Laparoscopic repair vs open surgery for incisional hernias: a comparison study

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Abstract

Background: *Incisional Hernias complicate 2-11% of laparotomies and the primary closure of the defect is followed by recurrence in 20-46% of patients.*
In spite of introduction of prosthetic materials and new techniques the rate of failure reduced but a gold standard has not been defined. Laparoscopic approach, recently introduced appears promisingly effective but only few and small series have been published.
Materials and Methods: *Two series of patient, 11 treated by laparoscopic repair (LR) and 15 undergone to open prostetic repair (OR) are compared with regard to age, sex, previous surgery, number of fascial defects, size and location of hernias, ASA status, operating time, intra and post-operative complications, lenght of hospital stay, follow up evaluation and hernia recurrence. Prosthetic materials were e-PTFE in LR group and e PTFE or Polypropilene in OR group. Peripherical hernias have been excluded from the study.*
Results: *In LR group has been observed a longer mean operative time and a shorter hospital stay than in OR group. No intraoperative complication was observed in LR and 1 in OR group. Early and late complications were more frequent in OR than in LR group but the removal of prosthesis was not needed in any case.*
Mean follow up is 40 months for OR and 18 for LR group with no recurrences in both groups.
Conclusions: *Laparoscopic repair of incisional hernias appears in our experience as good as open prosthetic repair, with all generic vantages related with mini-invasive approach and the specific one of lesser manipulation of prosthesis and fewer infective complications.*
Key word: Incisional Hernias, mini invasive surgery.

Introduction

Incisional hernias are still now an important complication that affect the relational life of many patients. Their incidence is reported in 2-11% of laparotomies.
Midline incisions are subjected to this complication more frequently (75% of incisional hernias); particularly affected are the upper and periumbilical portion of the incision [1].
General and local factors are involved in the pathogenesis of incisional hernias: Obesity, diabetes, age older than sixty years, wound infection are present in most of the patients. Also the technique and the suture materials used to close the wall have been evaluated as possible factors.
The recurrence rate has been proved to be higher after direct suture of the edges of the defect.
The introduction in practical surgery of new techniques, as described by Stoppa, Rives, Chevrel, and of prosthetic materials as Dacron, Polypropylene and expanded Polytetrafluoroetylene dramatically reduced recurrences.
In spite of the improvement obtained with the use of prosthetic materials, a gold standard has not yet been defined and the research for a better technique and an ideal material continues.
More recently the laparoscopic approach has been suggested and investigated by some Authors [2, 3, 4, 5, 6] as an useful tool in the treatment of incisional hernias. However a review of the most recent literature shows still few and small series.
In this study we compare two series of patients with

Riassunto

TRATTAMENTO CHIRURGICO DEL LAPAROCELE: LAPAROSCOPIA CHIRURGICA VS TRADIZIONALE

Background: *L'incidenza del laparocele oscilla tra il 2 e l'11% e la riparazione primaria del difetto erniario è seguita da recidiva nel 20-46% dei casi. Nonostante l'introduzione di materiali protesici e di nuove metodiche di riparazione l'incidenza degli insuccessi si è ridotta ma non si è a*

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tutt'oggi raggiunto un accordo circa il gold standard nella chirurgia dei laparoceli. L'approccio laparoscopico, recente - mente introdotto, appare promettente ma fino ad ora sono stati pubblicati solo i risultati di casistiche non molto ampie.
Materiali e metodi: *Due serie di pazienti, 11 trattati per via laparoscopica (LR) e 15 con metodica open (OR) sono state confrontate analizzando i seguenti parametri: età, ses - so, pregressi interventi chirurgici, numero dei difetti ernia - ri, dimensioni e localizzazione del difetto, classe ASA, tem - po operatorio, complicanze intra e post-operatorie, durata del ricovero ed incidenza di recidive.*
Il PTFE è stato impiegato nel gruppo LR mentre nel gruppo OR ha trovato impiego anche il Polipropile- ne.
I laparoceli di confine sono stati esclusi dallo studio
Risultati: *Nel gruppo LR è stato registrato un tempo operatorio medio più lungo ed un periodo di ricovero più breve che nel gruppo OR. Nessuna complicanza intraoperatoria è stata osservata nel gruppo LR mentre 1 nel gruppo OR. Le complicanze precoci e tardive sono state più frequenti nel gruppo OR che nel gruppo LR; la rimozione della protesi non è stata necessaria in nessun caso. Nessuna recidiva è stata evidenziata in entrambi i gruppi con un follow up medio di 40 mesi per OR e 18 mesi per LR.*
Conclusioni: *Il trattamento laparoscopico del laparocele nella nostra esperienza è risultato valido così come il trattamento protesico tradizionale, associato a tutti i vantaggi relativi all'approccio miniinvasivo con particola- re riferimento ad una minor manipolazione della protesi con conseguente riduzione delle complicanze infettive.*
Parole chiave: Laparocele, chirurgia mini invasiva.

incisional hernias treated by open and laparoscopic surgery.

Patients and methods

Between January 1998 and January 1999 we performed a laparoscopic repair (LR) on 11 patients with incisional hernias. The results obtained in these patients have been compared with those of 15 patients treated by open prosthetic repair (OR) from January 1996 and January 1998.
For both series we reviewed the charts of the patients collecting data relative to age, sex, previous surgery, number of fascial defects, size and location of the hernias, ASA status, operating time, intraoperative and post operative complications, length of hospital stay, follow up evaluation and hernia recurrence.
In the LR group the longitudinal diameter of the fascial defect was larger than 3 cm but no more than 16 cm. Peripherical hernias in which overlapping of the prosthesis with the fascial edges for at least 3 cm was not feasible were excluded from laparoscopic treatment (Tab. I).

Tab. I

Clinical data	*Laparoscopic Repair Group*	*Open Repair Group*
N.	11	15
Sex ratio M/F	7/4	9/6
Mean age (range)	61 (45-83)	62 (50-78)
ASA score (mean)	1-3 (2,2)	1-3 (2,4)
Incisional Hernia location		
lateral	2	2
midline	9	13
First repair	10	14
Previous repair	1	1
Mean defect size (cm^2)	104	120
Range (cm^2)	25-320	32-450

All patients were hospitalized the day before surgery and underwent to routine preoperatory evaluation (Chest X-ray, ECG, laboratory studies and Abdominal US) and bowel preparation. Antibiotic prophylaxis with third generation cephalosporins was administered at the induction of anesthesia. All patients were operated on under general anesthesia and with nasogastric tube and Foley catheter in place.
The patient was placed supine on the operating table with legs extended and abducted. The surgeon stands on the right side of the patient for defects located on the left side. For midline and right defects the surgeon stands on the opposite position. The assistant and the video monitor are positioned in front of the surgeon.
Whenever possible the Hasson cannula is placed on the midline but in 8 cases we were forced to place the first trocar in a left lateral location. This was more difficult because of the need to penetrate three muscle layers.
After the induction of the pneumoperitoneum, other two trocars (5 and 10 mm) are introduced, under direct laparoscopic guidance using a 30° scope, as farther away as possible from the edges of the hernia defect. In three cases, the next step was the lysis of massive adhesions, before the placement of the third trocar in the opposite side of the abdomen in an adequate location. Only in two cases a fourth trocar was needed to perform cholecy-stectomy.
Once the hernia was reduced, facilitated by external pressure applied to the abdominal wall by the left hand of the operator, the edges of the defect were identified and the intra-abdominal diameters of the hernia measured and compared with the external ones.
After that we tailor a prosthesis 3 cm larger than the fascial defect on each side. Then we mark the visceral surface and the corners of the prosthesis to avoid an incorrect placement and we apply at the four corners a 2-0 nonabsorbable monofilament suture.
The prosthesis rolled around a grasp forceps is introduced through the 10 mm trocar in the abdomen and there laid. In one case we used a Composix mesh whose thickness required the removal of the trocar and

a direct introduction of the mesh through the abdominal wall.
After that, we make small incision in the skin, pass the suture passer through the abdominal wall and tie the corner suture on the anterior surface of the external oblique muscle.
As last step we fix the mesh to the abdominal fascia with spiral tackers placed at 1cm intervals.
The fascial defect was never closed; only in three cases the sac was totally excised being fenestrated in all remaining cases.
Only one, a patient with cirrhosis had an abdominal drainage for 24 hours.
In the OR group the size of fascial defect were larger than in LR group with a maximum longitudinal diameter of 28 cm; periferical hernias have been excluded from the study because absent from LR group.
In 12 cases we used Polypropylene and in 3 cases the ePTFE for lacking of peritoneal tissue. We fixed the prosthesis between rectum muscle and its posterior fascia. Suture are passed through muscular layer and anterior fascia and tied above the latter, through small skin incisions. Drains are always placed in the peritoneal cavity and between muscle and prosthesis and left in place for 24-48 hours.

Results

The two groups of patients examined (11 patient of LR and 15 of OR) did not show significant difference in regards to sex and age.
Only one case for each group was a recurrent incisional hernia.
Hernias' size was larger in OR than in LR group with a mean difference of 15%.
Prolene mesh was mostly used in OR group while e PTFE was the material of choice in LR group (Tab. II).
Conversion was not needed in any LR patient.
Mean operative time was longer but hospital stay and analgesic requirement was remarkably lower in LR group (Tab. III). The LR group in fact required analgesic for a mean time of 1.2 days and the OR group for 2.9 days.

Tab. II

Prosthesis materials and size

	Laparoscopic Repair Group	Open Repair Group
Mean Prosthesis size (cm^2)	227	*
ePTFE 10 x 15	8	–
ePTFE 15 x 19	3	2
ePTFE 18 x 24	–	3
Composix 20 x 25	1	–
Prolene 20 x 30	–	9
ePTFE 26 x 34	–	1

* mean size not available because patches were usually cutted to fit to the parietal defect

Tab. III

Operative and post-operative course

	Laparoscopic Repair Group	Open Repair Group
Operative time (min)		
mean	140	120
range	100-300	80-240
Postoperative hospital stays (days)		
mean	3.5	11
range	2-8	7-21
Mean follow up (months)	18	40
range	15-25	26-50
lost	0	3
Complications		
Intraoperative		
bowel injury	0	1
early (< 30 days)		
wound infections	0	1
mild hematoma	*1	0
seroma	0	1
skin necrosis	0	1
prolonged ileus	0	1
late		
protracted pain	1	0
infected seroma	0	2
infected prosthesis	0	1
abscess	0	1
total	2	9

* patient with portal hypertension
No recurrency occurred in both groups

The only operative complication was observed in OR group, represented by a small bowel injury, immediately repaired, that did not precluded the placement of the prosthesis nor was followed by further complications.
Early and late complications were more frequent in OR group but the removal of prosthesis was not needed in any case. Actually the only complications observed in LR group were a mild hematoma in a patient with portal hypertension, which resolved with medical treatment, and one case of prolonged pain, recovered spontaneously. All patients in both groups returned to daily activities in one week for LR and after 4 weeks for OR group.
12 patients of OR group (3 were lost at follow up after 3 and 6 month respectively) and 11 patient in LR group were followed up for a mean time respectively of 40 and 18 months, founding no recurrences in any group.

Discussion

The failures in surgical repair of incisional hernias has been always associated with several factors such as the size of the defect, the tension on the edges of the wound or infections.

The recurrence rate after primary closure of an incisional hernia has been reported in 20-46 % [7] leading to a continuous research for better techniques. A significant improvement has been associated with the use of prosthesis [8, 9] so that the recurrence rate was reduced to 2-11%.

A further step in the search for a better control of incisional hernias is represented by the laparoscopic approach.

Technical feasibility of the laparoscopic repair for abdominal wall defects is demonstrated by various reports publicated since 1992. The preliminary reports concerned the laparoscopic preperitoneal and intraperitoneal approach for inguinal herniorraphy [10, 11].

The immediate consequence of these reports was the application of the laparoscopic approach to the repair of PO incisional hernias [2, 12].

The laparoscopic technique in fact carried a large number of theoretical advantages: lesser abdominal wall traumatisms, smaller fascial dissection, lesser wound and prosthetic contamination, fewer visceral injuries and no need for drainages.

These advantages have been confirmed in numerous reports and as well in our experience.

We approached laparoscopically only hernias with a maximum diameter not larger than 15 cm, for the technical impossibility to introduce the trocars at an adequate operative distance from the edges of the defect. It is in fact necessary to overlap the prostehesis to the healthy fascia all around the margin of the defect for at least 3 cm.

We also excluded from the treatment hernias with a single defect smaller than 25 cm^2 in which a classical surgical approach is more indicated and can be carried out with a primary closure in a same day surgery fashion.

In no cases we needed to convert the laparoscopic into open repair. Also the only case with recurrent incisional hernia in the LR group has been approached laparoscopically.

The laparoscopic approach facilities in fact the adhesiolysis by a backward view, avoiding injuries to the bowel.

The CO2 itself contributes to separate the adhesions.

Being unpredictable the entity of adhesion between bowel loop and defect edges, we believe, accordingly with many Authors, that laparoscopic approach must be now always attempted. Only when adhesion are too large and inextricable the conversion becomes mandatory.

As showed in Tab. II we used for laparoscopic repair ePTFE mesh only. This choice is due to the intraperitoneal location of prosthesis. Other Authors described in fact erosions and fistulas of the small bowel with different prostethic materials, and especially with polypropilene [2, 3, 13, 14]. In order to avoid these complicances some Authors have described a technique of coverage of the mesh (Marlex) by epiploon [6] but this method requires longer surgical times and is not feasible for large prosthesis.

This different trend of ePTFE, is due to its micropore structure that makes the coverage with epiploon unnecessary [15].

Along with many advantages PTFE has some disadvantages; in fact its softness and lack of trasparency make the laparoscopic procedure more challenging. In order to simplify the application of the spiral – tacks we prefer to apply an external fixation by Endo – close device (USSC, Norwalk, CT, USA) or Gore suture-passer instruments (W.L. Gore and Associated, WC, USA) at the four cardinal point. After that, we fix the tacks by the Elicoidal stapler (Tacker, Origin, CA, USA) 2 cm apart. The external fixation prolongs the operative time but prevents recurrences described by Park [3] at the corners of the mesh.

The possibility to apply a whole-thickness suture, overlapping the edges of the defect at least 2.5 cm on each side, has made feasible and successful the IPOM technique. The same technique is no more recommended in the inguinal hernias repair, in fact in this particular procedure it is not anatomically possible to apply and suture a patch overlapping the edges of the ileopubic tract, where the presence of important vascular structures makes this approach dangerous.

The mean operative time in the laparoscopic group was 140' and 120' in the OR group (not statistically significant difference). Park and Holzman [4, 6] reported a similar difference between their groups, as well. The time for laparoscopic repair decreases with the progresses in the learning curve but, as in the open repair, remain linked to the complexity of the defect and the entity of the adhesions.

Laparoscopic repair has been in our experience free from intraoperative complications. In the OR we observed a small bowel injury, repaired by primary suture and not followed by other complications.

Early postoperative complications were 1 (9%) in LR group represented by a mild hematoma in a patient with portal hypertension, and 4 (26%) in OR group. These results can be explained by a lesser exposition of the prosthesis to the skin and a minimal dissection of the already damaged abdominal wall so that drainage is not required and infections of the wound and of the graft are less frequent than in ORG.

The minimal traumatism to the abdominal wall leads to a lesser need for analgesic and to an earlier recovery and return to normal activities.

Postoperative hospitalization has been significantly shorter in the LR group with a mean stay of 3.5 days versus 7 days in the OR group. This means also a decreased hospitalization costs in spite of higher operative costs.

The only late complication in LR group has been protracted pain (35 days), in a patient in which a Composix patch was applied. In this instance a prolonged treatment with analgesic but not a longer hospitalization was observed. In the OR group late complications occurred in 4 (26%) re-admission requiring in all cases and in 1 case the removal of the implant.
During the follow up no recurrences were observed in either groups, supporting the evidence that laparoscopic repair is almost as good as the open repair. This last has reached its best results thanks to the concept described by Rives. The need of overlapping the edges of the parietal defect with the prosthesis is due to the opportunity of employ the patient own endo-abdominal pressure to keep in place the prosthesis itself. With this method the recurrence rate is reduced to 2-4% [16, 17] while with the side -to -side suturing technique it is rise to 11- 42% [5, 18, 19].

Conclusions

As reviewed in the most recent literature [3, 6, 12, 17, 20] our experience shows that laparoscopic repair of incisional hernias is feasible and safe. The intraoperative time is not too much longer than the open repair. Furthermore the LR shortens the hospital stay and consistently reduces early and late complication rates.
While looking for larger studies and longer follow ups, we feel authorized to propose the laparoscopic approach as first line technique in postoperative ventral hernias.

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Commento **Commentary**

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L'ultimo decennio del XX secolo ha visto affermarsi la metodica laparoscopica per un gran numero di interventi. Anche la chirurgia delle ernie della parete addominale, campo che aveva visto affermarsi le metodiche basate sull'utilizzo di materiali protesici e di tecniche volte a ridurre le frequenti complicanze e recidive, è stata oggetto di interesse ed è diventata campo di applicazione della metodica laparoscopica.
Proprio l'elevata frequenza di insuccessi (recidive, infezioni protesiche persistenti o recidivanti con conseguente espianto della protesi) che si è sempre osservata nella chirurgia delle ernie ed in particolare dei laparoceli, anche dopo l'introduzione di nuove tecniche e di nuovi materiali ha portato a considerare con speranza ma anche con un certo scetticismo le nuove metodiche.
In quest'ottica il lavoro di Zanghì e Coll. appare di grande interesse perché offre un ulteriore contributo alla valutazione dell'efficacia della metodica laparoscopica nel trattamento dei laparoceli. Interessati sono i dettagli tecnici e le considerazioni a favore della metodica, nate da una accurata valutazione e dal confronto dei risultati nei due gruppi di pazienti nonché da una attenta rilettura della letteratura più recente.

The last decade has been characterized by the great success of laparoscopic surgery. Also the surgery of abdominal wall and of incisional hernias, already modified by the introduction of prosthesic materials, has undergone to different mini-invasive approach.
Because of a great rate of complications and recurrence, in spite of newer and newer techniques and materials, the repair of incisional hernias is always far from to reach a gold standard and every new method is looked with a mixture of interest and skepticism.
The case reported by Zanghì and Coll. are an important contribution to explore vantages presented by laparoscopic repair in a field in wich still now no many series and no large have been produced. Points of interest in this work are the detailed description of the technique and the accurate evaluation of results obtained and of recent literature.

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