



Extraperitoneal laparoscopic ventral hernia repair: one step beyond

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Abstract

Purpose The objective of the study was to analyze the experience of the Department of Surgery of two institutions of high complexity in Colombia, with the extra peritoneal ventral hernia repair by laparoscopy during the last 2 years and characterize the clinical and surgical aspects most relevant in the procedures performed.

Methods Observational, descriptive, retrospective study, case series type: collection of data by clinical history and analysis thereof including calculation of frequency and central tendency measurements.

Results 59 Cases of Ventral Hernia Repair by laparoscopy, 41 with Transabdominal Preperitoneal approach and 18 totally Extraperitoneal. In total, 7 complications were presented as follows: 1 Case of recurrence, 1 case of chronic pain, 2 complications Dindo–Clavien IIIa and 1 complication IIIb.

Conclusions The repair of the ventral hernia by Extraperitoneal route is an innovative approach of increasing popularity, which avoids the contact of the mesh with the intestines, thus avoiding the potential complications that this situation generates with good outcomes and at a lower cost.

Keywords Incisional hernia · TAPP (transabdominal preperitoneal) · TEP (totally extraperitoneal) · Mesh · Laparoscopy · Extraperitoneal

Introduction

The incisional hernia is an aponeurotic defect, of multiple origin and high frequency with an incidence of 10–20% of the total laparotomies. It is estimated that a quarter of the world population has a ventral hernia throughout its life, it is the condition pathology most valued by surgeons [1–3]; Multiple risk factors are related to the appearance of incisional hernias, the most frequent being obesity, chronic obstructive pulmonary disease, wound infection, malnutrition, immunosuppression, herniosis and re-interventions [4].

This high frequency makes it a public health problem, which has forced to draw different strategies for its prevention, including changes in the way of closing the wall, recommended today, closures with absorbable monofilament, with a relation of the length suture/wound of 4:1 that in

specific populations has demonstrated statistically significant impact [5].

The presence of this type of hernia can lead to complications common to all hernia defects including obstruction, strangulation, pain and aesthetic impact that forces the patient to seek a surgical solution and surgeons to implement new and better techniques, which, however, to date they have a recurrence rate reported in 30% at 3 years, evolving from primary closure through laparotomies to current laparoscopic approaches.

Despite the preventive strategies, ventral hernia repair is among the 5 most performed procedures by a general surgeon [6], with a reported recurrence rate of up to 30% at 3 years [3]. This has led to the incorporation of new techniques and methods such as laparoscopic approaches and different anatomical positions of the prosthesis, to reduce the complications associated with surgical management and at the same time the direct and indirect costs of this, within these strategies the implementation of minimally invasive approaches and extraperitoneal techniques can be beneficial for the patient.

Since its appearance in the 90 s, laparoscopy has shown its benefits in reducing hospital stay and periods of disability,

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the former as a consequence of less aggression on the patient [7, 8].

The American Hernia Society (AHS) states that laparoscopic repair of the ventral hernia should be considered in all patients, unless there is an absolute contraindication, among which is medical disability for major surgery, strangulated hernia, coagulopathy uncontrolled and hostile abdomen [9] however, despite being a technique with adequate results, is not free of complications, among these the incidental enterotomies with an incidence between 1 and 3%, the symptomatic seroma, with an incidence of 0.7–12% and other complications of wounds such as infections 3.8–5.3%, which generates support for the decision to seek a minimally invasive approach [9].

Another controversial point is the economic impact of the minimally invasive technique, with this we find some studies, which report lower cost compared to an open approach, however, there are limitations due to bias given by conflicts of interest and design problems in the studies [10–12].

Established the importance of the minimally invasive approach, the increase of the skills of laparoscopic surgeons, has managed to generate anatomical spaces previously unexplored, such as the extraperitoneal.

Methods

Study design

It has been made a descriptive and retrospective study.

Population

Adult patients diagnosed with ventral hernia were recruited and their repair by extra-peritoneal technique was performed in the Department of Surgery of two high complexity institutions of the city of Bogotá D.C.; Patient information was collected through consecutive selection after compliance with inclusion and exclusion criteria (Table 1), during the period from October 2015 to December 2017.

Information on demographic and clinical variables was recorded and surgical techniques and procedures were analyzed. Patient information included follow-up during the

immediate postoperative period and evaluation of recurrence at 24 months. The data were systematized in spreadsheets for subsequent analysis and the research protocol with the evaluation and approval of the institutional research and ethics commissions.

Statistic analysis

The analysis of the data included the calculation of measurements of frequency and central tendency. The P–P and Q–Q charts, and the Shapiro–Wilk test determined the evaluation of the normal distribution function of the variables of interest. Categorical data are analyzed using the nonparametric Chi-square test and Fisher exact test. The comparison of means for independent samples was done with the Wilcoxon rank sum test. The “*p*” values for hypothesis testing were considered statistically significant when $p < 0.05$. The data were analyzed with the licensed software State V.13.0.

Results

The patients of the present study were examined preoperatively and classified according to the European scale of ventral hernias, taking into account the inclusion and exclusion criteria mentioned previously, they are subdivided into two large groups (1).

Two surgical groups were identified, the first (TAPP group) with 41 patients and the second (TEP group) with 18 patients. The technical difference of each surgical approach lies in the access to the preperitoneal space, where the prosthesis is installed to avoid contact with the abdominal cavity and its contents.

Supine position, and prophylactic cephalosporine single dosis was administrated in both patient group, at least two 5 mm trocars were used and positioned at the contralateral site of the ventral hernia, and a 10–15 mm port for the scope, preserving the triangulation principle of laparoscopic surgery (Fig. 1), adhesiolysis was next performed with scissors.

For the TAPP technique, the access is gained through the trocars to the peritoneal cavity, creating a flap of peritoneum to access the space and continue the surgical approach. While in the TEP technique the trocars are introduced into

Table 1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Defects in proximity to bony structures	Recurrent ventral hernia with mesh
Fenestrated or multiple hernias	Anticoagulation therapy
Defects under 8 cm	Need for dermolipectomy
Obesity	Resection of surgical scar
	Candidate patients for abdominal wall reconstruction



Fig. 1 Trocars position

the preperitoneal space directly, creating a space through dissection, either with a dissector balloon or with laparoscopic instruments such as traumatic forceps (method implemented in our study). Depending on the hernia location, the dissection should be extended at Retzius and Bogros space, leaving the mesh at the preperitoneal area in both groups. It is described that the extraperitoneal approach requires greater skill and surgical dexterity, therefore, it may take longer than the other one; the choice of one technique over another in the present study was based on the comfort, experience and decision of the surgeon.

The TAPP group, with an average age of 59 years, defect size with a range of 4–36 cm² and an average of 12 cm², was carried out with a range between 50 and 180 min with an average surgical time of 108 min, identifying that the variation depended on the moment of the surgeon's learning curve, the difficulty of the case and the abdominal wall of the patient. In this surgical group, the methods of fixation were very varied, predominating self-fixation and mixed fixation (glue + absorbable tackers). In the tackers cases, the tissue implant against the muscular plane, creating a double crown, or against the Cooper's Ligament in the infraumbilical hernias, always guaranteeing the 4 cm overlap. Why did we use one or another fixation method? That was a surgeon decision, but the recurrence or Body Mass Index was important issues for choosing the mixed fixation. The complications of the surgical group were 1 seroma, which did not require additional intervention, 1 case of recurrence per year (see Table 3).

On the other hand, the TEP group had an average age of 56 years, BMI with a range between 23 and 35 kg/m², defect size on average of 12 cm² and a size of the mesh with a range of 10×15 cm to 30×30 cm and an average surgical time of 111 min, with a range of 45–240 min. The

methods of fixation were also variable, however, we found predominance of automatic absorbable fixation, also against the Cooper's Ligament or the muscular plane. The complications evidenced in this surgical group were 1 enterotomy evidenced intraoperatively, during the hernia reduction because of an extended fibrosis, it was quickly identified, and corrected with primary raffia, the patient had a satisfactory recovery, 1 seroma and 1 chronic POP pain managed with bimodal analgesia and infiltrations (Dindo–Clavien IIIb) (see Table 3).

The demographic characteristics of all the patients included in the study can be seen summarized in Table 2, there are a greater number of female patients, 42 patients with associated comorbidities, the most frequent being arterial hypertension among others (rheumatological and pulmonary pathologies), Body mass index, as well as the size of the defect were variable.

When comparing the two groups of patients, it is possible to determine that there is no statistically significant difference, taken with a value of $p < 0.05$, in the age, the body mass index, the size of the defect or in the surgical time (Fig. 2).

Different variables were analyzed in the two population groups (TAPP and TEP), of which the type of hernia and mesh represent a statistically significant difference, representing the main type of defect in the transabdominal group ventral hernias, with use of mesh low density; on the other hand, no difference was found in variables such as age, defect size, types of fixation, recurrence, postoperative complications, among others (Table 3).

Discussion

The aim of the present study was to analyze the experience in the repair of extra ventral peritoneal hernia by laparoscopy during the last 2 years and to characterize the most relevant clinical and surgical aspects in the procedures performed. In reviewing the literature, extraperitoneal laparoscopic management for the management of ventral hernia has increased exponentially, Chowbey and Cols [13] describe a total of 34 patients in a period of 2 years, all of these under transabdominal technique, with a single method of fixation (tackers), presenting complications such as seroma and hemorrhage.

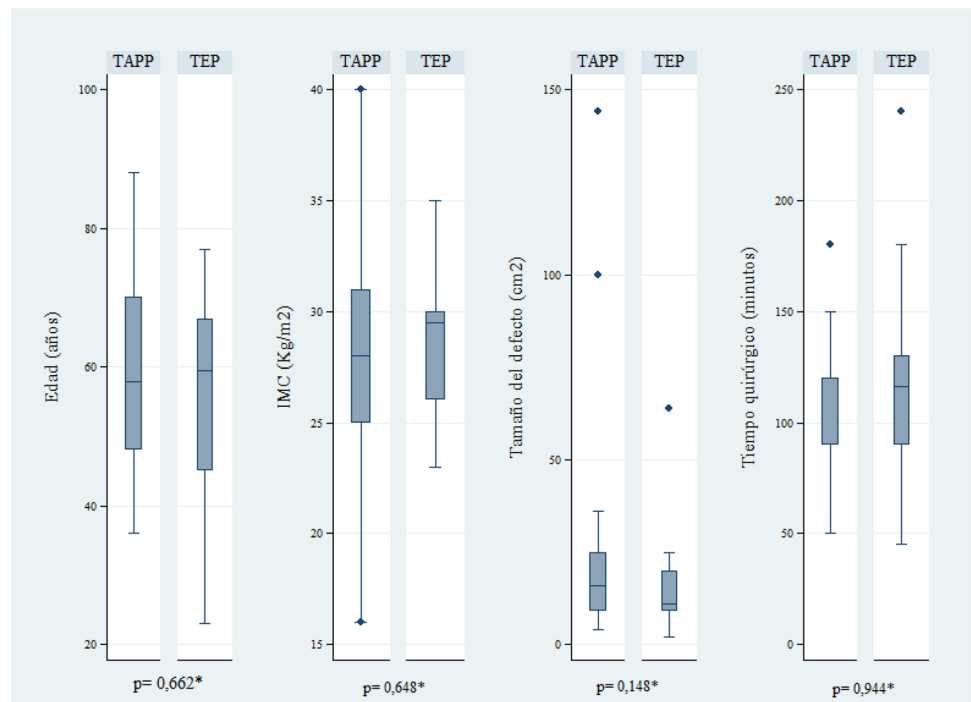
Another related study is that carried out by Miserez and Cols in Belgium [14] which shows repairs of ventral hernias less than 3 cm by extraperitoneal route where they perform the dissection of the preperitoneal space with the 0° laparoscope, they use metallic tackers as a method of fastening, it draws attention that patients are allowed to drain and there are no seroma cases, the length of hospital stay is 3–13 days. The largest published series is by Belyansky, Daes and Cols [15] retrospectively analyzes cases in 5 hernia centers, with

Table 2 Demographic and clinical characteristics of the patients included in the study

Variable	n (%)	CI 95%
Gender		
Woman	40 (67.80)	54.53–78.70
Man	19 (32.30)	21.29–45.46
Presence of comorbidities		
No	17 (28.81)	18.47–41.96
Yes	42 (71.19)	58.03–81.52
Type of comorbidity		
HBP	18 (30.51)	56.21–80.12
Stroke	12 (20.34)	11.73–32.90
Others	10 (16.95)	9.19–29.13
Hypothyroidism	9 (15.25)	7.97–27.21
Cancer	9 (15.25)	7.97–27.21
Diabetes	6 (10.17)	4.52–21.26
	Average (\pm SD)	Min–Max
Age (years)	58.37 (\pm 13.61)	23–88
BMI (Kg/M ²)	28.25 (\pm 4.28)	16–40
Defect size	29.19 (\pm 54.44)	2–32.4

SD standard deviation, BMI body mass index, CI confidence interval

Fig. 2 Differences in the repair of inguinal hernia using TAPP and TEP techniques (comparison by Wilcoxon rank test)



a total of 79 patients, using fibrin glue as the main fixation method, with a reported recurrence of 1.3% and two cases of seroma.

Our population group has a rate of complications and recurrence within the average reported in the literature, representing a significant number of cases for two

institutions in a short period of time, implementing the technique each time in more complex cases, related with obesity and recurrence, also bony structures proximity, with adequate and favorable results. The difficulties identified by the group of surgeons were hernias above the semi-circular line of Douglas, the non-articulated instruments

Table 3 Analysis and comparison of procedures and findings in surgery

Variables	TAPP n:41 n (%)	TEP n:18 n (%)	P
Gender			
Woman	26 (63.41)	14 (77.78)	0.277*
Man	15 (36.59)	4 (22.22)	
Comorbidities			
No	13 (31.71)	4 (22.22)	0.459*
Yes	28 (68.29)	14 (77.78)	
Defect closure			
No	2 (4.88)	1 (5.56)	0.672 ⁺
Yes	39 (95.12)	17 (94.44)	
Suture			
Knotless spiral	33 (84.62)	11 (61.11)	0.076 ⁺
Monofilament	6 (15.38)	6 (33.33)	
No absorbable	-	1 (5.56)	
Type of hernia			
Secondary (ventral)	36 (87.80)	11 (61.11)	0.013*
Umbilical	2 (4.88)	-	
Lumbar	-	2 (11.11)	
Spiegel	3 (7.32)	5 (27.78)	
Recurrence			
Neither	37 (90.24)	15 (83.33)	0.361 ⁺
One	4 (9.76)	3 (16.67)	
Mesh			
Low density	38 (92.68)	13 (72.22)	0.012⁺
Medium density	1 (2.44)	5 (27.78)	
Tissue-separating	2 (4.88)	-	
Type of fixation			
Absorbable	10 (24.39)	8 (44.44)	0.126 ⁺
No absorbable	8 (19.51)	3 (16.67)	
Mixed	11 (26.83)	2 (11.11)	
Self fixation	9 (21.95)	1 (5.56)	
Glues	3 (7.32)	4 (22.22)	
Intraoperative complication			
No	39 (97.50)	17 (94.44)	0.528 ⁺
Yes	1 (2.50)	1 (5.56)	
Enterotomy			
No enterotomy	50 (100)	17 (94.44)	0.310 ⁺
Colon	-	1 (5.56)	
POP complication 8 days			
No	40 (97.56)	16 (88.89)	0.218 ⁺
Yes	1 (2.44)	2 (11.11)	
Dindo–Clavien			
None	40 (97.56)	16 (88.89)	0.218 ⁺
IIIa	1 (2.44)	1 (5.56)	
IIIb	-	1 (5.56)	
Recurrence at 1 year POP			
No	40 (97.56)	17 (100)	0.707 ⁺
Si	1 (2.44)	-	

Table 3 (continued)*Chi²⁺Fisher test

that can affect the ergonomics of the surgeon, depending on the location and size of the ventral defect, comparing, for example, with de robotic dissection, and the abdominal wall relationship: hernia. To implement a new surgical technique, the pros and cons of it must be assessed. The abdominal wall group of Colsanitas clinics identified as unfavorable factors for the development of extraperitoneal surgery, the learning curve of the surgeons who are going to carry out the technique, a reduced anatomical space, in some cases with a surgical history it is difficult to achieve an adequate dissection of the space. The benefits of this technique are mainly represented by the non-use of intra-peritoneal mesh, decreased cost of surgery, that should be validated in complementary studies, lower incidence of enterotomies, especially in totally extraperitoneal techniques, the need for less invasive fixation and finally the location in the physiological and anatomical space of the prosthesis.

Conclusions

Laparoscopic extraperitoneal surgery, for the ventral hernia repair, is a type of innovative surgical approach, and it is expanding worldwide, which has multiple benefits, being a minimally invasive surgery, with a physiological position of the prosthesis in the abdominal wall, entails a lower possibility of peritoneal adhesions and lower cost due to the non-use of a coated mesh. However, more studies are needed to determine all the benefits and possible aspects to improve, since to implement it by the surgeon requires a learning curve and an adequate knowledge of the anatomy of the abdominal wall.

We are convinced that in the future it should be the gold standard for the repair of minimally invasive ventral hernia, not ignoring the indications and advantages in some IPOM plus patients [16]. Therefore, the aim of this paper is to promote the extraperitoneal laparoscopic ventral hernia repair, as a safe and effective technique in selected patients.

Compliance with ethical standards

Conflict of interest All authors declare that they have no conflict of interest.

Ethical approval Approval from the institutional review board was not required for this study.

Human and animal rights This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent For this retrospective review, formal consent is not required.

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