Short-Term Outcomes of Laparoscopic Inguinal Hernia TAPP Repair with Peritoneal Closure Using Tackers

**Abstract**

**Aims & Objectives:**

The aim of this study is to find out short term outcomes in terms of duration of surgery, length of hospital stay and acute post operative pain for a patient undergoing laparoscopic inguinal hernia TAPP repair with peritoneal closure by tackers.

**Methods:** A prospective, observational study was carried out in the institute over a period of 8 Months with 44 patients planned for elective Laparoscopic Inguinal Hernia repair were taken for study. Patients were studied for short term outcomes in terms of duration of surgery, length of hospital stay and acute post operative pain when peritoneal closure was done by tackers. This data was compared with current data available on same aspects where suturing was used as the method of peritoneal closure..

**Results:** Postoperative pain, measured through the Visual Analog Scale (VAS), provided valuable insights into patient recovery. At one hour post-surgery, the most commonly reported VAS score was 8 (34.1%), with a mean score of 7 ± 1, indicating substantial immediate postoperative pain. Pain levels decreased significantly over 24 hours, with the most frequent scores between 2 and 6, and a mean of 4 ± 2, reflecting effective pain management protocols.

The average hospital stay was 2.66 ± 0.68 days, demonstrating a relatively swift recovery period. All patients (100%) required rescue analgesia within one hour after surgery, emphasizing the importance of timely and effective pain relief strategies.

**Conclusion:** The study offers comprehensive insights into the demographic distribution, surgical duration, pain management, and hospital stay associated with inguinal hernia repair when closure of peritoneum is done with tackers. It highlights the increased prevalence of inguinal hernia among elderly male patients and the predominance of bilateral cases, emphasizing the need for detailed preoperative assessment and tailored surgical planning. The results demonstrate the effectiveness of current pain management protocols and the benefits of the surgical technique in reducing hospital stays. Despite the longer surgery times for some patients, the shorter hospitalization duration and consistent pain outcomes reflect positive clinical efficiency and patient recovery. Future research should explore the underlying factors contributing to variations in surgical duration and patient outcomes, with larger sample sizes and multicentre studies offering broader generalizability.

**Introduction**

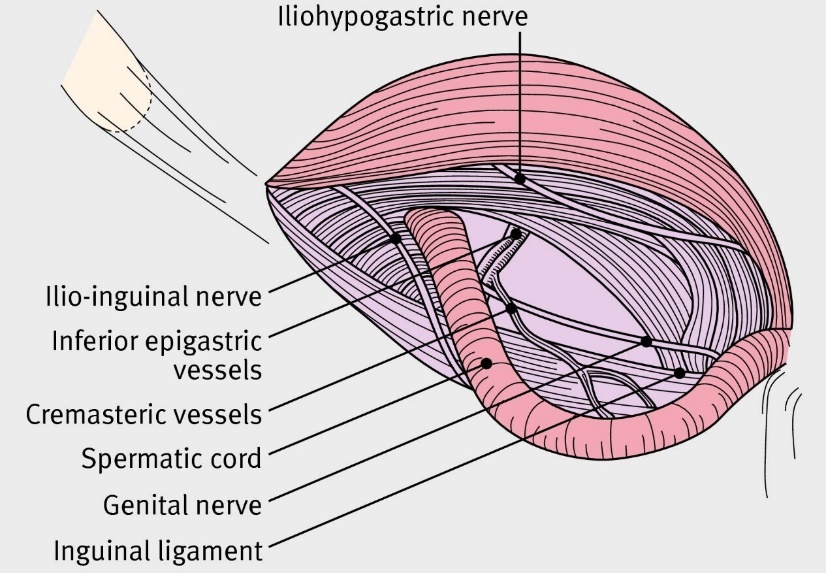
**An Inguinal Hernia and Its Management**

An inguinal hernia is a common surgical condition characterized by the protrusion of intra-abdominal contents through a weak point in the inguinal region of the abdominal wall. It is one of the most frequently encountered conditions in general surgery, affecting approximately 27% of men and 3% of women during their lifetime. The management of inguinal hernias has evolved significantly, transitioning from open repair methods to minimally invasive laparoscopic approaches(1-2).

In TAPP repair, the placement of a prosthetic mesh into the preperitoneal space reinforces the abdominal wall and prevents recurrence. Following the placement of the mesh, the peritoneum must be securely closed to isolate the mesh from intra-abdominal contents and minimize complications such as adhesion formation, bowel obstruction, and mesh migration. This peritoneal closure is a critical step in the TAPP procedure, and the method used can significantly influence short-term surgical outcomes.

A hernia is the bulging of part of the contents of the abdominal cavity through a weakness in the abdominal wall (3-6).

**Anatomy (7)**



*Fig 1: Anatomy of the Inguinal Canal (8)*

**Clinical Assessment (9,10)**

Inguinal hernias are categorized into two types: direct and indirect. A direct hernia occurs when the hernia sac protrudes directly through the posterior wall of the inguinal canal. An indirect hernia, on the other hand, follows the path of the inguinal canal, emerging through the internal inguinal ring alongside the spermatic cord.

**Management of Inguinal Hernia (10,11)** .

Available surgical options include:

* Herniotomy
* Open repair with sutures
* Open flat mesh repair
* Open plug, device, or complex mesh repair
* Open preperitoneal repair

Laparoscopic inguinal hernia repair **Short-Term Outcomes**

The primary metrics for evaluating short-term outcomes include:

1. **Duration of Surgery**: Reduced operative time improves patient safety and efficiency (12).
2. **Postoperative Pain**: Pain levels influence recovery and patient satisfaction (13).
3. **Length of Hospital Stay**: Recovery and complication rates are reflected in hospitalization duration (14).

**Rationale for Study (15)**

The optimal method for peritoneal closure in TAPP repair remains uncertain. Tackers offer efficiency but at the cost of increased pain and expenses. Sutures, though comfortable and cost-effective, require skill and prolong the procedure. Adhesives, while promising, need further validation.

**Significance of the Study**

This study aims to bridge the gap in literature regarding closure techniques in TAPP repair. By evaluating short-term outcomes, findings will help establish standardized protocols, enhancing surgical outcomes and patient care in inguinal hernia management.

**Review of Literature**

**Laparoscopic inguinal hernia repair** has become a preferred treatment modality due to its minimally invasive nature, reduced postoperative pain, and quicker recovery times(16). Among the laparoscopic approaches, Transabdominal Preperitoneal (TAPP) repair is widely employed.

It involves the creation of a preperitoneal space to place a mesh for hernia repair, followed by peritoneal closure to isolate the mesh from intra-abdominal contents. This final step is critical to prevent complications such as bowel adhesion or mesh migration(17). Various methods for peritoneal closure have been explored, including tackers, sutures, and adhesives. Each technique offers unique advantages and challenges, particularly in terms of operative time, pain levels, and short-term recovery outcomes(18). This review evaluates existing literature to compare these techniques, focusing on peritoneal closure using tackers and sutures in TAPP repairs.

**Laparoscopic Hernia Repair – Technique**

Laparoscopic inguinal hernia repair can be performed using two primary techniques: the Transabdominal Preperitoneal (TAPP) approach and the Totally Extraperitoneal (TEP) approach [19-21].

**Techniques in Peritoneal Closure**  
**Tackers (22-23)**  
Tackers are widely used in laparoscopic surgery for peritoneal closure due to their ease of application and ability to expedite surgical procedures. Oğuz et al(26). (2015) demonstrated that tackers facilitate a quicker closure process but may lead to localized tissue trauma, potentially increasing acute postoperative discomfort.  
**Sutures (24)**  
Suturing is a traditional yet effective technique for peritoneal closure in TAPP repairs. Ross et al(27). (2015) observed that patients undergoing closure with sutures reported better quality-of-life scores two weeks postoperatively compared to those treated with tackers.  
**Emerging Alternatives (25)**  
Adhesive technologies such as cyanoacrylate glue have emerged as promising alternatives for peritoneal closure.

**Complications**  
Key complications associated with peritoneal closure include seroma formation (28), bowel adhesion, and mesh migration(29-31).

**Materials and Methods**

**Study Design and Setting:** We conducted a prospective observational study at a tertiary care teaching hospital in western India, from January to October 2024. The study was approved by the Institutional Ethics Committee.

**Participants:** We included adults (>18 years) undergoing elective laparoscopic TAPP repair for uncomplicated, reducible, primary inguinal hernias. Patients classified as ASA Grade I–III were eligible. Exclusion criteria included recurrent or complicated hernias, emergency cases, ASA Grade IV–V, and pregnant women.

**Sample Size:** Based on literature estimates showing a 4% recurrence rate and using a 90% confidence interval, the required sample size was calculated to be 44 patients.

**Procedure:** All surgeries were performed using the standard TAPP technique. After mesh placement, peritoneal closure was done using absorbable tackers. No experimental interventions were introduced.

**Outcome Measures:**

* Duration of surgery (in minutes)
* Postoperative pain measured using the Visual Analog Scale (VAS) at 1 hour and 24 hours
* Requirement and timing of rescue analgesia
* Duration of hospital stay (in days)

**Statistical Analysis:** We used SPSS version 21 for analysis. Descriptive statistics included mean and standard deviation. Comparisons with published studies were done using independent t-tests, with a p-value < 0.05 considered statistically significant.

**Ethical Considerations:** Written informed consent was obtained from all patients. The study adhered to ethical guidelines, with patient anonymity and data confidentiality maintained

**RESULT**

**Table 1: Distribution according to side**

|  |  |  |
| --- | --- | --- |
|  | **N = 44** | |
| **Side** | **Number of patients** | **Percentage** |
| Right | 8 | 18.2 |
| Left | 9 | 20.5 |
| Bilateral | 27 | 61.4 |

**Table 1** shows that the majority of patients (61.4%) had bilateral hernias, followed by left-sided hernias (20.5%), while right-sided hernias were the least common (18.2%).

**Table 2: Distribution according to duration required for surgery**

|  |  |  |
| --- | --- | --- |
|  | **N = 44** | |
| **Duration required for surgery (min)** | **Number of patients** | **Percentage** |
| 80-100 | 12 | 27.3 |
| 101-120 | 9 | 20.5 |
| >120 | 23 | 52.3 |
| Mean duration | 127 ± 27 | |

**Table 2** shows that more than half of the patients (52.3%) required more than 120 minutes for surgery, while 27.3% had a duration between 80-100 minutes, and 20.5% between 101-120 minutes. The mean duration of surgery was 127 ± 27 minutes.

**Table 3: Visual analogue score (VAS) for pain**

|  |  |  |
| --- | --- | --- |
|  | **N = 44** | |
| **Visual analog score (VAS) for pain** | **Number of patients** | **Percentage** |
| VAS at 1 hr | | |
| 5 | 6 | 13.6 |
| 6 | 12 | 27.3 |
| 7 | 5 | 11.4 |
| 8 | 15 | 34.1 |
| 9 | 6 | 13.6 |
| Mean ± SD | 7 ± 1 | |
| VAS at 24 hrs | | |
| 1 | 6 | 13.6 |
| 2 | 9 | 20.5 |
| 3 | 7 | 15.9 |
| 4 | 7 | 15.9 |
| 5 | 7 | 15.9 |
| 6 | 7 | 15.9 |
| 7 | 1 | 2.3 |
| Mean ± SD | 4 ± 2 | |

**Fig 4- Visual analog score for pain at 1hour and 24 hour**

**Table 3 :Table 3** shows that at 1-hour post-surgery, most patients reported a VAS score of 8 (34.1%), followed by 6 (27.3%), with a mean pain score of 7 ± 1. At 24 hours, pain scores had reduced, with the most common scores being 2 (20.5%) and 3-6 (each 15.9%), resulting in a mean pain score of 4 ± 2.

|  |  |  |
| --- | --- | --- |
|  | **N = 44** | |
| **Hospital Stay (Days)** | **Number of patients** | **Percentage** |
| 2 | 20 | 45.5 |
| 3 | 19 | 43.2 |
| 4 | 5 | 11.4 |
| Mean duration | 2.66 ± 0.68 | |

**Table 4: Hospital stay**

**Fig. 5-The bar graph shows the number of patients with percentage stay at the hospital**

**Table 4** shows the mean hospital stay in our study was 2.66 ± 0.68 days, with the majority of patients staying for 2 (45.5%) or 3 days (43.2%) post-surgery. Only 11.4% of patients stayed for 4 days, indicating a relatively short hospitalization period for most patients..

**Table 5: Comparison of proportions for surgery duration categories between this study (closure using tackers) and earlier published studies (closure using sutures)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | Duration required for surgery (min) | | |
| **Source** | **N** | **80 – 100 (Percentage)** | **101 – 120**  **(Percentage)** | **>120**  **(Percentage)** |
| This study | 44 | 27.3 | 20.5 | 52.3 |
| Afsal et al | 38 | 16 | 61 | 24 |
| Singhal et al | 48 | 16 | 61 | 24 |

A **chi-square test** was conducted to compare the distribution of surgery duration categories between our study and the published studies.

As the sample sizes are different in all 3 studies, we have used proportions and not actual counts. Also, since the proportions are exactly similar in the 2 published papers, the results for comparison with our study are also similar.

* The results showed a **significant difference** in the distribution of surgery duration across the three categories (**χ² = 65.579, df = 2, *p* < 0.0001**).
* The observed percentages of patients in each surgery duration category **differed significantly** from the expected values derived from the published data.

These results suggest that the **distribution of surgery duration in our study is not comparable** to that reported in previous studies. The variation may be due to differences in **surgical techniques, patient selection, or other clinical factors** influencing the duration of surgery.

**Table 6: Comparison of VAS at day 1 post surgery between this study (closure using tackers) and earlier published studies (closure using sutures)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Comparison** | **Mean VAS** | **Mean Difference** | **95% CI** | **t-value** | ***p*-value** |
| This study vs. Afsal et al | This Study - 4  Afsal et al – 3.92  Singhal et al – 3.91 | 0.08 | (−0.5932, 0.7532) | 0.2365 | 0.81 |
| This study vs. Singhal et al | 0.09 | (−0.5135, 0.6935) | 0.2963 | 0.77 |

Fig 6- **Comparison of studies on the VAS on day 1**

**Table 6** Independent t-tests were conducted to compare the mean VAS at day 1 post-surgery between our study and two published studies. The mean VAS for our study (4 ± 2) was not significantly different from Afsal et al (3.92 ± 0.63; t = 0.24, *p* = 0.81) or Singhal et al (3.91 ± 0.63; t = 0.30, *p* = 0.77). Thus, the results suggest that the pain levels at day 1 post-surgery in our study are comparable to those observed in the previously published studies, indicating no significant difference in pain perception between the different surgical techniques.

**Table 7: Comparison of duration of hospital stay post-surgery between this study (closure using tackers) and earlier published studies (closure using sutures)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Comparison** | **Mean Stay duration**  **(Days)** | **Mean Difference (Days)** | **95% CI** | **t-value** | ***p*-value** |
| This study vs. Afsal et al | This study – 2.66  Afsal et al – 3.23  Singhal et al – 3.21 | -0.57 | (−1.1221, −0.0179) | 2.0545 | 0.0432 |
| This study vs. Singhal et al | -0.55 | (−1.1021, 0.0021) | 1.9824 | 0.0509 |

**Table 7** Independent t-tests were conducted to compare the mean hospital stay duration post-surgery between our study and two published studies. The mean hospital stay duration in our study (2.66 ± 0.68 days) was **significantly shorter** compared to Afsal et al. (3.23 ± 1.69 days; *t* = 2.05, *p* = 0.043), but only marginally different from Singhal et al. (3.21 ± 1.69 days; *t* = 1.98, *p* = 0.051). These results suggest that while the hospital stay in our study was generally shorter, the difference was statistically significant only when compared to Afsal et al.

**Discussion**

Postoperative pain, measured through the Visual Analog Scale (VAS), provided valuable insights into patient recovery. At one hour post-surgery, the most commonly reported VAS score was 8 (34.1%), with a mean score of 7 ± 1, indicating substantial immediate postoperative pain. Pain levels decreased significantly over 24 hours, with the most frequent scores between 2 and 6, and a mean of 4 ± 2, reflecting effective pain management protocols.

The average hospital stay was 2.66 ± 0.68 days, demonstrating a relatively swift recovery period. All patients (100%) required rescue analgesia within one hour after surgery, emphasizing the importance of timely and effective pain relief strategies.

When compared with published studies by Afsal et al. and Singhal et al., the mean VAS score on day 1 post-surgery (4 ± 2) showed no significant difference from their reported scores (3.92 ± 0.63 and 3.91 ± 0.63, respectively). However, the hospital stay duration in this study was significantly shorter than Afsal et al.’s findings (3.23 ± 1.69 days; p = 0.043) and marginally different from Singhal et al.’s results (3.21 ± 1.69 days; p = 0.051). The chi-square analysis revealed significant differences in the distribution of surgery duration categories between this study and the other two, therefore distribution of surgery duration in our study is not comparable to that reported in previous studies suggesting variations likely due to differences in patient selection and the fact that majority of cases in our study were bilateral , or clinical factors like like adhesions from previous surgeries, the presence of large or incarcerated hernias and hence need to explore these disparities and identify best practices for optimizing surgical efficiency.

**Conclusion**

The study offers comprehensive insights into the demographic distribution, surgical duration, pain management, and hospital stay associated with inguinal hernia repair when closure of peritoneum is done with tackers. It highlights the increased prevalence of inguinal hernia among elderly male patients and the predominance of bilateral cases, emphasizing the need for detailed preoperative assessment and tailored surgical planning. The results demonstrate the effectiveness of current pain management protocols and the benefits of the surgical technique in reducing hospital stays. Despite the longer surgery times for some patients, the shorter hospitalization duration and consistent pain outcomes reflect positive clinical efficiency and patient recovery. Future research should explore the underlying factors contributing to variations in surgical duration and patient outcomes, with larger sample sizes and multicentre studies offering broader generalizability.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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