sciendo
ПРИЛОЗИ. Одд. за мед. науки, XLIII 2, 2022 МАНУ
CONTRIBUTIONS. Sec. of Med. Sci., XLIII 2, 2022 MASA

10.2478/prilozi-2022-0020 ISSN 1857-9345

BENEFITS OF CONTRALATERAL PATENT PROCESSUS VAGINALIS CLOSURE DURING LAPAROSCOPIC SURGERY FOR INGUINAL HERNIA IN FEMALE CHILDREN

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ABSTRACT

After more than a decade, an accurate description of the current state of pediatric inguinal hernia repair still an issue of contention. Improvement of techniques together with patient-entered intervention that account for the experiences related to individual disease characteristics have become an important factor of which the surgeon must be aware. Therefore, the aim of this study is to analyze a potential treatment for metachronous contralateral inguinal hernia (MCIH) in children during laparoscopic assisted percutaneous internal inguinal ring suturing (PIRS). In a prospective clinical study, carried out at the University Clinic for Pediatric Surgery in Skopje, Republic of North Macedonia, we analyzed the data from 49 female children, aged 1-14 years old, with clinically diagnosed congenital inguinal hernia treated via PIRS. The position of hernias on the right side was 29 (59.2%) on the left side was 19 (38.8%) and on both sides was 1 (2.0%). With intraoperative assessment, it was determined that in 33 (67.3%) participants there was no presence of a hidden hernia, while in 16 (32.7%), there was indeed the presence of a hidden hernia. Of the hidden hernias determined laparoscopically [16 (100%)], 8 (50%) were left and right hidden hernias, all treated laparoscopically. The PIRS technique is a procedure where the basic advanced treatment is exploration. This also included the adequate treatment of other pathologies, such as the prophylactic closure of a contralateral patent processus vaginalis with simultaneous treatment as there is the potential for hernia in future, therefore reducing the number of metachronous inguinal hernias.

Keywords: inguinal hernia, laparoscopic, female children, percutaneous internal ring suture

INTRODUCTION

Inguinal hernias in children are the result of the non-closure of the processus vaginalis peritonei (PPV), which is normally open during a child's fetal life and closed upon birth. [1–3]

The incidence of congenital inguinal hernia varies in accordance with the age of the infant: 3–5 % in full-term infants, 10–30 % in premature infants, around 13 % in infants born before the 33rd week (gestational age), and 30 % in newborns whose weight at birth is less than 1000 grams. [4–6]

In the last several years, with the technological developments in surgical sets of minimally invasive surgical techniques, the surgical treatment of congenital inguinal hernia in children has converged from traditional open surgery to laparoscopic surgery. [7]

In 2006, Patkowski et al. described the extraperitoneal percutaneous internal ring suture (PIRS)-method with extracorporeal suturing of the internal inguinal ring. [8] Extraperitoneal laparoscopically assisted suturing of the internal ring has proven to pose a small risk of recurrence and development metachronous hernias as well as being cosmetically acceptable. [9] In 2015, we introduced the PIRS-technique to our institution.

The laparoscopic approach allows for evaluation and treatment of the contralateral side without the need for further surgical cuts, nor the need for additional dissection. In addition, the laparoscopic approach allows for minimum continuation of the surgical time and a minimum of postoperative pain. [4] Benefits include: the prevention of a further anesthetic in the future, any complications associated with an untreated inguinal hernia such as incarceration, and the risks associated with another procedure. [10] The main argument for using a laparoscopic approach is to reduce the risk of contralateral metachronous hernias. [11]

Some pediatric patients develop hernia on the opposite side in a previously asymptomatic groin, after the surgical intervention. Hernias of this type in patients who have undergone surgery for a unilateral inguinal hernia in the past are known as metachronous contralateral inguinal hernia (MCIH). [12]

The incidence of contralateral PPV at operation has been estimated to be 21–47 %, as deduced from laparoscopic studies. The overall incidence of metachronous contralateral inguinal hernia has been estimated to be between 6–7 %, with risk factors being initial left sided hernia and contralateral PPV in children aged 0–19 years. [9]

Long-term studies on the outcome of asymptomatic PPV closure are still lacking. Further studies are also warranted on whether the risks of complication of asymptomatic PPV closure outweigh the risks of additional surgery of contralateral metachronous hernia. [9, 13]

MATERIALS AND METHODS

The analysis represents a prospective clinical studies, done in 2015 and 2017, which were carried out at the University Clinic for Pediatric Surgery in Skopje, RN Macedonia. The study covered 49 female children with clinically diagnosed congenital indirect inguinal hernia, treated via the laparoscopic assisted percutaneous internal inguinal ring suturing PIRS method. The ages of the participants from the whole sample ranged from 1–14 years old. Patients were followed-up regularly at our outpatient clinic at 1 week, 6 months, and two years postoperatively to assess wound healing.

Surgical Technique, PIRS

After the introduction with general endotracheal anesthesia, through a previously made umbilical incision, pneumoperitoneum is created with the Veress needle. A port is inserted through the umbilicus, with the dimensions of 5 mm, and a camera with pressure of insufflation from 8 to 10 mmHg.

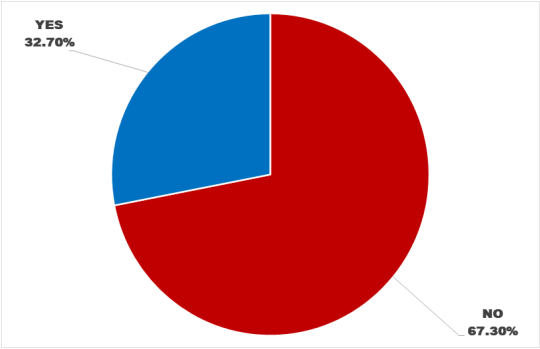
Under laparoscopic-guided vision, a 21-gauge needle with 2/0 non-absorbent monofilament polypropylene suture, holding tight both ends of the thread extraperitoneally, is placed underneath the peritoneum and with a few stabs of the needle, the lateral half of the internal inguinal ring is encircled, thus creating a loop in situ. The needle was removed and reintroduced. Another needle 21 gauge with 2/0 non-absorbable monofilament polypropylene suture is placed through the same skin puncture, this time with a few stabs of it covering the medial half of the internal inguinal ring. Special care was taken to avoid injury to the vessels while catching the peritoneum.

After the needle is removed, the end of the thread is held with the thread from which the loop is made, and the threads are pulled together, i.e. the thread is inserted as a loop intraperitoneally and is also pulled together with the needle. The end of the second non-absorbent monofilament thread which passes outside the incision is held, with which the internal inguinal ring is closed, under laparoscopic control. The thread is tied extracorporeally, obliterating the internal inguinal ring, with a knot that is set in the subcutaneous tissue. The umbilical incision is closed with a suture with absorbent thread 3/0, while the skin of the umbilical incision and the puncture wound is closed above the inguinum with a 3/0 non-absorbent thread.

RESULTS

The study included 49 female children, and 66 inguinal hernia repairs were done by a single surgeon at a single center. The number of patients with inguinal hernia on the right side PIRS was 29 (59.2 %), on the left side was 19 (38.8 %), while those with hernia on both sides were 1 (2 %).

The most children 22 (44.9 %) had hernia for a duration of 1–2 years, followed by 6–12 months in 11 (22.4%), 2–5 years in 8 (16.3 %), and more than 5 years in 3 (6.1 %). In all the participants treated with PIRS, an intraoperative assessment of hidden hernia was done (Graph 1). In our study, 16 (32.7 %) children in the PIRS group were diagnosed with bilateral inguinal hernia intraoperatively, while their primary diagnosis was a unilateral inguinal hernia. With intraoperative assessment, it was determined that in 33 (67.3 %) participants there was no presence of hidden hernia, while in 16 (32.7 %), there was indeed the presence of hidden hernia, open PPV.



Graph 1. *Analysis of the PIRS technique according to intraoperative assessment of hidden hernia*

From the laparoscopically determined hidden hernias [16 (100%)], 8 (50%) each were left and right hidden hernias. All the hidden hernias [16 (100%)] were treated according to PIRS.

Table 1 displays the comparison made between the intraoperative assessment of the existence of hidden hernia and the clinical observation of hidden hernia. It was concluded that in 32 (65.3%) cases, these two methods do match, while in 17 (34.7%) cases, they do not match.

Table 1. *Analysis of the match of intraoperative and clinical observations on hidden hernia*

Match of intraoperative and clinical observations on hidden hernia		**PIRS**
No	Number	17
	%	34.7%
Yes	Number	32
	%	65.3%
Total	Number	49
	%	100%

DISCUSSION

The introduction of laparoscopic surgery in the treatment of congenital inguinal hernia is an optimistic and promising method, which plays an important role as an alternative surgical technique, while at the same time represents excellent cosmesis, a better diagnostic tool for exploration, and simultaneous the treatment of contralateral hernia. [14]

It seems that opposed to the numerous multiport techniques for the treatment of congenital inguinal hernias during childhood during the last decade, the one-port laparoscopic technique of internal ring suturing-PIRS technique represents a top achievement regarding this issue. [15]

There have been many debates and dilemmas concerned with the simultaneous treatment of contralateral open PPV, the prevention and treatment of inguinal hernia at a later time again, therefore it is important to lower the incidence of recurrent and metachronous hernia. [1, 12]

About 25% of children with contralateral PPV developed metachronous inguinal hernia within 2 years in a prospective study by Koivusalo et al., [15] while the rate was 11 % in the study by Maddox and Smith. [9]

According Miyake et al., amid 1,530 children, there were 44.6 % confirmed intraoperative explorations for contralateral PPV and prophylactic surgical treatment during the intervention itself, [16] while Patkowski et al., provide data on the occurrence of contralateral hernia in 10.2% of cases. [8]

However, the results of our series show that our procedure has a high success rate and a low incidence of complications. In the series we studied, where the PIRS technique was used in the middle period of following the children from a minimum of 3 months to a maximum of 2 years, there were no recorded cases of recurrent hernia, nor the appearance of metachronous hernia in the postoperative period.

In 1997, Miltenberg et al., show the rate of metachronous hernias in children who were subject to unilateral hernioplasty in large meta-analysis was 7%. The risk was slightly higher if the initial presentation of the hernia was on the left side (11%). [17]

Other large studies show that metachronous hernias occur in 3.6% to 11.6% of children after unilateral repair of the inguinal hernia. [18–21]

In a study by Wolak and Patkowski, on 55 children, in 10 (10.2 %) cases, the presence of an open inguinal canal on the opposite side was noticed during the surgery. [8, 15] while in a study by Chang, they were contralaterally open PPV in 74 patients (34.3%). [22]

In all of the participants of our series belonging to the PIRS group, an intraoperative evaluation of hidden hernia was done, i.e. an open contralateral PPV, and it was determined that in 33 (67.3 %) patients there was not any, while in 16 (32.7 %) patients, hidden hernia was present, out of which 8 (50 %) were on the right side, i.e. the left side. All of the hidden hernias were simultaneously treated in the framework of the PIRS technique. In the case of a noticeable open PPV, we chose to treat this defect as potential hernia, even in the absence of clinical symptoms.

In our study compared the intraoperative evaluation for existence of hidden hernia and the clinical observation for hidden hernia, showing that in 32 (65.3 %) cases these two methods do match, while in 17 (34.7 %) cases they do not match. Our study is a small and prospective single-center study with limitations to be taken into consideration.

Several authors, though, report that the incidence of metachronous hernia is too low for a routine exploration and surgery for open PPV to be justified. It is nearly impossible to predict whether the open inguinal canal will result in inguinal hernia. [8]

The experience of a given series has shown that 22% of patients with a preoperative diagnosis of unilateral hernia had a contralateral open inner ring. [23]

In the study of Lipskar et al., 34 % contralaterally open PPV were determined, but in a series of patients researched by Abraham et al., 53 (25.4 %) children were contralaterally treated: 30 children with right-sided hernia and 23 children with left-sided hernia. [24, 25]

Wang reported the incidence of metachronous hernia to be from 5.2 % in children ≥ 1 year old. [26] Reported rates for the occurrence of contralateral hernia after an open surgery from 10.2% of patients in a researched series by Ulman et al. have resulted in recommendations for routine contralateral explorations for girls if they are over the age of 2, and especially if it regards left-sided hernia. [27]

Concerning the risk of development of metachronous hernia, Ron et al. discovered contralateral hernia in 16.4% of patients. They were all treated during the same surgery. [28]

In 2017, a large study by Zhao where patients were treated contralaterally for open PPV, those with hernia on the right side were 53.4% of the children as opposed to 50.2% on the left side. Oue, however, noticed 21 out of 62 (33.9%) right-sided hernias, and 19 out of 53 (35.8%) left-sided hernias. [29, 30]

In the series by Thakehara, Li and Thomas, the open contralateral inner inguinal ring was verified and at the same time sutured in 221 cases (20 %), 35 patients (16.4 %), and 91 contralateral PPV, respectively. [31–33]

Gollu et al. reported on a series with 705 children and stated that their failure rate of contralateral examination was nearly 30 % due to various reasons. They found 136 contralateral hernias (28 %), opposite to the study of Liu W et al. where contralateral PPV was present in 20 patients who were all simultaneously sutured. [2, 34]

The authors of one study believe that it is necessary for 16 contralateral explorations of the inner inguinal rings to be performed in order to avoid metachronous contralateral pediatric inguinal hernia. [35] According to Kokorowski et al., three asymptomatic contralateral PPVs must be closed to prevent one metachronous inguinal hernia, while Wenk et al. deduced that 17 contralateral inguinal explorations are needed to prevent one metachronous inguinal hernia. [9]

The results of our research confirm the benefits of laparoscopic hernioplasty as a possibility for diagnosis and contralateral exploration, thereby helping avoid the need for a second surgery and anesthesia in patients with open PPV. We believe that if an open PPV is found, each and every family should be offered treatment, and this has been confirmed by several studies.

CONCLUSION

The laparoscopically assisted technique of percutaneous internal ring suturing with one port is a minimally invasive method for treatment of congenital inguinal hernias during childhood. With this technique, there is possible exploration and adequate treatment of other pathologies, especially hidden contralateral hernia and their simultaneous treatment of that metachronous hernia as a potential hernia in the future.

REFERENCES

1. Huang FH, Cheng PL, Hou WH, Duh YC. Laparoscopic Hernia Repair with the Extraperitoneal Approach versus Open Hernia Repair in Pediatric Inguinal Hernia: A Systematic Review and Meta-Analysis. Journal of Clinical Medicine. 2022 Jan; 11(2): 321.
2. Kara YA, Yağız B, Balcı Ö, Karaman A, Özgüner İF, Karaman İ. Comparison of Open Repair and Laparoscopic Percutaneous Internal Ring Suturing Method in Repairing Inguinal Hernia in Children. Cureus. 2021 Apr 2; 13(4).
3. Frýbová B, Trčka J, Dotlačil V, Poš L, Patkowski D, Rygl M. Laparoscopic inguinal hernia repair in children via PIRS (percutaneous internal ring suturing). Rozhledy v chirurgii: mesicnik Ceskoslovenske chirurgicke spolecnosti. 2020 Jan 1; 99(6): 277–81.
4. Helal AAE. Laparoscopic single instrument closure of inguinal hernia in female children: A novel technique. J Pediatr Surg. 2015; 50(9): 1613–6.
5. Kumar VHS, Clive J, Rosenkrantz TS, Bourque MD, Hussain N. Inguinal hernia in preterm infants (≤32-week gestation). Pediatr Surg Int. 2002; 18(2–3): 147–52.
6. Lau ST, Lee YH, Caty MG. Current management of hernias and hydroceles. Semin Pediatr Surg. 2007; 16(1): 50–7.
7. Rao R, Smith M, Markel TA, Gray BW, Landman MP. Modified percutaneous internal ring suturing with peritoneal injury in children: matched comparison to open hernia repair. Surgical Endoscopy. 2021 Feb; 35(2): 854–9.
8. Patkowski D, Czernik J, Chrzan R, Jaworski W, Apoznański W. Percutaneous Internal Ring Suturing: A Simple Minimally Invasive Technique for Inguinal Hernia Repair in Children. J Laparoendosc Adv Surg Tech [Internet]. 2006; 16(5): 513–7.
9. Danielson J, Pakkasjärvi N, Högberg N. Percutaneous hernia repair in children: Safe to introduce. Scandinavian Journal of Surgery. 2021 Sep; 110(3): 380–5.
10. Lu J, Yu C, Zhao J, Wu S. The Incidence of Recurrence after Laparoscopic Versus Open Inguinal Hernia Repair in Children: a Systematic Review and Meta-Analysis. Indian Journal of Surgery. 2021 Jun; 83(3): 625–33.
11. Wang D, Yang P, Yang L, Jin S, Yang P, Chen Q, Tang X. Comparison of laparoscopic percutaneous extraperitoneal closure and laparoscopic intracorporeal suture in pediatric hernia repair. Journal of Pediatric Surgery. 2021 Oct 1; 56(10): 1894–9.
12. Hayashi K, Ishimaru T, Kawashima H. Reoperation after laparoscopic inguinal hernia repair in children: a retrospective review. Journal of Laparoendoscopic & Advanced Surgical Techniques. 2019 Oct 1; 29(10): 1264–70.
13. Ergun E, Yagiz B, Kara YA, Abay AN, Balci O, Eryilmaz S, Ozguner IF, Karaman A, Karaman I. Comparison of laparoscopic percutaneous internal ring suturing method and open inguinal hernia repair in children under 3 months of age. Turkish Journal of Surgery. 2021 Sep 1; 37(3): 215–22.
14. Bahadir K, Serttürk F, Ergun E, Gollu G, Ege EV, Çakmak A, Ufuk AT. The investigation survey of inguinal hernia operation techniques preferred by pediatric surgeons in Turkey. Journal of Experimental and Clinical Medicine. 2021 Oct 1; 38(4): 451–6.
15. Wolak PK, Patkowski D. Laparoscopic inguinal hernia repair in children using the percutaneous internal ring suturing technique – own experience. Videosurgery Other Miniinvasive Tech [Internet]. 2014; 1: 53–8.
16. Miyake H, Fukumoto K, Yamoto M, Nakajima H, Sekioka A, Yamada Y, et al. Risk factors for recurrence and contralateral inguinal hernia after laparoscopic percutaneous extraperitoneal closure for pediatric inguinal hernia. J Pediatr Surg. 2017; 52(2): 317–21.
17. Miltenburg DM, Nuchtern JG, Jaksic T, Kozinetz CA, Brandt ML. Meta-analysis of the risk of metachronous hernia in infants and children. In: American Journal of Surgery. 1997. p. 741–4.

18. Tackett LD, Breuer CK, Luks FI, Caldamone AA, Breuer JG, DeLuca FG, et al. Incidence of contralateral inguinal hernia: A prospective analysis. In: Journal of Pediatric Surgery. 1999. p. 684–8.
19. Hoshino M, Sugito K, Kawashima H, Goto S, Kaneda H, Furuya T, et al. Prediction of contralateral inguinal hernias in children: A prospective study of 357 unilateral inguinal hernias. Hernia. 2014; 18(3): 333–7.
20. Sözübir S, Ekingen G, Şenel U, Kahraman H, Güvenç BH. A continuous debate on contralateral processus vaginalis: Evaluation technique and approach to patency. Hernia. 2006; 10(1): 74–8.
21. Nassiri SJ. Contralateral exploration is not mandatory in unilateral inguinal hernia in children: A prospective 6-year study. Pediatr Surg Int. 2002; 18(5–6): 470–1.
22. Chang YT. Technical refinements in single-port laparoscopic surgery of inguinal hernia in infants and children. Diagnostic and Therapeutic Endoscopy. 2010.
23. Yang C, Zhang H, Pu J, Mei H, Zheng L, Tong Q. Laparoscopic vs open herniorrhaphy in the management of pediatric inguinal hernia: A systemic review and meta-analysis. Vol. 46, Journal of Pediatric Surgery. 2011. p. 1824–34.
24. Lipskar AM, Soffer SZ, Glick RD, Rosen NG, Levitt MA, Hong AR. Laparoscopic inguinal hernia inversion and ligation in female children: a review of 173 consecutive cases at a single institution. J Pediatr Surg [Internet]. 2010; 45(6): 1370–4.
25. Abraham MK, Nasir AA, Puzhankara R, Abdur-Rahman LO, Viswanath N, Kedari P, et al. Laparoscopic inguinal hernia repair in children: a single-centre experience over 7 years. African J Paediatr SurgeryAJPS. 2012; 9(2): 137–9.
26. Chang YT, Wang JY, Lee JY, Chiou CS, Hsieh JS. One-trocar laparoscopic transperitoneal closure of inguinal hernia in children. World journal of surgery. 2008 Nov; 32(11): 2459–63.
27. Marulaiah M, Atkinson J, Kukkady A, Brown S, Samarakkody U. Is contralateral exploration necessary in preterm infants with unilateral inguinal hernia? J Pediatr Surg. 2006; 41(12): 2004–7.
28. Ron O, Eaton S, Pierro A. Systematic review of the risk of developing a metachronous contralateral inguinal hernia in children. Vol. 94, British Journal of Surgery. 2007. p. 804–11.
29. Oue T, Kubota A, Okuyama H, Kawahara H. Laparoscopic percutaneous extraperitoneal closure (LPEC) method for the exploration and treatment of inguinal hernia in girls. Pediatr Surg Int. 2005; 21(12): 964–8.
30. Zhao J, Chen Y, Lin J, Jin Y, Yang H, Wang F, et al. Potential value of routine contralateral patent processus vaginalis repair in children with unilateral inguinal hernia. Br J Surg. 2017; 104(1): 148–51.
31. Takehara H, Yakabe S, Kameoka K. Laparoscopic percutaneous extraperitoneal closure for inguinal hernia in children: clinical outcome of 972 repairs done in 3 pediatric surgical institutions. J Pediatr Surg. 2006; 41(12): 1999–2003.
32. Li B, Nie X, Xie H, Gong D. Modified single-port laparoscopic herniorrhaphy for pediatric inguinal hernias: Based on 1,107 cases in China. Surg Endosc Other Interv Tech. 2012; 26(12): 3663–8.
33. Thomas DT, Göcmen KB, Tulgar S, Boga I. Percutaneous internal ring suturing is a safe and effective method for the minimal invasive treatment of pediatric inguinal hernia: Experience with 250 cases. J Pediatr Surg. 2016; 51(8): 1330–5
34. Kara YA, Yağız B, Balcı Ö, Karaman A, Özgüner İF, Karaman İ. Comparison of Open Repair and Laparoscopic Percutaneous Internal Ring Suturing Method in Repairing Inguinal Hernia in Children. Cureus. 2021 Apr 2; 13(4).
35. Steven M, Greene O, Nelson A, Brindley N. Contralateral inguinal exploration in premature neonates: is it necessary? Pediatric Surgery International. 2010 Jul; 26(7): 703–6.

Резиме

ПРИДОБИВКИ ОД КОНТРАЛАТЕРАЛНО ЗАТВОРАЊЕ НА ОТВОРЕН ПРОЦЕСУС ВАГИНАЛИС ЗА ВРЕМЕ НА ЛАПАРОСКОПСКА ОПЕРАЦИЈА ЗА ИНГВИНАЛНА ХЕРНИЈА КАЈ ЖЕНСКИ ДЕЦА

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По повеќе од една деценија точниот опис на моменталната состојба на третманот на ингвинална хернија кај децата е сè уште подвижна цел. Подобрувањето на техниките, заедно со интервенцијата на пациентот, која ги зема предвид искуствата поврзани со индивидуалните карактеристики на болеста, стануваат важен атрибут за кој хирургот мора да биде свесен. Целта на студијата беше да го проучи потенцијалниот третман на метахроната контралатерална ингвинална хернија (MCIH) кај деца за време на перкутаното затворање на внатрешниот ингвинален прстен со помош на лапароскопска техника (PIRS). Во проспективната клиничка студија спроведена на Универзитетската клиника за детска хирургија во Скопје, РС Македонија, ги анализиравме податоците од 49 женски деца на возраст од 1 до 14 години со клинички дијагностицирана конгенитална ингвинална хернија третирани со PIRS-техника. Хернија на десната страна беше застапена кај 29 (59,2 %), на левата страна кај 19 (38,8 %) и билатерално кај 1 (2 %). Со интраоперативна процена беше утврдено дека кај 33 (67,3 %) испитаници немало, додека кај 16 (32,7 %) од нив имало присуство на скриена хернија. Од лапароскопски утврдените скриени хернии [16 (100%)], по 8 (50 %) беа леви и десни хернии, и сите се третирани лапароскопски. PIRS-техниката е постапка каде што основниот напредок е експлорација и адекватен третман на другите патологии, какво што е профилактичкото затворање на контралатерален отворен процесус вагиналис, со нивно симултано лекување како потенцијална хернија, со што во иднина се намалува бројот на метахрони ингвинални хернии.

Клучни зборови: ингвинална хернија, лапароскопија, женски деца, перкутано затворање на внатрешниот прстен