Feasibility, advantages, and the outcome of laparoscopic ring closure for repair of inguinal hernia in children: a preliminary experience

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Background
Laparoscopic hernial repair is increasingly adopted even for neonates and has achieved a high success rate with low recurrence rate with long-term follow-up. The main advantages of laparoscopy are no incision of the fascia, exploriation of the other side in case of bilateral hernia, and visualization and safeguarding of the vas deferens and the spermatic vessels. Moreover, it is advantageous over open technique in case of recurrent hernia. Different modalities of techniques have been used for repair such as needlescopic disconnection of hernia sac, flip flap technique, muscular arch repair, and ring closure.

Aim
The aim of this study was to evaluate the feasibility, advantages, and the outcome of laparoscopic ring closure for repair of the inguinal hernia in children as a preliminary experience in our institution.

Patients and methods
This prospective study included 30 patients with unilateral and bilateral congenital inguinal hernia who were subjected to laparoscopic repair in the age group of 6 weeks up to 4 years. We use ring closure technique.

Results
Thirty children met our inclusion criteria; among them, 26 were boys, in whom indirect inguinal hernia sacs were closed (18 right, five left, three bilateral), and in the four girls, all indirect inguinal hernia sacs were closed. Currently, the median operating time for a unilateral hernia is 23 min (range: 19–40 min) and for bilateral hernias is 28 min (range: 25–55 min). There were no complications. Postoperative hydroceles occurred in three boys. Recurrence encountered in two (6.7%) cases.

Conclusion
The current series shows the feasibility of laparoscopic hernia repair in pediatric patients. Further technical refinement is needed to facilitate its applicability. Even if not used routinely, laparoscopy is a valuable tool for the objective evaluation and management of congenital inguinal hernia in children with advantage of being exploratory and curative with low recurrence and complications rate.

Keywords:
hernia repair, laparoscopy, ring closure

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Introduction

Congenital hernia is a common disease affecting infants and children, surgical correction of this anomaly is one of the most frequently performed pediatric surgical procedure [1].

With refinement of laparoscopic surgery and anesthesia, application of different fine surgical operations in pediatric became possible using these tools [2].

Laparoscopic hernial repair is increasingly adopted even for neonates and has achieved a high success rate with low recurrence rate with long-term follow-up [3].

The main advantages of laparoscopy are no incision of the fascia, exploration of the other side in case of bilateral hernia, and visualization and safeguardin of the vas deferens and the spermatic vessels [4]. Moreover, it is advantageous over open technique in case of recurrent hernia [5]. Different modalities of techniques have been used for repair such as needlescopic disconnection of hernia sac, flip flap technique, muscular arch repair, and ring closure.

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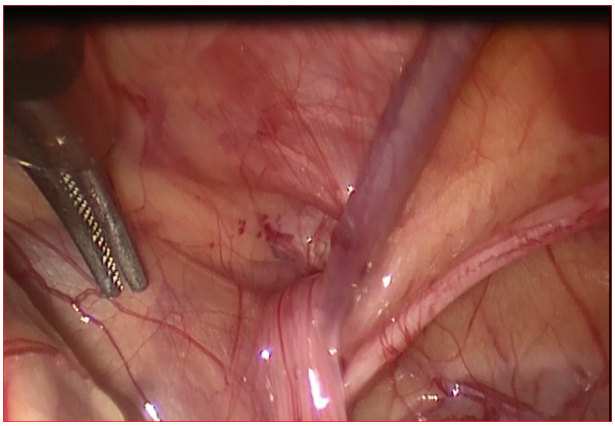
closure for repair of the inguinal hernia in children as a preliminary experience in our institution.

Patients and methods

This prospective study was done in Pediatric Surgery Unit at Sohag University hospital in the period from January 2015 to December 2017. All 30 patients with unilateral and bilateral congenital inguinal hernias were subjected to laparoscopic repair who were in the age group of 6 weeks up to 4 years. We excluded from the study but those associated with major cardiac or chest problem, premature babies with corrected age and more than 60 weeks and weight more than 2 kg are not excluded from the study.

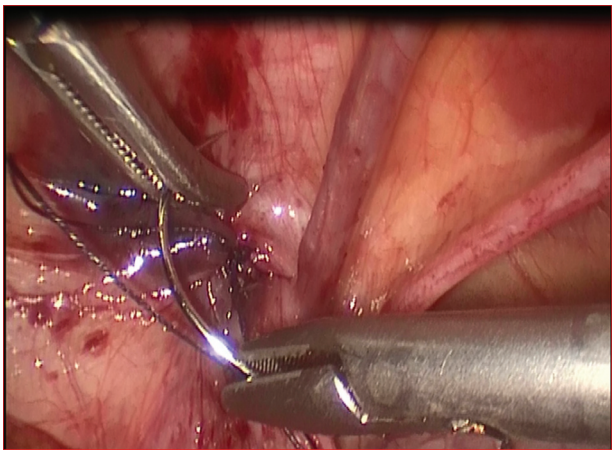
We use ring closure technique as it carries the advantages of less dissection, rapid, and less manipulation of the vas and vessels. A small transverse incision is made above the umbilicus or through the umbilicus if hernia was present. First, a 5-mm port was introduced by open technique. Insufflations were then initiated with carbodioxide gas in a slow rate of 1 l/min with maintained pressure of 10–12 mmHg. A 30° laparoscope (5 mm) was introduced into the abdominal cavity. Exploration for whole abdomen was done including ovaries in females and internal ring on both sides, and then two 3–5 mm ports – according to the age and weight of the patient – with needle drivers and curved Maryland forceps were inserted through the lateral abdominal wall at the level or below the umbilicus (Figs 1–5). The needle was introduced with the right needle driver grasping the suture 1 cm from needle root. The neck of the sac was closed with a 3-0 or 4-0 polyglactin 910 suture as a purse-string and Z-type reinforcement stitch if the purse-string is inadequate for preventing air leak, avoiding both vas and vessels in males. The needle was removed under vision. Only the umbilical fascia was sutured. The skin was closed with

Figure 1



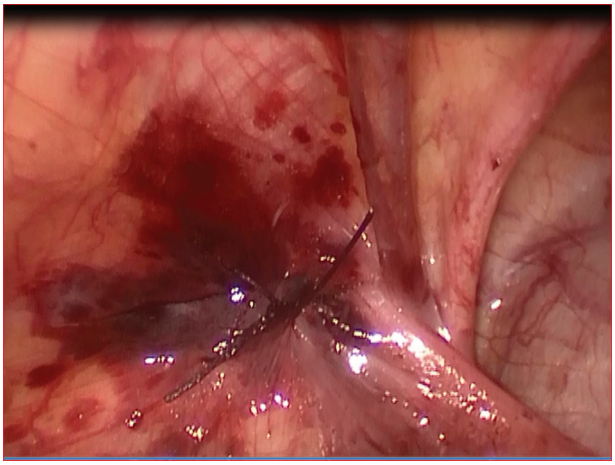
Left-side indirect hernia.

Figure 2



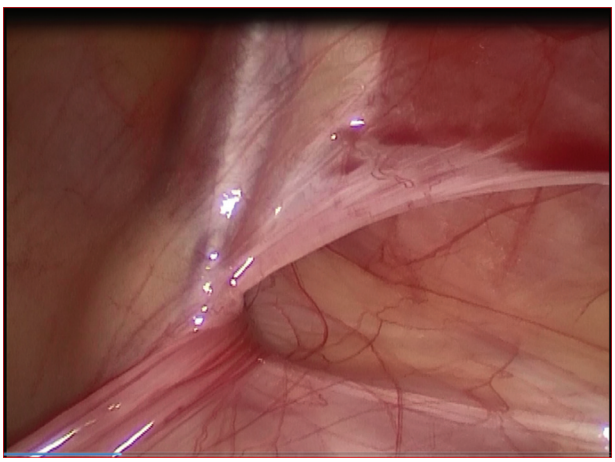
Intracorporeal purse-string suture.

Figure 3



Final view.

Figure 4



Contralateral side.

Figure 5

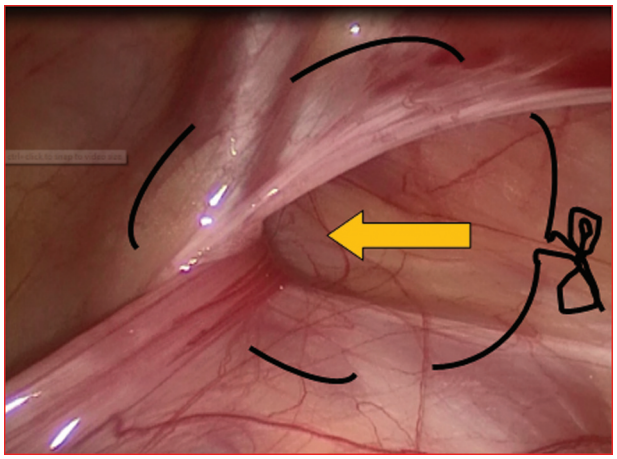


Diagram for suturing technique.

skin adhesive strip. Appropriate informed consent was obtained from parents before the operation. Demographic and technical details are collected, analyzed, and tabulated.

Results

Thirty children met our inclusion criteria. Anthropometric details of all cases are illustrated; among them, 26 were boys, in whom indirect inguinal hernia sacs were closed (18 right, five left, and three bilateral), and in the four girls, all indirect inguinal hernia sacs were closed (three right, one left). Details are depicted in Table 1.

Initially, the operative time was 65 min for the procedure. With experience, the operating time gradually decreased. Currently, the median operating time for a unilateral hernia is 23 min (range: 19–40 min) and for bilateral hernias is 28 min (range: 25–55 min). There were no complications. The asymptomatic, contralateral internal inguinal ring routinely was evaluated for patent processus vaginalis. If an expected contralateral open processus vaginalis was identified, it was closed. This was included in the preoperatively obtained informed consent. Openings smaller than 3 mm (the size of the needle driver shaft) and with length less than 1 cm, therefore unlikely to cause a hernia, were left open. Recurrence encountered in two (6.7%) cases. The follow-up period was up to 3 years.

Postoperative hydroceles occurred in three boys. A subtle change in testicular position and size was noted in one boy. Except for premature babies and those who had history of bronchial asthma and needed postoperative ventolin therapy, all children left the hospital the same day or the day after operation (Table 2).

Table 1 Demographic data

	Male	Female
Sex	26	4
Age (months)		
Mean±SD	12.1±10.56	10.25±2.87
Median	8.5	11.5
Weight (kg)		
Mean±SD	8.96±3.92	9.75±1.59
Median	8.9	10.35
Right	18	3
Left	5	1
Bilateral	3	–

Table 2 Operative time and complications

	Unilateral (min)	Bilateral (min)
Operating time (median)		
Initial (range)	65 (53–97)	92 (85–123)
Later (range)	23 (19–40)	29 (25–55)
Hydrocele	3	–
Recurrence	2	–

Discussion

The principle of open inguinal hernia repair is different from that done in adults because this is a congenital defect owing to failure of processus vaginalis to obliterate, so we incise the external oblique fascia, prepare the cord, divide the patent processus vaginalis, and close what we opened [6].

The conventional surgical repair of congenial hernia is easy, quick with nearly no complications, so it is considered a problem-less operation since long time ago [7]. Postoperative recurrence rate is from 0 to 0.5% for pediatric surgery. It is cosmetically appealing because of short incision (one inch) on a lower abdomen skin crease, which almost disappears with time [8]. Other reported complications are testicular atrophy (2.7%) and iatrogenic testicular malposition (2.1%). However, the report about vas deferens injuries is usually hidden because we operate on babies and children and do not follow them up after they become adults to see the effects [9]. There is increased incidence of childhood hernia repair in infertile men. Moreover, it is proved experimentally that if we squeeze the vas with forceps, it will be permanently damaged [10].

The rationale for laparoscopy is that we go higher than the cord to close the defect without touching the vas or the spermatic vessels [5].

The procedure is straightforward and has fewer steps and less dissection than the open approach [11]. Visual exposure of the anatomy is excellent. Technically, it needs only two needle drivers and a scissor [12].

Initially the experience was obtained by operated on girls only, fearing of harm to the testicular vas in boys. This fear proved unwarranted. Girls now constitute 13.3% of this series.

We feel that the advantage of the technique is best seen in younger children. Therefore, younger children predominate in this series.

The operating time is comparable with that for a conventional open procedure. Excessive times (about an hour) occurred in the beginning because of inadequate experience. With practice, the median operating time for a unilateral hernia decreased to 25 min and, for bilateral hernias, a few minutes more, and this is relatively the average operative time of other studies [11].

On withdrawal of the trocars, only the umbilical port site is closed using 3-0 absorbable suture, whereas the other sites are not sutured but simply approximated with skin adhesive strips, such that the port site on the skin almost disappears, with agreeable cosmetic appearance.

Difficulties in identifying the correct relation of the anatomic structures, as occasionally encountered in open procedures, practically almost never occurs with the laparoscopic approach [12].

Many authors used 4-0 sutures, either absorbable or nonabsorbable [3,13]. However, we use absorbable sutures with low rate of recurrence.

Marte *et al*. [14] found that the incision of the peritoneum lateral to the internal inguinal ring has no advantages over without incision in incidence of recurrences. So in our series we were not concerned about this step.

The recurrence rate in this series (6.7%) is higher than those generally accepted for open repair [14]. This undoubtedly is at least in part caused by a limited number of cases with less experience in this technique, especially in the initial phase. However, recurrences did occur beyond the initial learning curve [15].

A small number of postoperative hydroceles that evidenced that the hernial sac does not necessarily have to be transected or removed during hernia repair [16].

One of the interesting findings of this analysis was that contralateral processus peritoneovaginalis patency was low. Accordingly, routine contralateral 'open' exploration does not seem to be justified [17].

Because of the technical simplicity in reaching both sides with the laparoscopic approach, unilaterality or bilaterality is not an issue [18].

Among the possible disadvantages of this type of hernia repair are the requirement for general endotracheal anesthesia for laparoscopy and learning curve for suturing and intracorporeal knotting, but it can be overcome by more practicing and mastering, with the technique aiming for better outcomes [19].

Conclusion

The current series shows the feasibility of laparoscopic hernia repair in pediatric patients. Further technical refinement is needed to facilitate its applicability. Even if not used routinely, laparoscopy is a valuable tool for the objective evaluation and management of congenital inguinal hernia in children with advantage of being exploratory and curative with low recurrence and complications rate.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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