Efficacy of laparoscopically assisted high ligation of patent processus vaginalis in children

H. Ahmed b, M.K. Youssef a, E.A. Salem a, A.M. Fawzi a, E.A.E. Desoky a, A.M. Eliwa a, A.M.N. Sakr a, A.M.S. Shahin a

Summary

Introduction
Laparoscopic hernia repairs have been proven to be efficient and safe in children, despite the slightly higher recurrence rate compared with the classic surgical repair. They have the advantage of easy and precise identification of the type of defect and its correction, both in ipsilateral and contralateral sides.

Objectives
The objectives of this study were to evaluate the efficacy, safety and outcome of the laparoscopically assisted piecemeal high ligation of a patent processus vaginalis (PPV) in children.

Methods
A total of 40 children were enrolled into this prospective study; they were aged ≥6 months and had an inguinal hernia. The peritoneal cavity, including the contralateral side, was inspected for the possibility of bilateral hernias using a 3-mm 30° telescope. Another 3-mm port was introduced through the same infra-umbilical incision. The hernia was manually reduced or with the aid of a working infra-umbilical grasper. A prolene or vicryl 2/0 or 3/0 suture on a curved semicircle round-bodied taper-ended 25–30 mm needle was introduced through a very small inguinal skin-crease incision. It was passed through the abdominal wall layers to the peritoneum and was manipulated by the laparoscopic grasper to pick up the peritoneum in piecemeal all around the internal ring. The needle was then pushed to the outside near to the entrance site, thus forming a semicircle around the internal ring. The suture was then tied and the knot was subcutaneously buried.

The primary outcome of the procedure was the incidence of intraoperative diagnosis and surgical repair of contralateral hernias in pre-operatively diagnosed unilateral cases. The secondary outcomes were defined as the incidence of complications and hernia recurrence.

Results

Discussion
The exploratory laparoscopy found contralateral patent processus vaginalis (CPPV) with a detection rate of 28.1%. Chan et al., Esposito et al., Toufique et al. and Niyogi et al. reported similar figures for laparoscopic contralateral hernia detection rates of 28%, 39%, 39.7% and 29.2%, respectively.

The limitations of this study were the small sample size, plus the risk factors and clinical significance for CPPV.

Conclusion
Laparoscopically assisted piecemeal closure of the internal inguinal ring in children is a safe and effective procedure. It helps in detecting a contralateral hernia without prolonging the operative time.

Table

Patients demographics, operative time and post-operative hospital stay.

<table>
<thead>
<tr>
<th>Table</th>
<th>Age (years)</th>
<th>Side</th>
<th>Laterality</th>
<th>Operative time (minutes)</th>
<th>Hospital stay (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 ± 1.5</td>
<td>Right</td>
<td>Pre-operative</td>
<td>Unilateral</td>
<td>32 (80%)</td>
<td>25 ± 4</td>
</tr>
<tr>
<td>6 ± 1.5</td>
<td>Left</td>
<td>Intra-operative</td>
<td>Unilateral</td>
<td>23 (67.5%)</td>
<td>34.6 ± 3.8</td>
</tr>
<tr>
<td>6 ± 1.5</td>
<td>Bilateral</td>
<td>Unilateral</td>
<td>Bilateral</td>
<td>17 (32.5%)</td>
<td>4.3 ± 1.5</td>
</tr>
</tbody>
</table>

http://dx.doi.org/10.1016/j.jpuro.2015.05.036

1477-5131/© 2015 Journal of Pediatric Urology Company. Published by Elsevier Ltd. All rights reserved.
Introduction

Laparoscopy has been a cornerstone in the diagnosis and management of impalpable testes in children. The increased use of laparoscopic techniques in managing different urologic diseases has provided many benefits for children [1]. The routine method of surgical treatment for patent processus vaginalis in children has been herniotomy through an inguinal incision [2]. The reported recurrence rate for conventional open hernia repair in children is 0.8–3.8% and the postoperative contralateral hernia rates are 5.6–30% [3]. However, the trend has moved towards the application of laparoscopic techniques for pediatric hernia repairs [4].

Laparoscopic hernia repair in children has proven to be efficient and safe, despite the slightly higher recurrence rates compared with the classic surgical repair [5]; it has the advantage of easy and precise identification of the type of defect and its correction, both in ipsilateral and contralateral sides. Modern laparoscopic techniques have made ligation of the internal ring with a single port more feasible [6]. The debate about whether the laparoscopic approach for an indirect inguinal hernia should replace the standard surgical procedure still exists. The present study aimed to evaluate the efficacy, safety, and outcome of the laparoscopically assisted piecemeal high ligation of a patent processus vaginalis in children.

Patient and methods

This prospective study was conducted from October 2009 to March 2011 after approval from the institution ethics research committee. Informed, written patient consent was obtained from all participants. Forty children aged ≥6 months and with an inguinal hernia, irrespective of laterality, were enrolled into the study. All children underwent complete physical examination and pre-operative laboratory investigations. Inclusion criteria were children with an indication for hernia repair and having no contraindication to perform a laparoscopy. Children with coagulopathy and those with complicated hernias or hernias associated with other inguino-scrotal swellings were excluded from the study.

Data were checked, entered and analyzed using SPSS software (SPSS, Chicago, IL, USA, version 20). Quantitative data were expressed as mean ± standard Deviation (SD), while qualitative data were number or ratio.

Operative procedure

All children received general inhalational etidocaine anesthesia with muscle relaxation and were placed in a slight Trendelenburg position during the procedure. A urethral Foley catheter of appropriate size was fixed. Pneumoperitoneum was established with an open technique by introducing a 3-mm reusable trocar through a transverse infra-umbilical incision. The insufflation pressure was adjusted between 8 and 10 mmHg, according to the patient’s age. The peritoneal cavity was inspected using a 3-mm 30° telescope, including the contralateral side for the possibility of bilateral hernias. Another 3-mm port was introduced through the same infra-umbilical incision. The hernia was manually reduced or with the aid of the working infra-umbilical grasper. Under laparoscopic monitoring, a 10-cc local anesthetic (lidocaine 0.5%) and saline mixture in 1:1 ratio were extraperitoneally injected at the site of the internal ring, creating an extraperitoneal space for needle passage without endangering the vas and vessels, and helping in the control of postoperative pain. A prolene or vicryl 2/0 or 3/0 suture on a curved semicircle round-bodied taper-ended 25–30 mm needle was introduced through a very small inguinal skin crease incision using a needle holder. It was passed through the abdominal wall layers to the peritoneum and was manipulated by the laparoscopic grasper to pick up the peritoneum in piecemeal all around the internal ring. The needle was then pushed to the outside near to the entrance site, thus forming a semicircle around the internal ring. The suture was then tied and the knot was subcutaneously buried (Fig. 1 and Fig. 2). All needle movements, starting from insertion to finishing outside of the body cavity, were laparoscopically guided. Prior to the tightening of the purse-string suture, laparoscopic revision of the internal ring structures was conducted to assure that none were included in the suture or injured during needle movement. Skin incisions were closed using vicryl 4/0 subcuticular sutures. Bilateral hernias that had been pre-operatively or intraoperatively diagnosed were simultaneously managed during the same procedure. The operative time was defined as the time starting from port insertion until the end of deflation and closure of the wound.

The primary outcome of the procedure was the incidence of intraoperative diagnosis and surgical repair of contralateral hernia in pre-operatively diagnosed unilateral cases. The secondary outcomes were defined as the incidence of intraoperative and immediate postoperative complications, and incidence of hernia recurrence.

Results

The study included 40 children: 26 males and 14 females with a mean age of 3.4 ± 1.8 years (range 6 months–7 years). A pre-operative inguinal examination detected bilateral hernias in eight children (20%) — five males and three females (Table 1).

Figure 1 Piecemeal closure of the internal inguinal ring.
Source: authors’ own photo.
All children had a smooth procedure with no intraoperative complications and no conversion to open surgery. Nine children (28.1%) with unilateral hernias (six right and three left) were found to have a synchronous contralateral hernia, which was intraoperatively diagnosed. Therefore, a total of 57 hernias were repaired.

The mean operative time was 25±4 (range 13–37) minutes for unilateral cases and 34.6±3.8 (range 23–48) minutes for bilateral cases. No children had immediate postoperative complications, and any mild-to-moderate pain responded to non-steroidal anti-inflammatory drugs. The mean postoperative hospital stay was 4.3±1.5 (range 2–8) hours (Table 2).

The mean follow-up period was 18.5±5.4 (range 12–30) months. One child with a bilateral hernia developed unilateral recurrence 4 months after surgery and was conventionally managed using an open approach. No contralateral or ipsilateral, direct or indirect inguinal hernias developed in the unilateral cases. No cases of testicular atrophy were reported.

Discussion

Laparoscopy is a minimally invasive surgery with rapid postoperative recovery and return to usual daily activities, and with minimal, cosmetically acceptable scars. Children are good candidates to benefit from these advantages [7].

In the present study, an exploratory laparoscopy was conducted for 32 children who were clinically diagnosed as having a unilateral inguinal hernia. Nine of them were found to have a contralateral hernia, with a detection rate of 28.1%. Chan et al. [8], Esposito et al. [9], Toufique et al. [10] and Niyogi et al. [11] reported similar figures for laparoscopic contralateral hernia detection rates of 28%, 39%, 39.7% and 29.2%, respectively.

The laparoscopic exploration of the contralateral inguinal region neither prolonged the operative time nor added complications, so it can be considered to be cost effective and sparing any unnecessary secondary inguinal surgery. This finding is consistent with Guner et al. [12] and Lee et al. [13]. All procedures were safely performed without any intraoperative complications related to anesthesia, peritoneal insufflations or the surgery itself. In the present study, the mean operative time was 25 and 35 min for unilateral and bilateral cases, respectively, which was in line with that reported by Parelkar et al. [14], Esposito et al. [15] and Giseke et al. [16], who reported mean operative times of 23, 27–30 and 26.2 min for unilateral and 29, 12–42 and 34.5 min for bilateral hernia, respectively.

In the present study, the mean postoperative hospital stay was 3.4 h (range 2–8 h). The management of laparoscopic inguinal hernial repair as a day-case coincided with that reported by Parelkar et al. [14] and Giseke et al. [16]. It is proven that laparoscopic hernia repair is a method that can avoid all the possible causes of recurrence in open

Table 1  Children’s characteristics and clinical data.

<table>
<thead>
<tr>
<th></th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number (%)</td>
<td>26 (65%)</td>
<td>14 (35%)</td>
<td>40 (100%)</td>
</tr>
<tr>
<td>Age</td>
<td>Mean ± SD (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age strata</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>3.6 ± 1.5</td>
<td>3.3 ± 2.1</td>
<td>3.4 ± 1.8</td>
</tr>
<tr>
<td>1–3 years</td>
<td>2 (7.7%)</td>
<td>1 (7.2%)</td>
<td>3 (7.5%)</td>
</tr>
<tr>
<td>&gt;3–5 years</td>
<td>11 (42.3%)</td>
<td>7 (50%)</td>
<td>18 (45%)</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>9 (34.6%)</td>
<td>3 (21.4%)</td>
<td>12 (30%)</td>
</tr>
<tr>
<td></td>
<td>4 (15.4%)</td>
<td>3 (21.4%)</td>
<td>7 (17.5%)</td>
</tr>
<tr>
<td>Laterality</td>
<td>Unilateral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bilateral</td>
<td>21 (80.8%)</td>
<td>11 (78.6%)</td>
<td>32 (80%)</td>
</tr>
<tr>
<td>Side</td>
<td>Right</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>18 (58.1%)</td>
<td>10 (58.8%)</td>
<td>28 (48.3%)</td>
</tr>
<tr>
<td></td>
<td>13 (41.9%)</td>
<td>7 (41.2%)</td>
<td>20 (41.7%)</td>
</tr>
</tbody>
</table>
surgery [8]. In the present study, only one child had a recurrent hernia, giving a frequency of 2.5% for children and 1.75% for repaired hernias. The reported recurrence rate goes in hand with that previously reported by Niyogi et al. [11] and Parelkar et al. [14].

To overcome the reported [17] relatively high recurrence rate in children's laparoscopic hernia repair using an intracorporeal suturing technique, the applied procedure was conducted through an extracorporeal approach. The present technique of ligating the internal ring seems to be simpler and does not need any specially designed instruments. This is in comparison with Tam et al. [18] who used the hook method during hernia repair to allow extraperitoneal passage of the suture to close the hernia sac.

Endo et al. [19] described a method that needs a specially designed needle and the stitch around the internal ring is laparoscopically tied, with the possibility that it may loosen. Bharathi et al. [20] assessed the differences in outcome between the three-port technique and the single-port laparoscopically assisted ligation technique, and found that both are safe and efficacious day-case procedures. In the present study, the operative time was comparable to that reported in the literature for the three-port technique and was without difficulty in visualization during the procedure [20].

Rothenberg et al. [6] tried to determine the safety and efficacy of limited-access laparoscopic procedures in children by using a modified single-port technique and found it to be a safe and viable alternative to a standard laparoscopic approach for some procedures in children. The primary advantage was cosmetic scar, however, they stated that visualization and tissue manipulation were more difficult and time consuming. They assumed that the addition of a single 3-mm instrument at a separate site allows for easier dissection and triangulation, with almost no visible scarring. It is worth noting that Rothenberg et al. [6] described their experience using a single port for various operative procedures without focusing on hernia repair. The current study found no need for an additional port, as the vision was clear with satisfactory manipulation.

Conclusion

Laparoscopically assisted, piecemeal closure of the internal inguinal ring in children is a safe and effective day-case procedure, with satisfactory cosmetic appearance. It helps in detecting a contralateral hernia without prolonged operative time.

Conflict of interest

There was no direct or indirect commercial financial incentive associated with publishing this article. No funding agreement limits the ability to complete and publish this research/study. There is full control of the primary data.

Funding

None.

Ethical approval

The institutional ethics committee approved this study.

References
