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Feasibility of Transabdominal Preperitoneal Laparoscopic Inguinal Hernia Repair in Obese Male Patients

Yasser Baz, MD; Tarik Abd El-Azim, MD; Mohammed Mahmoud Ezzat Ibraim, MD
Department of General Surgery, Faculty of Medicine, Helwan University, Egypt

Introduction: Inguinal hernia repair (IHR) is one of the most commonly performed operations by general surgeons. The transabdominal preperitoneal (TAPP) procedure became the primary IHR in many specialized centers. Surgeons are challenged by the increasing prevalence of obesity around the world, which necessitates a reassessment of TAPP in obese patients. The current study's goals are to evaluate how obesity impacts an appropriate inguinal hernia management plan and to assess TAPP postoperative outcomes in obese patients.

Patients and methods: Patients undergoing elective minimally invasive TAPP inguinal hernia repair in our hospital, were included from January 2021 to January 2022. And distributed into two groups according to BMI (Above and below 30). Data of interest were the patient demographics, the body mass index (BMI), smoking history, hernia type, and perioperative outcomes.

Results: A total of 40 male patients were included in the present analysis, of whom 20 (50%) were obese with an average BMI of 43.69 and 20 (50%) were non-obese with an average BMI of 25.29. Operative time was equivalent between the compared groups, with intraoperative events rates being higher in the non-obese group 5% versus 2.5% in the obese group, although this finding did not attain statistical significance p = 0.5. The length of hospital stay was marginally longer in the obese subgroup (36.5 hours versus 31.75 in the non-obese subgroup), with the finding being statistically significant p=0.003.

Conclusion: Obese patients can benefit from TAPP laparoscopic inguinal hernia repair in a manner similar to those who are not obese.

Key words: Laparoscopic inguinal hernia repair, TAPP, Obese patient.

Introduction

Inguinal hernia repair (IHR) is one the most commonly performed operations by general surgeons. Surgical repair is the only confirmed, effective treatment for inguinal hernias, however there are many different described procedures for IHR. Since Lichtenstein and his colleagues described mesh for tension-free IHR, the open Lichtenstein mesh repair of inguinal hernias has become the standard of care.[1-3]

Lichtenstein procedure is a common operative technique for IHR due to its ease, low cost, and shorter learning curve in comparison with the laparoscopic Transabdominal Preperitoneal (TAPP) procedure. However, in the hands of an experienced surgeon, TAPP has fewer post-operative complications and recurrence so it became the primary Laparoscopic Inguinal Hernia repair (LIHR) in many specialized centers.[1,4-8]

Surgeons are challenged with an increasingly complex patient population that is frequently overweight of growing obesity epidemic. It is known that obesity increase morbidity and mortality in general population and therefore is perceived as a risk factor for perioperative complications. There are few investigations comparing postoperative complications in obese and non-obese patients.[9-11]

The association between obesity and inguinal hernia occurrence and postoperative complications is still a matter of debate as a lot of surgeons have demonstrated a protective effect of obesity on the occurrence of primary groin hernia while others have described an association in linear form between obesity and higher risks of postoperative complications and recurrence rate following IHR, so that, the increasing obesity around the world necessitates a reassessment of TAPP in obese patients.[1,6]

The current study's goals are to evaluate how obesity impacts an appropriate inguinal hernia management plan and to assess TAPP postoperative outcomes in obese patients.

Patients and methods

Between January 2021 and January 2022, male patients admitted to surgery clinic in Badr University Hospital with groin hernia, accepted to participate in the study and met the inclusion criteria were included to undergo TAPP inguinal hernia repair in our hospital. The research ethical committee approved the study after receiving written informed consent from each patient. Our work was done in traditionalism with the updated Declaration of Helsinki.

Forty patients were recruited for the study and then distributed among both groups according to their BMI; one group included 20 obese patients with BMI ≥ 30 kg/m2, and the other group include 20 non-obese patients with BMI < 30 kg/m2, the study continue till the recruitment of 20 patient in each group was completed.

The criteria for inclusion include any male above 18 years complaining of uncomplicated groin Hernia and fit for anesthesia, while patients with complicated inguinal hernia (Irreducible, obstructed, or strangulated), recurrent inguinal hernia following laparoscopic repair, contraindications for laparoscopy, prior pelvic surgery, or prior pelvic irradiation were excluded from our study.

All participants were admitted through the outpatient clinic and subjected to thorough history taking, clinical examination and laboratory workup.

Preoperative preparation

The patient sign informed written consent, the side of the hernia was marked, fasting for at least 6 hours, abdominal and groin hair was clipped and patient was requested to urinate immediately before being transferred to the operating room, sequential compression stockings for obese participants and subcutaneous administration of low molecular weight heparin for deep venous thrombosis prophylaxis 12 hours preoperatively. Single prophylactic dose of antibiotic was administrated at the induction of anesthesia for all participants and urinary catheter was inserted.

Operative procedure

The procedure was performed under general anesthesia with endotracheal tube. The patient was positioned in supine Trendelenburg position with arms at his side. The operating surgeon work from the opposite side of hernia facing the pelvis and his assistant surgeon holding the camera stand beside him at the opposite patients shoulder. **(Figure 1).**

Access to the peritoneum was done through the open technique by insertion of the 10 mm camera port at the umbilicus or using 12 mm disposable visual port especially in obese patients. Pneumoperitoneum up to 14 mmHg was generated with CO_2.

Afterwards, two ports for working instrument 5 and 10 mm were inserted at the level of right and left mid-clavicular lines, just below the level of the umbilicus, or the ipsilateral above and the contralateral below the level of umbilicus according to the preoperative designed working arc **(Figure 1).**

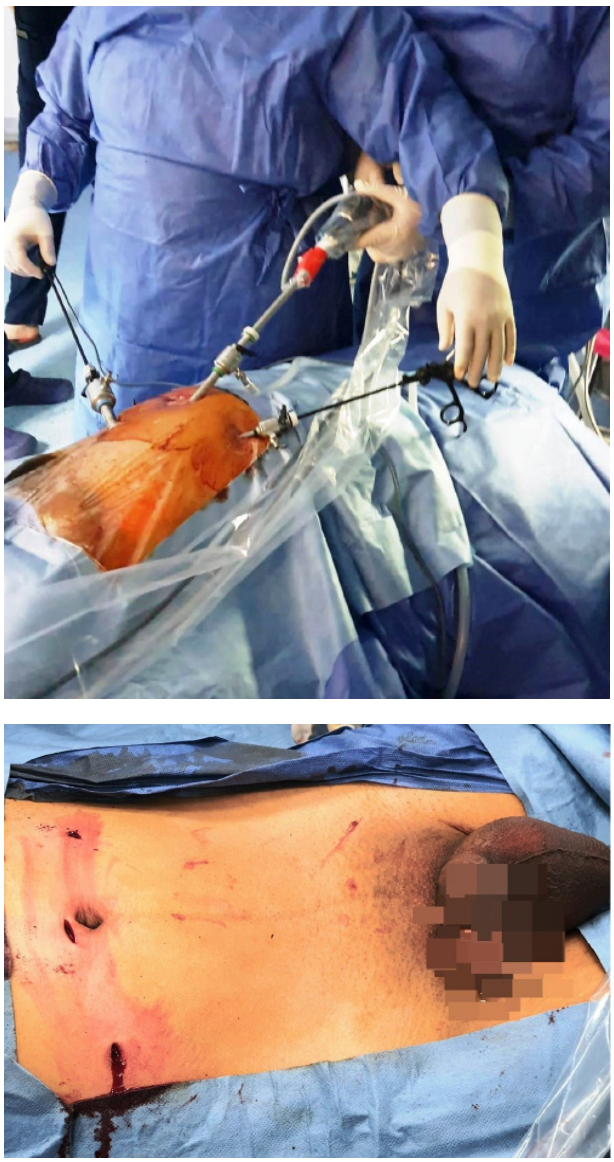


Fig 1: Patient, team positioning and Port sites in the left inguinal hernia TAPP procedure.

We entered the pre-peritoneal space medial to and at the level of anterior superior iliac spine, or about 4 cm above the defect, and Wise dissection through the pre peritoneal plan laterally from the anterior superior iliac crest, and Medially to the symphysis pubis and at least 2 cm below, to allow mesh to overlap direct and femoral hernia triangle by 3-4 cm. Sac is dissected down, the dissection of indirect sac from the cord is the most challenging, in large or inguinoscrotal hernia the sac may be transacted after identification of all aspects of the cord and its distal part is abundant in the scrotum. The Inferior dissection of the peritoneum is continued till the Vas crossing the external iliac vein is visualized medially and the iliopsoas muscle laterally. The critical view of Myopectineal orifice (MPO) become clear after achieving hemostasis (Five triangles of direct, indirect, femoral hernia, triangle of doom and pain) the Landing zone is ready for mesh which covers the MPO completely overlapping all spaces by 3-4 cm reaching symphysis medially, ASIS laterally and

inferiorly above the edge of peritoneum to avoid mesh folding after closure. **(Figure 2).**

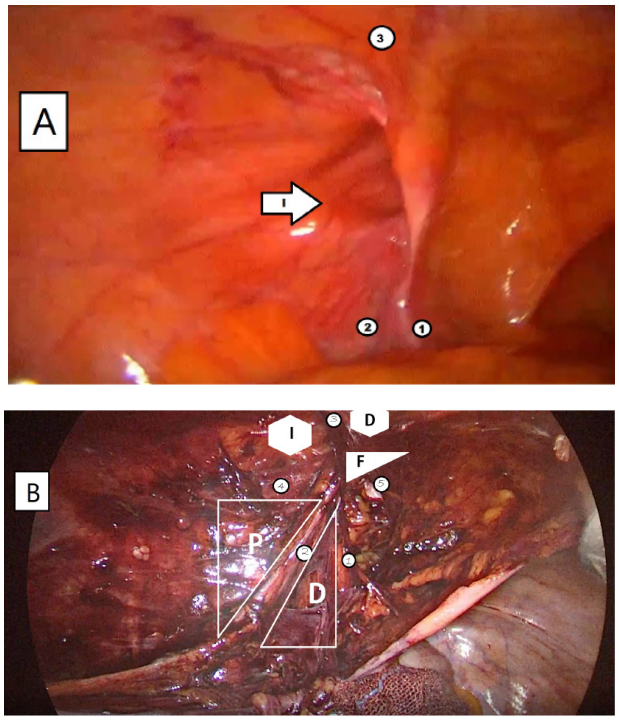


Fig 2: Laparoscopic anatomy identification in obese patient, A before and B after dissection. 1; vas differans, 2; gonadal vessels, 3; Inferior epigastric vessels, 4; iliopubic tract, 5; cooper's ligament, I; indirect hernia defect, D; site of possible direct hernia defect, F; site of possible femoral hernia defect, triangle P; triangle of pain, triangle D; triangle of Doom.

A polypropylene Mesh 10 x 15 cm rolled up and inserted via 10 mm working port, Mesh unrolled, landed and fixation done by non-absorbable helical titanium clip (ProTackTM Auto sutureTM) at cooper's ligament medially, laterally 2 cm above iliopubic tract (IPT) and two clips in between near the upper edge medial and lateral to the inferior epigastric vessels. No extra clip fixation was needed in most cases, in all cases care was taken to avoid triangles of Doom and pain.

The peritoneal flab suturing and closure of the defect is done at the end using polyglactin 3-0 absorbable sutures on 26 mm round needle. It was helpful to decrease the Pneumoperitoneum below 10 mmHg for better approximation of the peritoneum **(Figure 4)**. Deflation of the abdominal cavity and scrotum if it was inflated. All instruments and ports were removed after the surgery, No drains left in any of the participants. Then skin closure Using polyglactin 4-0 suture and adhesive tapes (3M Steri-StripTM).

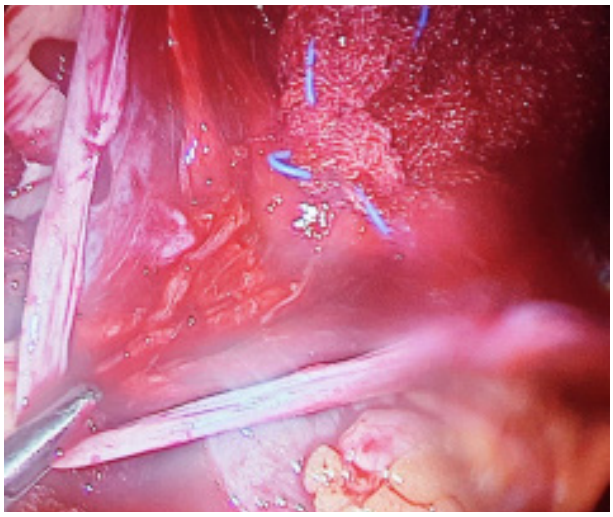


Fig 3: Intra operative minor vascular injury during dissection.

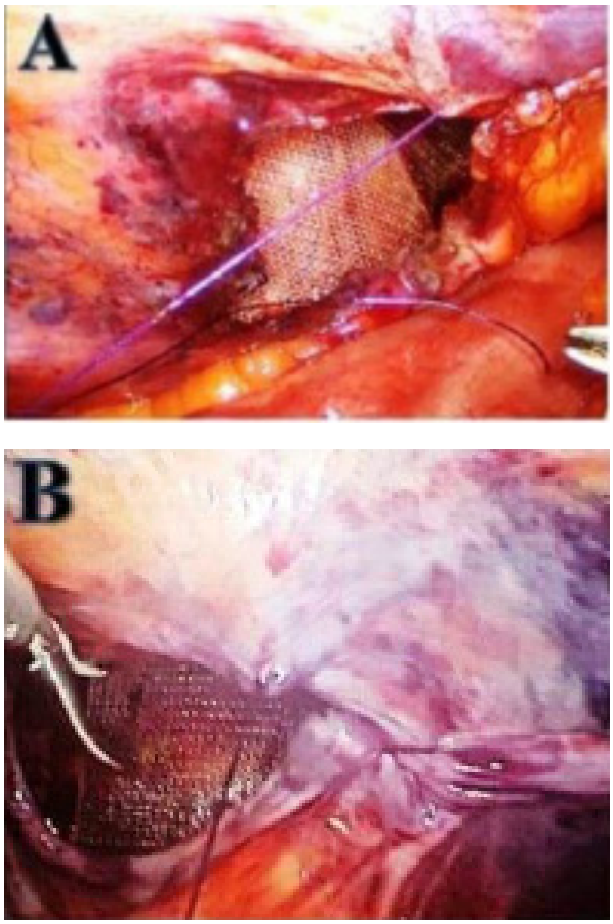


Fig 4: Closure of peritoneum; (A) in obese patient and (B) in non-obese.

Post-operative course

Analgesics (I.M NSAIDs) were given on need, shifted to oral Diclofenac potassium 50 mg tablets, taken twice daily. Ambulation of patients was encouraged and starting daily activities as early as possible.

Participants' observation and recording of their data for. 1. Post-operative pain according to Numerical rating scale from 1-10, where 0 means no pain while 10 means the worst pain. 2. Intra-operative and Post-operative complications such as seroma, hematoma. 3. Hospital stays in Hours. 4. The time (In days) required for the patient to resume his normal daily activities.

Most patients were discharged the next day or within 48 hours. At discharge, patients was given 5 follow up appointments in outpatient clinic every week, in the first two weeks, then after one, three and six months. Afterwards, patients were instructed to connect us if they had any complains.

Data regarding preoperative patient variables included participant's age, body mass index (BMI), and smoking history. Operative outcome variables included; operation time, intraoperative injuries, conversion rate, Postoperative seroma, hematoma, hospital stay, resumption of normal activity and early six month recurrence, was recorded in our work. Data was collected by assessment of the participants during postoperative follow up visits.

Statistical analysis

Data analyses were performed using the Statistical Package for Social Sciences (SPSS) version 23.0 (SPSS Inc., Chicago, IL, USA). Numbers and percentages (N, %) were used to describe categorical data, while the mean and standard deviation (Mean, SD) were used to describe continuous data. The Chi-square test and Fischer's exact test were utilized for comparisons between categorical data. Continuous data were tested for normal distribution using visual curve inspection, and Kolmogorov-Smirnov test and Q-Q plots. Parametric T test was used for comparison between normally distributed data, while non-parametric test the Mann-Whitney-U was used for testing non- normally distributed continuous data. A two tailed p-value below 0.05 is the chosen cut off point for statistical significance.

Results

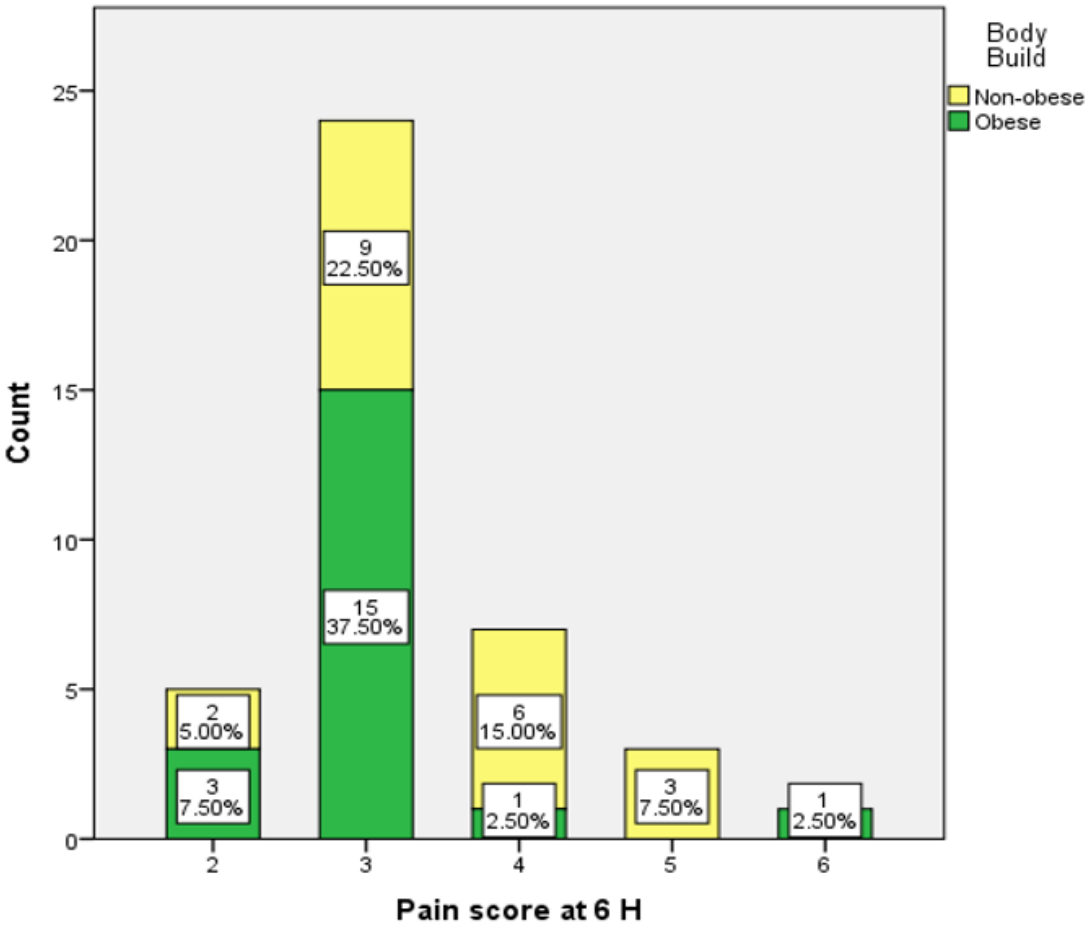
Patient characteristics

A total of 40 male patients were included in the present analysis, of whom 20 (50%) were obese with mean BMI of 43.6+9.5 kg/m2, and 20 (50%) were non-obese with mean BMI of 25 +2.9 kg/m2 and underwent elective TAPP repairs. When the two groups were compared, there were no statistically significant differences in terms of participants' age, smoking status, side, type and Nyhus Hernia class **(Table 1).**

Operative and post-operative period

There was no significant difference between both groups regarding mean operative time which was slightly longer in obese Group 102.9+12 min and 98.9+13.5 min for non-obese. Regarding Intra-operative events mainly in the form of minor vascular injury rates being insignificantly higher in the non-obese group 2 patients (5%) versus 1 patient (2.5%) in the obese group. The mean length of hospital stay was significantly longer in the obese group than Non-obese (36+5 hours and 31.7 +5 hours respectively), with p value of 0.003. Postoperative complications was nearly equivalent in both groups with hematoma formation rate insignificantly slightly higher in non-obese group in 2 cases (5%) while only one case (2.5%) from obese group with p value 0.55. Only one patient develop recurrence from the non-obese group 5%, however this was not significant with p value of 0.3. **(Table 2).**

Post-operative pain after 6 Hours of surgery was significantly worse in Non-obese group with p value of 0.04. While subsequent pain at 24 Hours and one week show no significant difference with one case of chronic pain in the Non-obese group **(Figure 5, Table 3).**


Body Build
Non-obese
Obese
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25
20
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10
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0
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5.00%
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9
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37.50%
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3
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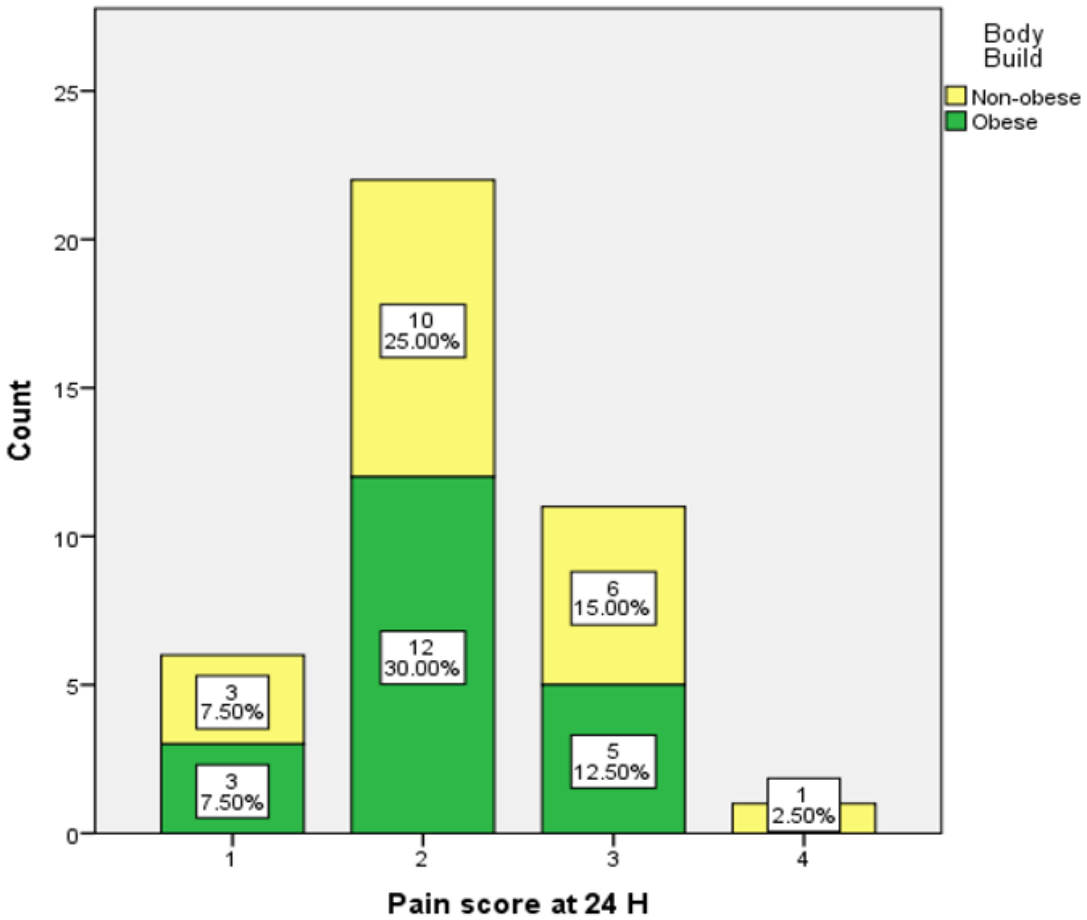
Pain score at 6 H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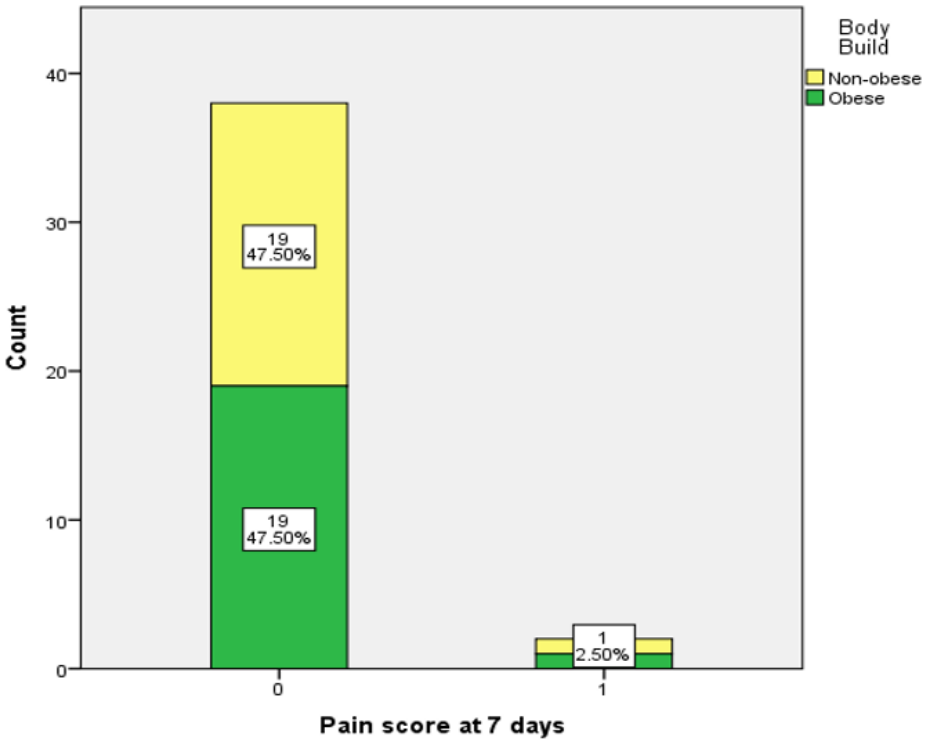
Pain score at 24 H



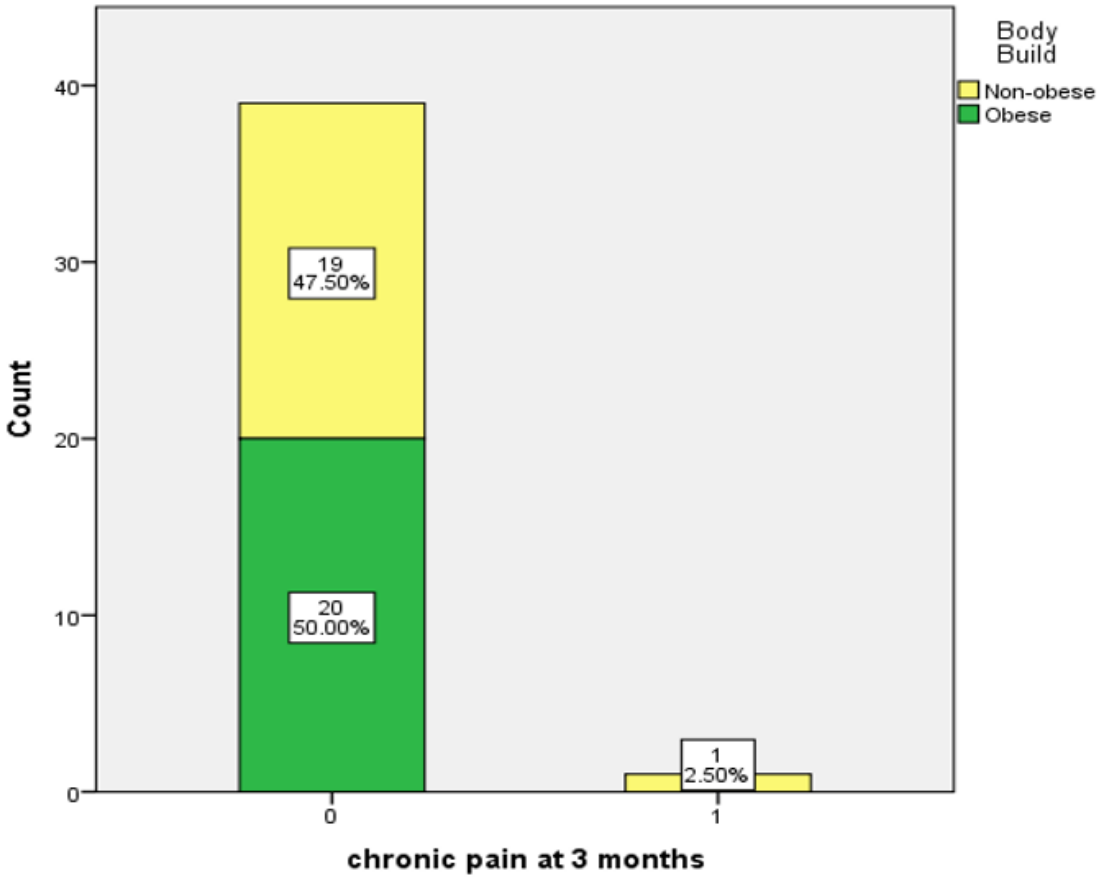


Fig 5: 6H, 24H, 7D and 3 m Post-operative pain on Numerical Rating scale.

Table 1

Characteristics	Total (n=40)	Non-obese (n=20)	Obese (n=20)	P value
Mean BMI kg/m^2 (SD)	34.3 (± 11.6)	25 (± 2.9)	43.6 (± 9.5)	< 0.001
Mean age years (SD)	39 (± 12.6)	38.45 (± 13)	39.6 (± 12.4)	0.7
Gender male/female n (%)	40/0	20/0	20/0	NA
Smoking				
Smoker n (%)	21 (52.5%)	12 (60%)	9 (45%)	0.5
Nonsmoker n (%)	19 (47.5%)	8 (40%)	11 (55%)	
Laterality				
Unilateral n (%)	37 (92.5%)	18 (90%)	19 (95%)	0.5
Bilateral n (%)	3 (7.5%)	2 (10%)	1 (5%)	
Type (Anatomical defect)				
Indirect n (%)	10 (25%)	6 (30%)	4 (20%)	0.7
Direct n (%)	30 (75%)	14 (70%)	16 (80%)	
Femoral n (%)	0	0	0	
Nyhus classification n (%)				
I	7 (17.5%)	4 (20%)	3 (15%)	0.5
II	19 (47.5%)	9 (45%)	10 (50%)	
III A	10 (25%)	6 (30%)	4 (20%)	
B	4 (10%)	1 (5%)	3 (15%)	
C	0	0	0	
IV	0	0	0	

NA, not applicable.

Table 2

Characteristics	Total (n=40)	Non-obese (n=20)	Obese (n=20)	P value
Mean operative time min (SD)	100.9 (± 12.8)	98.9 (± 13.5)	102.9 (± 12)	0.3
Intraoperative complications n (%)				
Vascular injury	3 (7.5%)	2 (5%)	1 (2.5%)	0.5
Bladder injury	0	0	0	NA
Bowel injury	0	0	0	NA
Peritoneal tear	0	0	0	NA
Conversion	0	0	0	NA
Postoperative complications n (%)				
Subcutaneous emphysema	2 (5%)	1 (5%)	1 (5%)	NA
Hematoma	3 (7.5%)	2 (5%)	1 (2.5%)	0.55
Seroma	2 (5%)	1 (5%)	1 (5%)	NA
Scrotal swelling	0	0	0	NA
Mean Hospital stay (Hours) (SD)	33.9 (±6.6)	31.7 (±5)	36 (±5)	0.003
Mean Resumption of activity D (SD)	35 (±5.2)	34 (±5.1)	35.8 (±5.4)	0.34
Recurrence n (%)	1 (2.5%)	1 (5%)	0	0.3

NA, not applicable.

Table 3

Characteristics	Total (n=40)	Non-obese (n=20)	Obese (n=20)	P value
Postoperative pain score* (Mean/Median/Mode)				
6 Hours	3.28 / 3 / 3	3.5 / 3 / 3	3 / 3 / 3	0.04
24 Hours	2.18 / 2 / 2	2.25 / 2 / 2	2.1 / 2 / 2	0.5
7 Days	2 (score 1)	1 (score 1)	1 (score 1)	NA
3 Months	1 (score 1)	1 (score 1)	0	NA

* Numerical rating scale from 1-10.

NA, not applicable.

Discussion

Inguinal hernia repair is one of the many conventional procedures that are currently being replaced with more advanced minimally invasive procedures AS Many authors have adopted TAPP as the standard laparoscopic technique for day surgery IHR.[12] When compared to open tension-free repair, the TAPP procedure has a lower risk of postoperative pain and a quicker return to work or daily activities, making it the gold standard IHR in the future.[8,13]

Many people's poor activity patterns nowadays result in an increase in BMI, which undoubtedly raises intra-abdominal pressure, which is the primary etiological factor of inguinal hernias. In overweight and obese population adult inguinal hernia developed at relatively younger ages in comparison with normal-weight patients. Similarly, males are more affected than females; there is a significant correlation between BMI and the development of complicated hernias.[14-17]

Increased BMI, particularly in male patients, seats additional challenges on the surgeon during TAPP. Patients with overweight or obesity had a highly significant influence on the risk of pain at rest, on exertion, and chronic pain requiring treatment following TAPP. Therefore, while operating on patients who are overweight, appropriate caution must be taken.[18] Chronic Postoperative pain after laparoscopic repair has been reported in up to 3% of patients.[13]

When comparing ventral hernia repairs in obese patients; laparoscopic to open, many authors have reported more favorable results in the laparoscopic group that have the advantage of avoiding the extensive dissection needed in an open ventral hernia repair. On the contrary, in the open IHR, there is often little to no subcutaneous dissection. In addition, the large retroperitoneal dissection created in the laparoscopic inguinal hernia repair (LIHR) can be challenging in an obese patient and might limit outcomes. Many previous studies address the issue of extensive tissue dissection that usually leads to tissue devascularization and development of dead space, which facilitate bacterial growth and ultimately lead to surgical site wound complications.[19]

Regarding to post-operative pain in our study; at six hours after surgery, post-operative pain was significantly lower in the obese group. Despite the fact that LIHR was successful and had a good postoperative pain profile, the obese patient had a protective extra-peritoneal fat layer. The operator's skill in wise dissection, the mesh type, and fixation all affect post-operative pain. Following LIHR, Dickinson and his colleagues could not find any association between BMI and the occurrence of postoperative pain. However, there was a tendency for underweight patients' postoperative pain to be more severe. This might be because these patients have less subcutaneous fat and muscle, which could make them more sensitive to pain from staples.[20]

There are many unique challenges during IHR in obese patients due to excessive preperitoneal fatty tissue, which mandates more extensive tissue dissection, increasing IHR complexity and postoperative complications.[1,19] In our study, mean operative time was about 4 minutes longer in the obese patient group which is not statistically significant (P=0.3), whereas in Park and his colleagues,[21] study, operative time was equivalent between the compared groups (p value 0.103).

In our study, intraoperative complications reported in the obese group were comparable to those in the non-obese group, with 3 cases having intraoperative vascular injuries, all vascular injuries were minor vessels injury controlled by direct gauze compression or by available energy device and no recorded major vascular injury neither to the inferior epigastric nor to the iliac vessels. There were no surgical site wound infections in any of the patients, and there was no conversion to open surgery. These findings create a diagnostic and therapeutic dilemma in the approach to inguinal hernia repair in the obese population. Bambade et al.[22] reported a statistically significant higher risk of intraoperative injuries, wound infection, and urinary tract infection in obese patients, concluding that obesity may

increases the risk of perioperative morbidity and, to a lesser extent, mortality. On the contrary, 10 years later, Froylich and his colleagues published,[19] LIHR in obese patients has similar outcomes as an open approach.

Obese patients with low risk inguinal hernia, a bariatric procedure before IHR may be considered to decrease post-operative complications and recurrence,[14,23] Recurrence after TAPP is comparably low to open conventional surgery, with mentioned recurrence rates of up to 2 %,[24] and Matched results in our study were reported (2.5%). Many other causes have previously been identified as risk factors.[25,26]

Initial reports investigating LIHR were not satisfactory and reported that the open technique was superior to LIHR for treating primary inguinal hernias, which might be due to the relative inexperience with the LIHR approach. Nevertheless, additional studies have shown that LIHR is at least equivalent to the open conventional approach for all patients especially with experienced surgeons.[19] These findings are consistent with those found within our study, as we found that TAPP is feasible in overweight and obese patients and that they can obtain similar benefits from TAPP as their non–obese counterparts.

It should be noted that the present study is limited by the relatively small number of included patients, which significantly impacts the generalizability of the obtained results. Large prospective investigations are needed to clarify the association between postoperative complications and obesity.

Conclusion and recommendation

Obese patients can benefit from TAPP laparoscopic inguinal hernia repair in a manner similar to those who are not obese. When determining whether to do TAPP on these obese patients, surgeons should take into account the patient and the hernia's characteristics rather than BMI alone. Preferably, inguinal hernia repair in the obese can be performed throug a minimally invasive approach that minimizes the already higher risk of postoperative morbidity while concurrently providing a long term durable repair that prevents inguinal hernia recurrence.

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