folia medica

Folia Medica 64(1):61-6
DOI: 10.3897/folmed.64.e65965

Original Article

Advantages and Disadvantages of Laparoscopic Inguinal Hernia Repair (Hernioplasty)

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Received: 16 Mar 2021 ♦ **Accepted:** 29 Apr 2021 ♦ **Published:** 28 Feb 2022

Citation: Trokovski N, Uchikov P, Yordanov E, Atliev K. Advantages and disadvantages of laparoscopic inguinal hernia repair (hernioplasty). Folia Med (Plovdiv) 2022;64(1):61-6. doi: 10.3897/folmed.64.e65965.

Abstract

Aim: The aim of this study was to explore the advantages and disadvantages of laparoscopic hernioplasty by comparing them with conventional surgeries.

Materials and methods: The study included 376 patients (344 men and 32 women) who underwent inguinal hernia repair in inpatient settings over a 3-year period (2017–2020). The patients were divided into two groups: patients with conventional hernioplasty (CH) - 312 patients (291 men and 32 women, mean age 55±15 years, range 18–93) and 64 patients with laparoscopic hernioplasty (LH), all of them middle-aged men at mean age 45±15 years (range 24–69).

Results: Thirty-eight patients (59.38%) with LH were ASA class 1 patients while the CH patients were stratified in ASA classes 1 to 4. The LH group consisted of 39 patients who had transabdominal preperitoneal (TAPP) surgery and 25 who received total extraperitoneal (TEP) repair. The average operating time was 12 minutes (range 90–200 min) for TAPP and 50 minutes (range 20-125 min) for TEP. The mean intensity of pain score measured by VAS (0-10) was 4 (2-5) for CH patients and 3 (2-4) for LH patients. The duration of pain was 3 days (2-4) for CH patients and 2 days (1-3) for the LH group. Ninety-five percent (61/64) of LH patients defined their quality of life as "better".

Conclusions: The following factors are of particular importance for the choice of hernioplastic technique: operating time, possible intraoperative complications, the level of postoperative pain and potential postoperative analgesics, possible complications, patient recovery, length of hospital stay, cost, quality of life, and long-term results of the treatment.

Keywords

conventional hernia repair, hernioplasty, inguinal hernia, laparoscopic hernia repair, surgical site infection, transabdominal preperitoneal repair, total extraperitoneal repair

INTRODUCTION

The problem of inguinal hernias is relevant and significant because it involves a big part of the modern general, planned, and emergency surgery worldwide due to its high prevalence and still high incidence of recurrence as well as early complications requiring reconsideration of the applied surgical techniques and the creation of new ones.

With more than 20 million surgeries per year, inguinal hernioplasty is one of the most commonly performed surgical procedures worldwide. The risk of developing inguinal hernia throughout the entire life is 27–43% for men and 3–6% for women.[1]

Inguinal hernia (IH) accounts for 75% of all abdominal wall hernias with peaks around the age of 5 and after age of 70 with a 90% incidence in men and approximately 800000 IH surgeries performed annually in the USA. In Bulgaria, this number reaches 20000.[2]

Different approaches, indications, and surgical techniques require guidelines for standardizing treatment methods in order to improve outcomes and in particular to reduce the incidence of recurrence and chronic postoperative pain. These guidelines have been approved by the International Hernia Association and the European Endoscopic Surgery Association.[3]

Minimally invasive laparoscopic methods and prosthetic approaches with synthetic materials are given a major scientific and practical priority in modern herniology of inguinal hernias. Laparoscopic hernioplasty (LH) is now widely accepted by both surgeons and patients and its success is comparable to that of conventional hernioplasty (CH).[4]

LH has some additional benefits such as less postoperative pain and analgesic use, and shorter hospital stay.[5-7] Laparoscopic hernioplasty is usually performed using two major surgical techniques: total extraperitoneal (TEP) and transabdominal preperitoneal (TAPP) repairs.

AIM

The aim of this study was to explore the advantages and disadvantages of laparoscopic hernioplasty by comparing them with conventional surgeries.

MATERIALS AND METHODS

The present study on the major modern surgical techniques for inguinal hernias includes clinical material from 376 patients (344 men and 32 women) with anamnestic symptoms of inguinal hernias confirmed by clinical examination and operation in an inpatient setting. All patients were divided into two groups: patients who underwent conventional (open) hernioplasty and patients with laparoscopic hernioplasty. The CH group included 312 patients of whom 291 were men and 32 – women (mean age 55±15 years, range 18–93). The group with laparoscopic hernioplasty consisted of 64 male patients (mean age 45±15 years, range 24–69). Of the 376 surgeries performed for the 3-year period from 2017 to 2020, 176 were conducted in the Department of General Surgery at the Clinical Hospital in Štip and in the Clinic of Abdominal Surgery at the Department of Special Surgery of the Medical University of Skopje, Republic of Northern Macedonia and 198 (all of them conventional) - in the Clinic of Thoracic and Abdominal Surgery at the Department of Special Surgery of the Medical University of Plovdiv, Bulgaria. In the group of endoscopic hernioplasty (TAPP, TEP), three-port or four-port laparoscopic technique was used.

RESULTS

Conventional hernioplasties were performed in 312 patients. Sixty-four male patients underwent laparoscopic inguinal hernioplasty – in 39 of these we used the TAPP technique and in 25 – the TEP technique **(Table 1)**.

Table 1. Distribution of LH patients by type of technique they underwent

LH	Men, n=64
Transabdominal preperitoneal repair (TAPP)	39
Total extraperitoneal repair (TEP)	25

All 64 LH patients underwent general intubation anesthesia. Preoperative American Society of Anesthesiologists classification of the patients from the laparoscopic group showed 38 (59.38%) of them to be the ASA class I. In contrast, patients with CH were stratified into ASA classes 1 through 4 showing a statistically significant difference.

The mean operating time was 128 minutes (range 90–200 min) for TAPP and 50 minutes (range 20–125 min) for TEP. LH takes more time due to the pneumoperitoneum, the presence of adhesions, difficulties in repositioning the hernia sac, placing and fixing the prosthesis.

Of the early postoperative complications, 2 postoperative hematomas were found in CH and 1 in LH.

Mild surgical site infections were found in 8 cases with CH and in 2 cases with LH.

The severity of early postoperative pain was assessed via VAS scale from 0 to 10 **(Table 2)**.

Table 2. Treshhold, pain tolerance, and use of analgesics in CH and LH

Indicators	CH	LH	*p*
Level of pain, VAS (0–10)	4 (2–5)	3 (2–4)	< 0.05
Pain duration (days)	3 (2–4)	2 (1–3)	< 0.05
Use of analgesics in points from 0 to 4	3 (3–4)	2 (2–3)	< 0.05

Pain intensity score was 4 on average (2–5) in the cases with CH and 3 (2–4) in the cases with LH. Pain duration in CH was on average 3 (2–4) days while in LH it was 2 (1–3) days. The statistical analysis showed a slight increase in the level of pain on the first postoperative day in patients with CH. In patients with LH, there was a decrease in the level of pain on the first postoperative day compared to CH and a general decrease in the level of pain tolerance compared to CH.

The use of analgesics was calculated in points from 0 to 4. In CH the use was established on average by 3 (3–4) points while in LH it was on average 2 (2–3) points. The strength, duration, and level of pain as well as the use of analgesics showed statistically significant differences ($p<0.05$).

The assessment of patients by quality of life after inguinal hernioplasty shows that 95% (61/64) of the patients with LH define their quality of life as "better".

The cost of the surgeries was established in three price ranges - up to 300 BGN, from 300 BGN to 1400 BGN, and more than 1400 BGN **(Table 3)**. Conventional hernioplasty cost as much as 300 BGN for 256 (82.15%) patients, from 300 BGN to 1400 BGN for 44 (14%) patients, and more than 1400 BGN in 12 (3.85%) patients. Laparoscopic hernioplasty cost for 46 (71.88%) patients from 300 BGN to 1400 BGN and for 18 (29.12%) patients it was more than 1400 BGN.

Table 3. Price analysis in CH and LH

Price BGN	CH n=312	LH n=64
Up to 300	256 (82.15%)	
From 300 to 1400	44 (14 %)	46 (71.88%)
More than 1400	12 (3.85%)	18 (29.12%)

$p<0.05$ (Chi-squared test)

LH is a much more expensive surgical technique compared to the conventional open technique which depends mostly on the cost of the surgery itself and to a lesser extent on the hospital stay. The price of medicines also gives small differences most often for the expense of anesthetics.

DISCUSSION

In recent years, there have been a lot of research on the advantages and disadvantages of LH. The subject of such publications is explored in several systematic reviews, meta-analyses, and randomized trials.

Scheuermann et al. identified eight randomized controlled trials which found that the mean duration of operation in Lichtenstein's CH was shorter by an average of 6.79 minutes. Patients with LH showed significantly less chronic inguinal pain postoperatively. The other indicators did not show any significant differences between the two techniques which allowed the authors to conclude that the degree of complications and the result of the two procedures were comparable as TAPP showed only less chronic inguinal pain postoperatively compared to the Lichtenstein's CH.[8]

In a randomized study, Kargar et al. reported that patients in the TAPP group had significantly less postoperative pain than those in the Lichtenstein group at all times ($p<0.05$). The TAPP group had a lower incidence of hematoma (TAPP, 6.6% vs. Lichtenstein 13.3%; $p=0.67$), seroma (TAPP 10% vs. Lichtenstein 13.3%; $p=1.00$), and infection (TAPP 0 vs. Lichtenstein 1.6%; $p=0.67$). However, the authors did not find any differences between the two groups in postoperative complications. In the TAPP group, the average hospital stay was significantly lower than that in the Lichtenstein group (8.13±2.19 vs. 13.15±1.5 days, respectively; $p<0.001$). The two main short-term advantages of LH-TAPP versus Lichtenstein's CH were the lower postoperative pain and the earlier return to normal life activities with no significant differences.[9]

Analysing a total of 57906 patients with primary unilateral inguinal hernias, Köckerling et al. monitored 16375 patients with Lichtenstein's CH, 12564 with TEP, and 14426 with TAPP for a period of 1 year after surgery.[10] Comparison of CH with TEP revealed the weaknesses for CH in terms of postoperative complications (3.4% vs. 1.7%; $p<0.001$) related to recurrent complications (1.1% vs. 0.8%; $p=0.008$), pain at rest (5.2% vs. 4.3%; $p=0.003$), and pain on exertion (10.6% vs. 7.7%; $p<0.001$). TEP showed weaknesses in terms of intra-operative complications (0.9% vs. 1.2%; $p=0.035$).[11] Comparison of CH with TAPP showed disadvantages for CH in terms of postoperative complications (3.8% vs. 3.3%; $p=0.029$) related to recurrent complications (1.2% vs. 0.9%; $p=0.019$), pain at rest (5% vs. 4.5%; $p=0.029$), and pain on exertion (10.2% vs. 7.8%; $p<0.001$). The authors concluded that TEP and TAPP were superior to Lichtenstein's CH.[12]

In a randomized controlled trial of long-term one-year postoperative inguinal pain in 384 patients, Westin et al. compared the TEP results (n=193) with CH results (n=191). In the TEP group, 39 (20.7%) patients complained of pain compared to 62 (33.2%) patients in the CH group ($p=0.007$); severe pain was reported by 4 patients in the TEP group and by 6 patients in the CH group (2.1% and 3.2%, respectively; $p=0.543$). Hence, the authors concluded that patients operated with TEP had less long-term postoperative pain than those with CH and recommended TEP as a method of choice in the surgical treatment of primary inguinal hernia.[13]

In their 2020 meta-analysis of the safety and efficacy of Lichtenstein's CH compared to LH in inguinal hernias based on randomized controlled trials (RCT), Sun et al. included 21 studies with 3772 patients in the laparoscopic group and 3910 patients in the Lichtenstein's CH group. The results show that compared to CH, LH has a significantly longer operating time but in terms of the incidence of hematomas, seromas, and complications, there was no significant difference between the two groups. However, compared to CH, LH had a higher recurrence rate, lower incidence of chronic pain and surgical site infection compared to CH.[14]

In a systematic review of 965 studies, Li et al. identified eight relevant studies where, after inversion of the transverse fascia in LH, they found a 4.17% incidence of postoperative serum in direct inguinal hernias ($p<0.05$). Seroma formation was a natural process that could be completely prevented after laparoscopic inguinal hernioplasty, especially in patients with direct and large indirect inguinal hernias.[15]

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When updating their systematic review and meta-analysis of 16 RCTs, Chen et al. randomized 1519 patients with LH-TEP and TAPP. The results revealed that TEP repair led to a shorter hospital stay (MD −0.87, 95% CI 1.67 to −0.07) but was associated with a longer operating time (MD 3.35, 95% CI 0.16 - 6.54).[16]

In a retrospective cohort study of 4667 patients with planned primary hernioplasty according to data from the Michigan Surgical Quality Collaborative from 2012 to 2016 in 72 hospitals, 1253 (27%) patients with LH were examined for dependency on race, age, and operator. Of 190 surgeons, 81 (43%) performed CH with the older patients being less prone to LH (OR 0.41, $p<0.001$).[17]

The systematic review and meta-analysis performed by Köckerling et al. included 16 studies with 51037 patients. Of these patients, 35.5% underwent CH, 33.5% TAPP, 30.7% were with TEP, and 0.3% had robotic TAPP repair. The postoperative seroma risk ratio (RR) was comparable taking into consideration TAPP vs. CH (RR 0.91; 95% CrI 0.50–1.62), TEPP vs. CH (RR 0.64; 95% CrI 0.32–1.33), TEP vs. TAPP (RR 0.70; 95% CrI 0.39–1.31), and robotic TAPP vs. CH (RR 0.98; 95% CrI 0.37–2.51). The risk of postoperative chronic pain was similar for TAPP vs. CH (RR 0.53; 95% CrI 0.27–1.20), TEP vs. CH (RR 0.86; 95% CrI 0.48–1.16) and TEP vs. TAPP (RR 1.70; 95% CrI 0.63–3.20). RR for relapses was comparable when comparing TAPP vs. CH (RR 0.96; 95% CrI 0.57–1.51), TEP vs. CH (RR 1.0; 95% CrI 0.65–1.61), TEP vs. TAPP (RR 1.10; 95% CrI 0.63–2.10), and robotic TAPP vs. CH (RR 0.98; 95% CrI 0.45–2.10). No differences were found in the period of postoperative hematoma occurrence, surgical site infection and hospital stay. The authors suggest that CH, TAPP, TEP and robotic TAPP are comparable in short terms.[18]

In the last 5 years, robotic surgery has expanded its application in general surgery, especially concerning hernioplasty.

The first report of 76 inguinal hernias performed in 64 patients in 2017 with Senhance Robotic System showed a mean robot preparation time of 7 minutes (range 2–21 minutes) and an average operating time of 48 minutes (range 18–142 minutes). Compared to CH (TAPP), there was no significant difference in the operating time or perioperative complications.[19]

Tam et al. reported 335 robotic inguinal hernias performed in 7 hospitals by 18 surgeons for a period of 19 months. The average operating time was 102 minutes (SD 38), with mild postoperative complications in 54 patients (16%) including 14 with urinary retention (4.2%), and 13 with scrotal edema (3.9%). The training curve of the first surgeon is 11-12 cases.[20]

The operating time for performing LH (90-180 min) established in our study, significantly exceeds the time for performing CH (50-120 min). These results are similar to those reported by Sun et al. and Chen et al.[14,16]

The nature and type of complications such as seroma, hematoma, and surgical site infection were comparable to those in the studies of Kargar et al.[9], Li et al.[15], and Köckerling et al.[18] which all emphasize the superiority of LH.

The intensity and duration of early postoperative pain (1-3 days after surgery) in our patients showed similar values and advantage of LH over CH similar to the results of Köckerling et al.[18], Westin et al.[13], Kargar et al.[9], and Scheuermann et al.[8]

Quality of life as measured in postoperative pain, quick recovery of normal physical activity, general health condition, and emotional comfort were slightly better in endoscopic hernioplasty than in conventional hernioplasty in the recently published randomized controlled study by Myers et al.[21] Abbas et al.[22] and Kushwaha et al.[23] also reported improved quality of life of the endoscopic group in the early postoperative period. Disadvantages of endoscopic hernioplasty were reported in a clinical randomized study by Jacobs et al.[24] where the cost for treating patients with CH was lower than that for LH patients by 40-50%.[24]

The results of our studies in the current study show that LH can be used in patients with unilateral, bilateral and recurrent inguinal hernia despite the disadvantages and complications.

CONCLUSIONS

Recent years have marked a trend of serious progress and global popularity of LH as a surgical procedure with minimum pain and consequences for patients, quick recovery, and optimal cosmetic results.

LH is superior to CH with the reduced hospital stay, the weaker and shorter postoperative pain, earlier return to daily activities and work, and an overall better quality of life.

LH has been criticized for its complexity, high cost, risk of complications, and the need for general anesthesia.

In the selection, systematization, analysis, and summarization of data from the available literature, today we need more quality systematic and prospective studies so we can further develop and create new evidence-based consensus opinions, guidelines and recommendations as a basis for creating standardized surgical techniques for contemporary treatment of inguinal hernias.

Surgical treatment of inguinal hernia is evolving and the effect of adopting innovative minimally invasive techniques needs to be further investigated in future. The choice of the most appropriate treatment should be based on the individual experience of the surgeon and it should be compliant to each patient.

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Преимущества и недостатки лапароскопической пластики паховой грыжи (герниопластики)

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Дата получения: 16 марта 2021 ♦ **Дата приемки:** 29 апреля 2021 ♦ **Дата публикации:** 28 февраля 2022

Образец цитирования: Trokovski N, Uchikov PA, Yordanov EM, Atliev K. Advantages and disadvantages of laparoscopic inguinal hernia repair (hernioplasty). Folia Med (Plovdiv) 2022;64(1):61-6. doi: 10.3897/folmed.64.e65965.

Резюме

Цель: Установить преимущества и недостатки лапароскопической герниопластики путём сравнения её с традиционными операциями.

Материалы и методы: В исследование включено 376 пациентов (344 мужчины и 32 женщины), которым проводилось стационарное лечение паховой грыжи за 3-летний период (2017-2020 гг.). Пациенты были разделены на две группы: пациенты с традиционной герниопластикой (ТГ) – 312 пациентов (291 мужчина и 32 женщины, средний возраст 55 ± 15 лет, диапазон 18-93 года) и 64 пациента с лапароскопической герниопластикой (ЛГ), все мужчины, средний возраст которых составлял 45 ± 15 лет (диапазон 24–69 лет).

Результаты: Тридцать восемь пациентов (59.38%) с ЛГ относились к 1-му классу по классификации физического состояния ASA, в то время как пациенты с ТГ были распределены с 1-ого класса по 4-ый класс по ASA. Группа ЛГ состояла из 39 пациентов, перенёсших трансабдоминальную предбрюшинную (ТАПБ) операцию, и 25 пациентов, перенёсших тотальное экстраперитонеальное (ТЭП) лечение. Среднее время операции составило 12 минут (диапазон 90-200 мин) для ТАПБ и 50 минут (диапазон 20-125 мин) для ТЭП. Средний балл интенсивности боли по VAS (0-10) составил 4 (2-5) для пациентов с ТГ и 3 (2-4) для пациентов с ЛГ. Длительность болевого синдрома составила 3 дня (2-4) для больных с ТГ и 3 дня (1-3) для группы с ЛГ. Девяносто пять процентов (61/64) пациентов с ЛГ описали свой образ жизни как «лучший».

Заключение: Особое значение для выбора метода герниопластики имеют следующие факторы: время операции, возможные интраоперационные осложнения, уровень послеоперационной боли и потенциальные послеоперационные анальгетики, возможные осложнения, выздоровление пациента, продолжительность пребывания в стационаре, затраты, качество жизни и длительность лечения, результаты лечения.

Ключевые слова

традиционное лечение грыжи, герниопластика, паховая грыжа, лапароскопическое лечение грыжи, инфекция области хирургического вмешательства, трансабдоминальная предбрюшинная пластика, тотальная экстраперитонеальная пластика