

# Laparoscopic inguinal hernia repair in the obese patient population: A single- center's 5- year experience

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## Research Article

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# Abstract

**Purpose:** The purpose of the present study is to explore how obesity impacts daily practice by reviewing the experience of a single-center, to evaluate the distribution of the TAPP and TEP methods amongst obese and non-obese patient populations and assess relevant postoperative outcomes.

**Methods:** patients undergoing elective minimally invasive inguinal hernia repair in our hospital, were included from January 2017 to January 2022. Data of interest were the minimally invasive technique utilized, patient demographics, individual patient American Society of Anesthesiology (ASA) score, the body mass index (BMI), underlying hypertension and diabetes, and smoking status.

**Results:** A total of 109 patients were included in the present analysis, of which 81 (74.3%) underwent elective TEP repairs, while 28 (25.7%) underwent elective TAPP repairs. Overall, 39 (35.7%) patients were included in the obesity subgroup with an average BMI of  $35.4 \pm 4.9$ , with a range from 30,1 to 52,7, and 70 (64.3%) were included in the non-obese subgroup, with an average BMI of  $23.2 \pm 3.3$  and a range from 16,2 to 29,7.

**Conclusions:** The laparoscopic approach to inguinal hernia repair in obese patients has similar outcomes as an open approach regarding the 30-day events, in the hands of experienced surgeons with the advantages of the laparoscopic approach vs. the open one.

## Introduction

Over 20 million patients worldwide are estimated to undergo elective inguinal hernia repairs every year [1,2]. The Lichtenstein tension-free repair is the most commonly performed procedure with low complication and recurrence rates [3]. Since the early 1990s when the technique was first published, it has evolved, with new laparoscopic approaches such as the transabdominal preperitoneal (TAPP) and the totally extraperitoneal repair (TEP) emerging to further enhance patient outcomes [4–10]. Compared to the conventional Lichtenstein technique, the minimally invasive approaches seem to be associated with a reduced risk of early postoperative pain, wound-related infections, chronic pain and earlier return to work and daily activities compared to the open approach [11]. The advantage of the TEP repair is the non-violation of the peritoneal cavity with the procedure performed entirely in the preperitoneal space [12]. On the contrary, the TAPP repair necessitates entry into the peritoneal cavity, providing a wide operative field and the opportunity to detect unsuspected contralateral hernias [13, 14]. Previous studies and meta-analyses yielded conflicting results in the head-to-head comparison of TEP with TAPP, with proponents of the former arguing that it is associated with less postoperative pain, while TAPP involves a less steep learning curve [15–21].

The increasing population of obese patients around the world requires a reevaluation of the two minimally invasive techniques in this particular subset of patients. The relationship between obesity and inguinal hernia occurrence and recurrence still remains controversial. Several studies have demonstrated a protective effect of being overweight and obese on the incidence of primary groin hernia [22-25]. Others

have reported a linear association between obesity and increased risks of postoperative complications and hernia recurrence following ventral and inguinal hernia repairs [26-29].

The purpose of the present study is to explore how obesity impacts daily practice by reviewing the experience of a single-center, to evaluate the distribution of the TAPP and TEP methods amongst obese and non-obese patient populations and assess relevant postoperative outcomes.

## Materials And Methods

Consecutive patients undergoing elective minimally invasive inguinal hernia in our hospital, were included from January 2017 to January 2022. For each patient case, data of interest were the minimally invasive technique utilized, patient demographics, individual patient American Society of Anesthesiology (ASA) score, the body mass index (BMI), underlying hypertension and diabetes, and smoking status. Patients were separated into an obese and a non-obese patient subgroup using a BMI cut-off value of 30. Outcomes of interest were the length of surgical procedure, the postoperative length of hospital stays, and postoperative morbidity and recurrence rates.

In the cases of totally extraperitoneal (TEP) inguinal hernia repair, a conventional 10 mm laparoscopic port was placed above the posterior rectus sheath laterally to the umbilicus preperitoneal space was expanded carefully using the endoscope. Standard 5 mm ports were entered in the midline, as per convention, and the preperitoneal dissection was carried to the space of Retzius under direct vision. After the reduction of the hernia sac was complete, a 10x15 cm microporous three-dimensional polypropylene mesh was inserted and was fixated with only a single tacker in the pubic bone. The air in the preperitoneal space was then slowly evacuated under direct vision to ensure that no slippage of the mesh ensued.

In the cases of transabdominal preperitoneal (TAPP) inguinal hernia repair, entry into the peritoneal cavity was achieved via the open Hasson technique for insertion of the 10 mm camera port. After that, two 5 mm ports were inserted in the right and left mid clavicular lines, just inferior to the level of the umbilicus. The preperitoneal space was entered at the anterior superior iliac spine level, two finger breadths medially, and was carefully dissected until the parietalization of the hernia was complete. Mesh insertion and fixation were identical to TEP cases, and closure of the peritoneal defect at the end of the operation was achieved using absorbable tackers.

Two senior surgeons experienced in both techniques performed all procedures, having performed over 300 lifetime minimally invasive inguinal hernia repairs each. Ethical committee approval was obtained for this study by the hospital's Ethical Committee and informed consent was taken from all patients to be included in the current study

### *Statistical analysis*

All analyses were performed using the Statistical Package for Social Sciences (SPSS) version 20.0 (SPSS Inc., Chicago, IL, USA). The Chi-square test and Fischer's exact test were utilized for comparisons between categorical variables. The non-parametric Mann-Whitney-U test was used for comparison between continuous variables. A p-value less than 0.05 was considered statistically significant throughout the analysis.

## Results

A total of 109 patients were included in the present analysis, of which 81 (74.3%) underwent elective TEP repairs, while 28 (25.7%) underwent elective TAPP repairs. Overall, 39 (35.7%) patients were included in the obesity subgroup, with an average BMI of  $35.4 \pm 4.9$ , with a range from 30,1 to 52,7, and 70 (64.3%) were included in the non-obese subgroup, with an average BMI of  $23.2 \pm 3.3$  and a range from 16,2 to 29,7. When the two subgroups were compared, the obese patient subgroup demonstrated a statistically significant increase in the number of diabetic patients, with a significantly increased predilection towards utilization of the TEP operative method (89.7% in the obese patient subgroup versus 70% in the non-obese,  $p=0.01$ ). No statistically significant differences were registered in terms of ASA score, smoking, and hernia bilaterality.

Operative time was equivalent between the compared groups (Table 1), with complication rates being higher in the non-obese subgroup (5.1% versus 12.9% in the non-obese subgroup), although this finding did not attain statistical significance ( $p=0.32$ ). The length of hospital stay was marginally increased in the obese subgroup ( $1.7 \pm 0.8$  versus  $1.5 \pm 1.9$  in the non-obese subgroup), with the finding being statistically significant ( $p=0.03$ ).

## Discussion

The recent European Hernia Society's guidelines state that Lichtenstein tension-free and minimally invasive techniques such as TAPP and TEP, performed by expert surgeons, are the best evidence-based options for inguinal hernia repair [1]. A recent network meta-analysis of randomized controlled studies demonstrated that both TEP and TAPP are associated with a reduced risk for postoperative pain and earlier return to work/daily activities compared to open tension-free repair [11]. Hernia recurrence after minimally invasive repair is also comparably low, with cited recurrence rates of up to 2%, for both TEP and TAPP repairs [1–3]. Mesh type, size, overlap extent, technique for mesh fixation (self-gripping vs. sutured meshes vs. tacker vs. glue fixation), medial or lateral hernia sac, sliding hernias, operating time, type of anesthesia, participation in a register database, adequate dissection and space creation, postoperative complications, and center/surgeon volume have previously been identified as risk factors [30-33].

Postoperative chronic pain after minimally invasive repair has been reported in up to 3% of patients [11]. In our cohort no cases of chronic pain were reported. Surgeon experience, expertise, variation in technical skills, and hospital volume are key determinants for operative time while TAPP and TEP have been shown

to be associated with a steep learning curve [34, 35]. The European Hernia Society indicated that one hundred TAPP procedures are necessary to achieve comparable results with open mesh repair and that at least 50 cases are required to halve complication rates [1, 36]. Lau et al. affirmed that at least 80 TEP repair cases are required to complete the learning curve, while Aeberhard et al. reported a significant drop in surgery duration after one hundred procedures [37, 38].

In the present study, both TAPP and TEP procedures were carried out by two qualified minimally invasive surgeons with experience of more than 300 cases for each procedure. Operative time was equivalent between the compared groups; in this time the anesthesia time is included as well (Table 1), with complication rates being higher in the non-obese subgroup (12.9% vs. 5.1% in the obese subgroup), although this finding did not attain statistical significance ( $p=0.32$ ). There was no conversion to open surgery.

The repair of inguinal hernias in obese patients presents many unique challenges to the surgeon. The excessive preperitoneal fatty tissue and the propensity for developing postoperative complications increase the complexity of inguinal hernia repair in obese patients. As previously mentioned, obesity appears to confer a protective effect on the occurrence of primary groin hernia. Particular to the obese population is a characteristically increased risk of postoperative morbidity [39], which is likely related to the increased incidence of cardiac and metabolic comorbidities that are often present in this patient population [40]. These findings create a diagnostic and therapeutic dilemma in the approach to inguinal hernia repair in the obese population. Nevertheless, in the present study, postoperative complications in the obese group were lower than in the non-obese one, with the majority of the cases having postoperative subcutaneous hematomas. There was one case that developed necrotizing pancreatitis after the operation, which was attributed to anesthesia associated medications. There were no surgical site wound infections in any of the patients.

When comparing laparoscopic to open ventral hernia repairs in obese patients, several authors have reported more favorable outcomes in the laparoscopic group concerning wound morbidity. This difference is likely related to the extensive subcutaneous dissection that often occurs in an open ventral hernia. In minimally invasive repairs of inguinal hernias, there is often little to no subcutaneous dissection and thus wound-related events might be much less frequent. On the other hand, the large retroperitoneal dissection necessary in a laparoscopic inguinal hernia repair can be particularly challenging in an obese patient and might limit the general improvements in outcomes in this patient population. As has been described in previous studies, more extensive dissection may lead to tissue devascularization and increases in the dead space, which facilitates bacterial growth and ultimately leads to surgical site wound events [41, 42].

Early reports investigating the laparoscopic approach to inguinal hernia repair were not favorable [43, 36]. In fact, the randomized controlled trial from the Veterans Affairs medical centers by Neumayer et al. [36] concluded that the open technique was superior to the laparoscopic technique for the repair of primary inguinal hernias. The support for the open approach to inguinal hernia repair was initially due to the

inexperience with the laparoscopic method for inguinal hernia repair. Nevertheless, as experience accumulated, subsequent studies have shown that the laparoscopic approach is at least equivalent to the open approach for in experienced surgeons' hands [44]. Ideally, inguinal hernia repair in the obese should be performed in a way that minimizes the already higher risk of postoperative morbidity while simultaneously providing a durable, long-term repair that prevents hernia recurrence [44].

The low complication rates in the obese patient subgroup may partly be explained by the careful patient selection for each method (TEP repairs were more preferentially utilized in the obese subgroup) as well as the experience of the surgeons performing the procedures [36]. It should be noted that the present study is limited by its retrospective nature and the relatively small number of included patients significantly impact the generalizability of the obtained results and potentially suggest that the risk for type I statistical error is present.

## Conclusion

The laparoscopic approach to inguinal hernia repair in obese patients has similar outcomes as an open approach regarding the 30-day events in the hands of experienced surgeons with the advantages of the laparoscopic approach vs. the open one. We recommend that a surgeon chooses the inguinal hernia repair (open or laparoscopic) that they are most comfortable with in an obese patient.

## Declarations

I, the corresponding author, declare that the authors have no competing interests as defined by Springer, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

### Authors contributing Statement

N. P helped with gathering the data and manuscript writing and reviewing

A. P. helped with the data analysis and statistics

M. B. helped with the writing and reviewing of the manuscript

Y. Z. helped with the statistical analysis and prepared the table and helped with the writing of the manuscript

A. M. A. helped with the collection of the data and interpretation of the data

D. P. helped with the statistical analysis, the creation of the results and methods, and reviewed the manuscript

E. P. revised the manuscript critically for important intellectual content and reviewed the article

**Competing Interests:** All authors declare that have no financial or other interests that are directly or indirectly related to the work submitted for publication.

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## Tables

**Table 1.** Characteristics of the included patient population.

	Total / Mean $\pm$ SD (n=109)	Obese patients (n=39)	Non-obese patients (n=70)	p-value
Age	46 $\pm$ 16.8	46.4 $\pm$ 13.9	45.8 $\pm$ 18.3	0.2
Gender (M/F)	105 (96.3%) / 4 (3.7%)	35 (89.7%) / 4 (10.3%)	70 (100%) / 0	0.01
BMI	28.2 $\pm$ 6.6	35.4 $\pm$ 4.9	23.2 $\pm$ 3.3	0.08
ASA score	2 (1-4)	2 (1-3)	2 (1-4)	0.62
Hypertension	26 (23.8%)	8 (20.5%)	18 (25.7%)	0.64
<b>Diabetes</b>	<b>13 (11.9%)</b>	<b>9 (23%)</b>	<b>4 (5.7%)</b>	<b>0.01</b>
Smokers	22 (20.1%)	10 (25.6%)	12 (17.1%)	0.28
<b>TEP / TAPP</b>	<b>81 (74.3%) /</b> <b>28 (25.7%)</b>	<b>35 (89.7%) /</b> <b>4 (10.3%)</b>	<b>46 (65.7%) /</b> <b>24 (34.3%)</b>	<b>0.02</b>
Bilateral hernia	24 (22%)	11 (28.2%)	13 (18.6%)	0.16
Bilateral hernia TEP/TAPP	21 (25.9%) / 3 (10.72%)	10 (28.6%) / 1 (25%)	11 (23.9%) / 2 (8.3%)	0.11
Operative time	98 $\pm$ 35.3	96.5 $\pm$ 44.1	98.7 $\pm$ 29.8	0.59
<b>Length of hospital stay</b>	<b>1 (1-15)</b>	<b>1.7 <math>\pm</math> 0.8</b>	<b>1.5 <math>\pm</math> 1.9</b>	<b>0.03</b>
Complications	11 (10%)	2 (5.1%)	9 (12.9%)	0.32