

Laparoscopic Inguinal Hernia Repair in Children

Palanivelu Chinnaswamy, MCh (GE), Vijaykumar Malladi, MS, Kalpesh V. Jani, DNB, MS, R. Parthasarathi, MBBS, Roshan A. Shetty, MS, Alfie Jose Kavalakat, DNB, MS, Anand Prakash, MS

ABSTRACT

Background: This study aimed to document the authors' experience with laparoscopic inguinal hernia repair in children.

Methods: Ninety-three hernia repairs were performed in 64 children. The neck was closed with a purse string suture by using 4-0 absorbable suture.

Results: Ninety-three indirect inguinal hernial sacs were closed in 64 children. Nine percent of children had an ectopic testis. The mean operating time for laparoscopic ring closure was 25 minutes (range, unilateral 21 to 35; bilateral, 28 to 50). The contralateral processus vaginalis was patent in 20% of children. In 24% of children, the final procedure was modified based on the findings of a dilated internal ring. A laparoscopic ilio-pubic tract repair was done in these cases. Laparoscopic mobilization, orchiopexy followed by ilio-pubic tract repair was done in 9% of children. Scrotal swelling occurred in one child. Hydrocoele occurred in one patient. Recurrence rate was 3.1%.

Conclusion: Laparoscopic inguinal hernia repair in children can be offered, as it is safe, reproducible, and technically easy for experienced laparoscopic surgeons. Ilio-pubic tract repair may be added in cases with dilated internal ring. Recurrence following laparoscopic ring closure can be managed with laparoscopic ilio-pubic tract repair. The long-term follow-up of laparoscopic ilio-pubic tract repair is awaited.

Key Words: Inguinal hernia, Children, Laparoscopic repair.

INTRODUCTION

Pediatric inguinal hernias are due to the persistent processus vaginalis. Conventional inguinal hernia repair in children involves ligation of the hernial sac at the internal inguinal ring. Laparoscopic surgery has been applied in children, and the repair is based on the same principle.¹ Laparoscopic repair has also been applied to direct² and recurrent³ inguinal hernias. This study aimed to document the authors' experience with laparoscopic inguinal hernia repair in children.

METHODS

Patients were admitted in the evening 1 day before surgery and discharged within 24 hours following surgery. Sixty-four children (93 inguinal hernias) underwent laparoscopic inguinal hernia repair. The patients were placed in a supine position. An infraumbilical incision was made. The abdomen was inflated with a Veress needle, establishing and maintaining CO₂ pneumoperitoneum. The intraabdominal pressure was set at 10mm of mercury. A 3-mm scope was then placed at the umbilicus. Findings were noted. Two lateral ports of 3-mm were made through the right and left pararectal region to maintain a triangular orientation.

In cases with small defects, laparoscopic ring closure (LRC) was done with 4-0 absorbable purse-string suture (**Figures 1, 2, and 3**). Sutures were taken directly through the anterior abdominal wall. The spermatic vessels and vas deferens were well visualized and protected during the suture. In early cases and when difficulty was noted, saline was injected to separate the peritoneum from cord structures. The procedure was modified in 24% of children with a dilated internal ring (**Figure 4**). Ligature of the hernial sac at the internal ring is inadequate in such cases. Here, a laparoscopic iliopubic tract repair (LIPTR) was done. Initial steps of port placement remain the same. The peritoneum was incised circumferentially at the neck of the sac. The sac was identified and dissected from the cord structures and then divided (**Figure 5**). In patients with a large hernial sac, the sac was divided longitudinally on the lateral aspect of the cord structures. The opening in the sac was closed with an absorbable endloop. The

Coimbatore, Tamil Nadu, India (all authors).

Address reprint requests to: Vijaykumar Malladi, MS, GEM Hospital, 45-A, Pankaja Mill Road, Ramanathapuram, Coimbatore, Tamil Nadu, India - 641045. Telephone: 91 422 2324100, 01, 02. Fax: 91 422 2320879, E-mail: drmvijay@gmail.com

© 2005 by JSLs, *Journal of the Society of Laparoendoscopic Surgeons*. Published by the Society of Laparoendoscopic Surgeons, Inc.

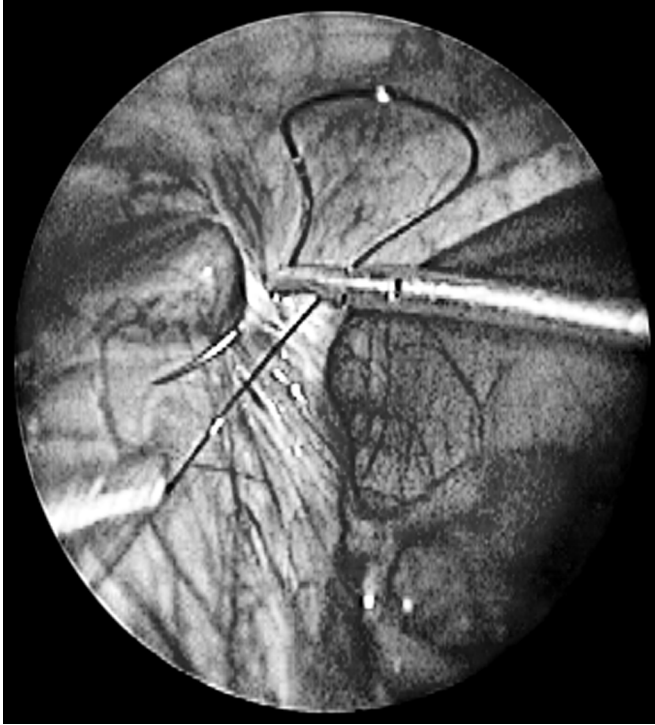


Figure 1. Laparoscopic ring closure: suture starting on the medial aspect of the internal ring.

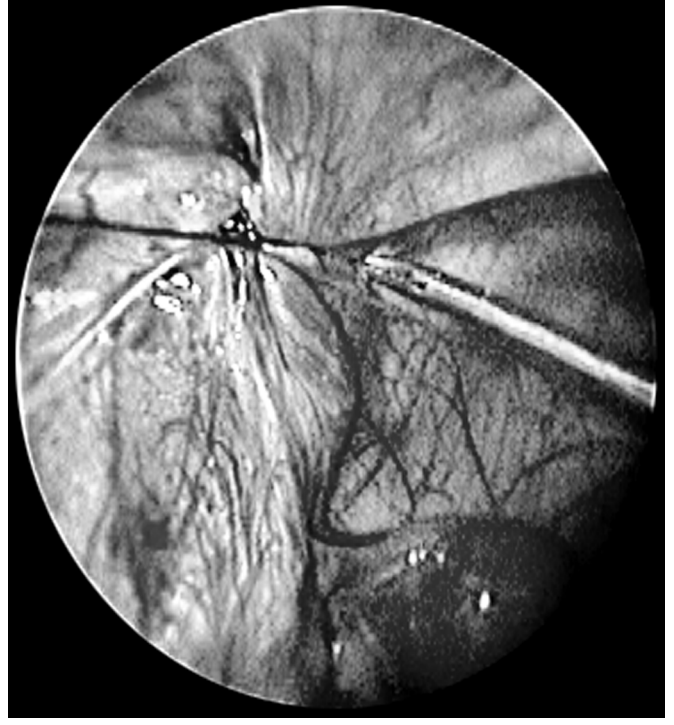


Figure 3. Laparoscopic ring closure: completion of the purse string suture and occlusion of the internal ring.

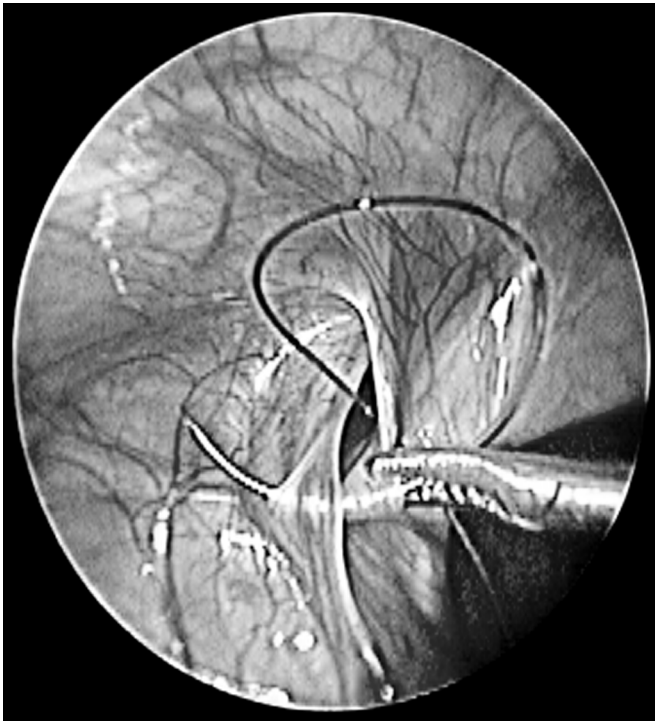


Figure 2. Laparoscopic ring closure: continuation of the purse string on the inferior aspect of the internal ring.

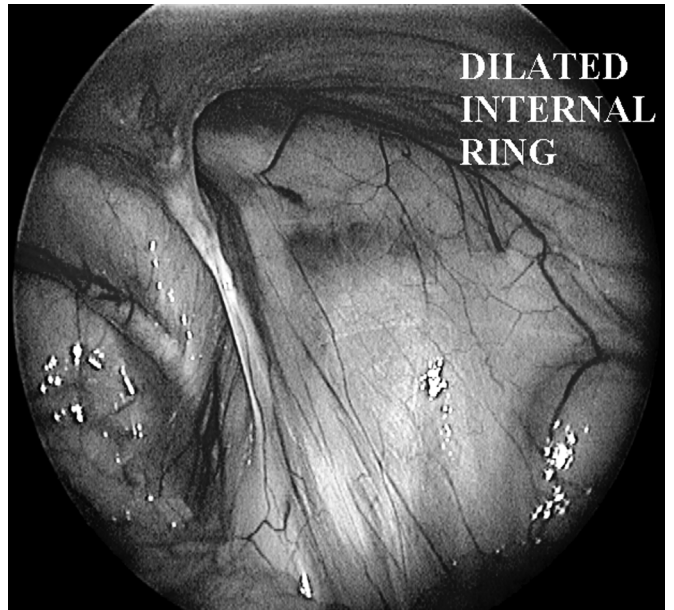


Figure 4. Dilated internal ring.

dissection was kept to a minimum to avoid injury to the cord structures. The landmarks identified included the iliopubic tract (IPT), arching of fascia transversalis, cord

structures, and the peritoneal reflection (**Figure 6**). The IPT was identified as a shiny white band running under the cord structures at the inferior border of the internal ring. The transversus arch was identified as the arching of the transversalis fascia immediately above and lateral to

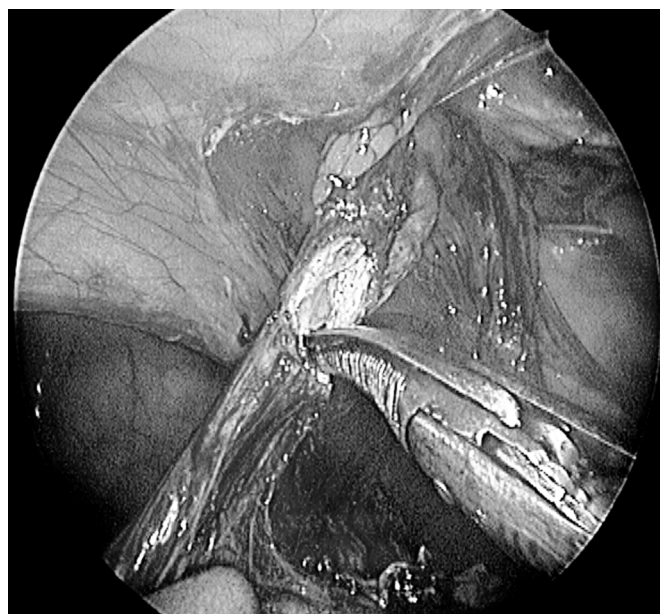


Figure 5. Laparoscopic iliopubic tract repair: division of the dissected sac.

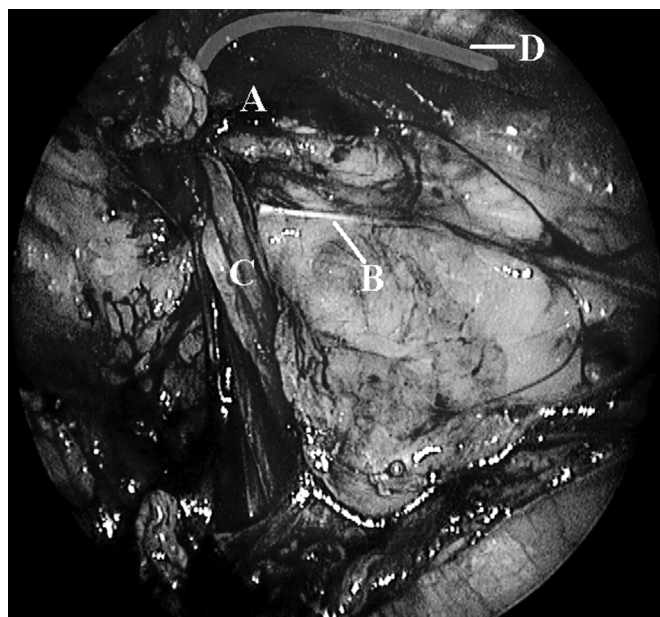


Figure 6. Laparoscopic iliopubic tract repair: completion of the dissection and landmarks identified: (A) dilated internal ring, (B) iliopubic tract, (C) cord structures, (D) transversalis fascial arch.

the internal ring.⁴ The IPT was approximated to the transversus arch by using nonabsorbable 2-0 interrupted suture to narrow the internal ring (**Figure 7**). Too tight approximation was avoided. Usually 1 or 2 sutures was sufficient (**Figure 8**). Also, during the repair, cord structures were not handled. The peritoneum was closed with

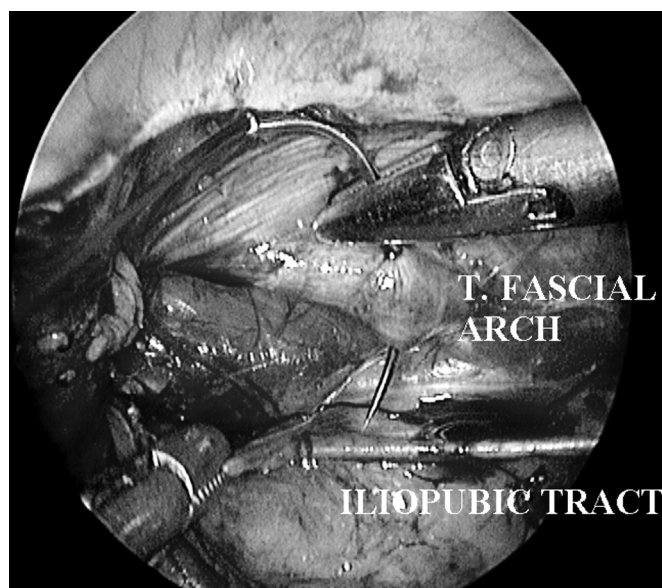


Figure 7. Laparoscopic iliopubic tract repair: approximation of the transversalis fascial arch and iliopubic tract.



Figure 8. Laparoscopic iliopubic tract repair: completion of the iliopubic tract repair.

4–0 absorbable suture (**Figure 9**). Cyanoacrylate glue was used to seal the trocar entry. Liquids were started after 4 hours and solids after 8 hours. Patients were routinely discharged on the first postoperative day. All patients were evaluated after 5 days, 4 weeks, 6 months, 1 year, and then annually, when possible.

RESULTS

Ninety-three indirect inguinal hernial sacs were closed (28 right, 7 left, 58 bilateral) in 64 children (56 boys and 8 girls), ranging in age from 3 years to 13 years (median, 5.1 years). Hernias were noted in all. No direct or femoral hernias were present. Zero percent of children had an ectopic testis. The mean operating time for LRC was 25 minutes (range, unilateral 21 to 35; bilateral 28 to 50). With experience, this time has gradually decreased. No intra-operative complications occurred. The contralateral processus vaginalis was patent in 20% of children. In 24% of children, the final procedure was modified based on the findings of a dilated internal ring. LIPTR was performed in these patients. LRC was performed in 71 hernias, whereas LIPTR was performed in 22 hernias. Of the 35 unilateral hernias, 29 underwent LRC and 6 underwent LIPTR. Of the 29 bilateral hernias, 20 underwent LRC, 7 underwent LIPTR, and 2 underwent LRC on one side and LIPTR on the other side. Laparoscopic mobilization, orchiopexy followed by LIPTR was performed in 9% of children. The testis was repositioned in the scrotum in all cases. The median follow-up was 30 months (range, 2 to 84). No wound

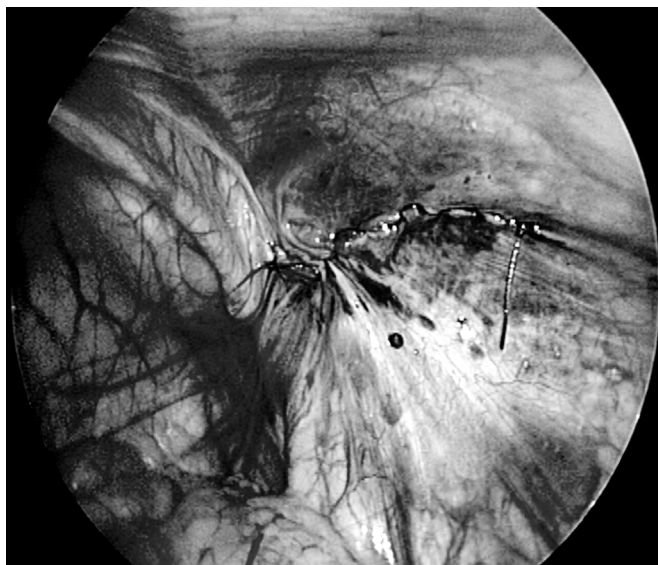


Figure 9. Laparoscopic iliopubic tract repair: after peritoneal flap closure.

complications occurred. Scrotal swelling occurred in 1 child. Hydrocoele occurred in 1 patient. No testicular atrophy was noted. No conversion to open was required in any case. Recurrence was noted in 2 children (3.1%). The first recurrence was in a 3-year-old female child after 8 months, following a right LRC. The second one was in a 4-year-old boy after 5 months, following a left LRC. See **Table 1** for demographic and technical details.

DISCUSSION

Laparoscopic herniorrhaphy in children is gaining increasing acceptance in pediatric surgery.⁵ The essential step in the conventional method for inguinal hernia repair in children is simple ligation of the hernial sac without narrowing the open ring. From our point of view, one needs to identify 2 things. First and the most obvious is the confirmation of the hernia and looking for the contralateral side. The second aspect is the size of the internal ring. First championed by Ger,^{6,7} ring closure is essentially a high ligation of the indirect hernia sac, which is the preferred technique in pediatric patients. Many surgeons have reported similar laparoscopic repairs.^{8,9} This technique re-establishes the usual anatomic relations of the medial aspect of the internal ring and cord structures, giving them a flush union with the transversus abdominis muscle and eliminating the lead point that allows the intestine to enter the inguinal canal.¹⁰ Ligation of the hernial sac at the internal ring alone is inadequate in patients with dilated internal ring (24% of children), as it does not take care of the component of the dilated ring.

Reports exist in the literature of methods to tighten this dilated ring. In hernias exceeding 4 mm to 5 mm in diameter, the external hemicircumference of the neck was opened to bring the conjoined tendon closer to the crural arch with a nonresorbable suture without the use of a prosthesis.⁹ IPT repair has been described as Ringplasty, wherein the deep structures of the lateral iliopubic tract were approximated to the proximal arching musculotendinous fibers of the transversus abdominis muscle^{11,12} Gazayerli¹³ described a laparoscopic preperitoneal IPT repair by approximating the transversus abdominis to the IPT, similar to the anterior preperitoneal approach described by Nyhus and associates.¹⁴ We perform only the IPT repair without placing a mesh. Hence, LIPTR could be termed “Ringrrhaphy.”

We first started with LIPTR in 1994. We believe that in children with a dilated internal ring, a routine LRC would be inadequate. This is also observed in our 2 recurrences with one of them occurring within 5 months of LRC. The

Table 1.
Demographic and Technical Details

Demographic	Schier ^s	Montupet ^s	Esposito ^s	Palanivelu
Age	3 weeks–13 yrs	8 months–14 yrs	4 weeks–10 yrs	3–13 yrs
Median age (yr)	2.0	4.2	3.6	5.1
No. of boys	185 (74%)	334 (99%)	102 (98%)	56 (88%)
No. of girls	58 (26%)	5 (1%)	2 (2%)	8 (12%)
Patients	223	339	104	64
Suture used	4-0 nonabsorbable	4-0 nonabsorbable	4-0 absorbable	4-0 absorbable
Operating time (min), unilateral/bilateral	14/21	13/23	20/26	25/40
Recurrence	8 (3.5%)	12 (3.5%)	3 (2.9%)	2 (3.1%)
Hydrocoele	9 (4%)	4 (1.2%)	-	1 (1.6%)
Testicular atrophy	1 (0.5%)	-	-	-

recurrence rate of inguinal hernias is slightly higher with laparoscopic herniorrhaphy than with the conventional technique. Our recurrence rate was 3.1%. Following LIPTR, there have been no recurrences. In children with recurrences after LRC, the surgeon has an undisturbed anatomy for the groin incision; the risk of an injury to the vas deferens, subsequent testicular atrophy, and the risk of superior displacement of the testicle seem less likely.¹⁵ The problems we faced during LIPTR were trivial and related to the little scar tissue at the internal ring.

Our technique requires 3-mm instruments. All our hernias were indirect, and 6 children had an ectopic testis. The incidence of patent processus vaginalis was 20%. Scrotal swelling appeared in 1 patient. Hydrocoele was seen in 1 patient. This could be explained by some peritoneal fluid passing in between the knots placed during ring closure. This patient was treated by relaparoscopy and closure of the gap. Testicular atrophy was not seen in any patient. No conversions were necessary.

Our series shows that both techniques are safe, reproducible, and technically easy for experienced laparoscopic surgeons. The long-term follow-up of LIPTR would help assess any technical modifications.

CONCLUSION

Laparoscopic inguinal hernia repair in children can be offered, as it is safe, reproducible, and technically easy for experienced laparoscopic surgeons. LIPTR may be added in patients with a dilated internal ring. Recurrence following LRC can be managed with LIPTR. The long-term follow-up of LIPTR is awaited.

References:

1. Shcheben'kov MV. The advantages of laparoscopic inguinal herniorrhaphy in children. *Vestn Kbir Im II Grek.* 1997;156(1): 94–96.
2. Schier F. Direct inguinal hernia in children: the laparoscopic aspect. *J Pediatr Surg.* 2000;16:562–564.
3. Esposito C, Montupet P. Laparoscopic treatment of recurrent inguinal hernia in children. *Pediatr Surg Int.* 1998;14(3):182–184.
4. Palanivelu C. Laparoscopic pediatric hernia repair. In: *Operative Manual of Laparoscopic Hernia Surgery.* Coimbatore, IN: Gem Foundation; 2004;195–205.
5. Schier F. Laparoscopic surgery of inguinal hernias in children—initial experience. *J Pediatr Surg.* 2000;35(9):1331–1335.
6. Ger R. The management of certain abdominal herniae by intra-abdominal closure of the neck of the sac. *Ann R Coll Surg Engl.* 1982;64:342–344.
7. Ger R, Monroe K, Duvicier R, et al. Management of indirect inguinal hernias by laparoscopic closure of the neck of the sac. *Am J Surg.* 1990;159:370–373.
8. Schier F, Montupet P, Esposito C. Laparoscopic inguinal herniorrhaphy in children: a three-center experience with 933 repairs. *J Pediatr Surg.* 2002;37:395–397.
9. Montupet P, Esposito C. Laparoscopic treatment of congenital inguinal hernia in children. *J Pediatr Surg.* 1999;34:420–423.
10. Arregui ME, Navarrete J, Davis CJ, et al. Laparoscopic inguinal herniorrhaphy—Techniques and controversies. *Surg Clin North Am.* 1993;73(3):513–527.
11. Dion YM, Morin J. Laparoscopic inguinal ring closure. *Can J Surg.* 1992;35:209–212.

12. Spaw AT, Ennis BW, Spaw LP. Laparoscopic hernia repair: The anatomical basis. *J Laparoendosc Surg*. 1991;1:269–277.
13. Gazayerli MM. Anatomical laparoscopic hernia repair of direct of indirect inguinal hernias using the transversalis fascia and iliopubic tract. *Surg Laparosc Endosc*. 1992;2(1):49–52.
14. Nyhus LM. The preperitoneal approach and iliopubic tract repair of inguinal hernia. In: Nyhus LM, Condon RE (eds). *Hernia*. Philadelphia, PA: JB Lippincott; 1989,154–188.
15. Miltenburg DM, Nuchtern JG, Jaksic T, Kozinetiz C, Brandt ML. Laparoscopic evaluation of the pediatric inguinal hernia—A meta-analysis. *J Pediatr Surg*. 1998;33(6):874–879. Vol. 9, No. 34