

Evaluation of postoperative chronic neuropathic pain in patients with Lichtenstein hernia repair and laparoscopic hernia repair

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ABSTRACT

Objectives: The high incidence of inguinal hernia over the globe makes hernia repair the most common procedure in general surgery, and 10-15% of all surgeries are composed of hernia repair. In this study, we tried to elucidate the effect of risk factors of laparoscopic techniques on chronic neuropathic pain formation in the postoperative period in patients who underwent Lichtenstein hernia repair and laparoscopic hernia repair.

Methods: A total of 404 patients have been enrolled in this study. Two different surgery techniques have been conducted on the participants, as Lichtenstein repair (n=214) and laparoscopic inguinal hernia repair (n=190). Demographic data of the patients were recorded. Transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) techniques were applied to patients who underwent laparoscopic repair. The 'Lanss Pain Score' was utilized in the evaluation of chronic pain in the postoperative period.

Results: We detected a statistically significant difference between the groups in terms of age and the Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) scores ($P<0.05$). It was determined that the mean age of the patients with Lichtenstein repair was 57, and the mean LANSS score was 3. It was determined that the mean age of the patients with laparoscopic inguinal hernia repair was 49, and the mean LANSS score was 1. The distribution of demographic and clinical findings of the patients who underwent laparoscopic inguinal hernia repair according to the operation methods revealed no statistically significant difference in patients who underwent TAPP and TEP methods.

Conclusions: In conclusion, the TEP and TAPP methods have lower pain in the postoperative period.

Keywords: Lichtenstein repair, laparoscopic inguinal hernia repair, transabdominal preperitoneal, totally extraperitoneal

Tit is thought that more than 20 million inguinal hernia repairs are performed annually worldwide [1]. Bassini made the first modern surgical treatment description for inguinal hernias in 1884, and over

time, it became a technique created via using the patient's own tissue and successfully applied for many decades [2].

Since then different techniques have been intro-

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duced, and today laparoscopic methods have been widely used in inguinal hernia repairs. The most important advantages of laparoscopic inguinal hernia repairs are lower postoperative pain and reduced infection risk compared to open surgery, patients returning to their activities earlier, better cosmetic appearance, and similar results in terms of recurrence compared to open surgery. Today, the most commonly used laparoscopic methods in inguinal hernia repairs are: totally extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) approaches [3, 4].

After the 1970s, the use of synthetic patches in inguinal hernia repairs to reduce tension and recurrence had a very important place in the development of modern hernia surgery. In the following years, many different methods have been used in inguinal hernia repairs [5]. The first laparoscopic inguinal hernia repair was performed by Ger in 1982 after detecting an inguinal hernia in a patient who had been operated for other reasons [6]. Standard inguinal hernia repair changed little over the hundred years before the use of synthetic mesh. The next major change was the initiation of laparoscopic repair. There are discussions in the literature about which approach should be performed for routine inguinal hernia repair [5].

Although various techniques have been reported for hernia repair, the "tension-free" hernia repair described by Lichtenstein is the preferred method among open surgery techniques [7]. With the application of laparoscopic surgery in inguinal hernia repairs, hernia surgery has gained a different dimension and these laparoscopic methods have become accepted all over the world and successfully applied in many centers in a short time. TEP and TAPP are tension-free methods, also has the general advantages of laparoscopic surgery such as less postoperative pain, shorter recovery time and good cosmetic result [3, 5].

Chronic pain is a potential complication following inguinal hernia repair, defined as pain lasting between three and six months with a fluctuating nature. Chronic neuropathic pain, also referred to as persistent pain, is characterized by symptoms such as burning or shooting sensations and may result from damage to the somatosensory system [8]. Both modern open and laparoscopic repairs of groin hernias have been associated with entrapment-related symptoms involving the genital nerves, particularly the genitofemoral and ilioinguinal nerves.

This type of pain negatively impacts physical activity and overall comfort, leading to a reduced quality of life [9]. While the exact incidence remains debated, evidence consistently shows that chronic neuropathic pain is becoming more prevalent than hernia recurrence, historically the most common complication of hernia repair [10].

Chronic neuropathic pain is typically sharp, activity-related, and localized to the groin, though it may radiate toward the inner thigh. Associated symptoms include paresthesia, hypoesthesia, and hyperesthesia [11]. The condition can arise from intraoperative or postoperative injury to the inguinal nerves. Intraoperative injuries may result from thermal damage or nerve compression caused by suture or tack fixation. Postoperative nerve damage may occur due to scar tissue formation or involvement with meshoma [11, 12]. This highlights the importance of meticulous surgical techniques and careful postoperative monitoring to minimize nerve damage and manage pain effectively.

The Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) score is one of the neuropathic pain rating scales. In previous studies, we observed that LANSS has been applied to evaluate cervical hernia, small bowel obstruction, and different surgeries, but it has not been studied before for inguinal hernia surgery to our knowledge [13, 14].

Success of inguinal hernia repair is evaluated according to recurrence rates and the presence of chronic pain. In previous literature it has been reported that TEP and TAPP methods has less recurrence and less chronic pain compared to other methods [3, 15, 16]. In this study, we tried to elucidate the effect of risk factors of inguinal hernia repair techniques on chronic neuropathic pain formation in the postoperative period in patients who underwent Lichtenstein hernia repair and laparoscopic hernia repair.

METHODS

This study evaluated the medical records of 482 patients who underwent inguinal hernia repair between January 2018 and December 2020. All participants were at least six months postoperative at the time of data collection. Two different surgery techniques have been conducted on the participants as Lichtenstein repair (n=214) and laparoscopic inguinal hernia repair

(n=190). Patients were excluded if they had undergone additional lower abdominal or perineal surgery for other indications or if they did not attend regular postoperative check-ups. Additionally, patients with femoral hernia, previous inguinal hernia surgery, and urgent hernia surgery due to peritoneal sign or incarceration were excluded from the study (totally 78 patients).

The ethics committee approval has been granted at 29.12.2021 and protocol number 2011-KAEK-25 2021/12-22. The study has been performed according to the Declaration of Helsinki as a statement of ethical principles for medical research involving human subjects and informed consent has been obtained from all individuals.

The patients who participated in the study were operated by the same surgical team. Demographic data of the patients were recorded. TAPP and TEP techniques were applied to patients who underwent laparoscopic repair. Prolene mesh has been used in both Lichtenstein repair and laparoscopic repair. In the Lichtenstein repair, the mesh was fixed with sutures. In patients who underwent laparoscopic repair, the mesh was fixed to the pubis with a laparoscopic vicryl stapler. The 'LANSS Pain Score' was utilized in the evaluation of chronic pain in the post-operative 6th-month follow-up.

The Self-administered-LANSS (S-LANSS) score is a self-report version of the LANSS. The S-LANSS aims to identify pain of predominantly neuropathic origin, as distinct from nociceptive pain, without the need for clinical examination. The LANSS score is calculated between 0–24, <12 is considered no chronic pain, and a score of ≥12 is considered chronic pain.

Lichtenstein hernia repair was performed with an open technique and tension-free repair with an anterior

approach to the anatomical area of the hernia. Prolene mesh was used in the repair. The mesh is fixed primarily with prolene sutures.

Laparoscopic hernia repair includes two different techniques, TEP and TAPP. In both techniques, the hernia area is reached with a posterior approach. Again, in both techniques, one 10mm camera trocar and two 5mm trocars were used. In TEP, trocars are placed in the preperitoneal space. In TAPP, the trocars are in the abdomen. Prolene mesh was used in the repair. Prolene mesh is fixed to the pubis with only one vicryl tacker.

Statistical Analysis

Patient data collected within the scope of the study were analyzed with the IBM Statistical Package for the Social Sciences (SPSS) for Windows 23.0 package program. Frequency and percentage for categorical data, mean and standard deviation for continuous data were given as descriptive values. "Independent Sample T-test" was utilized for comparisons between groups, and "Fisher's Exact or Pearson Chi-Square Test" was used for comparison of categorical variables. The results were considered statistically significant when the P value was less than 0.05.

RESULTS

The study population was divided into two different study groups according to the operation method. The Lichtenstein repair group consisted of 214 patients with a median age of 57±16 years. The majority of the individuals were male, 89.3% (n=191) and 10.7% (n=23) of them were female. In terms of gender dis-

Table 1. Distribution of demographic and clinical findings by operation types

| Characteristics (n=404) | Lichtenstein repair (n=214) | Laparoscopic inguinal hernia repair (n=190) | P value |
|----------------------------|--------------------------------|--|---------|
| Age (years) | 51±16 | 49±14 | 0.254 |
| LANSS score | 3±4 | 1±3 | <0.001 |
| Gender | | | 0.553 |
| Male | 191 (89.3%) | 165 (86.8%) | |
| Female | 23 (10.7%) | 25 (13.2%) | |

Data are shown as mean±standard deviation or n (%). LANSS=Leeds Assessment of Neuropathic Symptoms and Signs

tribution of laparoscopic hernia repair group 86.8% (n=165) of them were male and 13.2% (n=25) of them were female. Regarding these demographic findings, no significance has been achieved in between the groups in gender difference.

Within the scope of the study, a total of 404 patients were included in the evaluation, including 214 Lichtenstein and 190 laparoscopic inguinal hernia repair. The distribution of the demographic and clinical findings of the patients according to the operation types was given in Table 1. When the table was examined, a statistically significant difference was observed between the groups in terms of LANSS scores ($P<0.05$). It was determined that the mean age of the patients with Lichtenstein repair was 51, and the mean LANSS Score was 3. It was determined that the mean age of the patients with laparoscopic inguinal hernia repair was 49 and the mean LANSS Score was 1.

The distribution of demographic and clinical findings of the patients who underwent laparoscopic inguinal hernia repair according to the operation methods was given in Table 2. When the table is examined, no statistically significant difference was observed between all demographic and clinical findings of the patients who underwent TAPP and TEP methods ($P>0.05$).

When the patients were analyzed in terms of laparoscopic inguinal hernia methods 23% (n=44) of them were operated via TAPP, and 77% (n=146) of them were operated via TEP. The mean LANSS score of the TAPP group was 1±3 and the TEP group was 2±3 with no significance ($P=0.640$) among laparoscopic inguinal hernia methods. However, individuals in the Lichtenstein repair (n=214) had LANSS score of a

mean 3±4, while this score was 1±3 in the laparoscopic inguinal hernia ($P<0.001$).

DISCUSSION

Over the past 30 years, laparoscopic inguinal hernia repair has become widely available, thanks to advances in videoscopic equipment and patches. The most commonly used methods today; TEP and TAPP repairs. The most important advantages of laparoscopy are that the anatomy of the posterior wall of the inguinal region can be revealed relatively easily and that laparoscopic repairs have similar results with open repairs in terms of recurrence and complications [17]. As two minimally invasive surgical techniques, TAPP and TEP methods were first used in 1994 for inguinal hernia repair by Tetik *et al.* [15]. Although there are studies comparing laparoscopic inguinal hernia repair with open methods, there are few studies comparing TEP and TAPP methods [16, 18].

Laparoscopic repair is primarily recommended in cases of recurrence and bilateral inguinal hernia, since tissue changes secondary to surgery are not expected in the posterior area and both inguinal areas can be dominated from the same trocar entrances in cases of recurrence after the anterior approach [19]. Laparoscopic approach also has other advantages such as smaller incisions leading to earlier recovery time, less pain after surgery, early mobilization and early return to daily activities [20].

In our study, consistent with these literature data, the LANSS score was statistically significantly lower in the laparoscopic repair group than in the Lichtenstein

Table 2. Distribution of demographic and clinical findings according to laparoscopic inguinal hernia methods

| Characteristics (n=190) | TAPP (n=44) | TEP (n=146) | P value |
|-------------------------|-------------|-------------|---------|
| Age, years | 52±14 | 48±14 | 0.091 |
| LANSS score | 1±3 | 2±3 | 0.640 |
| Gender | | | 0.718 |
| Male | 37 (84.1%) | 128 (87.7%) | |
| Female | 7 (15.9%) | 18 (12.3%) | |

Data are shown as mean±standard deviation or n (%). LANSS=Leeds Assessment of Neuropathic Symptoms and Signs, TAPP=Transabdominal preperitoneal, TEP=Totally extraperitoneal

repair group. In addition, there was no significant difference in LANSS scores between the TEP and TAPP groups in patients who underwent laparoscopic repair.

In previous literature, the rate of conversion to open technique during laparoscopic repair has been reported as 2-3%. Complications such as seroma, hematoma, testicular ischemia or pain, hydrocele, epididymitis, orchitis and chronic pain can be seen in the postoperative period [21]. Studies comparing the laparoscopic approach and the open anterior approach for hernia repair did not show any difference in recurrence rates. It is also emphasized that the learning time of laparoscopic methods is longer compared to open repairs and the recurrence rates are the same when performed in experienced hands [22].

The TAPP method is performed by entering the peritoneal cavity. There is no area restriction and it requires less experience than TEP. TEP, on the other hand, is thought to require more experience and is a somewhat more difficult technique than TAPP, since it is performed in a limited and less familiar area. However, since abdominal cavity is not entered in TEP risks such as organ injury, adhesion and infection are less than TAPP [22]. In a study by Matsumoto *et al.* (2018), when recurrences were observed more than expected in laparoscopic hernia repair, training courses were given to surgeons and it was observed that the recurrence rates decreased to the expected levels [23]. In the meta-analysis conducted by Wu *et al.* [24], the recurrence rate was reported as 3.8% in 1310 patients who underwent the TAPP technique, and it was observed that there was no significant difference in terms of recurrence when compared with the open technique.

In clinical practice and in the literature, there is much debate about the superiority of TAPP over TEP. Especially in bilateral inguinal hernia defects, the ability to repair intraperitoneally without entering the preperitoneal region seems to be a potential advantage of TAPP over TEP [16, 21]. During laparoscopic repair, hernia was detected in the contralateral region in 11-25% of patients with unilateral hernia in the pre-operative physical examination [16]. The most important disadvantage during the application of TAPP is that the peritoneal dissection and flap must be closed again during the hernia repair. There is no need for such closure in patients who have undergone TEP. After laparoscopic repair, the peritoneum should be

reapproximated to prevent the intra-abdominal organs from coming into contact with the mesh. Various methods of peritoneal flap closure have been described, such as tacker, fibrin adhesives and suture closure [16, 25].

While most of the studies on laparoscopic fixation devices today have focused on hernia recurrence that may occur in the postoperative period, there are few studies on the quality of life and pain of patients after laparoscopic hernia repair. In recent studies, postoperative chronic pain and decreased quality of life are the most common postoperative complications (1-54%) after laparoscopic inguinal hernia repair [26]. Although not certain, some authors consider young, female patients, recurrent and bilateral hernias, presence of preoperative pain, operation time and the number of tackers used during laparoscopic surgery as risk factors for postoperative pain and quality of life [27].

Laparoscopic hernia repair is recommended in case of recurrence after bilateral inguinal hernias and anterior approach repair [28]. TAPP and TEP methods are two important laparoscopic repair methods of inguinal hernia. The main difference between the TAPP and TEP method is the access route to the preperitoneal space. Although the results of TAPP and TEP procedures are similar in many respects, some results may differ. These differences may affect the technique preference in patient subgroups. TEP method is more suitable in patients with intra-abdominal adhesions because of not entering the abdomen. Because of the advantage of abdominal exploration, the TAPP method may be more suitable for laparoscopic repair of strangulated hernias [19, 29, 30].

It has been reported that the learning curve for the laparoscopic TEP method is completed after 60 cases [19]. The long learning curve is one of the main reasons why some surgeons avoid using the TEP method and prefer the TAPP method [22]. The results obtained by two physicians who achieved success in inguinal hernia repair is associated with the recurrence rates observed in the long-term, and these rates have been reported in the range of 1-2% for the TEP method and 0-3% for the TAPP method [25]. Recurrence was observed in 2 of our patients during follow-ups. Varcus *et al.* [16] reported length of hospital stay was 2 days for patients who underwent surgery using the TAPP & TEP method. In the study of Sağiroğlu *et al.* [26], all patients were discharged on the 1st postoperative day.

In our study all patients were discharged on the 1st post-operative day.

Several tackers are used in laparoscopic hernia surgeries. On the contrary, we have used only one tacker in each patient and this might be elaborated as the reason for the less chronic pain in our cases.

Strengths and Limitations

The strengths of our study include the use of a single surgical and anesthesia team and the large number of patients. However, the limitation of our study can be identified as the preoperative database not defining the subgroups of patients with inguinal hernia (direct, indirect, mixed, and femoral) and the size of the defect. If the study continues with more comprehensive data, it may allow for determining the most appropriate surgical procedure for patients during the preoperative assessment.

CONCLUSION

In conclusion, the use of TEP and TAPP methods in laparoscopic hernia repair was compared with Lichtenstein repair within the scope of this study. The TEP and TAPP methods have lower pain in the postoperative period.

Ethics Approval and Consent to Participate

This study was approved by the Bursa Yüksek İhtisas Training and Research Hospital Clinical Research Ethics Committee (Decision No: 2011-KAEK-25 2021/12-22; date: 29.12.2021). All procedures were conducted in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments. Written informed consent was obtained from all individual participants included in the study.

Data Availability

All data generated or analyzed during this study are included in this published article. The data that support the findings of this study are available on request from the corresponding author, upon reasonable request.

Authors' Contribution

Study Conception: MFE; Study Design: MD; Supervision: MFE; Funding: MD; Materials: MD; Data

Collection and/or Processing: BD; Statistical Analysis and/or Data Interpretation: FG; Literature Review: SA; Manuscript Preparation: MFE; and Critical Review: BD.

Conflict of Interest

The author(s) disclosed no conflict of interest during the preparation or publication of this manuscript.

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Generative Artificial Intelligence Statement

The author(s) declare that no artificial intelligence-based tools or applications were used during the preparation process of this manuscript. The all content of the study was produced by the author(s) in accordance with scientific research methods and academic ethical principles.

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