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A case controlled study of laparoscopic incisional hernia repair

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Abstract

Background: Although the feasibility of laparoscopic incisional herniorrhaphy has been demonstrated, its advantages over the open technique are still unproven.

Methods: Fourteen consecutive laparoscopic incisional hernia repairs were compared with 14 matched controls of the open repair done by the same surgeon at the same institution. The controls were selected by a medical record technician not connected with the study. The cases were selected to match diagnoses, ASA status, and body weight as closely as possible. The outcome data for operating time, blood loss, hospitalization, resumption of oral intake, and postoperative complications were analyzed for statistically significant differences.

Results: There was no statistical difference between the two groups in the parameters of blood loss, hospital days, or days to oral intake. The laparoscopic operation took 40% longer. Similar complications were seen in both groups. No mortality or early recurrences occurred in either group.

Conclusion: Laparoscopic incisional hernia repair of at least moderate complexity had no demonstrable advantage over the open repair in the present study.

Key words: Laparoscopy — Incisional hernia repair — Case-controlled study — Herniorrhapy

The laparoscopic approach to incisional hernia repair was first reported in 1992 [1], and subsequent work [2, 3] has confirmed its feasibility. Evaluation of its true efficacy, as for all new operations, should be done by rigorous comparison to the established technique in the form of large randomized controlled trials. However, a case-controlled study, which can be readily accomplished in a community hospital and duplicated in many centers, can provide useful interim information before the results of randomized controlled trials become available.

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Table 1. Patient risk factors

	Open	Laparoscopic
ASA status	2.5 ± 0.5	2.43 ± 0.8
Body mass index	29.6 ± 5	31.6 ± 8
Obesity (BMI ≥30)	9	7
Age (>70 yr)	9	6
COPD	3	3
Diabetes mellitus	1	1
CAD	4	3
Hypertension	5	6

ASA, American Society of Anesthesiologists; COPD, chronic obstructive pulmonary disease; CAD, coronary artery disease

Materials and methods

We reviewed 14 consecutive laparoscopic incisional hernia repairs performed by one surgeon (M.S.E.) at a community hospital between January 1996 and March 1997, and compared the outcome measures with 14 open repairs using the case-controlled method. In this procedure, a medical record technician not connected to the study was instructed to select 14 open repairs from a pool of 20, which was the total number of open repairs performed by the same surgeon during the same time period. The instruction was to match as closely as possible the prinicpal diagnosis, ASA status, and weight of the patient (expressed as body mass index [BMI]), without regard to the outcome. The data for both groups are summarized in Table 1.

From both the laparoscopic repairs and the matched controls, the following outcome data were abstracted: operating time (min), estimated blood loss (EBL) (ml), hospitalization (days), short term recurrences at 6–24 months of follow-up, and major complications necessitating prolonged hospital stay or readmission. Since recurrence was looked for by physical examination at follow-up, the data were abstracted from the office records.

Statistical analysis consisted of analysis of variance followed by null hypothesis testing. Where the data were normally distributed, the *t*-test was used; otherwise the Mann-Whitney rank sum method modified for small samples was used. All computation was done on the computer, using the statistical program SigmaStat (Jandel Scientific, Carlsbad, CA).

The surgical techniques have been described in the literature [1–7]. The open repairs were performed under general anesthetic. A large piece of polypropylene mesh, with 3–4 cm margin of overlap for the defect, was placed underneath the fascia and anchored by appropriate suturing. The

Table 2. Outcome measures of the two operations

	OR time (min)	EBL (ml)	Hosp (days)	Mesh (sq cm)	Days to PO
Laparoscopic	124 ± 64[a]	68 ± 42	5 (1–33)	495 ± 343[b]	1 (1–22)
Open	78 ± 41[a]	168 ± 145	5.5 (2–30)	97 ± 69[b]	2.5 (1–22)

OR, operating room; EBL, estimated blood loss; Hosp, hospitalization time; PO, oral intake
[a] $p = 0.0039$
[b] $p = 0.0030$, Mann-Whitney rank sum test

mesh was routinely sequestered from the bowel with omentum if the peritoneum could not be closed. Drains were used selectively.

The laparoscopic repair was also performed under general anesthetic. Pneumoperitoneum was induced via Veress needle puncture. Four to six ports were placed as far laterally as possible from the defect. Angled (30° and 45°) laparoscopes were used routinely. Intraabdominal lysis of adhesions was done as needed. No attempt was made to resect the hernia sac. After reduction of the hernial contents and identification of the hernial defect, an ePTFE (Dualmesh; W. L. Gore, Flagstaff, AZ) sized for a 4-cm overlap of the defect was inserted through a 10- or 12-mm port and secured to the anterior abdominal wall using titanium screws (Origin, Menlo Park, CA, USA). Three concentric circles of screws, placed ~3–4 cm apart, were placed. Anchoring sutures, now routine in many techniques, were not used in those early cases. No drains were used.

Results

Table 2 lists the outcome measures compared. The operating time was 40% longer for the laparoscopic operation ($p = 0.0387$). Neither operative blood loss nor hospitalization time were significantly different. The mesh size was larger for the laparoscopic operation—not so much a reflection of the size of the hernia as a reflection of differences in technique. There was no difference in the time to resumption of oral intake following both procedure.

Major complications occurred in both groups. In the open group, one patient had an enterotomy, which was repaired without sequelae; another patient had a prolonged ileus with atelectasis and pneumonitis, requiring ventilatory management.

In the laparoscopic group, two patients had enterotomies. One of these patients ultimately required mesh removal due to infection, and another had a prolonged postoperative course with respiratory failure and sepsis. No deaths occurred in either group.

Discussion

To adequately repair any incisional hernia, certain basic principles have long been recognized [1]. The defect must be completely defined, the adhesions must be separated, and the repair must be done without tension. If a prosthetic patch is to be used, it should be placed beneath the plane of the fascial defect [1, 7], and the size of the patch should be larger than the hernial orifice.

Experience with the laparoscopic repair has shown that the anatomic defect of the incisional hernia can be visualized readily from inside the abdomen, and the adhesions are often—but not always—few and easy to divide. With appropriate instrumentation, a large patch can be secured onto the abdominal wall for a tension-free repair. It would appear therefore that a laparoscopic repair would simplify the operation and result in a shorter recovery. Our results, controlled by unbiased case matching, shows that this is not the case. We did not, however, look at other outcome measures such as total and itemized cost or time off work.

We have identified two factors that may contribute to this unexpected conclusion. The first problem is an inadequate sample size, which, as in many surgical trials, is often a major reason for detecting no difference when a true difference exists (the beta error). Our series, which consisted of operations performed in a community hospital, clearly suffers from this disadvantage. Thus, sampling error may explain the negative results. A larger comparison study [4], using retrospective controls and combining 56 patients from two centers, arrived at a totally different conclusion.

The second factor is the lack of patient selection. Comparing the two operations in a consecutive series without selection may yield heterogeneous results influenced by chance. When all patients are considered for the laparoscopic operation, the hazards of the technique, particularly in dissection of complex adhesions, can lead to major complications. It only takes one of two major complications to wipe out the potential benefits for the entire series. This explanation is consistent with the results reported by Holzman et al. [2], who found a 25% incidence of prolonged hospitalization in their series of 21 laparoscopic incisional hernia repairs.

Based on the observations in this study, we believe that, just as in all laparoscopic operations, there are circumstances that favor the laparoscopic approach over the open, and vice versa. Therefore, patient selection is critical for good results.

Since complex adhesions were the main cause of nonoptical results in this series, we recommend that the laparoscopic approach be abandoned and the procedure converted to an open operation as soon as this problem is discovered on initial examination. Additionally, based on this experience, we conclude that mesh placement in a patient with enterotomy is ill-advised. Patients who developed incisional hernias after an uncomplicated abdominal operation, or who had no history of peritonitis, usually had few adhesions and were thus good candidates for the laparoscopic technique. By the same token, patients who have small defects and are not obese should be repaired with the open method since this method will result in as fast a recovery as the laparoscopic operation, without the added expenses associated with the high-tech procedure.

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