: Pie chart showing hernia side distribution.

Figure 3: Distribution According to Side of Hernia

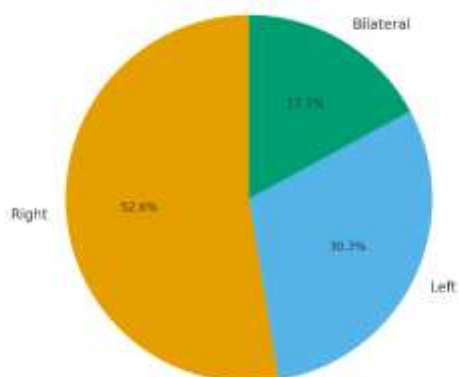


Table 4. Type of hernia distribution

Type	Frequency	Percentage
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Indirect	58	76.3
Direct	18	23.7

Indirect hernias were more common, consistent with global trends ($p = 0.589$).

Figure 4: Bar chart comparing hernia types between groups.

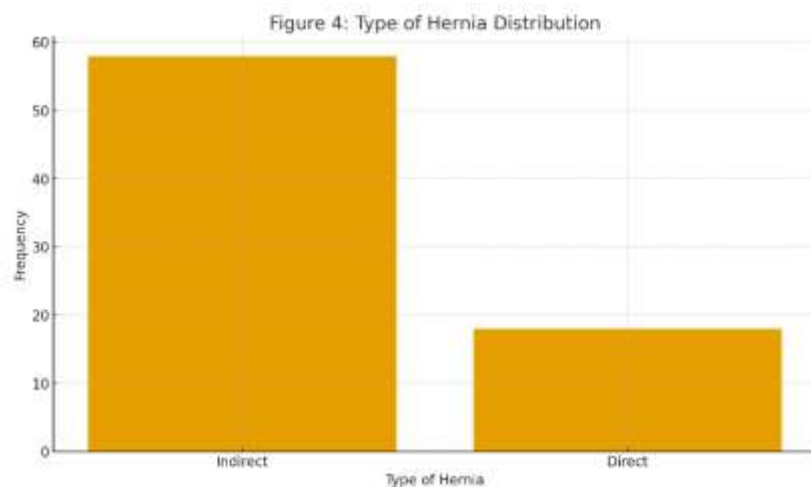


Table 5. Mean operative time comparison

Group	Mean $\pm$ SD (min)	p -value
A (Prolene)	45.92 $\pm$ 6.99	0.001
B (Staple)	40.63 $\pm$ 6.30	

Figure 5: Bar chart comparing mean operative times. Titanium staples significantly reduced operative duration by approximately 5 minutes.

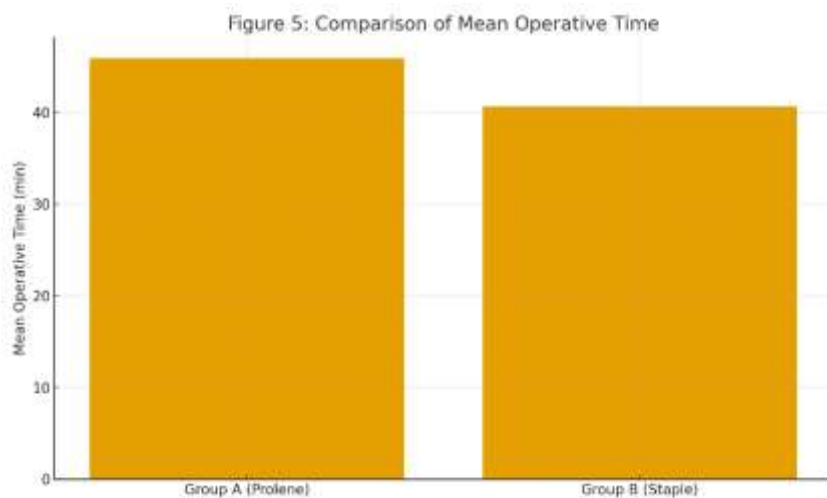


Table 6. Mean VAS pain scores

Time Point	Group A	Group B	<i>p</i> -value
Day 1	4.84 ± 1.13	3.74 ± 1.04	0.001
Day 2	4.00 ± 1.39	2.95 ± 1.03	0.001
Day 30	2.61 ± 0.91	1.51 ± 0.78	0.001
Day 90	1.16 ± 0.89	1.06 ± 0.56	0.552
1 year	0.86 ± 0.57	0.67 ± 0.44	0.109

Figure 6: Line graph of mean postoperative VAS scores over time. Significant early postoperative pain reduction was seen with staples.

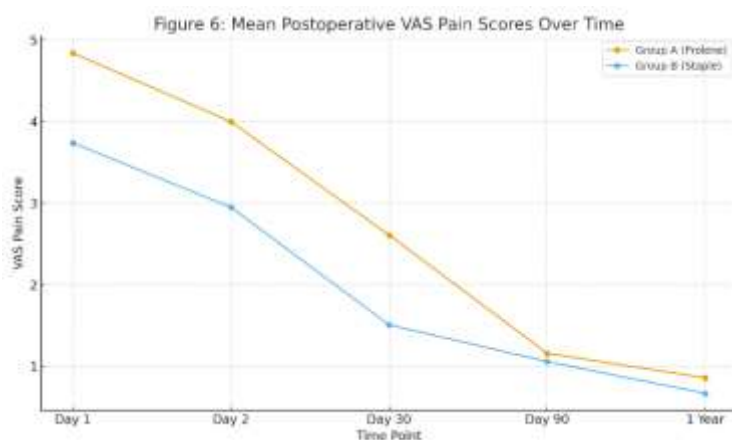


Table 7. Hospital stay duration

Group	Mean ± SD (days)	<i>p</i> -value
A	2.53 ± 0.80	0.001
B	1.84 ± 0.55	

Figure 7: Bar chart comparing mean hospital stay. Patients in the staple group were discharged earlier, highlighting faster recovery.

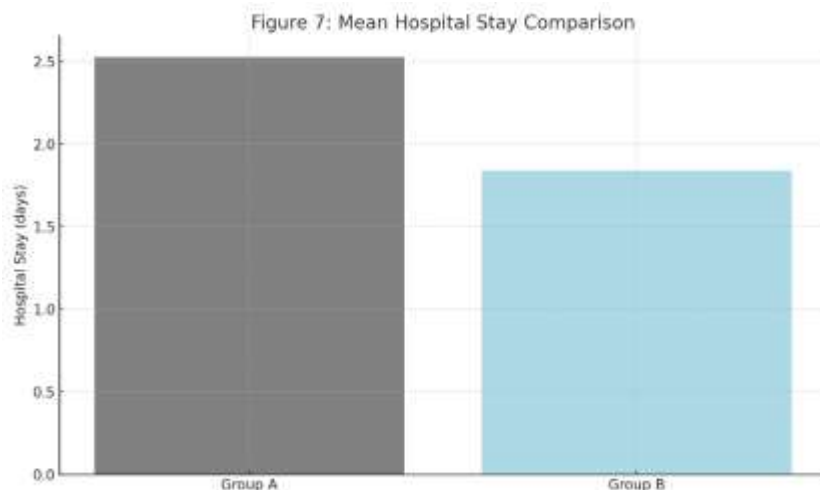


Table 8. Postoperative pain grading

Severity	Group A (%)	Group B (%)	<i>p</i> -value
Mild	44.7	47.4	
Moderate	39.5	52.6	
Severe	15.8	0	0.034

Severe pain was reported exclusively in the suture group, demonstrating superior comfort with staple fixation.

DISCUSSION

The present study compared two common methods of mesh fixation in Lichtenstein hernioplasty: conventional prolene sutures and titanium skin staples. Both techniques effectively repaired hernias, but staple fixation showed significant benefits in efficiency and early postoperative comfort.

Operative Time:

The average operative time was reduced by about 11.5% in the staple group, confirming earlier findings by Wani et al. [9] and Mills et al. [17], who reported similar time reductions. The quick deployment of staples likely explains this time saving.

Postoperative Pain:

Pain plays a key role in recovery and patient satisfaction. The staple group consistently reported lower VAS scores during the early postoperative period, matching the studies by Saqib et al. [13] and Shireen et al. [12]. The reduction in tissue handling and the lack of nerve injury from repeated needle use contribute to this outcome. However, by 3 months and 1 year, pain levels were similar, indicating that the early advantage does not last long-term.

Hospital Stay:

Shorter hospital stays in the staple group reflect less pain and quicker mobilization. Pragya et al. [11] and Ella et al. [14] also noted better early discharge rates with staple fixation, supporting the financial and logistical benefits of this method.

Recurrence and Complications:

Over a one-year follow-up, there were no recurrences or significant infections in either group. Similar findings by Trindade et al. [19] support that titanium staples provide secure fixation without harming long-term mesh stability. Despite concerns about cost and the potential for metal artifacts in imaging, studies confirm that titanium staples are safe and do not migrate [8,18].

Cost Consideration:

Although the upfront cost of staples is higher than sutures, the shorter operative time, reduced anesthesia exposure, and quicker hospital stays yield indirect economic advantages. In high-volume surgical centers, this balance often favors the staple method.

Comparison with Literature:

Several authors have confirmed the safety and effectiveness of titanium staples. Singh et al. [10] reported improved patient comfort. Meanwhile, Khan et al. [15] and Zwaal et al. [16] highlighted comparable recurrence rates between staples and sutures. Together, these studies, along with the current findings, suggest that titanium staple fixation can be adopted safely without affecting outcomes.

Limitations:

This study had a modest sample size and was conducted at a single center. Although the follow-up period was sufficient for checking for recurrences, it could be extended to assess chronic pain and long-term complications.

CONCLUSION

Titanium skin staples provide a dependable and effective option for mesh fixation in inguinal hernia repair compared to traditional prolene sutures. They shorten operative time and lessen early postoperative pain while keeping complication and recurrence rates similar. Due to their ease of use and benefits for patient comfort, titanium staples are worth recommending, especially in busy centers where efficiency is crucial.

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