



Case series

Laparoscopic inguinal hernia repair in bladder exstrophy, a new modified solution to an old problem: A cohort study

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ABSTRACT

Purpose: Open inguinal hernia repair in children with bladder exstrophy is challenging and associated with a high recurrence rate (15%–22%).

We report our initial experience with laparoscopic repair of inguinal hernias in five children with repaired bladder exstrophy. This study is the third describing inguinal hernia repair in bladder exstrophy patients using the laparoscopic approach. In this study, we report a different laparoscopic technique.

Methods: This retrospective study was performed on data regarding laparoscopic inguinal hernia repair collected over one year (July 2019–2020). We carried out the laparoscopic inguinal hernia repair, closing the internal inguinal ring using a non-resorbable sliding knot suture and incorporating the transversalis fascia for reinforcement, followed by purse-string closure of the peritoneum.

Peri- and postoperative outcome parameters, including recurrence rate, were evaluated over a follow-up period of 14 months.

Results: A total of seven male patients from July 2019 to 2020 were admitted to our center with a history of repaired bladder exstrophy and reducible inguinal hernias. Two patients had open inguinal hernia repair due to parental preference and five patients had laparoscopic repair. In the laparoscopic group three patients had bilateral inguinal hernias in one of them a metachronous hernia was discovered intraoperatively, and the remaining two patients had unilateral hernias, one on the right side and the other on the left side. All patients in the laparoscopic group had an uneventful recovery and were discharged within 24 h and there were no complications or recurrences during follow-up.

Conclusion: Laparoscopic inguinal hernia repair is a better alternative to managing inguinal hernias in children with bladder exstrophy.

1. Introduction

The incidence of bladder exstrophy is 2.1 to 3.3 per 100,000 live births, with a male-to-female ratio of 1.5 to 2:1 [1,2]. These patients have a higher (56 to 86%) incidence of inguinal hernia compared to the general population and a 57 to 78% reported rate of bilaterality [3–8], which may be due to congenital weakness of the abdominal wall, defective anti-hernia mechanisms (ex. lack of obliquity of the canal due to pubic diastasis), as well as the high abdominal pressure following bladder closure [3–5]. These hernias are more liable to complications, including incarceration (17% to 29%), recurrence (15% to 17%), and

testicular atrophy (3%) [3,4,6,8].

Upon clinical diagnosis of an inguinal hernia, urgent surgical intervention is recommended due to the risk of incarceration. Both new and old inguinal surgical approaches to treat inguinal hernias failed to improve these outcomes [9,10]. Laparoscopic hernia repair has proven to be of better yield since it is easier to perform, has fewer complications, and has a shorter hospital duration [11–13].

Our study reports our initial experience with laparoscopic inguinal hernia repair in children with bladder exstrophy. Our study is one of the few papers discussing the laparoscopic approach for hernial repair in patients with bladder exstrophy [13,14].

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2. Materials and methods

2.1. Study design

We retrospectively reviewed the data collected about patients with repaired bladder exstrophy presenting with a reducible inguinal hernia that were admitted from July 2019 to 2020 and underwent laparoscopic inguinal hernia repair in the pediatric surgery department at Cairo University, which is a tertiary center.

The study obtained ethical approval from the local ethical committee of our university hospital. We got informed consent from a parent/legal guardian on behalf of the infant. The study has been registered on the research registry website, with the research registry's unique identifying number researchregistry7890.

Preoperatively the patients carried out routine investigations of CBC and blood chemistry, including urea and creatinine. IV prophylactic Antibiotics were given in theaters.

Patients were followed up for 14 months. The outcomes assessed postoperative hospital stay and recurrence.

2.2. Operative technique

All patients were placed under general anesthesia and remained in a Trendelenberg position for the procedure duration. Insertion of the ports with a Hasson technique through the umbilicus, and a capnoperitoneum of 10 mmHg was insufflated (Fig. 1).

The instruments were inserted via two ports made at the right and left flank (1a-d, 2b). The peritoneum was dissected around the ring, followed by narrowing the inguinal ring via approximating the conjoint tendon to the iliopubic tract - the part of fascia transversalis below the internal ring; this step was facilitated by a braided silk or Polypropylene purse-string suture and a sliding knot (movie 1).

The procedure was performed by a consultant pediatric surgeon with experience in pelvic surgery.

This work has been reported following the PROCESS 2020 criteria [15].

3. Results

A total of seven male children with repaired bladder exstrophy presented with reducible inguinal hernias, two patients had open inguinal hernia repair due to parental preference and five patients had laparoscopic repair. In the laparoscopic group three patients had bilateral inguinal hernias one of them discovered intraoperatively (Table 1). All children in the laparoscopic group had an uneventful recovery and were discharged within 24 h. There were no complications or recurrences over the 14-month follow-up period. The two patients who had open repair one patient returned for a contra lateral hernia repair and the second patient had no recurrence over the long term follow up.

4. Discussion

Bladder exstrophy is associated with a very high incidence of inguinal hernia, especially following bladder closure. Previous studies

Table 1

Clinical presentation and intraoperative finding.

Infant	Age at presentation/ months	Clinical presentation	Age at surgery/ months	Intraoperative finding
1	8	Bilateral IH	11	Bilateral open internal ring
2	6	Bilateral IH	10	Bilateral open internal ring
3	8	Left IH	10	Bilateral open internal ring
4	4	Right IH	11	Right open internal ring
5	6	Left IH	12	Left open internal ring

IH, inguinal hernia.

reported inguinal hernia incidences of 56%, 69%, 81.8% and 86% in males and 8, 10.5%, 15%, and 40% in females [1–4].

Connolly et al. reported that clinically most inguinal hernias present before the age of 2 years, while Stringer et al. said that 82% of his series were less than six months old [3,8]. Our patients presented to us between 4 and 8 months (Table 1).

Bladder exstrophy has been associated with higher complication rates. For example, incarceration rates were 9%, 12%, 50%, and 57% in the individual studies, and testicular atrophy was reported in 3% and 10%. Bilaterality (57% to 78%) and recurrence were also more prevalent (8.3%, 10%, 15% to 17%) [3,4,6,8,16]. The recurrence rate was especially high in the neonatal population at 3.5–7.2% [17].

Several alterations to the standard surgical techniques have been proposed to decrease complications. However, the preperitoneal approach described by Fernandes and Gonzales and the modified approach by the Baltimore group failed to improve these outcomes [3,9]. Another study showed a decreased incidence of inguinal hernia with herniotomy at bladder closure. We should note that simple herniotomy is insufficient in bladder exstrophy patients [10], leading to laparoscopic repair.

Generally, laparoscopy has several advantages over the conventional open approach, including good visualization, lesser dissection, fewer complications, comparable recurrence rates, and better cosmetic results (Fig. 2) [18–20]. During long-term follow-up, male fertility was compromised by the open technique, especially if the patient underwent previous groin operations [21]. According to previous studies, the magnified view of the surgical field in laparoscopy allows for clear visualization and reasonable evaluation of the anatomy, which helps to avoid direct injury to the vas and vessels during the dissection and hernia closure, even during recurrent hernia repair [13,22–24].

Due to the increased incidence of incarceration and bilaterality, bilateral inguinal exploration may be recommended at the time of bladder closure. However, 20% of these explorations can be unnecessary [3,4,8, and]. Meanwhile, laparoscopy allows assessing and repairing the contralateral side, decreasing the risk of metachronous hernias and unnecessary procedures as evident with the patient in our series who had open surgery on the other hand in the laparoscopic group a patient had a metachronous hernia which was discovered intraoperatively and

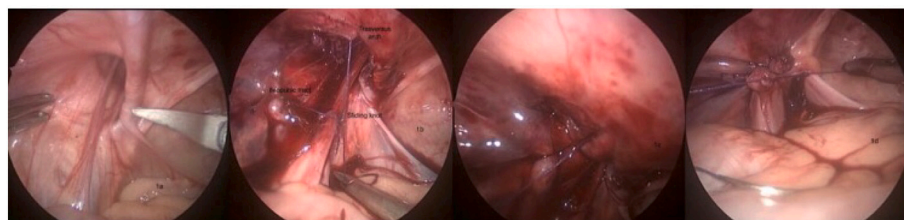


Fig. 1. The peritoneum was dissected around the ring followed by narrowing of the inguinal ring via approximating the conjoint tendon to the iliopubic tract - the part of fascia transversalis below the internal ring. This was facilitated by a braided silk or polyester purse string suture and a sliding knot.



Fig. 2. Pre-operative, immediate post-operative and post-operative appearance.

repaired laparoscopically the laparoscopy possibly causes fewer adhesions and less postoperative pain.

The original open inguinal repair recommended tightening the wide, deep ring to reduce recurrence by placing an interrupted suture between the transversus arch and the iliopubic tract, which would increase the obliquity of the inguinal canal [3]. We reproduced the same steps laparoscopically with good provisional results (2c) in our approach. Another laparoscopic approach described was the hitch stitch to increase the obliquity of the canal using purse-string closure for the defect without disconnection of the peritoneal sac [13]. There have been no signs of recurrence in our patients; however, long-term follow-up for at least five years and bigger sample size are required to draw more robust conclusions. In addition, follow-up into adulthood to check for fertility would be beneficial and is planned for our patients.

As a result of the scarcity of educational surgical videos about this procedure, the challenging nature of this operation due to the congenitally distorted anatomy might reduce the adoption of a laparoscopic approach. A suggestion that might help in the future adoption of this approach would be creating a video registry for complex hernia procedures performed by expert consultants and using those videos to create artificial intelligent interfaces to guide surgeons in training during such operations [25–29].

5. Conclusion

Laparoscopic inguinal hernia repair is a better alternative to managing inguinal hernias in children with bladder exstrophy. Mini-invasive surgery provides superior visualization to open surgery, particularly in the narrow pelvic region [30]. Hence, better anatomical repair and reduced chances of re-operation for metachronous contralateral hernia, better cosmetic appearance postoperative, and fewer abdominal scars.

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Consent

Since patients are minors parental consent has been obtained.

Author contribution

Heba taher operating and drafting the manuscript
 Ahmed fares operated on patients
 Mohamed el barbary conceptualisation of the manuscript
 Aly elBoraie drafting the manuscript
 Sherifa tawfik drafting and following up the patients
 Khaled S. Abdullateef drafting manuscript following up patients

Registration of research studies

This is not a first in man study.

1. Name of the registry: research registry.
2. Unique identifying number or registration ID: researchregistry7890.
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://www.researchregistry.com/browse-the-registry/#home/registrationdetails/62766b85e1e2860020a0dda5/>.

Guarantor

Heba taher.

Declaration of competing interest

There is no conflict of interest.

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