Laparoscopic herniorrhaphy after manual reduction of incarcerated inguinal hernia

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Abstract

Background: After a manual reduction (MR) of an incarcerated inguinal hernia (IIH), it is recommended that an open herniotomy (OH) be performed after a one-day delay because of the postincarceration tissue edema. We assumed that performing laparoscopic herniorrhaphy (LH) shortly after MR reduces the hospital stay for IIH. We compared LH with OH rectrospectively. We expected equal results but a shorter hospital stay with LH.

Methods: From May 2002 to April 2006, 40 successive patients with IIH were admitted. OH was scheduled two days after MR, whereas no delay for performing LH was required. Patients in whom MR failed and who required immediate surgery ($n = 4$) and patients whose medical condition prevented surgery within the schedule ($n = 3$) were excluded from the study. Follow-up consisted of an outpatient visit and telephone survey.

Results: Thirty-three patients (31 male, 15 OH, 18 LH) were included. For the LH patients, the median age was 15 (0.7–81) months and that for OH patients was 8.6 (0.6–61) months. For LH patients, weight = 11.5 (3.6–22) kg and for OH patients, weight = 9.8 (3.5–17) kg ($p = $ NS). Median delay from MR to OH was 2 (2–4) days, and from MR to LH median delay was 1 (0–3) day ($p < 0.05$). Length of the operation was 29 (10–80) min in OH and 39 (20–60) min in LH ($p = $ NS). Total theatre time was 44 (17–111) min in OH and 66 (44–86) min in LH ($p < 0.05$), and hospital time was 3 (3–6) days in OH and 2 (1–4) days in LH ($p < 0.05$). Median cost (surgery + hospitalization) of OH was €2315 (1910–3530) and that of LH was €3215 (2605–3650) ($p < 0.05$). Median follow-up was 26 (4–49) months, one patient (LH) had re-LH for recurrent hernia.

Conclusion: After MR, LH can be performed with minimal delay and similar results as OH. Despite increased theatre time and total hospital costs, LH shortened hospital stay.

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The preferred treatment for an incarcerated inguinal hernia is manual reduction (MR) followed by stabilization and observation of the patient because of the risk of bowel gangrene. Elective surgery may be performed 24–48 h after MR when edema and swelling of the hernia sac and the associated structures have subsided [1, 2]. In recent years the laparoscopic inguinal hernia operation has been performed on children [3, 4]. We hypothesized that laparoscopic herniorrhaphy (LH) can be performed in a stable patient with shorter delay because the tissue at the inner orifice is not edematous and is amenable to suture closure. In addition, we could avoid the separation of a friable and edematous hernia sac from the vas deferens and the spermatic vessels by performing a laparoscopic instead of an open operation. During a laparoscopic procedure, it is also possible to check the condition of the bowel, ovary and the contralateral inguinal orifice. In a retrospective study, we compared LH with open herniotomy (OH). We expected equal results but fewer days in the hospital after LH.

Materials and methods

During the period from May 2002 through May 2006, 40 patients were admitted in our institution because of an incarcerated inguinal hernia. The criteria for incarceration included positive history, diagnosis, and MR without general anesthesia by a consultant pediatric surgeon or a senior registrar. After MR the patient was stabilized, and LH was scheduled as soon as practicable, whereas OH was scheduled on the second day after MR. Four patients whose hernia could not be reduced without surgery under general anesthesia and three patients whose acute respiratory infection caused postponement of surgery for at least one week were excluded.

All operations were performed under general anesthesia and intubation. LH was performed by using three 5-mm trocars, one through the umbilicus for the video camera and insufflation, and one

Table 1. Clinical data of 33 patients who underwent laparoscopic or open surgery after manual reduction (MR) of an incarcerated inguinal hernia

	Laparoscopic herniorraphy	Open herniotomy	p
Number of patients	18	15	
Gender (Male:Female)	17:1	14:1	NS
Side (Right:Left)	16:2	12:3	NS
Age (months)[a]	15.1 (1.0–81.1)	9.1 (1–61.1)	NS
Weight (kg)[a]	11.5 (3.6–22)	9.8 (3.5–17)	NS
Delay from MR (days)[a]	1 (0–3)	2 (2–4)	
Operative time (min)[a]	39 (20–48)	29(10–80)	< 0.05
Theatre time (min)[a]	66 (44–86)	44 (17–111)	< 0.05
Hospital stay (days)[a]	2 (1–4)	4 (3–6)	< 0.05
Hospital cost (euros)[a]	3215 (2.820–3.650)	2315 (21.990–3.530)	< 0.05

[a] Values given are median (range)

each through the left and right upper quadrants of the abdomen. The open inner orifice of the inguinal canal was closed with one or two purse-string stitches with nonabsorbable thread. Every stitch contained both peritoneum and the underlying tissue. The trocar sites were closed in layers with absorbable thread. Open herniotomy was performed according to standard methods described in textbooks on pediatric surgery [1, 2]. Each operation was performed by one of five consultant pediatric surgeons. Three of the five surgeons performed both laparoscopic and open procedures.

We compared operative time, theatre time (the time the patient was in the theatre), hospital time in full days (date of discharge minus admission date), and results between LH and OH. We also compared the estimated costs, which were based on the rates of our hospital, for laparoscopic and open treatments of the incarcerated inguinal hernia. The delay between MR and the operation (date of operation minus date of MR) was recorded in both types of surgery.

At the outpatient visit two months after the surgery, the testes were examined manually and if atrophy or other complications were suspected, an ultrasound scan and further follow-up were performed. The patients were told to contact the hospital if any suspicion of complications arose.

For statistical analysis the StatView computer program (StatView 512 Software, Brain power, Calabasas, CA, USA; was used. Fisher's exact test was used to compare nominal frequencies, whereas numerical means were compared by using nonparametric Mann-Whitney U Test. A p value less than 0.05 was considered significant.

Results

Thirty-three patients were included in the study. The clinical data of the patients is presented in Table 1. Five of the 18 (28%) LH patients underwent surgery on the same day that MR was performed. In accordance with our initial plan, the actual time between MR and the operation became shorter, with a median of 1 (range = 0–3) day in LH and 2 (2–4) days in OH ($p < 0.05$).

None of the LHs was converted. The contralateral orifice of the inguinal canal was found to have closed spontaneously in all 18 patients who underwent LH. Although the tissue at the inner orifice was found to be somewhat edematous, suture closure of the orifice was possible in all 18 patients who underwent LH. Gangrenous bowel was not seen in any of the patients.

Twenty-four patients, 15 LH and 9 OH, came to the outpatient visit. No relapsed hernias, testicular atrophy, hydrocele, or other kind of complications were found. In addition to outpatient follow-up, a telephone survey was performed by a nurse consultant who did not participate in the initial treatment; 32 of our 33 patients were reached. No surgical complications, recurrent hernia,

testis atrophy, or port hernias were reported in the telephone survey. For the 32 patients followed clinically or by telephone, the median follow-up was 26 (4–49) months.

One (6%) of 18 patients who underwent LH, the first in the series, had recurrent hernia and redo-LH 15 months after the first operation. At the redo-LH we found that the rhaphy had failed at the medial wall. A new closure with two nonabsorbable sutures was performed, and after 12 months no new relapse was seen.

Discussion

The feasibility of laparoscopic operations for elective, complicated inguinal hernias has been shown by Schier et al. [3]in their a large descriptive series. The open operation has, however, remained the standard treatment for an elective and uncomplicated inguinal hernia as well as for an incarcerated inguinal hernia [1, 2]. While we agree that the open operation is the mainstay of treatment for inguinal hernia in children, we think that laparoscopy may be useful in special situations including an incarcerated inguinal hernia.

In the present study we attempted to shorten the time required for the treatment of a reduced incarcerated inguinal hernia by the use of a laparoscopic operation. A recent study described laparoscopy-assisted reduction of incarcerated inguinal hernia [5]. Some authors prefer the reduction of incarcerated or irreducible inguinal hernia under laparoscopic control [1], whereas others have recommended laparoscopy with inguinal hernia repair to check whether the contralateral inguinal orifice is open or closed [6]. Our practice has been to perform MR without general anesthesia and, if not successful, proceed with open herniotomy, because at nighttime laparoscopic expertise is not always available until next day. Our experience in the use of laparoscopy for irreducible hernias is limited to one case only, in which a gangrenous incarcerated bowel could not be disentangled with combined laparoscopic and external manipulation and an open operation was needed.

In the present study we found that laparoscopic inguinal herniorrhaphy could be performed after a short observation period on the same day that MR was performed. Tissue edema at the inner orifice was minimal and suture closure of the orifice was always possible. A

potential advantage of LH is the fact that no friable tissues, testicular blood vessels, and vas are manipulated during surgery. Our follow-up disclosed no cases of testicular atrophy. It is well known that incarceration of an inguinal hernia may cause testicular ischemia and atrophy [1, 2]. However, it is not known whether peritoneal sutures near the testicular vessels, as used in LH, are deleterious to a testis which at the time of the recent incarceration have been ischemic. To detect testicular atrophy, follow-up longer than six months may be necessary.

The duration of the surgery itself was not statistically significantly longer in LH than in OH. The total theatre time required for LH was, however, two times longer than for OH. For LH, the time required to assemble all the necessary equipment and preparation of the patients for surgery depends on the familiarity of the operative team and the anesthetist with laparoscopic operations. Because theatre time is expensive, the longer theatre time of LH is a disadvantage. By using LH we were able to save one hospital day, but the high cost (theatre cost of LH is twice that of OH) and the long theatre time required more than offset the savings from a shorter hospitalization. One might also argue that after MR and observation in the hospital, hospital days may be saved by sending selected patients home to wait for scheduled surgery. We were not able to assess how much the parents of a child who underwent LH benefited from the shorter hospitalization. The benefits, e.g., shorter absence from work (because of a sick child) and shorter time for altered family routines, may be of some significance.

Open herniotomy for a reduced incarcerated inguinal hernia may be demanding and require an experienced surgeon. However, LH requires the availability of an experienced surgeon who is also a skilled laparoscopist. If the theatre logistics do not allow the performance of LH on the day of MR or on the day after MR, the potential advantage of a shorter hospital stay is lost. However, because the tissue edema of the hernia sac of a tightly incarcerated inguinal hernia may last longer than two days after MR, we think that LH is beneficial even if several days have lapsed after MR.

Although our series contained no premature babies with incarcerated inguinal hernia, it is doubtful whether we could have used the laparoscopic approach in them. The small size of the baby and the anesthesiologic considerations (bronchopulmonary dysplasia, hypothermia) favor open herniotomy in babies who are premature or of small size.

The present study was not controlled and randomized. In addition, the quality of the follow-up was inadequate. Although 32 of 33 (97%) patients were reached in the telephone survey, only 72% of the patients were seen in an outpatient check-up.

Because one of our patients had a recurrent hernia that manifested 15 months after surgery, we consider that our median follow-up of 26 months is of adequate length. In patients who undergo surgery for a recently incarcerated inguinal hernia, a recurrence is more likely than in those electively operated on for an noncomplicated inguinal hernia [7]. Because the patient with the recurrent hernia was one of those operated on at the beginning of our series, i.e., early in our learning curve of LH, we are not yet alarmed at our 6% frequency of recurrent hernias. If more patients with a relapsed hernia appear, the technique of LH may need to be changed. Instead of a simple rhaphy, cutting a flap of lateral peritoneal wall over the inner inguinal orifice may be used [8].

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