Laparoscopic treatment for ventral hernia in obese patients

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AIM: *Obese patients generally are not considered good candidates for wall defect repair, because of associated comorbidities, increased surgical risk, and high risk of surgical site infection and recurrence. The purpose of this retrospective study was to evaluate the results of laparoscopic incisional hernia repair in a group of patients with Body Mass Index (BMI)>35 kg/m^2.*
MATERIAL AND METHOD: *From January 2016 to October 2018, 15 obese patients, including 11 females (73.3%) with a BMI > 35 kg/m^2 underwent laparoscopic repair of an incisional abdominal hernia. Median BMI was 40 (SD±5). No selection related to comorbidities was performed. As primary endpoints, main postoperative general complications and hernia recurrence were taken into account. Secondary endpoints were the incidence of seroma, hematoma, wound infection and length of hospitalization. In addition, a systematic review of the literature on open and laparoscopic repair techniques was carried out.*
RESULTS: *All patients were treated by laparoscopy and no conversions were required. No intraoperative complications were observed, and no patients underwent early re-intervention. Mortality was zero. One patient (6.6%) presented a seroma, conservatively managed, and evaluated over time without the need of re-intervention. One patient (6.6%) suffered a recurrence a year later, also treated by laparoscopy. Average hospital stay was 2.79 days (DS±0.77).*
CONCLUSIONS: *Despite positive data and good results, laparoscopic treatment of wall defects has yet to be standardized. The feasibility of the laparoscopy for ventral hernias in patients with BMI>35 kg/m^2 should be considered. The proposed technique is standardizable and easily reproducible. In terms of complications in the short term (perforations, kidney and pulmonary failure, cardiovascular events) and in the long term (relapses, wound infections, seromas) our results justify recommendation of the minimally invasive approach for almost all patients with abdominal wall defects.*

KEY WORDS: Laparoscopy, Obese, Ventral hernia

Introduction

Indications for surgical treatment of incisional ventral hernias are generally very frequent. Their management is associated, using a laparotomic technique, with significant occurrence (15-25%) of complications and recurrences [1]. More often than not, obese patients are considered poor candidates for wall defect repair due to their comorbidities and increased post-operative risk of surgical wound infection and recurrence [2]. The rising popularity of laparoscopic techniques for bariatric surgery [3], currently considered the standard for this disease, has furthered a trend toward laparoscopic treatment of wall defects, even in obese patients. Laparoscopy can lead to a decreased number of complications and surgical site infections [4], but with a comparable number of recurrences. The aim of this study was to evaluate the feasibility and results of laparoscopic treatment of wall defects in patients with BMI>35 kg/m^2.

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The best surgical approach in wall defects in obese patients, i.e., whether it be laparoscopic or laparotomic, is not yet standardized. That much said, as laparoscopy has shown a lower incidence of complications than the open approach, this minimally invasive technique is now widely used in treatment of pathological obesity. Consequently, it was proposed to perform wall surgery with the same technique.
Regardless of the technique used, rate of recurrence after repair of wall defects in obese subjects is higher than in the general population; this is due to [5] multifactorial mechanisms, such as intra-abdominal pressure and poor vascularization of subcutaneous adipose tissue [5,6]. Laparoscopy has been shown to achieve good long-term results in reducing this complication [2].

Materials and Methods

From 2000 to 2018, 982 patients underwent ventral hernia repair with laparoscopic technique. Out of them, 290 underwent surgery between January 2016 and October 2018 and 15 had BMI > 35 kg/m^2. These patients were sent to laparoscopic surgery without further selection based on comorbidities. In many cases, high blood pressure (66.7%) was found; other frequent pathologies were diabetes mellitus (26.7%) and coagulation disorders (26.7%) (Table I). Mean patient age was 57.07 years (SD±12.68). Female prevalence was evidenced (73.34 %). Mean BMI was 40 (SD±5). One patient was considered as super-obese (BMI>50 kg/m^2).
Most patients presented an American Society of Anesthesiologists (ASA) score ≥ 3, which significantly expresses the tendency to frailty of these obese patients. The relevant data are summarized in (Table II).
All of the patients had incisional wall defects. The surgical procedures they had undergone were heterogeneous, including gynecological interventions, open and laparoscopic cholecystectomies, open colic resections and bariatric surgery. In addition, 5 patients (33.33%) had previously undergone surgery to repair one or more wall defects.
Almost all (93%) of the patients presented a defect in the midline with umbilical involvement. No limit on the defect area was considered in the exclusion criteria. The average area of defects treated was 29.1 cm^2 (SD 29.88 (Table III). The largest wall defect was 120 cm^2 in a woman with BMI of 40.4
Although the interventions were carried out by different operators from the General Surgery Operations Unit, the procedure was always standardized.
The procedure started with the introduction of 3 trocars, one of 12 mm, used for mesh insertion, and two 5 mm trocars. The 5 mm lens was sufficient for exposure and display of the surgical field during the procedure.
In most cases the 12 mm access was inserted on the left subcostal line to the insertion with the front axillary line, a 5 mm trocar on the midline in epigastrium and a last trocar at the level of the left flank. The position of the trocars may undergo slight changes depending on the patient's conformation and the distance of the defect. Pneumoperitoneum was induced with Verres needle or, more rarely, with open technique and a 5 mm trocar inserted under vision after exploration of the abdominal cavity.
The first phase of the intervention is carried out at an abdominal pressure of 12 mmHg and with careful release of the adherences, verifying the absence of any damage to the intestine. Once the contents of the defect are reduced in the abdomen (Fig. 1), measurement is carried out with a graduated centimeter, reducing abdominal pressure to 8 mmHg. A PTFE dual-mesh is then shaped, with a minimum overlap of 5 cm per axis. The major axis of the defect must guide to fixation of the prosthesis. Once the mesh is inserted through the 12 mm trocar, the upper pole is fixed with a stitch on the larger line of the defect. The procedure is then completed by fixing the distal end of the mesh at the lateral edges with the Protack® fixation device, thereby keeping the defect centered inside the mesh (Fig. 2).
All patients were included in the Enhanced Recovery after Surgery (ERAS) protocol and had not been fasted in the preoperative period, had been mobilized and fed early, and had an early recovery.

Results

A group of 4 males and 11 females (26.6% and 73.3% respectively) with a mean age of 57 years (SD±12.6) was included in the study. The mean BMI was 40 kg/m^2 (SD±5) (Table II). No patients underwent emergency surgery. Out of the 15 patients, 3 had multiple defects (2 patients had both an epigastric and an umbilical defect, 1 had an epigastric and a lateral defect), 2 patients had an epigastric defect, 8 an umbilical defect, and 2 a lateral defect with an average area to be treated of 29.1 cm^2 (SD±29.8) (Table III). All patients were treated with laparoscopic technique and no laparotomic conversion was necessary. No intraoperative complications were observed, and no patients underwent early re-operation. Mortality was zero. In 3 cases (20%) an intraabdominal drainage was placed and removed during the first post-operative day. No intestinal perforation or general complications, such as pneumonia or kidney failure, were detected. Post-operative pain, assessed with Visual Analogic Scale (VAS) was 2.3 (SD±0.8). These low values may have to do with the introduction by the anesthesiology team of a Transverse Abdominis Plane Block (TAP- Block) in all patients, for analgesic purposes. This procedure seems to help in the management of post-operative pain.
One patient (6.6%) presented a parietal seroma, which

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TABLE I - *Type of defect*

Defect type	N° almost	%	Area media (cm^2)	SD
Epigastric	5	33.33		
Umbilical	9	60		
Hypogastric	0	0		
Lateral	3	20		
			29,1	29.88421625

TABLE II - *Results*

	No	%	SD
conversion	0	0	
Early re-intervention (within 30 days)	0	0	
Intraoperative complications	0	0	
Drainage	3	20	
Post-op. VAS	2.38		0.8
Seroma	1	6.66	
Recidivism	1	6.66	
Post-op weight loss.	6	40%	
Days of hospital stay	2.79		0.77

was conservatively treated and assessed over time without the need for surgical re-intervention. One patient (6.6%) had a recurrence a year later, also treated by laparoscopic technique.
Only 6 patients (40%) experienced weight loss after the procedure.
Average hospital stay was 2.79 days (SD ± 0.77).
The therapeutic protocol provides for the administration of Enoxaparin from the evening before surgery up until the 21th postoperative day. Cefazolin was administered (2g) half an hour before surgery as ultra-short protocol. In addition, elastic compression of the lower limbs is mandatory during both the preoperative and the postoperative periods; it is achieved with elastic stockings and intermittent pneumatic compression in the operating theater.
All patients were contacted by phone and follow-up ranged from 18 months to of 4 years, with an average of 33 months.
The data are reported in Table I and II.

Systematic Review

This review was included with the aim of validating the results.
This review consists in:
– Recruitment of the population. At first, all the studies included attempted to detect patients developing a primary or incisional abdominal hernia with BMI ≥ 35 km/m^2. Subsequently, due to the small number of studies found, it was decided to search for all articles involving patients with BMI ≥ 30 kg/m^2.
– Surgical approach. Two different techniques were examined, laparoscopic and open, in frail subjects, irrespective of the different repair methods.
– Outcomes. The primary endpoint was to assess recurrence incidence. As secondary endpoint, the most frequent complications were considered: wound infection, seroma and hematoma. Clavien-Dindo classification, conversion rate, early reoperation were all taken into account.
The research was conducted on Pubmed/Medline and web of science, selecting all relevant articles in English medical subject headings (MeSH) containing the keywords "laparoscopy, obesity, incisional hernia repair, abdominal wall hernia, open".
Case reports and systematic reviews were excluded. Comparative articles on the two techniques were included. No experimental techniques were considered. The review included articles published from 2003 to 2020.
A descriptive evaluation of surgical technique, laparoscopic or open, type of mesh and prosthesis used, operative time, rate of wound infection, seroma, hematoma, conversions, major complications, recurrence, duration of hospital stay and duration of follow-up were considered.
The data were expressed as standard mean and deviation for continuous variables and as Odds or risk ratio for non-continuous variables. Statistical analysis was carried out using the Review Manager (RevMan) software [Computer program], Version 5.4.1, The Cochrane Collaboration, 2020. For student's T-test, a p-value of

Table III

Author	Year pub.		N. patients	N. patients
Lee J, et al [7]	2013		47661	
		LAP		8176
		OPEN		39485
Kadakia N, et al. [8]	2020		420	
		LAP		31
		OPEN		389
Schlosser, K. A, et al. [9]	2019		1906	
		LAP		786
		OPEN		1120
Williams K. N, et al [10]	2019		12026	
		LAP		2331
		OPEN		9695
Froylich D, et al [11]	2016		186	
		LAP		35
		OPEN		151
Bencini L, et al [12]	2003		91	
		LAP		42
		OPEN		49
Asencio F, et al. [13]	2009		84	
		LAP		45
		OPEN		39
Barbaros U, et al. [14]	2007		46	
		LAP		23
		OPEN		23
Gonzales R, et al. [15]	2005		87	
		LAP		45
		OPEN CTS		42

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less than 0.05 was considered statistically significant and appropriate.

The research identified 9 studies involving an overall total of 62507 patients (Table III).

All the included studies considered obese patients with abdominal defects, who were deemed suitable for both laparoscopic and open techniques (Table VI). Elective as well as urgent interventions were involved. Follow-up ranged from 1 to 157 months. The results reported in the studies varied widely. The different postoperative complications (recurrence, seroma, hematoma, wound infection, iatrogenic damage, major complications, re-operations) were analyzed with discontinuous prevalence (Table VI). Similar considerations came into play regarding the hospital stay and the time of surgery.

In this analysis, bias could not be altogether avoided. Heterogeneity was taken into consideration with the Tau and χ^2 tests.

A meta-analysis of continuous results requires data on average and standard deviation (SD), or Confidence Interval (CI). The studies reporting neither SD nor CI were excluded.

The heterogeneity of the results between the different studies was assessed. Where there was evidence of heterogeneity ($p<0.1$), random effect models were used for analysis.

Concerning operative time, the analysis of the results suggested a high degree of heterogeneity ($p<0,00001$). An assessment of random effects was consequently carried out. The average difference over time between the laparoscopic and open techniques was 26.04 min, with CI of 95% (0-31.98 min). This result was statistically

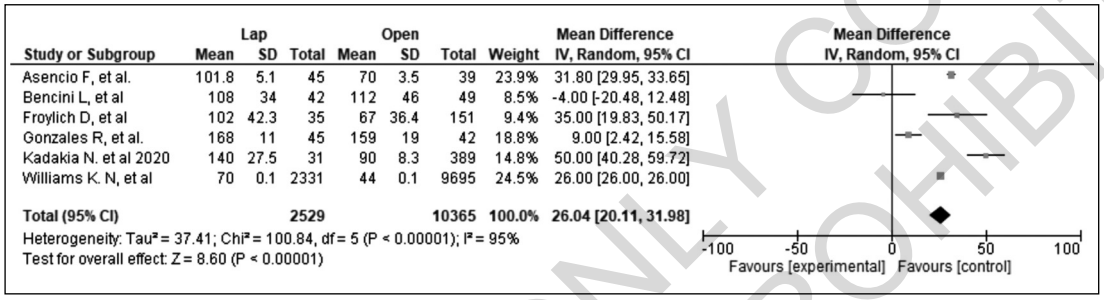

TABLE IV - *Operative time*

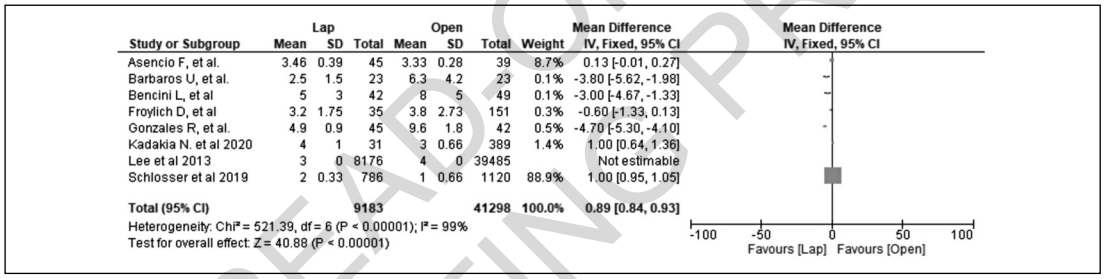

TABLE V - *Days of hospitalization*

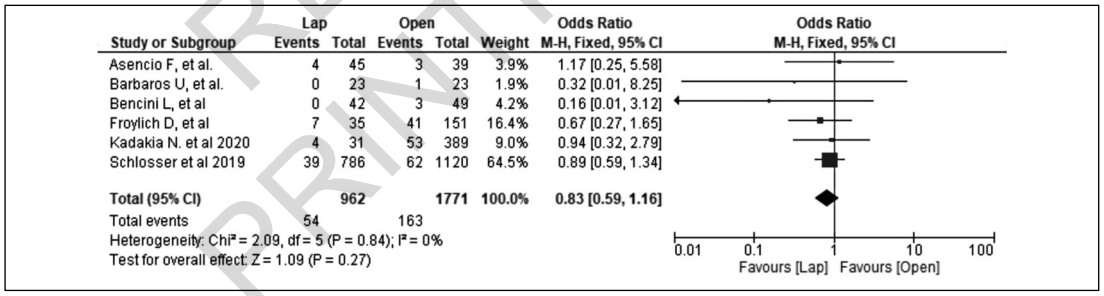

TABLE VI - *Recurrences*

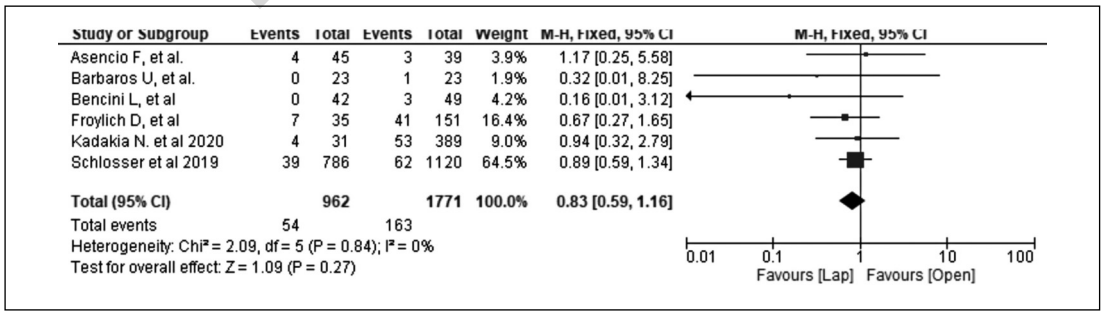

TABLE VII - *Infections*

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significantly (p<0.00001) in support of the open technique (Table IV).

On the other hand, concerning duration of hospital stay, the studies were quite homogeneous. A fixed-effect analysis was performed for the result the laparoscopic and open groups showed an average difference of 0.89 with a CI of 95%, between 0.84 and 0.93. This difference in support of the laparoscopic group was statistically significant (Table V).

The studies analyzing recurrence rate showed heterogeneity of p=0.89, and a fixed effect model was consequently used. Odds ratio was 0.83 with confidence of 95% and CI ranging from 0.59 to 1.16, with an associated p value of 0.27 (Table VI). The analysis did not

TABLE VIII - *Seromas*

Study or Subgroup
Asencio F, et al.
Barbaros U, et al.
Bencini L, et al
Froylich D, et al
Gonzales R, et al.
Kadakia N. et al 2020
Schlosser et al 2019
Total (95% CI)
Total events
Heterogeneity: Chi² = 7
Test for overall effect: Z

TABLE IX - *Hematomas*

Study or Subgroup	Lap Events	Lap Total	Open Events	Open Total	Weight	Odds Ratio M-H, Random, 95% CI
Barbaros U, et al.	4	23	0	23	0.8%	10.85 [0.55, 214.13]
Bencini L, et al	6	42	5	49	4.3%	1.47 [0.41, 5.20]
Froylich D, et al	0	35	0	151		Not estimable
Gonzales R, et al.	0	0	1	42		Not estimable
Kadakia N. et al 2020	6	31	41	389	7.6%	2.04 [0.79, 5.26]
Schlosser et al 2019	120	786	105	1120	87.4%	1.74 [1.32, 2.30]
Total (95% CI)		**917**		**1774**	**100.0%**	**1.77 [1.37, 2.30]**
Total events	136		152			

Heterogeneity: Tau² = 0.00; Chi² = 1.61, df = 3 (P = 0.66); I² = 0%
Test for overall effect: Z = 4.30 (P < 0.0001)

Odds Ratio M-H, Random, 95% CI
0.01 0.1 1 10 100
Favours [Lap] Favours [Open]

TABLE X - *Major complications*

Study or Subgroup	Lap Events	Lap Total	Open Events	Open Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Asencio F, et al.	1	45	0	39	1.9%	2.61 [0.11, 62.26]
Barbaros U, et al.	4	23	0	23	1.8%	9.00 [0.51, 158.17]
Bencini L, et al	0	42	0	49		Not estimable
Froylich D, et al	1	35	0	151	0.7%	12.67 [0.53, 304.57]
Gonzales R, et al.	0	45	1	42	5.6%	0.31 [0.01, 7.44]
Kadakia N. et al 2020	0	31	17	389	9.6%	0.35 [0.02, 5.66]
Schlosser et al 2019	13	786	27	1120	80.4%	0.69 [0.36, 1.32]
Total (95% CI)		**1007**		**1813**	**100.0%**	**0.90 [0.53, 1.55]**
Total events	19		45			

Heterogeneity: Chi² = 7.11, df = 5 (P = 0.21); I² = 30%
Test for overall effect: Z = 0.37 (P = 0.71)

Risk Ratio M-H, Fixed, 95% CI
0.01 0.1 1 10 100
Favours [Lap] Favours [Open]

TABLE XI - *Reoperations*

Study or Subgroup	Lap Events	Lap Total	Open Events	Open Total	Weight	Risk Ratio M-H, Random, 95% CI
Asencio F, et al.	0	45	0	39		Not estimable
Barbaros U, et al.	2	23	4	23	4.5%	0.50 [0.10, 2.47]
Bencini L, et al	0	42	1	49	1.1%	0.39 [0.02, 9.27]
Froylich D, et al	1	35	0	151	1.1%	12.67 [0.53, 304.57]
Kadakia N. et al 2020	2	31	51	389	6.2%	0.49 [0.13, 1.93]
Schlosser et al 2019	27	786	53	1120	56.0%	0.73 [0.46, 1.14]
Williams K. N, et al	12	2331	70	9695	31.0%	0.71 [0.39, 1.31]
Total (95% CI)		**3293**		**11466**	**100.0%**	**0.71 [0.51, 1.00]**
Total events	44		179			

Heterogeneity: Tau² = 0.00; Chi² = 3.77, df = 5 (P = 0.58); I² = 0%
Test for overall effect: Z = 1.97 (P = 0.05)

Risk Ratio M-H, Random, 95% CI
0.01 0.1 1 10 100
Favours [experimental] Favours [control]

TABLE XII - *Iatrogenic damage*

Study or Subgroup	Lap Events	Lap Total	Open Events	Open Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Asencio F, et al.	1	45	0	39	0.1%	2.66 [0.11, 67.26]
Barbaros U, et al.	1	23	0	23	0.1%	3.13 [0.12, 81.00]
Bencini L, et al	2	42	1	49	0.2%	2.40 [0.21, 27.45]
Froylich D, et al	0	35	1	151	0.2%	1.41 [0.06, 35.42]
Gonzales R, et al.	1	45	0	42	0.1%	2.87 [0.11, 72.29]
Lee et al 2013	131	8176	1071	39485	99.2%	0.58 [0.49, 0.70]
Total (95% CI)		**8366**		**39789**	**100.0%**	**0.60 [0.50, 0.72]**
Total events	136		1073			

Heterogeneity: Chi² = 4.31, df = 5 (P = 0.51); I² = 0%
Test for overall effect: Z = 5.58 (P < 0.00001)

Odds Ratio M-H, Fixed, 95% CI
0.01 0.1 1 10 100
Favours [Lap] Favours [Open]

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show a significant difference in recurrence rate between the two different methods. It is essential to emphasize that the follow-up time is the key to identify relapses. Duration of follow-up varied greatly from one study to another (1 month-157 months), a factor that influenced analysis insofar as longer follow-up could entail a larger amount of relapse data.
As regards infections, seromas and hematomas, the significant outcomes concern infections and seromas ($p<0.0001$), while for hematomas the p was 0.37. Analysis showed superiority of the Lap group regarding wound infections, but lower effectiveness in seroma occurrence. It should be emphasized that because the placement of subcutaneous drainage was already indicated in their study, Barbaros U. et al did not report data on seromas The relevant data are summarized in Tables VII to IX.
Other major complications (cardiac, respiratory and kidney failure), reoperations (intestinal occlusion, removal of infected meshes) and iatrogenic damage (bowel perforation) were likewise analyzed. The analysis showed negligible heterogeneity and all the results led to a significant difference ($p\leq05$) in favor of the Lap group.
The results are summarized in Tables X to XII.

Fig. 1: Reduction of the hernia contents

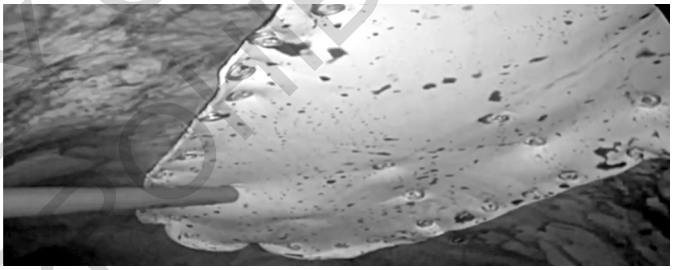

Fig. 2: Placement of the mesh

Discussion

The treatment of incisional hernia in obese patients is currently a topic still being debated, and no definitive solution has been found. Generally, an obese person is considered as a frail patient from both an anesthesiologic and a surgical point of view; nevertheless, an increase in the number of patients with high BMI values, raises questions on whether and how to treat these patients.
In Europe, as in other western countries, severe obesity is progressively increasing, and obese patients more commonly have abdominal defects than the general population; this trend seems to be explained by three factors:
– Acute increases in Intra-Abdominal Pressure (IAP), having similar effects in obese patients compared to non-obese ones, but in the first case the IAP threshold associated with organ dysfunction may be higher [16]. Chronic increases in IAP may be responsible for the pathogenesis of obesity-related co-morbidities such as hypertension, cerebral pseudotumor, pulmonary dysfunction, gastroesophageal reflux disease and abdominal wall hernias [17].
– Decreased tissue sealing capacity linked to poor vascularization of adipose tissue.
– The difficult closure of surgical accesses. According to the guidelines of the European Hernia Society, in high-risk patients such as those undergoing aortic aneurysm surgery and in obese patients, use of the prophylactic mesh can be suggested as an effective and safe method [18].
In our study, all patients with incisional hernia were approached laparoscopically, despite the technical difficulties that appeared in exceptional cases (abdominal chamber too small, intra-abdominal adhesions preventing the safe placement of trocars).
According to other studies in the literature [4,5,19], the results achieved up until now have been optimal, as no conversion or intraoperative complications have been observed, A single recurrence after 1 year was detected; the patient later also underwent bariatric surgery. Both treatments were performed laparoscopically.
The only seroma found was treated conservatively. Heniford reported a 2.3% rate of seromas, lower [4] than our incidence but in line with our case studies, whether or not non-obese patients are also considered. The most fearsome event is hematoma, due to injury of the epigastric vessels. In this condition the bleeding must not be underestimated, and the patient must undergo immediate diagnostic investigation possibly leading to surgery. No hernias have been observed at the trocar site, even at the level of lateral incisions. When it is not performed perpendicularly to the three muscles, parietal incision helps to prevent the occurrence of postoperative hernia [20].

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No wound infections were detected, as also reported in other studies showing better results than laparotomy [21,22,23]. As previously mentioned, all of our patients undergo ultra-short term antibiotic therapy half an hour before surgery.

Some patients, obese and non-obese, complain about persistent post-operative bulging. This topic is discussed among opponents of the laparoscopic technique. In this regard, it should be emphasized that, as proved by CT scan to verify correct placement of the prosthesis, bulging does not express a wall defect. The abdominal wall usually acquires good strength over time. When this is not the case, the technique should be investigated in view of pinpointing a possible defect.

Postoperative pain is reduced following the Enhanced Recovery After Surgery (ERAS) method. A Transverse Abdominal Plane (TAP) block can reduce postoperative therapy with opioids. Early mobilization and feeding from the evening of the intervention minimizes the risk of thrombosis and pulmonary embolism. However, some patients are given Enoxaparin 4000 UI from the evening before the surgery up until 21 days later.

An Intraabdominal drainage is placed only in the event of wide adherences or bowel damage and is removed during the first post-operative day.

Hospital stays averaged 2.79 days, comparable with other international studies. This finding supports laparoscopy as opposed to the open approach [24,25].

The age of patients should not be considered a limitation to laparoscopy. Given its advantages for the most fragile subjects and the lower incidence of complications, laparoscopic treatment of wall defects should always be considered as an option, especially in referenced centers [25,26]. In this study, the oldest patient was 75 years old and the youngest 29. Both presented the same post-operative pathway.

Patients having undergone surgery were submitted to yearly follow-up, with good control of the results in the post-operative course (average follow-up; 33 months). This represents rather infrequent follow-up method in this specific field. The recurrence rate is closely related to the length of follow-up, ranging in the literature from 15 to 19 months [6]. Although most recurrences appear within 2 years, 5-year follow-up would probably ensure safer assessment of the technique.

This systematic review shows that the variables observed are very heterogeneous and it is not easy to reach definitive conclusions. However, the data available from our meta-analysis suggest that laparoscopy is as effective as open repair, even though the meta-analysis showed that the recurrence rate in the two repair methods is similar, with a P-value of 0.27.

It should also be noted that the laparoscopic intraperitoneal approach facilitates identification of all defects of the wall, not just the main one. This allows the use of larger meshes covering all defects, including those that are not clinically or radiologically visible.

Conclusion

Laparoscopic treatment of wall defects has been reported since the early 1990s. It took a long time for the method to be accepted and to approach standardization [27] . Even today, despite the positive data and good results having been reported by several authors, the method is neither standardized nor fully accepted by most surgeons. Laparoscopic repair of wall defects in patients with pathological obesity is therefore a still evolving technique. Safety and efficacy seem to have been demonstrated [28], as in our sample, but more evidence is needed to compare the two surgical methods of repair.

Our study demonstrates the feasibility of the laparoscopic approach in the treatment of postoperative hernia in the most fragile patients such as those with BMI > of 35 kg/m^2. The proposed technique is standardized and reproducible. The confidence now acquired in bariatric surgery, enables management of these patients in terms of clinical, technical, and nursing approach.

The results achieved in terms of both short-term complications (perforations, kidney and/pulmonary failure, cardiovascular events, post-operative pain) and long-term complications (recurrences, wound infections, seromas) [29,30] justify recommendation of this minimally invasive approach for all patients with wall defects (and most others, as well).

The data are comparable to those from the open case studies reported in the revised literature. As mentioned above, other data with more specific items are needed, including the possible weight loss of patients before and after surgery, and longer follow-up [31.]

This approach could therefore be suggested, especially for obese patients, given the excellent outcomes achieved in all evaluated aspects, particularly safety and effectiveness.

Riassunto

INTRODUZIONE: Le indicazioni e il trattamento chirurgico di laparocele ed ernie addominali sono generalmente molto frequenti in chirurgia. Tradizionalmente i pazienti obesi non sono considerati buoni candidati da sottoporre a un intervento chirurgico ricostruttivo di parete a causa delle loro comorbidità, dell'aumento del rischio post-operatorio, dell'incidenza di infezioni della ferita e delle recidive. Lo scopo dello studio è quello di presentare il trattamento laparoscopico dei laparoceli in pazienti obesi. È stata inoltre effettuata un'ampia revisione sistematica della Letteratura tra tecnica laparoscopica e tecnica aperta valutandone i risultati.

MATERIALI E METODI: Da gennaio 2016 a ottobre 2018, 15 pazienti con BMI>35 kg/m^2 sono stati sottoposti a plastica di laparocele con tecnica laparoscopica. Le comorbilità erano rappresentate da ipertensione (66,7%); diabete mellito di tipo II (26,7%) e alterazione della coagulazione (26,7%). L'età media dei pazienti era di 57,07

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anni con un DS di ±12,68. Nello studio sono stati inclusi 4 maschi e 11 femmine (rispettivamente 26,6% e 73,3%). Il BMI medio era di 40 con un DS di ±5. Un paziente può essere considerato super obeso (BMI>50 kg/m2). Tutti i pazienti sono stati inclusi nel protocollo ERAS.

RISULTATI: Tutti i pazienti sono stati trattati con tecnica laparoscopica e non è stata necessaria alcuna conversione laparotomica. Non sono state osservate complicazioni intraoperatorie e nessun paziente è stato sottoposto a reintervento precoce. La mortalità è stata pari a zero. Un paziente (6,6%) ha presentato un sieroma parietale, trattato in modo conservativo e valutato nel tempo senza la necessità di un nuovo intervento chirurgico. Un paziente (6,6%) ha evidenziato una recidiva a un anno di distanza dall'intervento, trattata nuovamente con tecnica laparoscopica. La durata media della degenza è stata di 2,79 giorni (DS±0,77).

CONCLUSION: Il trattamento laparoscopico dei difetti della parete nei pazienti obesi ancora oggi, nonostante i dati positivi e i buoni risultati, non è standardizzato né favorevolmente accolto dalla maggior parte dei chirurghi, trovando numerosi oppositori. Lo studio ha dimostrato la fattibilità dell'approccio laparoscopico dei laparoceli in pazienti fragili come quelli con BMI > di 35 kg/m^2. La tecnica proposta è standardizzabile e riproducibile. I risultati ottenuti in termini di complicanze sia a breve termine (perforazioni, insufficienza renale e/polmonare, eventi cardiovascolari, dolore post-operatorio) che a lungo termine (recidive, infezioni della ferita, sieromi) permettono di considerare l'approccio mininvasivo per i pazienti obesi con difetti alla parete e per quasi tutti i tipi di difetti.

References

1. Marx L, Raharimanantsoa M, Mandala S, D'Urso A, Vix M, Mutter D: *Laparoscopic treatment of incisional and primary ventral hernia in morbidly obese patients with a BMI over* 35. Surg Endosc, 2014; 28(12):3310-4.

2. *Obesity surgery guidelines*. Italian Society of Obesity and Disease Surgery, 2016.

3. Heniford BT, Park A, Ramshaw BJ, Voeller G: *Laparoscopic repair of ventral hernias: nine years' experience with 850 consecutive hernias*. Ann Surg, 2003; 238(3):391-9, discussion 399-400.

4. Birgisson G, Park AE, Mastrangelo MJ Jr, Witzke DB, Chu UB: *Obesity and laparoscopic repair of ventral hernias.* Surg Endosc, 2001; 15(12):1419-22.

5. Tsereteli Z, Pryor BA, Heniford BT, Park A, Voeller G, Ramshaw BJ: *Laparoscopic ventral hernia repair (LVHR) in morbidly obese patients*. Hernia, 2008; 12(3):233-8.

6. Colon MJ, Kitamura R, Telem DA, Nguyen S, Divino CM: *Laparoscopic umbilical hernia repair is the preferred approach in obese patients*. Am J Surg, 2013; 205(2):231-6.

7. Lee J, Mabardy A, Kermani R, Lopez M, Pecquex N, McCluney A: *Laparoscopic vs open ventral hernia repair in the era of obesity*. JAMA Surg, 2013; 148(8):723-26.

8. Kadakia N, Mudgway R, Vo J, Vong V, Seto T, Bortz P, Depew A: *Long-term outcomes of ventral hernia repair: An 11-Year follow-up*. Cureus, 2020; 2:12(8):e9523.

9. Schlosser KA, Arnold MR, Otero J, Prasad T, Lincourt A, Colavita PD, Kercher KW, Heniford BT, Augenstein VA: *Deciding on optimal approach for ventral hernia repair: Laparoscopic or open*. J Am Coll Surg, 2019; 228(1):54-65.

10. Williams KN, Hussain L, Fellner AN, Meister KM: *Updated outcomes of laparoscopic versus open umbilical hernia repair in patients with obesity based on a national surgical quality improvement program review.* Surg Endosc, 2020; 34(8):3584-89.

11. Froylich D, Segal M, Weinstein A, Hatib K, Shiloni E, Hazzan D: *Laparoscopic versus open ventral hernia repair in obese patients: A long-term follow-up*. Surg Endosc, 2016; 30(2):670-75.

12. Bencini L, et al: *Incisional hernia repair: Retrospective comparison of laparoscopic and open techniques*. Surgical Endoscopy and Other Interventional Techniques, 2003; 17:1546-51,

13. Asencio F, Aguiló J, Peiró S, Carbó J, Ferri R, Caro F, Ahmad M: *Open randomized clinical trial of laparoscopic versus open incisional hernia repair*. Surg Endosc, 2009; l:23(7):1441-8.

14. Barbaros U, Asoglu O, Seven R, Erbil Y, Dinccag A, Deveci U, Ozarmagan S, Mercan S: *The comparison of laparoscopic and open ventral hernia repairs: a prospective randomized study.* Hernia, 2007; 11(1):51-6.

15. Gonzalez R, Rehnke RD, Ramaswamy A, Smith CD, Clarke JM, Ramshaw BJ: *Components separation technique and laparoscopic approach: A review of two evolving strategies for ventral hernia repair*. Am Surg, 2005; 71(7):598-605.

16. Angelici AM, Perotti B, Dezzi C, Amatucci C, Mancuso G, Caronna R, Palumbo P: *Measurement of intra-abdominal pressure in large incisional hernia repair to prevent abdominal compartmental syndrome*. G Chir, 2016; 37(1):31-6.

17. Malbrain ML, De Keulenaer BL, Oda J, De Laet I, De Waele JJ, Roberts DJ, Kirkpatrick AW, Kimball E, Ivatury R: *Intra-abdominal hypertension and abdominal compartment syndrome in burns, obesity, pregnancy, and general medicine*. Anaesthesiol Intensive Ther, 2015; 47(3):228-40.

18. Muysoms FE, Antoniou SA, Bury K, Campanelli G, Conze J, Cuccurullo D, de Beaux AC, Deerenberg EB, East B, Fortelny RH, Gillion JF, Henriksen NA, Israelsson L, Jairam A, Jänes A, Jeekel J, López-Cano M, Miserez M, Morales-Conde S, Sanders DL, Simons MP, Śmietański M, Venclauskas L, Berrevoet F, European Hernia Society: *European hernia society guidelines on the closure of abdominal wall incisions*. Hernia, 2015; 19(1):1-24.

19. Ching SS, Sarela AI, Dexter SP, Hayden JD, McMahon MJ: *Comparison of early outcomes for laparoscopic ventral hernia repair between nonobese and morbidly obese patient populations*. Surg Endosc, 2008; 22(10):2244-50.

20. Marx L, Raharimanantsoa M, Mandala S, D'Urso A, Vix M, Mutter D: *Laparoscopic treatment of incisional and primary ventral hernia in morbidly obese patients with a BMI over 35*. Surg Endosc, 2014; 28(12):3310-4.

21. Alexander AM, Scott DJ: *Laparoscopic ventral hernia repair*. Surg Clin North Am, 2013; 93(5):1091-110.

READ-ONLY COPY PRINTING PROHIBITED

22. Kaoutzanis C, Leichtle SW, Mouawad NJ, Welch KB, Lampman RM, Cleary RK: *Postoperative surgical site infections after ventral/incisional hernia repair: A comparison of open and laparoscopic outcomes*. Surg Endosc, 2013; 27(6):2221-230.

23. Colavita PD, Tsirline VB, Belyansky I, Walters AL, Lincourt AE, Sing RF, Heniford BT: *Prospective, long-term comparison of quality of life in laparoscopic versus open ventral hernia repair*. Ann Surg, 2012; 256(5):714-22, discussion 722-3.

24. Pierce RA, Spitler JA, Frisella MM, Matthews BD, Brunt LM: *Pooled data analysis of laparoscopic vs. open ventral hernia repair: 14 years of patient data accrual*. Surg Endosc, 2007; 21(3):378-86,

25. Polavarapu HV, Kurian AA, Josloff R: *Laparoscopic ventral hernia repair in the elderly: Does the type of hernia matter?* Hernia, 2012; 16(4):425-29.

26. Darecco A, Bocchi P, Kukleta JF: *Pneumatic positioning and mesh fixation in laparoscopic ventral/incisional hernia repair. New surgical technique and a new device. Pneumatic positioning and mesh fixation in laparoscopic ventral/incisional hernia repair New surgical technique and a new device*. Ann Ital Chir, 2015; 86:3:279.

27. LeBlanc KA, Booth WV: *Laparoscopic repair of incisional abdominal hernias using expanded polytetrafluoroethylene: Preliminary findings*. Surg Laparosc Endosc, 1993; 3(1):39-41.

28. Novitsky YW, Cobb WS, Kercher KW, Matthews BD, Sing RF, Heniford BT: *Laparoscopic ventral hernia repair in obese patients: A new standard of care*. Arch Surg, 2006; 141(1):57-61.

29. Maspero M, Bertoglio CL, Morini L, Alampi B, Mazzola M, Girardi V, Zironda A, Barone G, Magistro C, Ferrari G: *Laparoscopic ventral hernia repair in patients with obesity: should we be scared of body mass index?* Surg Endosc, 2021; 4, Online ahead of print.

30. van Silfhout L, Leenders LAM, Heisterkamp J, Ibelings MS, Ventral Hernia Group Tilburg: *Recurrent incisional hernia repair: Surgical outcomes in correlation with body-mass index*. Hernia, 2021; 25(1):77-83.

31. Vilallonga R, Beisani M, Sanchez-Cordero S, Garcia Ruiz de Gordejuela A, Rodríguez-Luna MR, Fort JM, Armengol Carrasco M: *Abdominal wall hernia and metabolic bariatric surgery*. J Laparoendosc Adv Surg Tech A, 2020; g:30(8):891-95.

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