

# Characteristics of laparoscopic inguinal hernia recurrences

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## Abstract

**Purpose** This is so far the largest series of recurrences after laparoscopic inguinal hernia repair.

**Methods** Video documents of 1,071 laparoscopic inguinal hernia repairs were retrospectively studied with respect to the affected side, anatomical appearance, gender, history and time interval between operation and recurrence. Only indirect, clinically manifest hernias were included.

**Results** Recurrences occurred in 32 children (3%), 26 boys and 6 girls, aged 62 days to 14 years (median 3). The right side was affected in 21 children, the left in 10 and a bilateral recurrence was noted in 1 child. A total of 25 recurrences occurred medially to the previous suture and 7 laterally. The knot became loose in three cases. An experienced surgeon had only half the recurrences of a less experienced surgeon. The median time interval between surgery and recurrence was 3.8 months. Children up to the age of 2 years had the highest risk of recurrence. The right/left incidence of recurrences roughly was in proportion to the statistical incidence of hernias.

**Conclusions** Boys had more recurrences than girls. Most recurrences occur medially. The more experienced the surgeon was, the fewer recurrences he had. The stitches at the medial aspect of the hernia, close to the vas, seem to be the most crucial ones.

**Keywords** Laparoscopic inguinal hernia repair · Groin hernia repair · Laparoscopic herniorrhaphy · Laparoscopic herniotomy

## Introduction

Laparoscopic inguinal hernia repair in children has been increasingly reported. A main concern is the increased recurrence rate after laparoscopy (3%). There is now sufficient experience with the technique to address the recurrences.

Technical modifications and new techniques of laparoscopic inguinal hernia repair have repeatedly been presented, implying that they may obviate recurrences eventually [1–3]. However, recurrences still occur. This study analyses the picture in a series of 32 recurrences. The intent is to better define the problem.

## Materials and methods

In two pediatric surgical departments (University Medical Centers Mainz and Jena, Germany) between 1997 and 2008, 1,071 laparoscopic inguinal hernia repairs were performed in 929 children. There were 697 boys and 232 girls. The age range was from 7 days to 14 years (median 1.8 years).

Only indirect hernias were included. Direct and femoral hernias, as well as combinations hereof, were excluded. Hydroceles were also excluded; they were considered as complications and not as recurrences. Since it was the goal of the study to characterize recurrences, only those sides that manifested clinically as inguinal hernias prior to surgery were included. All unexpectedly open internal inguinal rings were excluded, even though they had been sutured. Metachronic hernias were included.

Initially, a 5 mm optic was used at the umbilicus. Later in the series, a 2 mm optic was used. Two 2 mm instruments were introduced at the left and right middle abdomen

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for suturing the internal ring with a nonabsorbable suture in the shape of an “N” and not a purse-string. The technique has been described earlier [3, 4]. The surgeon would stand in a position opposite to the affected side, i.e., for a right-sided hernia he would stand on the patient’s left side and vice versa. In most cases, the internal ring was closed with one single suture. Only if the internal ring was felt to be incompletely closed, a further suture was applied. On the right side, the first stitch was inserted at the lateral aspect of the internal ring. Stitches then proceeded towards the medial aspect, eventually ending close to the vas and the epigastric vessels. On the left side, in contrast, the suturing started at the medial aspect, again close to the vas and the epigastric vessels, and proceeded laterally. Thus, the two sides were not sutured in an absolutely identical fashion. All surgeons had a dominant right hand.

All procedures were video recorded or photo documented and available for reviewing. Retrospectively, all recurrences were studied with respect to the affected side, patients’ gender, history, anatomical appearance and time interval between operation and recurrence.

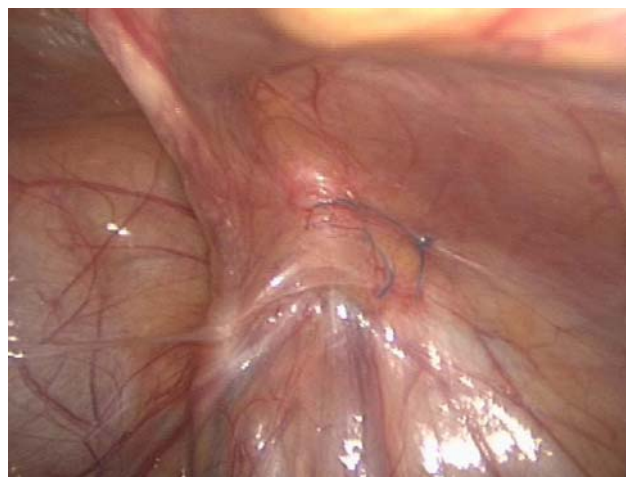
## Results

Recurrences occurred in 32 children: 26 boys and 6 girls, aged 62 days to 14 years (median 3). One boy was affected twice. This represents a recurrence rate of 3%. The right side was affected in 21 children, the left in 10 and a bilateral recurrence was noted in 1 child. The median time interval between surgery and recurrence was 3.8 months (range 1 day to 2.5 years). Children up to the age of 2 years had the highest risk of a recurrence. Children from 0 to 2 years of age (at the time of surgery) had 11 recurrences, from 2 to 4 years had 9, from 4 to 6 years had 7, from 6 to 8 years had 1, from 8 to 10 years had 2, from 10 to 12 years had 1 and from 12 to 14 years had 1 recurrence. A total of 25 recurrences occurred medially to the previous suture and 7 occurred laterally. The knot became loose in three cases.

The most experienced surgeon had a recurrence rate of 1.9% after he had operated 642 hernias. The next surgeon in sequence had, after 206 cases, a recurrence rate of 4.2%. Additional surgeons with fewer cases had more recurrences. Subsequent comparison of techniques and standardization eventually led to an almost uniform recurrence rate.

## Discussion

Following a normal hernia repair, the internal ring is closed and the suture is still visible (Fig. 1).



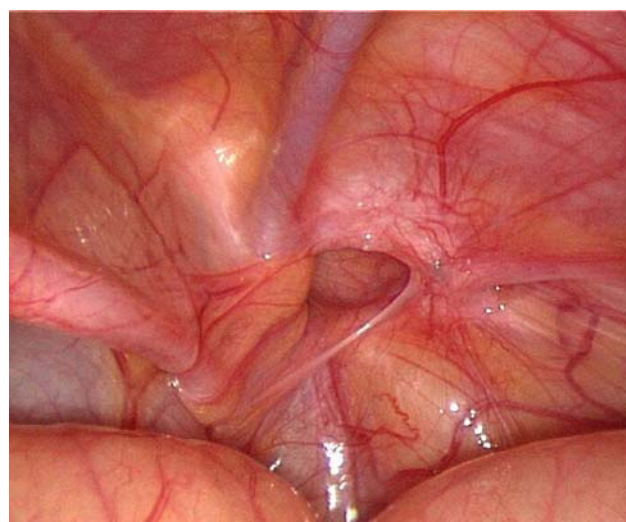
**Fig 1** Normal appearance of repaired inguinal hernia with no recurrence. Sutures are still visible

Recurrences are easy to identify laparoscopically. Most recurrences occur medially to the previous suture (Fig. 2).

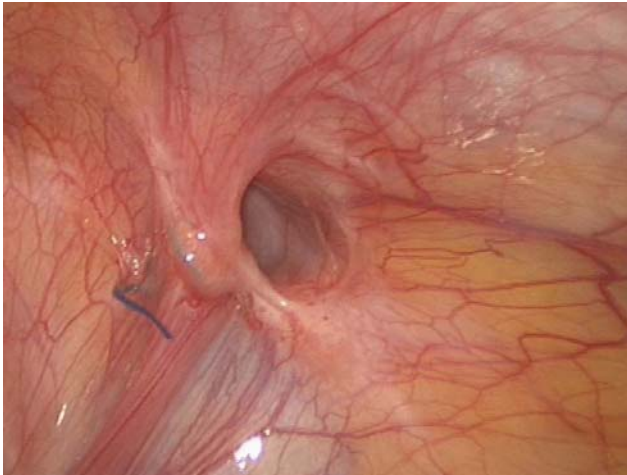
Lateral recurrences are less frequent (Fig. 3).

The reopening may be small, partially open or fully open and, surprisingly, there may be no opening at all! Recurrences are, like hernias, a spectrum [5]. In this study, only such recurrences were included which had clinically manifested as recurrent hernias. Hydroceles were excluded if they only had openings of less than 3 mm, obviously too narrow to allow bowel prolapse. A total of nine hydroceles were excluded.

Also, contralateral openings without previous hernia manifestation were excluded. Although they had been sutured, they were not included because they would have distorted the picture of the efficacy of laparoscopic inguinal



**Fig 2** Recurrence occurring medially to the suture (most frequent finding)



**Fig 3** Recurrence occurring laterally to the previous suture (less frequent)

hernia repair. Contralateral openings are relatively frequent findings [6] and constitute a risk factor in judging any inguinal hernia repair, open or laparoscopic, because they would, if included, yield inaccurately favorable results. The aim of this study was to evaluate the efficacy of suturing in case of a hernia and not in case of an opening.

In the first sequence of the series, the impression had been obtained that recurrences would occur almost exclusively on the right side and predominantly in boys [3]. The present study corrects that preliminary assumption. Now, after more than 1,000 cases, recurrences were noted roughly in accordance with the statistical side distribution of inguinal hernias. The earlier concern that the position or the hand dominance of the surgeon may play a role could not be substantiated. It also seemingly does not matter whether the internal inguinal ring is sutured from lateral to medial or vice versa.

Gender, however, seems to matter. Boys have slightly more recurrences than girls (3.7 versus 2.6%). Quite likely this is caused by keeping too much of a safety distance from the vas with the most medial stitches, out of fear of occluding the vas or injuring the nearby epigastric vessels. It seems that even leaving a small medial gap suffices to invite subsequent widening and hernia recurrence. This could explain why the majority of recurrences occurred medially to the previous suture (Fig. 2). It has been stated quite rightly that these cases may be called more adequately “incomplete closures” rather than “true recurrences”.

The tissue that is medial to the epigastric vessels is rather loose and can easily be pulled over to cover the medial aspect of the internal ring. This was thought to prevent recurrences. It turned out, however, that the tissue was too loose to provide a reliable mechanical shield. In girls, the surgeon will have no concerns in placing stitches medially. Therefore, probably, girls have fewer recurrences.

The conclusion is to suture with special care at the medial part of the internal inguinal ring. This seems to be the weak spot. Although in this series one single suture was used in most cases, retrospectively it appears safer to use a second or even third suture medially if there is any doubt about the mechanical stability of the medial area. The fear of impairing testicular perfusion is unfounded [7]. It has been shown in a further study that careful suturing and knotting techniques reduce the recurrence rate. The authors strived for an airtight and tension-less closure and reported 0% recurrence in the last 200 cases [3].

Intracorporeal suturing, as in the technique presented here, is in principle probably adequate. Non-suturing techniques are conceivable, have been tried and may replace suturing some day. In adult patients, a recurrence rate of 3% would be considered to be acceptable. In fact, simple suturing of the internal inguinal ring has been performed in adult patients, occasionally only with clips or endoloops. Up to 15% recurrences were observed if all types of adult hernias were treated, but only 2–3% if such hernias that required no formal repair were treated [8, 9]. These experiences led to the concern that children older than 13 years of age would have more recurrences after a simple internal suture of the inguinal ring than younger ones. The present study seems to demonstrate in contrary that the very young children are at higher risk of a recurrence than the older ones. In addition, the second author has repeatedly performed simple suturing in adult patients, females and males alike, with inguinal hernias, and, in contrast to expectations, has not observed recurrences. The only variation to the pediatric technique was that multiple sutures were used. In very young children, simple suturing seems not to work as well. The highest recurrence rate was noted at ages 4 years and below. Perhaps the sutured tissue in smaller children is looser, and less mechanically stable than in older children. After all, in the laparoscopic approach, more or less only the peritoneum is sutured, possibly including a bit of underlying tissue of the anterior wall, not representing a truly mechanically stable configuration. Open surgery, in contrast, incises, “exposes” and “dissects” the various overlying anatomical layers. Possibly, this leaves sufficient scar tissue behind to reduce the risk of recurrence. For compensation, it was thought that incising the peritoneum, imitating the open procedure, would reduce the recurrence rate. In fact, incision seems to have the expected effect [10]. However, in a study combining the results of three centers, one not incising and the two others incising, it was found that lateral incision of the peritoneum did not make a difference and the recurrence rate was identical in all three centers [11]. Complete circumferential incision may lead to a reduction of the recurrence rate because of the scarring involved.

It appears that surgeons with more practice have fewer recurrences. Beginners may not dare to place sutures as

closely as required to the vessels medially. In fact, it was found that recurrences of less experienced surgeons virtually always occur medially. The suggestion to tie knots in an airtight and tensionless fashion and place them with care might indeed help [3]. It is interesting that true circumferential ligatures, as they are applied in hernia repair techniques using extracorporeal knotting, yield lower recurrence rates. Possibly, a circumferential suturing technique would help also in the intracorporeal suturing technique.

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