Hernia (2000) 4: 81-84

Hernia

Laparoscopic treatment of inguinal hernias: prospective evaluation of 757 cases treated by a totally extraperitoneal route

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Summary: The aim was to assess the value of treament of inguinal hernias by a totally extraperitoneal laparoscopic route. Between January 1993 and December 1998, 541 patients (490 men, 51 women) with 757 hernias were operated laparoscopically by a totally extraperitoneal route. Whenever the parietal repair required the insertion of a prosthesis, this was the method chosen. The procedure was perfomed under general anesthesia. One or two polypropylene prostheses of 15 x 12 cm were placed at the deep aspect of the abdominal wall, split but not fixed. The patients were followed up at one, six and twelve months and then annually. The mean operation time decreased with experience, from 66 minutes in 1993 to 47 minutes in 1998 for unilateral hernias and from 104 to 71.5 minutes for bilateral cases. The laparotomy conversion rate was 2%. Mortality was nil. Morbidity was as follows : hemorrhagic scrotal extravasations 10%, serous effusions 3.5%, phebitis 0.3%, pneumopathies 0.3%. The mean period of hospitalization was 2.9 days and the global recurrence rate was 0.6% (4 cases in the first year, 1 case at three years).The totally extraperitoneal laparoscopic route seems to be the method of choice for the treatment of inguinal hernias requiring a prosthesis. It reduces hospital stay and allows earlier return to work and is associated with only minor morbidity and a low recurrence rate.

Key words: Inguinal hernias – Laparoscopic treatment – Extraperitoneal route

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Received July, 13, 1999
Accepted in final form January, 24, 2000

The high incidence of inguinal hernias constitutes a major public health problem: more than 140,000 are operated every year in France. The medical and economic impact of the treatment of this disorder is therefore considerable. Morbidity and recurrence rates, hospital stay and absence from work, must all be decreased to improve the management of this disorder. Therefore an apprenticeship in the techniques of hernia repair is a fundamental part of surgical training. In the absence of a consensus as to the technique its choice is often left to the individual surgeon's initiative. The laparoscopic treatment of inguinal hernias was developed at the beginning of the 1990s

[McKernan 1993, Corbitt 1993] and was based on two options: the transabdomino-preperitoneal route (TAPP) and the totally extraperitoneal route (TEP) [Champault 1994], which we initially adopted in 1991 and assessed in the context of prospective randomized studies, comparing its results with those of two other operations, the Shouldice procedure [Champault 1994] and the Stoppa operation [Champault 1996], with a follow-up of over four years [Champault 1998]. From 1992 on, instruction in this technique was included in the initial stage of surgical training [Champault 1994] and in advanced training [Champault 1996].

Table 1. Clinical data

Patients	Men	Women	Mean age (range)	ASA score	Mean weight (kg) (range)
541	490 (90.6%)	51 (9.4%)	53.8 yrs (18 – 88)	I : 338 II : 184 III : 19	73 (47 – 145)

Table 2. Hernia classification

Total of hernias	Right	Left	Bilateral	Recurrent	Nyhus classification :
757	253	212	146	81 (10.7%)	type 2 : 303 (40.02%) type 3 : 373 (49.27%) type 4 : 81 (10.7%)

Material and methods

Patients

From January 1993 to December 1998, 541 patients (Table 1) comprising 757 inguinal hernias, were operated electively by laparoscopy using the TEP procedure, inserting one or two polypropylene prostheses after the creation of a prevesical air-space.

Method

The inclusion criteria were: uni- or bilateral inguinal hernias, whether direct or external oblique, primary or recurrent.

The exclusion criteria were: strangulated and/or incarcerated hernias, femoral hernias, hernial recurrences already treated by prostheses, and bulky inguino-scrotal hernias ; pregnancy and contraindications to general anesthesia and laparoscopy (cardiopulmonary conditions, cirrhosis, coagulopathies, closed-angle glaucoma); previous midline subumbilical laparotomy, local parietal infection and pelvic irradiation.

For all the surgeons, a previous instruction period of a minimum of 30 procedures was instituted. The hernias were classified by the method of Nyhus (Table 2).

Operative technique

The procedure was carried out under general anesthesia with prophylactic antibiotherapy by means of an i.v. bolus of 1.5 g of curoxim. The technique used was that of theTEP route. The prevesical air-space was created by puncture or direct umbilical accesss; the dissection was extended to the outer part of the iliac fossa, identifying the pubic symphysis, Cooper's ligament, the inferior epigastric vessels and the reflected iliopubic band. The peritoneal sac and the cord were carefully dissected, sufficiently to parietalize the cord but limited in extent so as to minimize the risk of postoperative hematoma and pain. If the peritoneal sac was inadvertently opened the pneumoperitoneum hindering the continuation of the procedure was evacuated by introducing a Veress needle in the left hypochondrium. One or two polypropylene prostheses of 15 x 12 cm were placed on the deep aspect of the abdominal wall, split but not fixed. Drainage of the preperitoneal space was left to the judgment of the surgeon. Prophylaxis for venous thrombosis was routine (fraxiparin® Sanofi, 0.3 ml/day subcutaneously).

The patients were followed up at one, six and 12 months and then annually. The asessment criteria were: operating time and hospital stay ; rates of conversion, mortality and morbidity at 30 days; number of immediate and delayed reoperations and recurrence rates.

Results

Operating time

Mean operating time: For unilateral hernias this was 54.5 ± 13.5 minutes. For bilateral hernias, it was 85 ± 18.5 minutes.

Evolution with experience

Unilateral hernias: 1993: 66 min, 1994: 62.7 min, 1995: 58.5 min, 1996: 50.5 min, 1997: 50 min, 1998: 47 min.
Bilateral hernias: 1993: 104 min, 1994: 103 min, 1995: 87 min, 1996: 86 min, 1997: 80.5 min, 1998: 71.5 min.

Peroperative complications

There were six vascular lesions (1.1%): five injuries of the epigastric plexus where hemostasis was achieved by diathermy coagulation, and one wound of the right external iliac a. requiring conversion to a laparotomy for hemostasis and repair. One intolerance to CO_2 necessitated cessation of the procedure. There were no visceral lesions (small bowel, bladder, etc.) and no gas embolism. Opening of the peritoneum during dissection of the preperitoneal

space or of the hernial sac was noted 66 times (12%). Drainage (Redon drain) was used 33 times (6%).

Conversions

There were 11 conversions (2%). Two were due to obesity of the patients, one to a very large longstanding inguinoscrotal hernia, one to a wound of the iliac a., and one to a major peritoneal breach with a pneumoperitoneum hindering procedure by the TEP route. These five patients were treated by the Lichtenstein method. In six cases (1.8%) subperitoneal stripping was impossible. Four of these were treated by the intraperitoneal route (TAPP), one by a Stoppa procedure, and one by a Shouldice operation.

Mortality and morbidity

There was no mortality. Morbidity amounted to 10% (55/541) (Table 3). There were 26 (4.9%) hemorrhagic scrotal or penile extravasations (not affecting the outcome or duration of hospitalization) and 27 postoperative complications: 3 pneumopathies, 5 prevesical hematomas, 2 episodes of delayed phlebitis (day 7) despite the institution of prophylaxis against thrombosis, 1 chronic ischemia and 1 postoperative obstruction due to incarceration of a loop of small bowel in a peritoneal breach (reoperated at day 15 by laparoscopy). Nineteen (3.5%) seromas were treated by simple aspiration (at the beginning of the series) and one pelvic lympohocele had to be reoperated. There was one infection at a trocar orifice.

Table 3. Postoperative morbidity

Scrotal bruising	26
Prevesical hematoma	5
Seroma	19
Lymphocele	1
Pneumopathies	3
Phlebitis	2
Obstruction	1
Ischemia lower limb	1

Mean duration of hospital stay (MDHS)

This was 2.9 days (range 1 – 10), 1.9 postoperatively. Ten patients were treated as day cases and 195 (36%) stayed less than two days.

Recurrences

All the patients were reviewed at one month, 98% at 6 months, 95% at one year, 91% at two years, 84% at 3 years and 79% at 4 years. The total number of recurrences for the series was 5, 0.9% of the patients and 0.6% of the hernias operated. Four occurred at one year and one at 3 years and were reoperated by the Lichtenstein technique. Two of these recurrences developed in patients operated during the first year of the series and were ascribed to the use of too small prostheses.

Discussion

In the context of laparoscopic hernia surgery the TEP route [Champault 1994] is probably the most difficult to perform and thus to learn and teach. As compared with the TAPP approach, it has the twofold advantage [Fiennes 1997, Cohen 1998] of decreasing the visceral or vascular risks associated with the insertion of peritoneal trocars and the risk of obstruction due to defective closure of the peritoneum [Johanet 1996]. It respects the abdominal cavity, which is sometimes the site of adhesions resulting from previous operations. Complete dissection of the fascia propria in the extraperitoneal situation allows precise diagnosis of the lesions of the posterior wall of the inguinal region, thus avoiding the risk of error possible in an intra-abdominal approach when a hernial orifice is occluded by a lipoma. Another advantage of laparoscopy (TAPP or TEP) is the possibility of discovering during operation the presence of undetected hernias, thanks to the bilateral view of the hernial orifices. These concepts are relative, since in our series we have to report an injury of the external iliac a. and a postoperative obstruction due to incarceration of a loop of bowel in a peritoneal breach. The TEP route, the «laparoscopic equivalent» of Stoppa's procedure, seems superior and preferable to the TAPP route from recent prospective comparative studies [Ramschaw 1996, Cohen 1998, Fitzgibbons 1995].

In cases of external oblique inguino-scrotal hernias, two difficulties may be encountered:

1. Displacement of the inferior epigastric vessels inward and downward may make it difficult to identify the anatomic structures exposed, with the risk of vascular injury requiring hemostatic procedures and sometimes conversion to a laparotomy.

2.The difficult dissection of a hernial sac which is sometimes fixed to the cord may give rise to a hematoma of the cord and postoperative pain. The other complications (hematomas, seromas, infections) may be minimized by cautious dissection and rigorous hemostasis and should decrease with experience. The recurrences we have seen were usually due to faulty technique and the choice of a prosthesis of a size adequate to cover the entire hernial orifice should prevent these. Not opening the peritoneum during the TEP access prevents peritoneal irritation and abdominal distension due to the escape of CO_2, and thus the postoperative abdominal and shoulder pain found with the TAPP route. We have modified the initial technique described by Begin [1996] by using reusable operative equipment in the interests of economy [Champault 1994] and split but not fixed prostheses (12 x 15 cm) [Champault 1994], and by creating the preperitoneal dissection space by puncture-insufflation of the prevesical space or by direct umbilical access, rather than by trocars fitted with an inflatable balloon [Benchetrit 1995].

Our patients were for the most part included in two already published randomized trials [Champault 1996] comparing the TEP technique with the operations of Shouldice and Stoppa [Champault 1994]. Our practice is associated with a progressive decrease of operating time, but also with a tech-

nical modification for the latest patients in this series, where the split unattached prostheses have been replaced by preformed prostheses. Hospital stay was progressively shorter in our series. Laparoscopic hernial repairs can be done as day-case treatment, as reported by Evans [1996] in 114 patients where the mean operating time was 24 minutes and by Johannet [1996] in France in a group of 197 patients.

It was not possible for us to calculate the periods of incapacity for physical or professional activity, but it has already been shown that the social status of the patient is more determinant on this point than the type of repair carried out. Heikkinen [1996] reports that the total cost of 749 dollars was lower for the TEP route than for the Lichtenstein procedure, since patients operated by the TEP technique were able to return to work earlier. The same study reported a decreased cost associated with a lesser use of analgesics in the TEP group compared to the Lichtenstein group. The mean cost of hospitalization was increased by 457 dollars for the TEP method, due to the general anesthesia, whereas the Lichtenstein procedures were performed under local anesthesia.

Our recurrence rate (since 1993) of 0.9% for a follow-up of 4 years is consistent with the data in the literature [Ramschaw 1996, Cohen 1998, Begin 1996]. The causes of recurrences noted are common to all prosthetic repairs [Lowham 1997] and are due essentially to prostheses which are too small or poorly positioned.

Conclusion

Laparoscopic treatment of inguinal hernias by a totally extraperitoneal route (TEP) is currently an alternative to other hernia repair techniques with insertion of a prosthesis. Because of the minimal access, not opening the peritoneum and tension-free repair, it allows a decrease of postoperative pain and an earlier resumption of activity. The costs incurred by laparoscopy are falling regularly thanks to a continuing reduction of the length of hospital stay and the fall in cost of the materials used. The impact of instructional programs on the repair of inguinal hernias by the laparoscopic preperitoneal route (TEP) is evidenced by a significant increase in operating time, hospital stay and morbidity and hence in costs. In the long term the incidence of recurrences has not been affected.

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