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Laparoscopic percutaneous inguinal hernia repair in children: Review of technique and comparison with open surgery

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Summary

Introduction
Minimally-invasive approaches for inguinal hernia repair have evolved from conventional laparoscopy requiring placement of three ports and intracorporeal suturing to simple, one and two port extraperitoneal closure techniques. We utilize a single port laparoscopic percutaneous repair (LPHR) technique for selected children requiring operative intervention for inguinal hernia. We suspect that compared to open surgery, LPHR offers shorter operative duration with comparable safety and efficacy. Our objectives are to (1) illustrate this technique and (2) compare operative times and surgical outcomes in patients undergoing LPHR versus traditional open repair.

Methods
We reviewed operative times, complications, and recurrence rates in 38 patients (49 hernias) who underwent LPHR at our institution between January 2010 and September 2013. These data were compared with an age-, gender-, weight-, and laterality-matched cohort undergoing open repair during the same 3 year period. All cases were performed by a pediatric urologist or pediatric surgeon.

Results
Thirty-eight patients with a median age of 21.5 months underwent LPHR, and 38 patients with a median age of 23 months underwent open repair. In both groups, 27/38 patients (71%) had unilateral repairs, and 11/38 patients (29%) had bilateral repairs. For unilateral procedures, average operative duration was 25 min for LPHR and 59 min for OHR ($p < 0.001$). For bilateral procedures, average operative duration was 31 min for LPHR and 79 min for OHR ($p < 0.001$). There were no intraabdominal injuries in either group. In the LPHR group, there were no vascular or cord structure injuries and no conversions to open technique. Median follow-up was 51 days for the LPHR group and 47 days for the OHR group ($p = 0.346$). No hernia recurrence was observed in either group.

Conclusions
In select patients, LPHR is an efficient, safe, and effective minimally invasive alternative to OHR, with reduced operative times but without increased rates of complications or recurrences. The technique has a short learning curve and is a practical alternative to OHR for pediatric urologists who infrequently utilize pure laparoscopic technique.

Table Patient characteristics, operative duration, and follow-up.

Characteristic	Total	LPHR	OHR	*p*
Male, *n* (%)	70 (92%)	34 (90%)	36 (95%)	0.674[a]
Age (months), median (range)	23 (1–103)	21.5 (2–103)	23 (1–92)	0.934[b]
Weight (kg), mean (±SD)	12.8 (±6.7)	13.1 (±6.7)	13.2 (±6.8)	0.981[c]
Laterality, *n* (%)				1.00[a]
Unilateral	54 (71%)	27 (71%)	27 (71%)	
Bilateral	22 (29%)	11 (29%)	11 (29%)	
Operative time, median (range)	43 (13–135)	31 (13–85)	64 (30–135)	<0.001[b]
Unilateral	42 (13–135)	25 (13–85)	59 (30–135)	<0.001[b]
Bilateral	61 (25–102)	31 (25–62)	79 (61–102)	<0.001[b]
Follow-up (days), median (range)	48 (21–146)	51 (37–113)	47 (21–146)	0.346[b]

[a] Fisher's Exact test.
[b] Mann–Whitney *U*.
[c] *t* test.

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Introduction

Inguinal hernia (IH) is the most common surgical condition of childhood, affecting 1—2% of mature infants and up to 30% of premature babies [1], and is frequently encountered in pediatric urologic practice. Treatment requires high ligation of the patent processes vaginalis at the level of the internal inguinal ring—achieved by either conventional open hernia repair (OHR) or laparoscopic hernia repair (LHR) [2]. The incidence of contralateral hernia identified after initial repair is thought to be 5—10%, and as high as 85% for those with initial presentation under 2 months [3].

Current trends are towards laparoscopy and minimally invasive approaches [4—9]. Laparoscopic approaches offer several advantages over OHR, including (1) opportunity to visually inspect the contralateral canal for the presence of an occult hernia without incision, (2) superior visualization to potentially avoid trauma to the vas deferens and spermatic vessels, and (3) opportunity to accomplish a safe high ligation of the hernia sac at the internal ring [5,10—12]. Traditional laparoscopic hernia repair requires placement of three ports for the laparoscope, grasping forceps, and needle holder, respectively, and involves intracorporeal laparoscopic suturing and tying of the defect. These techniques are time-consuming and technically challenging, even in the hands of experienced laparoscopists. Compared with open surgery, traditional three port LHR has been shown to confer longer operative time and increased postoperative pain despite comparable recovery time and outcomes [13]. Furthermore, recurrence rates have exceeded those of open surgery in early reports [10].

More recently, one and two port extraperitoneal closure techniques have been described [8,14—22]. Several variations of the procedure have been described in the pediatric surgery literature (Table 1). These approaches are technically simple, have a relatively short learning curve, and do not require advanced laparoscopic suturing skills [4]. Pediatric surgeons and pediatric urologists at our institution have begun utilizing a single port laparoscopic percutaneous repair (LPHR) for select children requiring surgical intervention for IH. To our knowledge, there has not been an objective comparison of OHR with LPHR, nor have percutaneous techniques been described in the pediatric urology literature.

We suspect that compared with OHR, LPHR will offer shorter operative duration with comparable safety and efficacy. The purposes of this article are to (1) describe a simple new LPHR technique now utilized by pediatric urologists and pediatric surgeons at our institution, and (2) compare operative times and surgical outcomes in patients undergoing LPHR versus OHR.

Methods

Description of LPHR technique

Patients undergoing LPHR are taken to the operating room and placed in supine position. General endotracheal anesthesia is induced. A single 2—3 mm umbilical Step trocar is placed using the Veress technique. A 3.3 mm zero-degree laparoscope is introduced through the port. The abdomen is carefully inspected for any signs of injury resulting from trocar placement. Bilateral inguinal rings are inspected. If a hernia is identified, a 1—2 mm stab incision is made over the ipsilateral internal inguinal ring. A heavy needle driver is used to pass a non-absorbable 2—0 polyester suture on an MH needle through the incision just lateral (or medial) to the inguinal ring under direct laparoscopic vision. The needle is manipulated externally. The tip is used to catch the peritoneum overlying the spermatic cord and cord structures taking great care to avoid injury to the structures below. The suture is brought out through the same skin incision. The suture is tied taking care to ensure that the vas deferens, testicular vessels, and inferior epigastric vessels are neither injured nor included in the closure (Fig. 1, accompanying video). No intracorporeal suturing is necessary. The ipsilateral scrotum is compressed to remove any insufflant and the suture is tied extraperitoneally with laparoscopic confirmation of ring closure. The cord and cord structures remain freely mobile after the repair, confirmed by gentle traction on the ipsilateral testicle. If bilateral hernias are present, the procedure is repeated on the contralateral side. All cases in our series involved teaching and participation of junior and midlevel residents. Non absorbable suture was used in 37/38 (97%) of LPHR cases. Absorbable suture was used in the first case in the series, and then changed because of surgeon preference.

The following is the supplementary data related to this article:

Supplementary video related to this article can be found at http://dx.doi.org/10.1016/j.jpurol.2015.04.008.

Study design

Following IRB approval, we reviewed operative times, complications, and recurrence rates in all 38 patients (representing 49 hernias) who underwent LPHR at our institution between January 2010 and September 2013. These data were compared with an age-, gender-, weight- (within 2 kg), and laterality-matched cohort who underwent OHR during the same 3-year period. All cases were performed by one of three surgeons (two pediatric urologists and one pediatric surgeon) at the same institution. Two of the surgeons performed both LPHR and OHR, while the third surgeon performed OHR only. Children with communicating hydrocele (as suggested by reduction with palpation on examination) were not excluded from the LPHR group. Obese children with a thick low anterior abdominal wall on physical examination were not considered candidates for LPHR and were excluded. Operative time was defined as time from first incision to dressing application. One patient in the OHR group and two patients in the LPHR group did not have operative times documented and were excluded from analysis. Data analysis was performed using SPSS 17.0 (IBM Corporation, Armonk, New York). Comparisons were made using Fisher's Exact test, *t* test, or Mann—Whitney *U* test. All tests were two-tailed, with a p value of <0.05 considered significant.

Results

Seventy-six patients were included, 38 in the LPHR group and 38 in the OHR group. The median age in percutaneous