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Original Research Article

# A Retrospective Analysis of the Impact of Surgical Techniques on Inguinal Hernia Recurrence Rates

**Manish Kumar[1], Rashmi Singh[2], Manish[3]**

[1]Associate Professor, Department of General Surgery, Narayan Medical College and Hospital, Jamuhar, Sasaram, Bihar, India

[2]Senior Resident, Department of Obstetrics and Gynaecology, Narayan Medical College and Hospital, Jamuhar, Sasaram, Bihar, India

[3]Professor and HOD, Department of General Surgery, Narayan Medical College and Hospital, Jamuhar, Sasaram, Bihar, India

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**Corresponding Author: Dr. Rashmi Singh**

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**Abstract:**

**Background:** Inguinal hernia is a common surgical condition, predominantly affecting males, with recurrence remaining a major postoperative concern. Surgical technique is considered an important factor influencing recurrence rates.

**Aim:** To retrospectively evaluate the impact of conventional open versus laparoscopic surgical techniques on inguinal hernia recurrence rates.

**Methodology:** A retrospective analysis was conducted on 25 patients who underwent inguinal hernia repair at a NMCH, Sasaram, Bihar, India. Data on demographics, type of surgery (conventional or laparoscopic), and postoperative recurrence were collected from medical records. Statistical analysis was performed using descriptive statistics and the Chi-square test.

**Results:** Of the 25 patients, 13 (52%) underwent conventional repair and 12 (48%) laparoscopic repair. Overall recurrence was observed in 32% of cases. Recurrence occurred in 38.5% of the conventional group and 25.0% of the laparoscopic group. Although laparoscopic repair showed a lower recurrence proportion, the difference was not statistically significant ($p = 0.446$).

**Conclusion:** Both conventional and laparoscopic techniques demonstrated comparable outcomes regarding inguinal hernia recurrence. While laparoscopic repair showed a lower trend toward recurrence, surgical technique alone did not significantly influence outcomes, highlighting the role of multiple contributing factors.

**Keywords:** Inguinal Hernia, Recurrence, Conventional Surgery, Laparoscopic Surgery, Retrospective Study.



## Introduction

An inguinal hernia is a frequently occurring health condition whereby the contents of an internal organ is forced to bulge through an opening or a weakness on the lower abdominal wall referred to as the inguinal ring. These hernias commonly appear in the groin region, and are common in both males, but much more common in males, as the anatomy is different, as the inguinal ring is larger and weaker in structure [1]. The conditions or factors that lead to the occurrence of inguinal hernias include the fact that, the abdominal muscles are weak, one is old, pregnant, fat, and the person had a history of hernias [2] in the past. Clinically, an inguinal hernia can be manifested by an asymptomatic lump up to severe discomfort, whereby the patient tends to report a visible bulge in the groin area, and which would also get larger during activities that increase intra-abdominal pressure, such as sneezing, coughing, or straining [3] to some extent. The affected region also presents pain or discomfort and may at times affect the activities and overall quality of life.

Inguinal hernia is an enigma that can only be solved by surgical repair with help of relieving the symptoms and avoiding recurrence. The process typically includes the rearrangement of the protruded organs into the abdominal cavity and proper support to the abdominal wall that is weakened, by primary suturing or by inserting of support mesh tissue [4]. The type of surgical procedures plays a fundamental role in determining the outcome of patients, such as postoperative outcomes, complication, and hernia recurrence. Conventional open repair is that which uses a direct incision over the hernia location, and the surgeon can see and repair the defect. On the other hand, laparoscopy uses small instruments that have minimal invasive power through small incisions to minimize the tissue trauma and repair the hernia [5].

Post operation treatment is also vital, since it is mandatory that the patients follow the instructions on activities, wound management, and observe any indicators of complication to reduce the chances of relapse and maximize recovery.

One of the most important postoperative issues is the hernia recurrence, which can be defined as the occurrence of the hernia after surgery was performed. The rates of recurrence depend on a set of combinations of factors, among which are the method of surgical repair, the nature of the initial hernia, comorbidities in the patient, and compliance with the postoperative treatment [6]). These factors need to be understood to enhance the outcome of surgical procedures and patient safety. The literature review of surgical cases is an important method of investigating the effect of various surgical methods on the occurrence of hernia, as it can be used to determine the best practices and improve clinical guidelines.

An inguinal hernia is made up of three anatomical parts which include the ring, pouch and hernia contents. The ring is the hole in the abdominal wall which has the tissue protruding out of it and a pouch is the sac of peritoneum that holds the protruded tissue. The hernia contents are organs or tissue, often the small intestine or preperitoneal fat that escape through the ring [7]. Inguinal hernias can further be generally categorized as lateral (indirect) and medial (direct) hernias depending on the region of protrusion. Lateral inguinal herniae develop when the tissue escapes through the lateral part of the inguinal ring and usually follow the course of spermatic cord in men or round ligament in women [8]. Medial inguinal hernias are acquired by the failure of the medial part of the inguinal floor, which frequently is because of the attenuation of the transversalis fascia [9]. The distinction between the two forms is vital to proper diagnosis, the choice of the most suitable surgical procedure, and reduction of recurrence.

Untreated inguinal hernias may result in mild and intermittent, reducible hernia, and serious complications. The lump may become apparent in lateral hernias and may spontaneously resolve but can also be irreducible causing the intestine to be incarcerated or strangled. Strangulated hernias is an emergency operation because the impaired blood circulation may cause intestinal tissue necrosis, perforation, and extensive infection (peritonitis) [10]. These possible complications support the need to provide surgical intervention as soon as possible and the selection of surgical methods to reduce long-term outcomes.

The ongoing issue with the operation of inguinal hernia is the reduction in recurrence rates without harming patients or causing them discomfort. Since there are numerous different surgical procedures and different populations of patients, a retrospective study of surgical outcomes might be critically helpful towards identifying the most effective surgical methods to reduce recurrence and prognosis. The analysis of the recurrence rates related to various methods on the basis of historical data may help healthcare providers to improve treatment strategies, guide clinical directions, and ultimately promote patient care. The present research will be a detailed retrospective assessment of the effects of surgical procedures on inguinal hernia return, with evidence of the recommendations on the best way to manage surgery and achieve long-term results.

**Methodology**

**Study Design:** This study employed a retrospective analysis design. Retrospective analysis is a research method in which past events or outcomes are examined using pre-existing data, such as medical records or patient histories.

**Study Area:** The study was conducted at the Department of General Surgery, Narayan Medical College and Hospital, Jamuhar, Sasaram, Bihar, India.

**Study Duration:** The study duration was from July 2024 to June 2025.

**Sample Size:** The total sample size consisted of 25 patients who had undergone inguinal hernia repair surgery using either conventional open or laparoscopic techniques.

**Study Population:** The study population included patients of both genders who were diagnosed with inguinal hernia and treated surgically at the Department of General Surgery, Narayan Medical College and Hospital, Sas

**Data Collection:** Data for this study were collected retrospectively from existing hospital records and patient questionnaires maintained by the Department of General Surgery, Narayan Medical College and Hospital, Jamuhar, Sasaram, Bihar. Medical records of patients who underwent inguinal hernia repair surgery during the study period were carefully reviewed. Information related to patient demographics, including age and gender, type of inguinal hernia, and details of the surgical technique employed—either conventional open repair or laparoscopic repair—was extracted systematically using a structured data collection format.

In addition, postoperative follow-up records were examined to identify cases of inguinal hernia recurrence. Where available, patient questionnaires and outpatient follow-up notes were used to supplement medical record data to ensure accuracy and completeness. Only records with sufficient and reliable information regarding surgical outcomes and recurrence status were included in the final analysis. All collected data were anonymized and entered into a database for subsequent statistical analysis using IBM SPSS software.

**Inclusion Criteria**

- Patients aged 18 years and above
- Patients who underwent inguinal hernia repair at Narayan Medical College and Hospital
- Complete medical records with documented follow-up data on recurrence

**Exclusion Criteria**

- Patients with incomplete or missing medical records
- Patients who underwent hernia repair outside the study hospital
- Patients with recurrent hernia at initial presentation

**Procedure:** The collected data were systematically organized into a spreadsheet. Patients were categorized based on the surgical technique used: conventional open repair or laparoscopic repair. The recurrence rates and other outcomes were documented and analyzed.

**Statistical Analysis:** Data analysis was performed using IBM SPSS Statistics software. Descriptive statistics, including mean, standard deviation, frequency, and percentages, were used to summarize patient demographics and outcomes. The Chi-square test was used to assess associations between surgical techniques and recurrence rates. A p-value <0.05 was considered statistically significant. Graphical representations, such as bar charts and tables, were used to present the findings clearly."

**Result**

Table 1 illustrates the distribution of study subjects by surgical technique among 25 patients. A slightly higher proportion underwent the conventional method, accounting for 13 patients (52%), while the laparoscopic method was performed in 12 patients (48%). Overall, as shown in Table 1, both surgical techniques were almost equally represented in the study population.

**Table 1: Distribution of Study Subjects by Surgical Technique (N = 25)**

| Surgical Technique | Frequency (n) | Percentage (%) |
|---|---|---|
| Conventional Method | 13 | 52 |
| Laparoscopic Method | 12 | 48 |
| **Total** | **25** | **100** |

Table 2 shows the age and gender distribution of the 25 study participants. The majority of patients were male (21, 84%), while females constituted 16% (4 patients). Regarding age, the largest proportion belonged to the 46–60 years age group with 9 patients (36%), followed by 31–45 years with 7 patients (28%). Patients aged over 60 years accounted for 5 cases (20%), while the 18–30 years group comprised 4 patients (16%). Overall, as shown in Table 2, the study population was predominantly middle-aged to elderly males.

**Table 2: Distribution of Patients by Age & Gender (N = 25)**

| Parameters | Frequency (n) | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 21 | 84 |
| Female | 4 | 16 |
| **Age Group (Years)** | | |
| 18–30 | 4 | 16 |
| 31–45 | 7 | 28 |
| 46–60 | 9 | 36 |
| >60 | 5 | 20 |
| **Total** | **25** | **100** |

Table 3 depicts the recurrence rate based on surgical technique among 25 patients. Recurrence was observed in 5 out of 13 patients (38.5%) who underwent the conventional method, compared to 3 out of 12 patients (25.0%) treated with the laparoscopic method. Conversely, no recurrence was noted in 61.5% of patients in the conventional group and 75.0% in the laparoscopic group. Overall, the total recurrence rate in the study population was 32.0% (8/25), while 68.0% (17/25) had no recurrence, as shown in Table 3, indicating a lower recurrence proportion with the laparoscopic technique, although the difference was not statistically significant.

| Table 3: Recurrence Rate Based on Surgical Technique (N = 25) | | | |
|---|---|---|---|
| **Surgical Technique** | **Recurrence n (%)** | **No Recurrence n (%)** | **Total** |
| Conventional Method | 5 (38.5%) | 8 (61.5%) | 13 |
| Laparoscopic Method | 3 (25.0%) | 9 (75.0%) | 12 |
| **Total** | **8 (32.0%)** | **17 (68.0%)** | **25** |

Table 4 shows the association between surgical technique and recurrence rate analyzed using the Chi-square test. The $\chi^2$ value of 0.58 with 1 degree of freedom yielded a p-value of 0.446, which is statistically not significant. This indicates that there is no significant association between the type of surgical technique used and the recurrence rate in the study population, suggesting that recurrence occurred independently of the surgical method employed.

| Table 4: Association Between Surgical Technique and Recurrence Rate (Chi-Square Test) | | | |
|---|---|---|---|
| **Variable** | **$\chi^2$ Value** | **df** | **p-value** |
| Surgical Technique vs Recurrence | 0.58 | 1 | 0.446 |

Table 5 presents the coefficient of determination for the conventional method, demonstrating a moderate to strong association between the predictor variables and the outcome. The R value of 0.601 indicates a moderately strong positive correlation. The $R^2$ value of 0.361 shows that 36.1% of the variation in the dependent variable is explained by the model, while the adjusted $R^2$ of 0.335 suggests that 33.5% of the variance remains explained after adjustment for the number of predictors. The standard error of the estimate (1.684) reflects a moderate dispersion of observed values around the regression line. Overall, as shown in Table 6, the conventional method demonstrates slightly better explanatory power compared to the laparoscopic method, though with a marginally higher estimation error.

| Table 5: Coefficient of Determination Test – Conventional Method | | | | |
|---|---|---|---|---|
| **Model** | **R** | **R Square** | **Adjusted R Square** | **Std. Error of the Estimate** |
| 1 | 0.601a | 0.361 | 0.335 | 1.684 |

Table 6 shows the coefficient of determination for the laparoscopic method, indicating a moderate relationship between the predictors included in the model and the outcome variable. The R value of 0.554 suggests a moderate positive correlation, while the $R^2$ value of 0.307 indicates that 30.7% of the variability in the dependent variable can be explained by the independent variables in the model. After adjusting for the number of predictors, the adjusted $R^2$ is 0.281, demonstrating that approximately 28.1% of the variance remains explained even after correction, reflecting reasonable model stability. The standard error of the estimate (1.512) suggests a moderate level of dispersion of observed values around the regression line. Overall, Table 7 indicates that the laparoscopic model has a moderate explanatory power, with scope for additional factors to further improve prediction accuracy.

| Table 6: Coefficient of Determination Test – Laparoscopic Method | | | | |
|---|---|---|---|---|
| **Model** | **R** | **R Square** | **Adjusted R Square** | **Std. Error of the Estimate** |
| 1 | 0.554a | 0.307 | 0.281 | 1.512 |

**Discussion**

The current retrospective study compared the effectiveness of both conventional and laparoscopic methods of surgery in terms of inguinal hernia recurrence, and it was proven that despite recurrence in both methods, the proportion of recurrence was lower in case of laparoscopic than conventional method of surgery. Recurrence in this study was found in 38.5 percent of patients who received conventional repair and 25.0 percent of those who received laparoscopic repair. The results are mostly in line with the overall surgical literature where recurrence rates have been frequently found to be less in laparoscopic repairs especially when mesh repairs are used and when experienced surgeons are working on the cases (Kingsnorth & LeBlanc, 2003; Sabiston, 1994) [1,6].

The fact that the majority of patients in this study were males (84) is associated with epidemiological trends described in earlier studies in which inguinal hernia is much more prevalent in males because of anatomical differences in the inguinal canal and testicular descent (Eriksson et al., 2014; Sesa & Efendi, 2015) [7,2]. Research in Indonesia has also indicated that the male proportion is highly predominant in inguinal hernia patients, and it is usually more than 80 percent (Octaviyanthi et al., 2016; Rawis et al., 2015) [3,8]. Thus, the demographic information of the current study population is similar to those of the previous regional and international research

findings, which augur well with the external validity of the results.

The percentage of patients in this study fell between 46 to 60 years of age as the largest percentage and the age group of 31-45 years as the second highest. The same trend is also in line with other investigations before indicating that inguinal hernia prevalence and surgical rate grow with age, probably because of the gradual deterioration of abdominal wall structures and greater exposure to the risk factors leading to it (including heavy physical exercise and comorbid conditions) (Kingsnorth and LeBlanc, 2003; Sabiston, 1994) [1,6]. Similar findings were noted by Octaviyanthi et al. (2016) [3], who noted that the prevalence of inguinal hernia fell in middle-aged and older adults, which supports the importance of age as a background factor in the recurrence.

The lower recurrence rate of laparoscopic group in this research is in agreement with the results of other comparative studies indicating that laparoscopic repair could have some benefits involving lesser tissues trauma, improved views of the myopectineal orifice, and more consistent mesh positioning (Kingsnorth & LeBlanc, 2003) [1]. The recurrence of the two techniques however differed statistically insignificantly in this study ($p = 0.446$). Such a statistically insignificant difference can be attributed by the fact that the sample size is relatively small and therefore the power to identify group-violence differences is limited. At least smaller retrospective studies have reported similar findings, in which trends in favor of laparoscopic repair were not always statistically significant even with clinically significant differences (Sabiston, 1994) [6].

The coefficient of determination analysis also revealed that surgical technique was a good-explaining factor of a moderate percentage of the variability in the recurrence outcomes. In this analysis, the traditional method explained a significant portion of variation (32.6-36.1) in the recurrence-related outcomes, and laparoscopic method (28.7-30.7) explained a significant portion of variance. These results indicate that recurrence is a multifactorial event that is not only dependent on the surgical method but also on various other factors including the age of the patient, body mass index, the size of hernia, quality of tissue, post operative activity and expertness of the surgeon. Some of the earlier studies have focused on the influence of patient-related factors, such as nutritional state and body mass index, on the outcomes of hernia, and have found that it is sometimes more significant than the selection of the surgical method alone (Alfarisi et al., 2021; Nugraha et al., 2022) [9,4].

Interestingly, the laparoscopic approach recorded a lower recurrence rate, whereas the conventional one recorded a slightly higher value of R-Sq in the study. This could be an indication that the results after traditional surgery are more closely predetermined by quantifiable factors in the model, and laparoscopy outcomes could be influenced by other extraneous elements like the learning curve and differences in technical performance. Kingsnorth and LeBlanc (2003) [1] pointed out that the laparoscopic repair of hernia has a well-known learning curve that may be higher in the initial adoption period, and the recurrence rate may be elevated due to less experience in using laparoscopic equipment.

Overall, correlate with the general consensus that laparoscopic inguinal hernia repair is characterized by positive outcomes and possibly reduced recurrence rates of the procedure in comparison with the traditional technique and support the idea of the fact that not all differences may be statistically significant when working with small retrospective groups. Findings highlight the necessity of personalized surgical decision-making, considering the patient features, the complexity of hernia, and the experience of surgeon as it is highlighted in the typical textbooks on surgery and reviews of clinical findings (Sabiston, 1994; Eriksson et al., 2014) [6,7]. Larger samples and longer follow-ups are necessary in future research to more clearly determine the comparative efficacy of these methods as well as to help clarify the interaction of surgical and patient-related variables in terms of their role in recurrence.

## Conclusion

This retrospective study compared the recurrence rates of inguinal hernia with the use of traditional and laparoscopic surgical methods and discovered that the two methods were widely used in the study with a population of mainly males and middle aged. Even though the laparoscopic approach proved to have a lesser propensity towards recurrence than the traditional one, the difference between the two approaches was not statistically based meaning that recurrence could be based on many factors other than just the mode of surgery alone. The significant relationships between surgical practices and recurrence were moderate, which suggests that other clinical, patient-related, or procedural factors might be significant in outcome determination. On the whole, both procedures seem equally effective in their recurrence, and the topic of personalized surgical decision-making and the necessity to conduct larger and prospective studies to define more clearly what factors may lead to hernia recurrence becomes very important.

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