

## COMPARATIVE ANALYSIS OF CHRONIC GROIN PAIN AFTER SURGERY USING LAPAROSCOPIC AND LICHTENSTEIN SURGICAL TECHNIQUES FOR THE MANAGEMENT OF UNILATERAL PRIMARY INGUINAL HERNIA

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### Abstract

**Background:** Every year, more than twenty million inguinal hernia surgeries are carried out globally to treat them surgically, making it one of the most common medical treatments. The best methods for treating inguinal hernias are generally agreed to be the tension-free open Lichtenstein approach and laparoscopic surgeries. Since postoperative pain directly impacts patients' quality of life, it is widely acknowledged as one of the main issues associated with inguinal hernia repair. In order to repair primary inguinal hernias, this study contrasts the prevalence of long-term pain between transabdominal preperitoneal laparoscopy (TAPP) and open Lichtenstein (LC) procedures. **Materials and Methods:** This was a hospital centered observational study with a Sample size of 64 (32 each in open and laparoscopic group). Patients' informed permission was obtained following approval from the institutional ethical committee and who are eligible to participate in the study and was enrolled into 2 groups, group 1 undergoing TAPP hernia repair and group 2 undergoing open Lichtenstein hernia repair. A proforma was filled by the researcher after interviewing the patient and analysing medical records. The patient was advised to come for review at 4 months and a questionnaire sf-IPQ was filled by the patient. Data collected by these methods were compiled and later analysed. **Result:** Open lichtenstein repair reported negligible pain among 78.1% and substantial pain in 22.9% whereas Laparoscopic TAPP group reported negligible pain for all (100%) the participants. Chi square analysis between the groups reported significant difference regarding chronic groin pain ( $p < 0.05$ ). **Conclusion:** As with most of the outcomes of laparoscopic surgical techniques, post inguinal hernioplasty chronic groin pain is also found to be significantly reduced in laparoscopic TAPP compared to open Lichtenstein repair.

## INTRODUCTION

The Latin term "rupture" is where the word "hernia" originates. In surgical practice, abdominal wall hernias are frequent, making for 15–18% of all surgical procedures.<sup>[1]</sup> Almost 20 million hernias are operated on worldwide each year.<sup>[2]</sup> In the United States, around 750,000 hernias are operated on annually, while approximately 125,000 in the United Kingdom.<sup>[3]</sup> Abdominal wall hernias range in frequency from 100–300/100,000 per year among different nations. The groin is where about 75% of abdominal wall hernias occur.<sup>[4]</sup> Men have a lifetime

risk of 15–27% and women a lifetime risk of 3% of getting an inguinal hernia. Femoral hernias occur in women four times more frequently than in males, despite the fact that men are affected more frequently (7:1).<sup>[5]</sup>

Surgical correction methods for inguinal hernias, which date back to the ancient Greek and Egyptian cultures, are often more harmful than the condition itself. The death rate must have been rather significant because these surgeries were carried out before aseptic technique became widely used. Hernia recurrence is prevalent among surgical survivors. Poor comprehension of the natural history

of hernia formation and insufficient knowledge of the anatomy of the groin are blamed for the failure of these early hernia repair techniques. The groin's anatomy was established when individuals first began studying human anatomy through dissection studies. During an extended follow-up period, outcomes improved but recurrence rates remained high. Following the increasing adoption of prosthetic materials for inguinal floor reconstruction, the tension-free repair generation started to pose a threat to tissue-based repair. Compared to earlier tissue healing techniques, these are better because they allow for the restoration of transversalis fascia weakness by filling the defect with a mesh instead of using tension to seal it shut between the tissues. Even non-specialist hernia surgeons can produce excellent outcomes. Furthermore, the most recent change in inguinal hernia repair has been brought about by the development of minimally invasive surgery. Because laparoscopic inguinal hernia repair offers a method that lessens postoperative pain and speeds up recovery, it has become more and more popular among general surgeons. A variety of prosthetic materials have also been introduced to help patients have the highest possible quality of life and to further lower recurrence rates. The basis of inguinal anatomy is crucial to the current state of inguinal hernia surgery, regardless of the approach used to repair the hernia—open or laparoscopic. The successful treatment of inguinal hernias with minimum morbidity—unprecedented in surgical practice—has been made possible by the application of modern technologies to this anatomical understanding. Recurrence rates have drastically dropped since mesh implants and other advanced procedures became available. As a result, the emphasis switches from clinical outcomes—like relapse—to patient-perceived criteria—like persistent discomfort. The complicated and poorly understood mechanisms that lead to pain following hernia surgery are numerous. Reduced rates of postoperative problems were observed to be related to older age, laparoscopy, and mild mesh types. However, there is considerable contradiction in these conclusions.<sup>[6]</sup> One of the most common surgeries carried out on a daily basis at our facility is the treatment of an inguinal hernia. Since postoperative pain directly impacts patients' quality of life, it is widely acknowledged as one of the main issues associated with inguinal hernia repair. Studies using the open Lichtenstein approach have shown increased chronic and postoperative discomfort. Thus, the aim of this research is to investigate the prevalence of persistent pain in individuals undergoing transabdominal pre-peritoneal laparoscopy (TAPP) with open Lichtenstein (LC) for primary inguinal hernia treatment.

## MATERIALS AND METHODS

From January 2020 to September 2021, a hospital-based observational study was carried out in the General Surgery Department of Sree Gokulam Medical College and Research Foundation, Venjaramoodu, a tertiary care facility in South India.

### Study Population

#### Inclusion criteria

All patients older than eighteen who are admitted to the surgical gastroenterology and general surgery departments for the purpose of unilateral inguinal hernia repair.

#### Exclusion criteria

Patients with recurrence and postoperative complications, Patients with complicated inguinal hernia and patients who do not give consent.

#### Sample Size Estimation

$$n = \left[ \frac{[Z1 - \alpha/2] \sqrt{2p(1-p)} + [Z1 - \beta] \sqrt{p_1(1-p_1)} + p_2(1-p_2)}{(p_1 - p_2)^2} \right]^2$$

$$p = \frac{p_1 + p_2}{2}$$

$p_1$  = proportion in TAPP  
= 3.6% (from Pedroso et al)(1)

$p_2$  = proportion in LC  
= 32.1%(from Pedroso et al)(1)

$\alpha$ =5%

$1 - \beta$ =80%

Sample size= 27.

Assuming 15% lose for follow up, sample size = 32 in each group Prior to achieving the desired sample size, all patients who were admitted for unilateral inguinal hernia repair and were at least eighteen years old to the Departments of General Surgery and Surgical Gastroenterology were consecutively included. Study variables include Age, Sex, BMI, Side of hernia, Duration of hernia, Pre operative pain, comorbidities, Duration of surgery, Post operative analgesic administration and Post operative complications. Following receipt of Institutional Ethical Committee approval (**SGMC-IEC-NO: 36/498/01/2020 dated 1/2/2022**), the patients who are eligible to participate in the trial gave their informed permission and were enrolled into 2 groups, group 1 undergoing TAPP hernia repair and group 2 undergoing open Lichtenstein hernia repair. A proforma was filled by the researcher after interviewing the patient and analysing medical records. The patient was advised to come for review at 4 months and a questionnaire sf- IPQ was filled by the patient. Question 2 adds one point for each reported activity that is hindered by pain, up to a total of six points. Question 1 contributes 0–6 points, with greater points awarded for more extreme pain. There are 12 possible points in the total score. A score of 0–2 indicates very little pain, while a score of 3–12 indicates significant discomfort. These techniques gather data, which is then assembled and examined.

## Statistical Analysis

The gathered data were imported into Microsoft Excel and subjected to SPSS analysis. Qualitative variables expressed as percentages. Chi square analysis was performed to compare the two groups.

## RESULTS

Regarding age, around 5.7% belong to 18-30 yrs, 9.4% belong to 31-40 yrs in each group. Around 21.9% belong to 41-50 yrs, 16.1% in 51-60 yrs and 46.9% belong to >60 yrs in Open lichtenstein repair group. In Laparoscopic TAPP group the participants distribution are as follows; 12.5% (41-50 yrs), 31.2% (51-60 yrs) and 41.2% (>60 yrs). Majority of the participants were males in both the groups (93.8% in Open lichtenstein repair group and 90.7% in Laparoscopic group). Female participants were 6.2% and 9.3% in each group respectively. Regarding BMI distribution of the study participants, Open Lichtenstein repair includes 68.8% (18.5-24.9), 28.1% (25-29.9) and 3.1% (>30) participants in each BMI category. In Laparoscopic TAPP group it is as follows, 75% (18.5-24.9), 18.8% (25-29.9%) and 6.2% (>30).

[Table 1] displays the side of hernia distribution of the study participants. Open lichtenstein repair includes 56.2% (Right) and 43.8% (Left). In Laparoscopic TAPP group 59.3% belong to (Right) and 40.7% (Left).

[Table 2] depicts the participant's distribution based on 'DURATION OF HERNIA'. Open lichtenstein

repair includes 21.9% (6 MONTHS – 1YR), 43.8% (1-5 YRS) 25% (<6 MONTHS) and 9.3% (>5 YRS) participants in each category. In Laparoscopic TAPP group it is as follows, 25% (6 MONTHS – 1YR), 43.4% (1-5 YRS) 15.7% (<6 MONTHS) and 9.3% (> 5 YRS).

The distribution of study participants according to Pre Op Pain is displayed in [Table 3]. Open Lichtenstein repair 31.2% and 28.2% among Laparoscopic reported pain.

CAD - coronary artery diseases CVA- Cerebrovascular diseases. [Table 4] shows the participants distribution based on 'CO-Morbidities'. Open lichtenstein repair reported Diabetes (9.4%), Hypertension (18.8%), Diabetes + Hypertension (28.1%) and Diabetes + Hypertension+CAD (21.9%). Among Laparoscopic TAPP group it is as follows, Diabetes (9.4%), Hypertension (9.4%), Diabetes + Hypertension (40.7%) and Diabetes + Hypertension+CAD (21.9%).

[Table 5] displays the distribution of participants according to the Duration Of Surgery. Among Open Lichtenstein repair participants had duration of surgery 62.5% (30 mins- 60 mins), 25% (60 mins-90 mins) and 6.2% >90 mins. Among Laparoscopic TAPP group it is as follows, 46.8% belong in both (30 mins- 60 mins) and (60 mins-90 mins) and 6.2% reported >90 mins and none under < 30 mins category.

**Table 1: Side of Hernia**

| Category | Open lichtenstein repair (N, %) | Laparoscopic TAPP (N, %) | X <sup>2</sup> value | P value |
|----------|---------------------------------|--------------------------|----------------------|---------|
| RIGHT    | 18(56.2%)                       | 19(59.3%)                | 0.185                | 0.66    |
| LEFT     | 14(43.8%)                       | 13(40.7%)                |                      |         |
| TOTAL    | 32(100%)                        | 32(100%)                 |                      |         |

**Table 2: Duration of Hernia**

| Category        | Open lichtenstein repair (N, %) | Laparoscopic TAPP (N, %) | X <sup>2</sup> value | P value |
|-----------------|---------------------------------|--------------------------|----------------------|---------|
| <6 MONTHS       | 8(25%)                          | 5(15.7%)                 | 4.91                 | 0.17    |
| 6 MONTHS -1 YRS | 7(21.9%)                        | 8(25%)                   |                      |         |
| 1-5 YRS         | 14(43.8%)                       | 13(43.4%)                |                      |         |
| >5 YRS          | 3(9.3%)                         | 6(18.8%)                 |                      |         |
| TOTAL           | 32(100%)                        | 32(100%)                 |                      |         |

\*P<0.05- significant

**Table 3: Pre Op Pain**

| Category | Open Lichtenstein repair (N, %) | Laparoscopic TAPP (N, %) | X <sup>2</sup> value | P value |
|----------|---------------------------------|--------------------------|----------------------|---------|
| YES      | 10(31.2%)                       | 9(28.2%)                 | 0.38                 | 0.74    |
| NO       | 22(68.8%)                       | 23(71.8%)                |                      |         |
| TOTAL    | 32(100%)                        | 32(100%)                 |                      |         |

**Table 4: CO Morbidities**

| Category                    | Open Lichtenstein repair (N, %) | Laparoscopic TAPP (N, %) | X <sup>2</sup> value | P value |
|-----------------------------|---------------------------------|--------------------------|----------------------|---------|
| No comorbidities            | 8(25%)                          | 9(28.1%)                 | 13.13                | 0.10    |
| Diabetes                    | 3(9.4%)                         | 3(9.4%)                  |                      |         |
| Hypertension                | 6(18.8%)                        | 3(9.4%)                  |                      |         |
| COPD                        | 1(3.1%)                         | 2(6.2%)                  |                      |         |
| CAD                         | 0                               | 1(3.1%)                  |                      |         |
| CVA                         | 0                               | 0                        |                      |         |
| Daibetes+ Hypertension      | 9(28.1%)                        | 13(40.7%)                |                      |         |
| Diabetes+ Hypertesnsion+CAD | 7(21.9%)                        | 7(21.9%)                 |                      |         |

|         |          |          |  |  |
|---------|----------|----------|--|--|
| CAD+CVA | 1(3.1%)  | 0        |  |  |
| Total   | >32(100) | >32(100) |  |  |

**Table 5: Duration of Surgery**

| Category        | Open lichtensteinrepair (N, %) | Laparoscopic TAPP (N, %) | X <sup>2</sup> value | P value |
|-----------------|--------------------------------|--------------------------|----------------------|---------|
| <30 MINS        | 2 (6.2%)                       | 0                        | 14.05                | 0.001*  |
| 30MINS -60 MINS | 20(62.5%)                      | 15(46.8%)                |                      |         |
| 60 MIN- 90 MINS | 8(25%)                         | 15(46.8%)                |                      |         |
| >90 MINS        | 2(6.2%)                        | 2(6.2%)                  |                      |         |
| TOTAL           | 32(100%)                       | 32(100%)                 |                      |         |

\*P<0.05- significant

**Table 6: Post Op Analgesic**

| Category | Open lichtensteinrepair (N, %) | Laparoscopic TAPP (N, %) | X <sup>2</sup> value | P value |
|----------|--------------------------------|--------------------------|----------------------|---------|
| <3 DAYS  | 11(34.4%)                      | 31(96.9%)                | 86.64                | 0.0001* |
| >3 DAYS  | 21(65.6%)                      | 1(3.1%)                  |                      |         |
| TOTAL    | 32(100%)                       | 32(100%)                 |                      |         |

\*P<0.05 - significant

**Table 7: Post Op Complication**

| Category         | Open lichtensteinrepair (N, %) | Laparoscopic TAPP (N, %) | X <sup>2</sup> value | P value |
|------------------|--------------------------------|--------------------------|----------------------|---------|
| No Complications | 27(84.4%)                      | 32(100%)                 | 16.21                | 0.0001* |
| Wound Infection  | 2(6.2%)                        | 0                        |                      |         |
| Seroma           | 3(9.4%)                        | 0                        |                      |         |
| Total            | 32(100%)                       | 32(100%)                 |                      |         |

\*P<0.05 - significant

**Table 8: Chronic Groin Pain**

| Category         | Open lichtensteinrepair (N, %) | Laparoscopic TAPP (N, %) | X <sup>2</sup> value | P value |
|------------------|--------------------------------|--------------------------|----------------------|---------|
| Negligible Pain  | 25(78.1%)                      | 32(100%)                 | 24.71                | 0.0001* |
| Substantial Pain | 7(22.9%)                       | 0                        |                      |         |
| Total            | 32(100%)                       | 32(100%)                 |                      |         |

\*P<0.05 - significant

[Table 6] depicts the distribution of the study participants according to the Post Op Analgesic. Open lichtenstein repair reported 34.4% (<3 Days) and 65.6% (>3 Days) and Laproscopic group 96.9% reported (<3 Days) and 3.1% (> 3 Days). Chi square analysis between the groups reported significant difference regarding Post OP Analgesic (p<0.05).

[Table 7] displays the distribution of the study participants according to the Post Op Complications. Open Lichtenstein repair reported complication among 9.4% (Seroma) and Wound Infection (6.2%) whereas Laparoscopic TAPP group did not report any complications. Chi square analysis between the groups reported significant difference regarding Post Op Complications (p<0.05).

[Table 8] shows the distribution of the study participants based on the Chronic Groin Pain. Open lichtenstein repair reported negligible pain among 78.1% and Substantial pain in 22.9% whereas Laproscopic TAPP group reported negligible pain for all (100%) the participants. Chi square analysis between the groups reported significant difference regarding chronic groin pain (p<0.05).

## DISCUSSION

### 1. Age related Demographics

According to Rutkow IM et al.'s study, the age group of 45–64 years old had the highest incidence

of inguinal hernias.<sup>[7]</sup> In a study done in the United States of America, Ruhl CE et al. found that the age range of 40–59 had the greatest incidence of inguinal hernia.<sup>[8]</sup> In a study carried out in the northern region of India, Indranil B et al. found that the age range of 47–52 years old had the highest incidence of primary inguinal hernia.<sup>[9]</sup> In 1978, Abramson provided evidence about the age dependence of inguinal hernias. The lifetime prevalence rate for those in the 25–34 age range was 15%.<sup>[10]</sup> The age group between 50 and 60 years old made up 23.6% of the patients in our study, with the majority of patients (44%) being above 60 years old. We came to the conclusion that hernias are more common in the elderly since our results were consistent with those of the earlier research.

### 2. Sex-related demographics

90% of cases of inguinal hernia were found to be male, while 10% were female, according to research done by Rutkow IM et al.<sup>[7]</sup> According to a study by Martin Kurzer and associates at the British Hernia Centre, there were 3% of female cases and 97% of male cases.<sup>[11]</sup> DC Shyam et al. observed that all 57 patients with inguinal hernias, from Shillong, India, were male.<sup>[12]</sup> Our study's gender distribution of 92.2% men and 7.8% women was in line with the findings of the research cited above.

### 3. BMI related demographics

Rates were lowest for obese and morbidly obese men and highest for men who were either normal weight or overweight.<sup>[13]</sup> In our study, 23.4% of patients were overweight, whereas 71.9% of patients fell within the normal range of BMI (18.5–24.9%). Just 3% of people were fat. We also found a much-reduced incidence among obese patients, in line with prior investigations. Thus, we deduce that obesity does not increase the likelihood of developing a hernia.

### 4. Side of swelling

A right-side hernia was present in 74% of the patients in a research done in Pakistan by Muhammad N et al.<sup>[14]</sup> According to research conducted in Northern India by Mukesh S et al., 67% of all instances of inguinal hernias were on the right side and 30% were on the left.<sup>[15]</sup> An Indian prospective study by DC Shyam et al, on 57 patients with inguinal hernias found that 31% of the patients had the hernia on the left side and 60% on the right.<sup>[12]</sup> We discovered that 42.25% of the cases in our study had a left sided inguinal hernia, while 57.75% of the cases had a right sided one. Our findings are consistent with the research mentioned above, causing us to conclude that inguinal hernias on the right side occur more frequently than those on the left.

### 5. Duration of surgery

In their publication, Zieran J et al. reported that the laparoscopic group's mean operating time was  $61 \pm 12$  minutes, while the open hernioplasty group's mean operating time was  $36 \pm 14$  minutes.<sup>[16]</sup> The mean operating time for laparoscopic hernia repairs was  $65 \pm 25$  minutes, while the mean operating time for open mesh repairs was  $38 \pm 14$  minutes, according to a study by B Johansson et al.<sup>[17]</sup> In a research study, Pawanindra Lal and associates observed that the laparoscopic group's mean operating time was  $75.72 \pm 31.6$  minutes, while the open mesh repair group's mean operating time was  $54 \pm 15$  minutes.<sup>[18]</sup> The laparoscopic procedure took longer in our study than the open procedure. While only 46.8% of laparoscopic procedures took less than 60 minutes, 68.7% of procedures concluded in that time. Both treatments' operating times are similar to the research mentioned above, emphasising the challenging learning curve associated with laparoscopic hernia repair.

### 6. Post-operative pain

In our study, 96.9% of patients who underwent laparoscopic TAPP did not require analgesics beyond 3<sup>rd</sup> post op day while in patients who had open Lichtenstein repair, 65.6% needed analgesics beyond 3 days. The results are comparable to the results of Filipi, et al,<sup>[19]</sup> Wellwood, et al,<sup>[20]</sup> Anadol, et al,<sup>[21]</sup> and Heikkinen, et al.<sup>[22]</sup>

### 7. Pre op pain

Pre-operative pain was reported by 24 out of 54 participants in research by Neil et al.<sup>[23]</sup> In research by Page et al., 176 patients (53.9%) reported only mild pain (score less than 10) and 86 patients

(26.6%) reported no pain at all from the hernia at rest. 53 patients (16.4%) reported no discomfort when moving, whereas 137 patients (42.4%) reported only mild pain. Just 1.5% of people reported having severe pain (a score of more than 50) while at rest, and 10.2% reported having severe pain when moving.<sup>[24]</sup> In our study, 29.7% reported pre-op pain where as 70.3% of patients did not have any pain prior to surgery.

### 8. Post-operative complications

The total complication rate was found to be 9.8% in the laparoscopic group and 20.4% in the open mesh group in a study by Bringman et al.<sup>[25]</sup> The study conducted by Bhandarkar S et al. found that the rates of wound infection following laparoscopic procedures (1%), as opposed to the Lichtenstein operation (2.7%) and other open mesh repairs (2.4%), were much lower. After laparoscopic repairs, the incidence of inguinal hematoma was observed to be much lower (13.1%) compared to other open mesh procedures (14.3%) and the Lichtenstein repair (16.0%).<sup>[26]</sup>

In a research, Erhan et al. found that 4-6% of patients experienced chronic pain following Lichtenstein and preperitoneal hernia repairs, whereas Poobalan et al. found that 10% of patients experienced chronic pain following open inguinal hernia repairs.<sup>[27]</sup>

According to Neumayer L. et al.'s research, the laparoscopic surgery group experienced a greater rate of complications (39%) compared to the open surgery group (33.4%). On the day of operation and after two weeks, the group undergoing laparoscopic surgery experienced less discomfort than the group undergoing open surgery.<sup>[28]</sup>

### 9. Chronic groin pain

In a Danish study conducted over a two-month period, 1,652 individuals who had groin hernia surgery experienced pain 28.7% of the time a year following the procedure. Just 4.5% sought or received medical attention, despite the fact that 11% said their discomfort interfered with their leisure activities, and 3% said their pain was moderate to severe.<sup>[29]</sup>

A study conducted by Pedroso et al reported significantly lower chronic pain at 12 months after surgery in patients who underwent laparoscopic TAPP compared to open Lichtenstein, 3.6% and 32% respectively.<sup>[6]</sup>

In our study, 22.9 % of patients who underwent open Lichtenstein repair reported significant pain at 3 months after the surgery while none of the patients who underwent Laparoscopic TAPP reported significant pain. This is consistent with previous studies and hence we concluded that laparoscopic procedure is much superior to open Lichtenstein technique with respect to incidence of chronic groin pain following surgery.

## CONCLUSION

Chronic groin pain following inguinal hernioplasty is also observed to be greatly reduced in laparoscopic TAPP as compared to open Lichtenstein repair, as is the case with most of the outcomes of laparoscopic surgical procedures. Important differences that might have played a role includes the amount of surgical trauma, the plane of dissection, and the ease of appreciation of the anatomy. Feature that is common for both open and laparoscopic techniques is the use of mesh. But the exact mechanism of pain is still not clearly understood and further research needs to be carried out. A perfect method in open surgery to avoid chronic groin pain is still considered desirable as one can avoid the risk of post op adhesions following laparoscopic TAPP repair.

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