ORIGINAL ARTICLE

Impact of peritoneal tears on the outcome and late results (4 years) of endoscopic totally extra-peritoneal inguinal hernioplasty

G. Muzio · K. Bernard · C. Polliand · N. Rizk · G. Champault

Abstract

Background The reported rate of intra-operative peritoneal laceration during endoscopic extra-peritoneal hernioplasty (TEP) ranges from 10 to 64%.

Aims To evaluate in a prospective study the predictive factors of peritoneal tears, their consequences in terms of outcome and late results.

Patients and methods Between July 1994 and December 2000, we performed 467 endoscopic extra-peritoneal hernia repairs (TEP). In 14.8% of the cases, single or multiples recurrences after conventional open herniotomy were treated. One hundred and forty-nine patients (38%) had had previous surgery (appendectomy); 277 procedures (70.8%) were performed by experienced surgeons and 114 (29.2%) by surgical trainees. We used a diathermic hook in 26.3% of the procedures. The mean follow-up period was 68 months (48–100).

Results Peritoneal tears occurred in 43 patients (10.9%). Six of them (13%) required operative closure, and six a conversion (four Lichtenstein, one Shouldice, and one TAPP). In 37 cases (86%), the tears were not closed. Peritoneal tears were significantly correlated with surgical experience, Nyhus classification, scar adhesion from previous surgery and the use of sharp instruments. Peritoneal tears interfere significantly ($P = 0.001$) with the operating time (82 vs. 63 min) and conversion rate (13.9 vs. 1.7%). It does not affect the outcome and late results in terms of recurrences, pain, or small bowel obstruction.

Conclusion Our data suggest that peritoneal tears in the vast majority of cases may be safely managed without peritoneal closure. In case of peritoneal laceration, the operative time was significantly longer, and the conversion rate was increased. These situations do not affect the outcome and late complications compared with the procedures without peritoneal tears.

Keywords Inguinal herniorraphy · Endoscopic totally extra-peritoneal repair · Peritoneal tears

Introduction

Endoscopic extra-peritoneal inguinal hernioplasty (TEP) has become an established technique for the repair of inguinal hernias [1, 2]. Reported rates of intra-operative peritoneal laceration range from 10 to 64% [3, 4, 5]. Peritoneal tear is the most common reason for the conversion of endoscopic extra-peritoneal inguinal hernioplasty to transabdominal pre-peritoneal or open approaches [6, 7, 8].

Peritoneal laceration not only leads to the loss of extra-peritoneal space, but also predisposes patients to internal herniation and/or small bowel herniation. Above all, because the mesh is no longer securely buttressed between the abdominal wall and peritoneum by intra-abdominal pressure, it becomes susceptible to migration, particularly when a non-stapled technique is performed.

We conducted a retrospective study on 391 patients, with 467 hernias, operated on over a period of 6 years (1994–2000) with a totally pre-peritoneal approach, with a mean follow-up of 4 years (2001–2004).

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Materials and methods

Between July 1994 and December 2000, we performed 467 endoscopic extra-peritoneal hernia repairs (TEP) in 391 patients, whose average age was 55.4 years (range 32–82 years), 93% of whom were men. Bilateral hernia was treated in 19.4% ($n = 76$) of these patients. In 14.8% ($n = 70$) of the hernias, single or multiple recurrences after conventional open herniotomy were treated. All recurrent hernias had developed after previous conventional hernia repair without the use of prosthetic material. For the unilateral hernias, 52% ($n = 249$) were found on the right and 48% ($n = 224$) on the left.

Surgical technique

The surgical technique of TEP has been described previously [9], according to the first description reported by Dulucq [10] in 1991. Extra-peritoneal space was dissected and created by endo-scissors or hooks with diathermy. Balloon dissection was not utilized, and urinary catheters were not employed. Hernia types were determined intra-operatively according to the Nyhus classification [11]. The polypropylene prosthesis (15×10 cm) was not stapled. In the event of pneumoperitoneum, a Veress needle was inserted through the subumbilical wound into the peritoneal cavity to release the intra-peritoneal carbon dioxide and allow partial re-expansion of the extra-peritoneal gas.

In case of peritoneal defects, the site of the peritoneal tear was located endoscopically by identifying the glistening visceral surface of the peritoneum through the defect. Occasionally, intra-abdominal contents such as omentum and/or small bowel were visible. In case of a limited tear, it was not closed; in other situations, techniques used for the closure of the peritoneal opening included pre-tied suture loop ligation, endoscopic stapling or suturing with intra-corporeal knotting.

The demographic features and peri-operative outcome were documented. A prospective collection and analysis of the peri-operative outcome and follow-up data were performed.

Operative time was defined as the time from the first incision to the last suture. Intra-operative complications (diffuse hemorrhage or bleeding from an epigastric vessel, or peritoneal defects), postoperative complications (large hematomas, seroma, paresthesia, wound infection, urine retention, and mesh infection) and conversion of the TEP operation to an endoscopic trans-abdominal (TAPP) or open procedure were noted. The length of the hospital stay (number of days in the hospital after the operation), recuperation time (number of days needed for recovery before returning to work or full daily activities) and recurrence of a hernia were assessed.

In the follow-up (2000–2004), all patients were approached by mail or telephone and asked to report to the outpatient department for a physical examination performed by a staff surgeon.

Statistical analysis

Operative deviation and postoperative morbidity were compared by Student's t test and the chi square test where appropriate. Statistical analysis was performed with the help of computer software (SPSS) PC + 9.0: SPSS, Chicago, Ill.). Values were expressed as the mean ± SD.

Results

One hundred and forty-nine patients (38%) had undergone previous abdominal surgery, including 124 open appendectomies (83.2%). None of them were obese (mean BMI = 24.5 per kg m², 18–29). All together, 277 procedures (70.8%) were performed by experienced surgeons, and 114 (29.2%) by surgical trainees under the supervision of an experienced surgeon.

Inguinal hernia (Nyhus) was reported according to the Nyhus classification. There were 165 type II (35.3%), 232 type IIIA/B (49.6%) and 70 type IV (14.9%) hernias.

The mean operating time was 68 mn (30–135) for unilateral hernia and 108 mn (48–152) for bilateral hernia. There were 17 conversions (4.3%) to an open procedure (Lichtenstein $n = 14$) or TAPP technique ($n = 3$). The mean hospital stay was 3.2 days (2–5).

Peritoneal tears occurred in 43 patients (10.9%). During the operation, 12 other patients (3%) developed pneumoperitoneum without identifiable peritoneal tears.

Of these, the prevalence of tears was 7.8% for primary repair and 14.5% for recurrent repair ($P < 0.01$) (Table 1). Laceration occurs during dissection of the sac ($n = 27$), because of scar adhesion from previous surgery ($n = 22$), because of a sharp instrument ($n = 16$),because of inexperience of trainees ($n = 27$) and for unknown reasons ($n = 2$). In a univariate study, predicting factors of peritoneal tears are surgical experience, hernia classification (Nyhus IIA, Nyhus IV), and the use of a monopolar hook (Table 1). A Veress needle was used in 28 cases (43%) of all tears. In 13 patients, important peritoneal tears (more than 2 cm) interfered with the operative course due to the collapse of the pre-peritoneal space. The attempt to close the

Table 1 Predicting factors

	N	No tear	Peritoneal tear (*n* %)	*P*
N patient	391	348	43 (10.5)	
Nyhus II	165 (35.3)	138	27 (10.3)	0.01
Nyhus IIIA/B	232 (49.6)	218	14 (6)	0.82
Nyhus IV	70 (14.9)	60	10 (14.2)	0.01
Previous surgery	149 (38)	127	22 (19.2)	0.01
Trainees	114 (29.2)	87	27 (23.6)	0.01
Experienced surgeon	277 (70.8)	261	16 (5.7)	-
Use of hook	103 (26.5)	87	16 (15.5)	0.01

Table 3 Outcome

N	*N* 391	Tear 43	No tear 348	*P*
Hospital stay (days)	2.8 ± 1.4	2.9 ± 1.6	2.8 ± 1.5	0.91
Seroma (*N*)	6	1	5	0.89
Hematoma (*N*)	5	0	5	0.79
Wound infection (*N*)	0	0	0	1
Urine retention (*N*)	8	2	6	0.93
Day 3; pain (VAS)[a]	2.3 (0–6)	2.2 (0–5)	2.5 (0–6)	0.98
Day 30; pain (VAS)[a]	1.1 (0–5)	1.2 (0–4)	1.1 (0–4)	0.89
Return to normal activity (days)[a]	17.2 (3–40)	18 (7–35)	17 (3–40)	0.91

VAS, visual analogic scale

[a] Mean range

Table 4 Follow-up at 4 years

N	*N* 391	Tear 43	No tear 348	*P*
Recurrence (*n*)	5	1	4	0.93
Chronic pain (%)	11%	8%	13%	0.91
Bowel obstruction (*n*)	0	0	0	
Mesh migration (*n*)	0	0	0	

tears in order to reduce the massive pneumoperitoneum was effective in six patients. In the remaining six patients, very large peritoneal tears on the peritoneum wall necessitated conversion (4 Lichtenstein, 1 Shouldice, and 2 TAPP). In 37 cases (86%), limited tears were not closed, and the procedure was successfully accomplished.

Intra-operatively, peritoneal tears significantly increased ($P < 0.001$) the operating time (82 vs. 63 min) and did affect the conversion rate (13.9% vs. 1.7%) (Table 2).

The postoperative course was uncomplicated (Table 2). The mean follow-up period was 68 months (range 48–100). Postoperatively, and during the follow-up for all 37 patients, peritoneal tears had no influence on the outcome (Table 3), early and late results (Table 4), especially on pain, delay to return to normal activities, recurrences and bowel obstructions.

Discussion

Previous studies [3, 8, 12] have reported major differences in the incidence of peritoneal injuries ranging from 0.4 to 67% during the course of laparoscopic TEP repair. During dissection of the extra-peritoneal space, the peritoneum can usually be freed from the abdominal muscles without difficulty. In the case of peritoneal tear, the rapid loss of working space and videoscopic view makes it very difficult, if not impossible, to perform

Table 2 Intra-operative comparison

	N	Peritoneal tear	No tear	*P*
N %	391	43 (10.5)	348 (89.4%)	
Operating time [a]	68 (30–135)	82 (45–135)	63 (30–125)	0.001
Bleeding (*N* %)	4 (1%)	1 (2.3%)	3 (0.8%)	ns
Conversion (*N* %)	12 (3%)	6 (13.9%)	6 (1.7%)	0.001
Drainage (*N* %)	12 (3%)	2 (5%)	10 (2.8%)	ns

[a] mn (range)

not only hernioplasty, but also the aforementioned remedial procedure. Most peritoneal tears occur during the blunt dissection of the hernia sac and the peritoneum from the spermatic cord structures. Peritoneal tears are therefore prone to occur near the vas when unbalanced traction and countertraction are applied during parietalization of the spermatic cord [5]. For recurrent hernias, where adhesions are present at the neck or fundus of the hernia sac, forceful reduction will also result in peritoneal laceration. An additional cause for peritoneal tears is the presence of adhesion due to lower previous abdominal scars [13]. There is the question of whether the presence of appendectomy scarring and adhesions will adversely influence the outcome. The incidence of peritoneal tear after appendectomy is high (56.5%) [13]. It prolonged the procedure, but did not influence the outcome [14]. Sharp instruments are not recommended [12].

In rare cases, peritoneal openings are intentionally created in patients with congenital inguinal hernias in whom the division of the distal part of the sac that descends into the scrotum is necessary in order to complete peritoneal dissection from the spermatic structures, thus creating an intentional peritoneal defect [15]. The present study demonstrated that peritoneal tears significantly ($P = 0.001$) prolonged the operative duration of TEP (82 vs. 63 min) and increased the conversion rate (1.7 vs. 13.9%). In our experience [14], the incidence of peritoneal tears is correlated with surgical experience (28 vs. 3%).

Most surgeons consistently recommend routine closure of peritoneal tears [6, 8]. The main reasons for the widely accepted policy of routine closure of peritoneal tears are based on the assumption that peritoneal tears may predispose to postoperative bowel obstruction due to internal hernia and adhesions of the bowel to the exposed mesh [6, 8]. However, there are numerous surgeons who do not advocate routine peritoneal closure [16, 17]. The tear is a gaping hole only if the peritoneal cavity is distended with gas. After all the CO_2 is evacuated, the edges of the tear come into apposition and seal [16]. Utilization of a Veress needle to decompress the peritoneal cavity might help in cases where the leak is a small one. This author has never closed any tear and has never had any adverse sequelae, such as bowel obstruction. In our study, we also demonstrated that leaving limited peritoneal tears open did not interfere with the operative course in the majority of the patients (86%) and was not associated with early or late postoperative complications in a long-term follow-up. The cumulative risk of obstruction after hernia repair is evaluated to be between 0.07 and 0.1% after 4 years [2, 18]. In our experience, we have not had any cases of episodes of bowel obstruction.

Peritoneal tear poses a challenging problem and is the main cause for conversion, especially during the early phase of the learning curve [19] and when the laceration is important. The conversion rate in our experience was (13.9%), significantly higher than in patients without tears (1.7%).

Conclusion

In the majority of our cases (86%), there were no significant adverse effects of intra-peritoneal gas leaks on the operative course. Meanwhile, the operative time and conversion rate significantly increase in case of peritoneal tears; the vast majority of them can be safely managed without peritoneal closure. With a mean follow-up of 4 years, there were no internal herniations and small bowel obstructions.

Obstructive ileus after hernia repair is a very rare, but major complication. The only way to avoid it is to close the peritoneal tear safely.

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