

LAPAROSCOPIC INGUINAL HERNIORRHAPHY: APPRAISAL OF A COHORT STUDY

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OBJECTIVES: To assess the safety and effectiveness of individualized laparoscopic herniorrhaphy and to compare its intraoperative cost to that of the standard Bassini operation.

DESIGN: An analytic cohort study.

SETTING: A university teaching hospital.

PATIENTS: One group of 158 patients underwent 167 laparoscopic herniorrhaphies for symptomatic groin hernias. The approach was transabdominal preperitoneal for the first 124 patients and totally preperitoneal for the last 34 patients. A second group of 50 patients underwent a conventional Bassini operation.

INTERVENTION: Individualized laparoscopic inguinal herniorrhaphy or Bassini herniorrhaphy.

MAIN OUTCOME MEASURES: Complications and recurrences encountered in the laparoscopic group. Total operative time and intraoperative cost involved in both procedures. Analgesia required in each group during the first 2 postoperative days.

RESULTS: Intra- and postoperative complications of the laparoscopic approach were not life threatening. The recurrence rate at a mean follow-up of 16.8 months was 1.2%. Total operative time was significantly ($p < 0.001$) longer in the laparoscopy group than in the Bassini group. Patients in the Bassini group took more parenteral analgesics than those in the laparoscopy group ($p = 0.02$), but there was no difference with respect to the number of times enteral analgesics were required ($p = 0.32$). Use of mesh and staples was more expensive than sutures alone inserted laparoscopically. The Bassini procedure was a less expensive procedure than laparoscopic herniorrhaphy.

CONCLUSIONS: The laparoscopic treatment of groin hernias is safe. The recurrence rate is low. Primary unilateral inguinal hernias could be adequately treated at a lesser cost by a standard approach. Bilateral, recurrent and femoral hernias could benefit from a laparoscopic approach.

OBJECTIFS : Évaluer la sécurité et l'efficacité de l'herniorrhaphie par laparoscopie individualisée et en comparer le coût peropératoire à celui de l'intervention standard de Bassini.

CONCEPTION : Étude analytique des cohortes.

CONTEXTE : Hôpital d'enseignement universitaire.

PATIENTS : Un groupe de 158 patients ont subi 167 herniorrhaphies par laparoscopie pour corriger une hernie inguinale symptomatique. L'approche a été transabdominale et préperitonéale chez les 124 premiers patients et entièrement préperitonéale chez les 34 derniers. Un deuxième groupe de 50 patients ont subi une intervention classique de Bassini.

INTERVENTION : Herniorrhaphie inguinale par laparoscopie individualisée ou herniorrhaphie de Bassini.

PRINCIPALES MESURES DES RÉSULTATS : Complications et rechutes chez les sujets qui ont subi une laparoscopie. Durée totale de l'intervention et coût peropératoire dans les deux cas. Analgésie requise chez les sujets des deux groupes au cours des deux premiers jours qui ont suivi l'intervention.

RÉSULTATS : Les complications peropératoires et postopératoires à la suite de la laparoscopie ne mettaient pas en danger la vie du patient. Le taux de récurrence à un suivi moyen de 16,8 mois s'est établi à 1,2 %. La durée totale de l'intervention a été beaucoup ($p < 0,001$) plus longue chez les sujets qui ont subi une

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laparoscopie que chez ceux qui ont subi une intervention de Bassini. Les patients qui ont subi l'intervention de Bassini ont pris plus d'analgésiques parentéraux que ceux qui ont subi une laparoscopie ($p = 0,02$), mais il n'y avait entre les deux groupes aucune différence en ce qui a trait au nombre de fois qu'il a fallu utiliser des analgésiques entéraux ($p = 0,32$). L'utilisation de treillis et d'agrafes a coûté plus cher que celle de sutures seulement insérées par laparoscopie. L'intervention de Bassini a coûté moins cher que l'herniorrhaphie par laparoscopie.

CONCLUSIONS : La correction des hernies inguinales par laparoscopie est sans danger. Le taux de récurrence est faible. Les hernies inguinales unilatérales primaires pourraient être traitées comme il se doit à un coût moindre par une approche standard. Une laparoscopie pourrait être avantageuse dans le cas des hernies bilatérales, répétitives et fémorales.

Early reports on laparoscopic inguinal herniorrhaphy emphasized some unique advantages of the procedure over the standard approach, including decreased patient pain, rapid return to work and consequent decreased cost for society.¹⁻³ Safety and effectiveness of the procedure were issues that needed validation. Recently, Maddern and colleagues⁴ failed to show a more rapid return to work. In this paper experience with laparoscopic herniorrhaphy, its safety and effectiveness are described, and the intraoperative cost is compared with that of the standard Bassini operation.

PATIENTS AND METHODS

From March 1991 to October 1994, 158 patients (143 men, 15 women) underwent 167 laparoscopic inguinal herniorrhaphies (Table I). They ranged in age from 19 to 84 years (mean 49.2 years). Our technique, based on the work of Nyhus, Klein and Rogers⁵

and Halverson, McVay and Yankton,⁶ has been described previously.⁷ In the first 124 patients a transabdominal preperitoneal approach was used, and in the last 34 patients a totally preperitoneal dissection of the inguinal region was done.

All patients were seen 6 weeks postoperatively and followed up periodically.⁷ Follow-up was complete for 97% of the patients.

The total operative time was defined as the time from entry to discharge from the operating room. Pain medication was recorded for the first 2 days after operation. Additional intraoperative costs due to laparoscopic instrumentation were evaluated. The findings were compared with those of a group of 50 consecutive patients who underwent a Bassini operation up to October 1994. The complications and the recurrence rate were assessed in the laparoscopic group.

Differences were analysed by the independent group *t*-test, with a probability value of less than 0.05 being considered significant.

RESULTS

Intraoperative and postoperative complications of the laparoscopic hernia repair were not life threatening. During surgery, the external iliac artery in one patient was accidentally punctured with the needle; local compression through the abdominal wall rapidly controlled the bleeding. In one patient the epigastric artery was

injured with a trocar. One elderly patient underwent conversion to an open procedure because of an elevated PCO₂ level. There were nine different postoperative complications. In three cases there were local wound hematomas, one of which was operated on for the misdiagnosis of recurrent hernia. Three patients had self-limited groin pain related to either clips or sutures or the presence of mesh. The pain was not located along the distribution of any of the sensory nerves. One patient presented with paresthesias along the distribution of the genital branch of the genitofemoral nerve; these resolved spontaneously. Testicular ischemia occurred in one patient operated on for a second recurrence. One patient, a few days after laparoscopic transabdominal surgery, had colicky abdominal pain, which subsequently disappeared. One patient each suffered a myocardial infarction, an episode of urinary retention, cubitalgia from the position on the operating-room table and vocal cord laceration as a result of endotracheal intubation, which resolved spontaneously. There were no deaths.

Parenteral analgesia was required significantly ($p = 0.02$) more often in the Bassini group, especially on the 1st day after surgery (Table II). There was no significant difference in the number of times enteral analgesic agents were required over the first 2 postoperative days ($p = 0.32$).

After a mean follow-up of

Table I

Number and Type of Inguinal Hernias Treated, According to the Classification of Nyhus, Klein and Rogers⁵

Type of hernia	No. (%) of hernias
II — indirect	71 (42.5)
IIIA — direct	36 (21.6)
IIIB — large, indirect	21 (12.6)
IIIC — femoral	8 (4.8)
IV — recurrent	31 (18.6)

16.8 months (range from 1 to 43 months), three recurrences (1.2%) were noted: one (3.2%) in the type IV (recurrence) group and 2 (2.8%) in the type II (small indirect) hernia group.

The total operative time was significantly ($p < 0.001$) longer in the laparoscopic group than in the Bassini group (Table III). Although it was significantly ($p < 0.001$) reduced during 1994 compared with 1991 and 1992, it was still longer than for the Bassini group ($p < 0.001$). The operative time for bilateral laparoscopic herniorrhaphies was not statistically longer than for other types of laparoscopic hernia repair except for femoral hernias (type IIIC) ($p < 0.01$) (Table IV).

Increased operative cost is due to the following supplemental instrumentation needed for the laparoscopic procedure: for type II and IIIC (femoral) hernias, one disposable trocar (\$70.00) and four 0-Prolene sutures (\$4.30 each); for type IIIA (direct), IIIB (large indirect) and IV (recurrent) hernias, one disposable trocar, one Prolene mesh (\$51.00), one stapling instrument (\$265.00) and four 0-Prolene sutures. The total intraoperative costs in this series were as follows: laparoscopy for types II and IIIC hernias, \$6888 (79 hernias); laparoscopy for types IIIA, IIIB and IV hernias, \$35 481 (88 hernias); for a Bassini repair \$1720 (50 hernias).

DISCUSSION

Decreased postoperative pain allegedly afforded by the laparoscopic approach has been instrumental in the development of this new treatment modality.³ Our series shows that patients treated laparoscopically required significantly less parenteral analgesia injections in the first 2 postoperative days than those who underwent a Bassini repair. This finding is corroborated by a recent random-

ized study,⁴ which showed that patient comfort levels were relatively similar. However, in that series, the group of patients operated on by a standard procedure required more analgesia to attain a level of comfort similar to that of the laparoscopic group. In our series, even though the finding was significant ($p = 0.02$), the small amount of parenteral analgesia required in both groups does not appear to justify use of laparoscopic surgery in order to decrease pain. Most of our patients are

presently treated on an outpatient basis. It has recently been shown⁴ that return to work does not occur sooner in the laparoscopic group.

Operative time is an important issue. It has been reported that the laparoscopic procedure does not take longer to perform than the open operation.^{8,9} However, in these reports, operative time was calculated from the time of skin incision to the time of skin closure. An appreciable amount of time is required to prepare the la-

Table II

Mean (and Standard Deviation) Postoperative Analgesia Requirements for Patients Who Underwent Inguinal Herniorrhaphy

Type of analgesia	Analgesic requirements*	
	Bassini repair, n = 50	Laparoscopic repair, n = 158
Parenteral	2.58 (1.8)	1.86 (1.3)†
Enteral	1.78 (1.2)	1.98 (1.2)‡

*No. of times a patient required analgesia

† $p = 0.02$

‡ $p = 0.32$

Table III

Mean (SD) Total Operative Time by Year

Procedure	Hernias, no.	Year	Time, min
Bassini repair	50	1994	92.1 (30.9)*
Laparoscopic repair	56	1994	138.1 (36.1)
Laparoscopic repair	17	1991	239.1 (57.3)†
Laparoscopic repair	35	1992	190.8 (48.4)†

* $p < 0.001$

† $p < 0.001$

Table IV

Mean (SD) Total Operative Time for Patients Who Underwent Laparoscopic Repair, According to Type of Hernia

Hernia type	Hernias, no.	Time, min
IIIC	8	128.1 (37.2)*†
II	71	159.0 (51.9)
IIIA, IIIB, IV	88	168.4 (53.5)†
Bilateral	8	180.0 (33.5)*

* $p = 0.01$

† $p = 0.04$

paroscopic equipment, induce general anesthesia, allow for extubation and introduce a bladder catheter. These extra steps increase total operative time compared with patients who undergo an open procedure. Although insertion of some sutures, in addition to staples, to hold the mesh demands extra time in our laparoscopic procedure, this variation in technique does not solely account for the increased operative time. Even if total operative time was significantly reduced between 1991 to 1992 and 1994 because of improved surgical skills and more rapid preparation of the patient and instrumentation in the operating room, there is still a significant ($p < 0.001$) difference in favour of the Bassini repair. We find that bilateral hernias are more quickly and easily treated by a totally preperitoneal procedure than by a transabdominal approach. The time required for repair of bilateral hernias (Table IV) applies mostly to the transabdominal repairs.

The increased cost of the laparoscopic procedure may not be justified by any of the originally proclaimed advantages of the technique. Whether the reduced trauma to the inguinal region associated with laparoscopic repair will have an impact on the recurrence rate remains to be seen. One of our recurrences occurred in a patient who was being operated on for a third recurrence. The two other patients who had recurrence had type II hernias. One of them required reoperation. Closure of the previous indirect hernia was found adequate, but a di-

rect hernia was noted. Misjudgement as to the strength of the posterior wall was the cause of the recurrence in this 62-year-old man. Halverson, McVay and Yankton⁶ reported eight similar cases in their series. At the time of writing our second patient had not yet undergone reoperation and the cause of his recurrence is unknown.

Subgroups of patients can definitely benefit from laparoscopic repair: bilateral hernias can be repaired with only three trocar sites in one session; recurrent hernias from a preceding open approach can be repaired through tissue planes that have not been violated; femoral hernias are ideally treated by a preperitoneal approach;⁵ type IIIC hernias are more easily treated by laparoscopy than other types of groin hernias (Table IV).

In summary, our study suggests that the laparoscopic treatment of groin hernias is safe, is associated with a low recurrence rate and should be tailored according to the individual patient. Primary unilateral inguinal hernias could be adequately treated at a lesser cost by an open approach. Bilateral, recurrent and femoral hernias could benefit from a laparoscopic totally extraperitoneal approach.

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