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Risk factors for the conversion



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Antonio Zanghì*, Maria Di Vita*, Antonio Borzì*, Andrea Cavallaro*, Francesco Cardì*,
Alessia Giaquinta**, Emanuele Lo Menzo***, Alessandro Cappellani*

*General and Breast Surgery Unit, Department of Surgery, University of Catania, AOU Policlinico, Catania, Italy

**Vascular Surgery and Organ Transplant Unit, Department of Surgery, University Hospital of Catania, Catania, Italy

***The Bariatric and Metabolic Institute, Cleveland Clinic Florida, Weston, FL, USA

Laparoscopic repair of incisional hernia: Risk factors for the conversion

INTRODUCTION: Some factors may affect the conversion to open of the laparoscopic treatment of incisional hernia. Their presence can help to choose the most appropriate technique identifying patients at high risk conversion.

METHODS: A retrospective study has been performed on a cohort of 306 patients, selected among those undergone to elective laparoscopic surgery for post incisional hernia between 2005 and 2015. Only symptomatic patients with single site wall defect, diameter between 5 and 10 cm, ASA ≤ 3 , have been included. Patients were divided in 2 groups, Laparoscopic (L) and Converted (C) and preoperative data were evaluated and statistically analyzed.

RESULTS: The L group accounted for 228 patients and C group for 78 patients. The univariate analysis showed that risk factor for conversion included BMI ≥ 30 , Smoking, Diabetes mellitus, Prior emergency surgery. Age > 60 years was associated with lower risk of conversion.

CONCLUSIONS: The result of this retrospective study allows us to say that the choice of the technique, in the presence of multiple risk factors, should be carefully assessed and discussed with the patient. A prospective study with a larger number of patients would allow a better definition of the risk determined by individual factors and the development of a score that could be used in practice to simplify the risk assessment

KEY WORDS: Conversion to open surgery, Incisional hernia, Laparoscopy, Risk factors

Introduction

Incisional hernia is one of the most frequent post-operative complications of abdominal surgery, varying between 2% and 13% of laparotomies ^{1,2}.

Male sex, older ages, defects in quality and quantity of collagen, such as in Ehlers-Danlos syndrome obesity and

smoking habits are the principal risk factors ³⁻⁵. Even techniques of suturing and complications of surgical wound can be related with the developing of incisional hernias ^{2,6,7}.

Treatment of incisional hernia is still controversial, being the role of laparoscopic surgery and open surgery still not well defined ^{8,9}.

Laparoscopic surgery offers well-known advantages: shorter hospitalizations, shorter recovery times, better cosmetic outcome and lower costs ^{10,11}. Even a lower rate of post surgical complications have been described ¹¹. Laparoscopy is even favored by patients because perceived as "less invasive" ^{12,13}.

Nevertheless, still now laparoscopy exposes to difficulties and higher risks of intraoperative complications. Bowel injuries ¹⁴ and the impossibility to overcome tenacious adhesions, how has been well documented in some series ¹⁵, can

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Correspondence to: Maria Di Vita. University of Catania, Department of Surgery and Medical, Surgical Specialties, General and Breast Surgery Unit, AOU Policlinico Vittorio Emanuele II, Via Santa Sofia 78, 95123, Catania (e-mail: maria.d.divita@gmail.com)

force the surgeon to convert the procedure to open. This event has even a cost in term of disposable instruments and operative time ¹⁶.

From the introduction of laparoscopy in surgical practice for the repair of incisional hernias, many studies have addressed the issue of the hernias' size best treated by laparoscopy: Abdominal wall defects lower than 3 cm deserve laparoscopic procedure ¹⁷ while the ones larger than 10-15 cm can present difficulties to place and overlap the mesh, depending on the size of the abdomen surface ¹⁷. Thus, the upper size of 15 cm is the limit under which a lower rate of recurrences has been seen in a randomized prospective trial by Moreno Egea et al. ¹⁸.

Even multilocular defects can present the same difficulties and, even presenting indications to laparoscopic repair, are well known to have a high rate of conversions.

Monolocular incisional hernias of more than 5 cm and less than 10 find an elective indication to laparoscopic surgery but even some of these will need conversion to open.

The identification of risk factors could help to select patients at higher risk of conversion, avoiding complications and wasting of resources and time.

To identify these factors, we reviewed the medical records of patients operated on at Department of Surgery – University of Catania Medical School – Unit of General and Breast Surgery, for incisional hernias.

Materials and methods

THE CASES

A retrospective cohort study has been designed to evaluate all consecutive patients undergone laparoscopic surgery for incisional hernia between January 2005 and June 2015 at Department of Surgery – University of Catania Medical School–Unit of General and Breast Surgery. No hernias smaller than 3 cm in size has been treated laparoscopically. Patients with life expectancy lower than 1 year, or ASA >3, or requiring emergent repair were also excluded from laparoscopic surgery. Poorly controlled diabetes has been as well a motive of exclusion from surgery except than in emergency setting. At the end 306 cases were included, 108 men and 198 women, with an age between 22 and 83 years.

SURGICAL TECHNIQUE

All the procedures were performed under general anesthesia by 2 surgeons with an experience of more than 50 cases of laparoscopic hernia repair. All patients underwent anti-thromboembolic prophylaxis with low molecular weight heparin (LMWH) and short-term antibiotic prophylaxis with cephalosporins (ceftriaxone).

After introduction of first trocar by Hasson open technique and induction of pneumoperitoneum, a 30-degree laparoscope was inserted so that other trocars could be introduced under direct vision. The adhesiolysis was done when needed and if possible, in order to expose the hernia and prepare the area for mesh fixation. Composite PTFE or polypropylene (PDO) meshes with a minimum overlapping of 3-5 cm were used on all patients. Once the mesh was inserted it was fixed to the anterior abdominal wall by transfascial sutures and a double crown of absorbable / non-absorbable tacks. The space between the two crowns was 1.5 cm. After fixation, the trocars were removed, hemostasis achieved, and pneumoperitoneum deflated.

The fascia of the Trocar sites greater than 10 mm was closed. After conclusion of the procedure, a compressive wound dressing was placed, so to prevent seroma.

All patients were mobilized and started on a diet within 8-12 hours.

Pain medications (Paracetamol and or Ketorolac) were given every 8 hours for 36 hours, afterwards, only if the pain persisted and the VAS was > 7.

Once discharged, patients have been seen in outpatient office after 1 week, 1 month, 3 months, 6 months and 1 year.

When the operation was converted to open, the PTFE-Composite was placed intraperitoneally, while Polypropylene / Polydioxanone were placed either intraperitoneally or in retromuscular position according to Rives' technique.

STATISTIC

The 306 patients were divided in two groups: Group A, included 228 (74,5%) patients operated on laparoscopically and Group B included 78 patients who required conversion to open repair (25,5 % of patients).

The categories were examined as raw numbers and as percent of the group and the 9 factors studied were analyzed as univariate independent factors.

The Statistical analysis was conducted using χ^2 -test for categorical data by MedCalc software, version 16.4.3.

Results

Of the 306 patients, 66 (21.5%) were recurrent incisional hernias, of which 8% were initially operated on in our department, and 92% were referred from other institutions

One hundred and forty-five patients (47.3%) were older than 60 years, 122 were in group A (53.5%) and 23 in Group B (29.4%). Diabetes was present in 53 patients (17.3%), 28 in Group A (12.2%) and 25 in Group B (32.0%). Body mass index (BMI) ≥ 30 Kg/m² was reported in 167 patients (54%), 104 in Group A (45.6%) and

TABLE I - Single-factor Analysis of Conversion to open surgery

Clinical Data	Group A (228, 74,51%)		Group B (78, 25,49%)		χ^2	P
	N.	%	N.	%		
Male Sex	75	32.89	33	42.31	2.255	0.1332
Female Sex	153	67.11	45	57.69	2.255	0.1332
BMI ≥ 30	104	45.61	63	80.77	28.973	<0.0001
Diabetes Mellitus	28	12.28	25	32.05	15.863	0.0001
Age ≥ 60 yrs	122	53.51	23	29.49	13.451	0.0002
Smoking (≥ 10 cig/die)	61	26.75	34	43.59	7.695	0.0055
Irriducibility	63	27.63	15	19.23	2.160	0.1417
Recurrent Treatment	48	21.05	18	23.08	0.141	0.7075
Prior Emergency Surgery	19	8.33	24	30.77	24.222	<0.0001
Prior Neoplastic Surgery	79	34.65	34	43.59	1.995	0.1579

TABLE II - Logistic Multivariate Analysis Result of Risk factor for conversion to open surgery

Risk Factors	B	Wald	P	Odd Ratio	95% Confidence Interval
Age ≥ 60	-0.66398	4.3714	0.0365	0.5148	0.2763 to 0.9593
BMI ≥ 30	1.88867	26.3253	<0.0001	6.6105	3.2129 to 13.6010
Diabetes Mellitus	1.05954	8.0427	0.0046	2.885	1.3872 to 6.0003
Prior Emergency	1.9029	19.9097	<0.0001	6.7053	2.9067 to 15.4680
Smoking Cigarette	0.68362	4.6296	0.0314	1.981	1.0628 to 3.6927
Constant	-2.80775	47.835	<0.0001		

a: $\text{Log}(p/1-p) = (-2.80775) + (-0.66398 * \text{Age} \geq 60) + (1.88867 * \text{BMI} > 25 \text{ Kg/m}^2) + (1.05954 * \text{Diabetes Mellitus}) + (0.68362 * \text{Smoking}) + (1.9029 * \text{Prior Emergency})$.

The presence of the risk factor has 1 value. Its absence has 0 value.

63 in Group B (80.7%). Smoking habits (more than 10 cigarettes/day) were present in 95 patients (31.0%), 61 in Group A (26.7%) and 34 in Group B (43.5%). Irreducibility of hernia was present in 78 patients (25.4%), 63 in Group A (27.6%) 15 in Group B (19.2%). Recurrent incisional hernia was the cause of operation in 66 patients (21.5%), 48 were completed by laparoscopic approach (Group A, 21.0%) and 18 were in Group B (23.0%). Prior emergency surgery had been performed in 43 patients (14.0%), 19 in Group A (8.3%) and 24 in Group B (30.7%). Prior surgery for neoplastic disease was reported for 113 patients (36.9%), 79 in Group A (34.6%) and 34 in Group B (43.5%). The causes of conversion, as related to the demographic data and to risk factors are reported in Table I, showing adhesions to be preponderant respect to other causes (enterotomies (2) and bleeding (1)). The analysis of risk factors is summarized in Table II, p-values below 0.05 were considered as significant.

The single factor analysis showed no statistical correlation with sex, irreducibility of hernia, recurrent incisional hernia, or neoplastic disease as cause of first operation. Age older 60 years was, contrary to the expected, associated to a lower risk of conversion, ($p = 0.0002$). BMI ≥ 30 turned to be an independent risk factor for conversion ($p < 0.0001$).

Further, diabetes mellitus and cigarette smoking showed to be somehow, independently related with conversion ($p = 0.0001$ and $p = 0.0055$ respectively).

The risk of conversion appears to be higher for incisional hernias secondary to emergency primary operations (<0.0001) while oncologic surgery appears not to be correlating.

The factors that resulted statistically significant underwent multivariate logistic regression analysis, and results are presented in Table II.

Discussion

Laparoscopic hernioplasty frequently requires conversion to open surgery. In our series we report conversions in about 25 % of the cases.

Some Authors observed a higher rate of complications and post-operative pain in patients undergone conversion respect to those in whom the procedure is carried out laparoscopically⁵⁻⁷.

Adhesions are the most frequent cause for abandoning the laparoscopic procedure, because of high risk of bowel injuries or for the impossibility to induce pneumoperitoneum. Last but not least, adhesions may prevent the display of the hernial defect. Incidental entero-

tomies, and not laparoscopically treatable bleeding are further causes of conversion. Though, it is true that such complications can occur even in course of open surgery and require very complex surgical treatment using biological prosthesis and other presidia¹⁹ (Nicodemi).

A careful retrospective examination of the characteristics of patients in our series has been carried out, aimed to extrapolate possible risk factors, related with failure in completing the laparoscopic procedure.

The literature has often pointed out as risk factor for conversion male sex, age older than 60 years, BMI ≥ 30 , Diabetes mellitus, smoking more than 10 cigarette/day, irreducible hernias, recurrent incisional hernias, prior emergency surgery, prior oncologic surgery.

Age over 60 could be a risk factor for a lower compliance to pneumoperitoneum, in presence of chronic respiratory and/or heart diseases, representing an anesthesiologic reason for interrupting the laparoscopic procedure. However, in our series patients with such chronic diseases, all with ASA score >3 , have been excluded from the study.

The relationship between obesity (BMI ≥ 30) and inability to perform laparoscopic repair has been analyzed by some author⁶. Obesity could impede the introduction of trocars and make difficult to identify the landmarks, due to excessive visceral fat.

Diabetes mellitus and cigarette smoking have been reported to increase the visceral adhesion through a systemic pro-inflammatory condition produced by the increase in production of free oxygen radicals. High serum levels of glycated haemoglobin (HbA1c) can also be considered. This value indicates a poorly controlled case of diabetes that might cause a more severe inflammation and the resulting higher formation of adhesions as highlighted by Simopoulos et al. in cholecystitis²⁰. Even the irreducible hernia could be a risk factor because of significant adhesions between the herniated viscus, parietal peritoneum and the wall defect, so to determine the failure to complete the laparoscopic procedure. In those cases the "component separation" technique can help to obtain a better closure of the wall without increasing in the intra-abdominal pressure²¹ (Mazzocchi). Recurrent incisional hernia could expose to a higher risk of failure due to adhesion secondary to both the surgery *per se* and to the presence of a mesh from previous hernia repair.

The relationship with previous emergency surgery finds a rationale in the presence of dense adhesions due to the inflammatory disease that required surgery (peritonitis, cholecystitis, appendicitis, perforated bowel or stomach)^{15,22}. The same mechanism of production of dense adhesions can be due to the entity of organ demobilization in oncologic surgery.

The experience of the surgeon, intended as number of laparoscopic repair of incisional hernia performed, has been found significantly related with the success of the procedure by Aquina et al.²³. In our experience this fac-

tor has not been evaluated since both surgeons had already performed more than 50 laparoscopic repairs of incisional hernias.

The limitations of this study include the retrospective nature of it. In fact, it is plausible that the most complex hernias, or the sickest patient were treated with open technique as per surgeon's decision, even if we tried to avoid this bias excluding from the study all patients with ASA score > 3 . Though, this same exclusion criterion could potentially eliminate the sickest patients older than 60 years of age altering the results in this category of patient.

Conclusions

In conclusion, we analyzed the preoperative characteristics of patients undergoing laparoscopic repair of incisional hernia in an effort to find significant risk factors for conversion to open surgery. The present results revealed that the independent risk factors for conversion to open surgery included BMI ≥ 30 , cigarette smoking, diabetes mellitus, recurrent hernias, and prior emergency surgery, while age older than 60 years was, in this cohort of patients, associated to a lower rate of conversion.

Riassunto

INTRODUZIONE: Alcuni fattori possono influenzare la conversione in open del trattamento laparoscopico del laparocele. L'identificazione di tali fattori può aiutare a selezionare i pazienti più idonei al trattamento laparoscopico o a quantificare il rischio di conversione.

METODI: Uno studio retrospettivo è stato condotto su una coorte di 306 pazienti, selezionati tra quelli sottoposti a chirurgia laparoscopica per laparocele tra il 2005 e il 2015. Sono stati inclusi solo pazienti sintomatici con difetto singolo della parete, diametro tra 5 e 10 cm, ASA ≤ 3 . I pazienti sono stati divisi in 2 gruppi, laparoscopico (L) e convertito (C) e i dati preoperatori sono stati valutati e analizzati statisticamente.

RISULTATI: Il gruppo L era costituito da 228 pazienti e il gruppo C da 78 pazienti. L'analisi univariata ha mostrato che i fattori di rischio per la conversione includevano BMI ≥ 30 , Fumo, Diabete mellito, pregressi interventi chirurgici in emergenza. L'età > 60 anni era associata a un minor rischio di conversione.

CONCLUSIONI: Il risultato di questo studio retrospettivo ci consente di affermare che la scelta della tecnica, in presenza di molteplici fattori di rischio, deve essere attentamente valutata e discussa con il paziente. Uno studio prospettico con un numero maggiore di pazienti consentirebbe una migliore definizione del rischio determinato dai singoli fattori e lo sviluppo di un punteggio che potrebbe essere utilizzato nella pratica per semplificare la valutazione del rischio.

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