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Case Report

Comparative Study, Totally Extraperitoneal (TEP) Versus Lichtenstein: About 100 Cases

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Abstract

Background: Groin hernia in adults remains a common condition in digestive surgery. Numerous repair techniques have been described, with two methods widely adopted for the surgical treatment of inguinal hernia: the Lichtenstein open repair technique and the totally extraperitoneal (TEP) laparoscopy.

Objective: This study aims to compare the outcomes of these two methods, focusing primarily on post operative complications, recovery time, and incidence of recurrence.

Materials and Methods: We conducted a prospective, randomized, double-blind comparative study of two methods for repairing uncomplicated inguinal hernias. The study population was mainly composed of young active military personnel, over an 18-month period (June 2021 to December 2022) in the general surgery department of the regional military university hospital in Constantine. One hundred patients undergoing outpatient surgery for uncomplicated inguinal hernia were divided into two homogeneous groups: Group A (TEP) and Group B (Lichtenstein). Evaluation criteria included operating time, postoperative pain, recovery time and return to normal activities, complication rate, and recurrence rate.

Results: All patients were male, with a mean age of 33.09 years. Herniogenic factors were dominated by physical exertion (83% of cases). The right-sided hernia was observed in 66% of cases, and 99% of patients were classified ASA I. The mean duration of the surgical procedure was 51.44 minutes (64,5 vs 48,5). Twenty-nine patients experienced immediate post-operative pain (50% vs. 18%, $p < 0.111$). However, on postoperative day 15, pain was more frequent in patients in the open surgical repair group (14% vs. 90%, $p < 0.444$). Forty-seven patients experienced post-operative nausea and vomiting (64% vs. 30%, $p \approx 0.26$). Chronic pain at three months post-operatively was reported by three patients (6%) in the Lichtenstein group ($p \approx 0.079$). Fifteen patients (30%) in the first group resumed physical activity from the third postoperative day, and 94% of patients in this group resumed physical activity by the seventh day. In contrast, 44 patients (88%) in the second group resumed their physical activities from day five onwards ($p < 0.444$). After 29 days off work, 81 patients returned to work (20.68 days vs. 32.7 days). Only one recurrence was observed in a patient operated on by TEP (2% vs. 0%, $p \approx 0.315$). The overall satisfaction rate was 87% (92% vs. 82%, $p \approx 0.012$).

Conclusion: The objectives of inguinal hernia repair are to provide patients with a better quality of life by reducing post-operative pain, enabling rapid rehabilitation and return to work, while minimizing the risk of recurrence. This involves improving repair techniques and the prosthetic materials used.

I. Introduction:

Inguinal hernias are one of the most common surgical conditions, requiring surgery to repair the protrusion of abdominal contents through the abdominal wall. Two main techniques are often compared for this repair: totally extraperitoneal (TEP) endoscopic repair and open repair using the Lichtenstein technique. This study aims to compare these two methods in terms of postoperative outcomes, complications, recovery time, and recurrence rates.

II. Methodology :

1. Type of study:

A prospective, randomised, double-blind comparative study involving 100 patients who underwent surgery for inguinal hernia at the general surgery department of the Constantine Regional Military University Hospital.

2. Study population:

This is a prospective, randomised, double-blind comparative study on inguinal hernia repair, comparing the efficacy and postoperative results of two techniques: TEP (Totally Extraperitoneal) and Lichtenstein.
Participants: Patients diagnosed with unilateral inguinal hernia and eligible for surgical repair, randomised into two groups: TEP and Lichtenstein.
• Group A (TEP): Totally extraperitoneal repair of inguinal hernia.
• Group B (Lichtenstein): Repair of inguinal hernia using the Lichtenstein technique.

3. Randomisation: Participants were randomly assigned to one of two groups: TEP or Lichtenstein.
Double-blind: The surgeon who performed the procedures received the patients in the operating theatre with an envelope indicating the technique used; the evaluators of the postoperative results were not informed of the techniques used.

4. Evaluation of results :

• Primary endpoints: Hernia recurrence rate, short- and long-term post-operative pain, recovery time.
• Secondary endpoints: Post-operative complications, duration of surgery, patient satisfaction, cost of the procedure.

III. Analysis of Results:

This is a prospective comparative study of the results of two methods of inguinal hernia repair. The average body mass index of 24.37 kg/m^2 in the majority of patients (66%) (23.2 kg/m^2 vs 22.48 kg/m^2, $p \approx 0.859$). The majority of our patients (89%) had no particular medical conditions or history of illness. Hernia-causing factors were found in both groups, linked to working conditions in remote operational units. These factors are dominated by physical exertion in 83% of the workforce (86% vs 80%), smoking in 64%, chronic constipation in 14% and chronic cough in 10% of cases. Right-sided hernias were the most common in both groups, accounting for 66% of the workforce in each group. Clinical symptoms manifested as inguinal swelling in 70 patients (72% vs. 68%, $p < 0.7$) and inguinal pain in 55 patients (56% vs. 54%, $p < 0.6$). As this was a young population with no associated conditions, 99% of patients were classified as ASA I, with no significant difference between the two groups ($p \approx 0.315$).

All patients in the first group (TEP) underwent surgery under general anaesthesia, while all patients in the second group (Lichtenstein) underwent surgery under spinal anaesthesia.
External oblique inguinal hernias were more common in 72 patients (82% versus 62%, $p \approx 0.083$). The direct form was present in 19 patients (12% versus 26%, $p < 0.17$), and the mixed form in 9 patients (6% versus 12%, $p \approx 0.083$) . The contents of the hernial sac consisted mainly of omentum in 72 patients (58% versus 86%, $p < 0.45$). In contrast, the contents of the sac consisted of intestines in 23

patients (40% versus 6%, p<0.45). Both groups had inguinal hernias (90% versus 94%, p ≈ 0.461).

The average duration of the surgical procedure for all patients was 51.44 minutes (64.5 minutes versus 48.5 minutes, p ≈ 0.683). It should be noted that no conversion from TEP to TAAP or open surgery was necessary.

We used double-dimensional (2D) polypropylene prostheses in 51% of patients and triple-dimensional (3D) anatomical PTFE prostheses in 49% of cases, p<0.54. Prosthesis fixation was systematic in Lichtenstein repairs, whereas prosthesis fixation was performed in only 6 patients (12%) undergoing TEP repairs, p < 0.44. We found no significant difference between the two groups in terms of length of hospital stay (529 minutes vs. 505 minutes, p ≈ 0.2).

We observed no significant differences between the two repair methods in terms of the incidence of hematomas or inguinal swelling. Three patients in the open surgery group developed a wall infection (p < 0.444). One patient who underwent Lichtenstein surgery required unscheduled hospitalisation on the third day due to scrotal pain(0% versus 2%, p ≈ 0.315).Three patients (6%) who underwent Lichtenstein repairs reported chronic pain three months postoperatively (p ≈ 0.079). Fifteen patients (30%) in the first group resumed physical activity on the third postoperative day, and 94% of patients in this group resumed physical activity on the fifth day. In contrast, 44 patients (88%) in the second group resumed physical activity on the seventh day (p < 0.444). After a 29-day period of sick leave, 81 patients resumed their professional activities (20.68 days versus 32.7 days). The recovery period is an important factor to consider, especially for reintegration into operational units. There is a statistically significant difference between the two techniques (p ≈ 0.0001). There was a single recurrence in a patient operated on using TEP (2% versus 0%, p ≈ 0.315). The overall satisfaction rate was 87% (92% versus 82%, p ≈ 0.012).

IV. Discussion:

1. Average age, BMI:

In our series, the average age of patients was 33.09 years, which can be explained by the youthfulness of the population. This result was observed in most series [1,2], where the average age ranged between 42 and 59 years. As a general rule, there is no age limit for inguinal hernia repair, and age should not be a determining factor for outpatient surgery [3,4]. The male predominance is reported by all authors [2,5,6]. Cubertofond [7] in a study of 443 patients showed that inguinal hernias affect males more frequently (81%), which can be explained by the passage of the cord in men.

The average body mass index was 24.37 kg/m^2 in the majority of patients, who were mainly young active military personnel. According to B. Meshkat [8], obesity is not a factor that contraindicates outpatient surgery, even though perioperative complications, including respiratory complications, may occur. The conclusions drawn from the examination of the various series are very similar to those we obtained.

Table 1. Average age, gender, BMI

Authors	Number of participants	Average age	Gender	BMI
J.P. Cossa2017**[7]**	6974	59,2	89,7 %M	24,9
Konaté. I et al **[9]**	432	50,5	/	/
A.Lamara 2021 **[6]**	600	52	515/85	/
M. Gadda 2020**[10]**	80	25,45	80M	24,45
A. Sahli 2017**[4]**	315	45,15±15,81	187/128	27,71±2,53
R.B.Dembélé 2022**[11]**	120	40	116/4	/
M.A.Niboucha 2012**[12]**	335	41	335 M	79,40 % (18-25)
Our study	**100**	**33,9**	**100**	**24,47**

2. Hernia-causing factors:
Work involving intense physical exertion increases the risk of inguinal hernias, as frequent exertion weakens the abdominal wall due to repeated strain [13]. Risk factors that promote inguinal hernias, such as heavy lifting, coughing, prostatism and chronic constipation, are considered herniogenic and are recognised by most authors [7,14,15]. The study population consisted of 91% enlisted men and non-commissioned officers, for whom heavy lifting was the most common triggering factor (83%), followed by smoking (64%), chronicconstipation (14%) and chronic coughing 10%.

3. Topography of the hernia:
In our study, the hernia was located on the right side in 66% of cases and on the left side in 33% of cases. This predominance on the right side compared to the left side is noted by the majority of authors [16]. This concept can be explained by embryogenesis, as testicular migration and atrophy of the processus vaginalis are slower on the right side than on the left side.

Table 2. Topography of the hernia

Authors	Right side	percentage	Statistical test
S.Zatir 2017**[17]**	68/133	51,1 %	/
Sagara A 2007 **[18]**	75/95	75,8 %	P=0,319
A.Lamara 2021**[6]**	358/600	59,7%	/
NJ Andrew **[19]**	61/82	74,32 %	P=0,448
R.B.Dembélé 2022**[11]**	63/120	52,5 %	/
A.Meyer 2013**[20]**	51/157	32,5 %	/
Our study	**66/100**	**66 %**	**0,583**

4. Type of hernia:
With regard to the type of hernia, the predominance of external oblique hernias is highly significant in various series, with a percentage varying between 49% and 90% [7, 14,15]. A. Meyer, in his 2013 study of 207 patients who underwent surgery for an inguinal hernia, found a rate of 66% for external oblique hernias compared to 32.6% for direct hernias, which is similar to our results (72% external oblique hernias and 19% direct hernias). This predominance can be explained by anatomical factors.

5. Operative time:
As observed in numerous randomised studies published to date, we found that operative time was longer for TEP than for open surgery [21,22]. Possible reasons for this increase include the complexity of the procedure and the need for general anaesthesia. According to Heikkinen et al. [23], the average operating time for patients undergoing inguinal hernia repair was 67.5 minutes for TEP compared to 53 minutes for the Lichtenstein technique. The results of the various published series are very similar to ours, with an average operating time of 64.5 minutes for TEP compared to 48.5 minutes for Lichtenstein.

V. Complications :

A review of the literature revealed an overall rate of post-operative complications ranging from 3% to 39% [24]. Several studies indicate more complications after open surgery compared to laparoscopy, while other series show more complications after laparoscopic surgery than with conventional surgery [25]. The prevention of these complications relies mainly on careful dissection of the hernia sac, as well as respect for and a good knowledge of the components of the spermatic cord and vessels in the region.

Neumayer et al. compared the results of repairs using the Lichtenstein technique with those of laparoscopic repair techniques and found that patients who underwent open surgery suffered significantly more often from early post-operative pain. In our study, the analysis of pre- and post-operative pain was refined by measuring pain intensity using a visual analogue scale (VAS) assessment. A study of 10,008 patients undergoing outpatient surgery revealed an incidence of severe pain of 5.3% [26]. Some studies report up to 30% moderate to severe post-operative pain [27], which is similar to the results of our study with a rate of 29%. Indeed, gender and prolonged operating time are predictive factors described in several studies, consistent with our results. Failure to control severe postoperative pain can lead to chronic pain in up to 15% of patients [26], but only 3% of our patients reported chronic pain. The rates reported in the literature vary from 0% to 23% [28, 29].

Apfel [30] operated on 2170 outpatients, identifying certain risk factors predictive of postoperative nausea and vomiting: female gender, age < 50 years, history of nausea and vomiting, use of morphine derivatives, and surgical duration > 60 minutes. Some of these factors were also found in our study, which resulted in a 47% rate of postoperative nausea and vomiting.

Postoperative complications were minor, with the exception of three cases of wall infection that were treated appropriately and subsequently resolved favourably. The risk of surgical site infection is very low, due to strict adherence to aseptic measures and rigorous surgical technique.

Compared with data in the literature, the rate of wall infection varies between 2% and 6.9% [31-32]. Other authors have reported similar rates: KW Millikan [33], in the United States in 2003, observed 19 cases out of 1,056 (1.80%). According to a study conducted by A. Essah [34], a surgical site infection rate of 0.37% was observed in 13,627 patients who underwent outpatient surgery between 2012 and 2016 [35].
The mortality rate in our series is zero, which reflects the advances in surgical and anaesthetic techniques in reducing the incidence of morbidity and mortality in outpatient surgery.

1. Late complications:

• Recurrences:
Recurrence is the key parameter to consider when choosing each surgical technique. The recurrence rate observed in our study of 2% is consistent with data in the literature [36,37]. Recurrence rates generally vary from 0% to 3.9% [22], however Netto [38] reports a recurrence rate of 1.7% for the TEP technique and 1.6% for Lichtenstein. In the study by Neumayer et al., the recurrence rate was less than 5% for surgeons who had performed more than 250 laparoscopic procedures. Of the 100 patients operated on, one case of right iliac hernia recurrence was observed after 5 months of follow-up, representing a recurrence rate of 2%.

• Postoperative pain:
Chronic pain is reported in 9.7% to 18.7% of cases [32,39]. In the study by Massaron et al [39], a significant correlation was observed between outpatient inguinal hernia repair and the onset of postoperative pain (POP), although

there was no direct link with long-term chronic pain. The incidence of chronic pain can reach up to 15% after one year [40]. In our study, chronic pain was observed in three patients (6%). The late complications identified in the literature are consistent with those observed in our own work.

2. Return to work:
Nine trials compared return to work between TEP and open repair. In eight of these trials, TEP repair showed a significantly lower number of lost working days than open repair. Laparoscopic hernia surgery also reduced post-operative pain, facilitating a rapid return to work. In our study, the average time to return to normal activity was 21 days, which is consistent with the data in the literature.

Table 3. Recovery in activity

Authors	TEP	Lichtenstein	P value
S.Zatir 2017**[17]**	22(15-29)	/	/
Liem et coll 1997**[41]**	14 (7 -21)	21(12–33)	0.001
Andersson et coll 2003**[42]**	8 ± 5	11 ± 8	0.003
Merello et coll 1997**[43]**	11^	26^	/
Heikkinen et coll**[44]**	12 (3–21)	17 (4–31)	0.01
Lal et coll 2003**[3]**	12.8 ± 7.1o	19.3 ± 4.3o	<0.001
Our study	**20,68**	**32,7**	**0,0001**

3. Satisfaction:

According to the International Association for Ambulatory Surgery (IAAS), patient satisfaction is an essential criterion for the overall effectiveness of outpatient surgery. It is essential to implement a questionnaire to assess patient satisfaction. Satisfaction generally varies between 89% and 96% [40, 46-47]. According to S. Gaucher [5], between 89% and 96% of patients report being satisfied with their outpatient treatment. According to studies by Bain J [48] and Colin F [49], the patient satisfaction rate after day surgery is estimated at 95%. These results are consistent with those observed in our study, with a satisfaction rate of 87%. It appears that outpatient care is an excellent option. Patients mainly report discomfort on days 2 and 7 after outpatient surgery, as well as at 3 months, mainly due to pain and problems with surgical wounds [50].

Table 4. Satisfaction

Authors	Number of patients	Satisfaction %
Dhumale R. 2010 **[51]**	1164	100%
Mattila K 2011**[25]**	89	99%
Barros F 2008**[52]**	160	89%
Callesen 2001**[16]**	912	80,3%
Fixot. K,2013**[1]**	42	92%
Our study	**100**	**87 %**

VI. CONCLUSION :

In digestive surgery, inguinal hernias remain a common condition with various repair methods, ranging from herniorrhaphy to prosthetic repairs, including laparoscopic techniques. Our prospective study aimed to compare and analyse two approaches to outpatient repair. Through a double-blind study, we compared TEP laparoscopic surgery with the tension-free open technique according to the Lichtenstein method. The results show that TEP is associated with a longer operating time but a faster return to work, without septic complications or haematoma. However, recurrence rates are slightly higher compared to the Lichtenstein technique. These challenges must be taken into account for the successful implementation of outpatient surgery in this particular context. The high patient satisfaction rate in both groups demonstrates the acceptability of the outpatient model.

Although limited, the results of this prospective study encourage us to use laparoscopic surgery for inguinal hernia repairs. The aim is to provide our patients with the necessary means and to make the technical improvements required to achieve better results, thereby enabling a better quality of life.

In summary, the treatment of inguinal hernias is evolving towards more sophisticated and less invasive techniques tailored to the specific needs of patients. The future of hernia surgery involves continuous adaptation to technological advances and increased integration of outpatient surgery to optimise clinical and economic outcomes.

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