ORIGINAL ARTICLE

Oman Medical Journal [2018], Vol. 33, No. 6: 481-485

# Patent Contralateral Processus Vaginalis in Infants and Children: Is Herniotomy Justified?

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**ARTICLE INFO**

***Article history:***
Received: 14 January 2018
Accepted: 10 May 2018

***Online:***
DOI 10.5001/omj.2018.89

***Keywords:***
Congenital; Hernia, Inguinal; Ultrasonography; Laparoscopy.

**ABSTRACT**

***Objectives:*** Contralateral inguinal exploration in pediatric unilateral inguinal hernia has been an issue of debate. Controversy still exists on whether contralateral patent processus vaginalis (CPPV) is justifiable for herniotomy. This study was conducted to investigate the hypothesis that CPPV always necessitates herniotomy. ***Methods***: This prospective study was conducted on 200 pediatric patients aged 2–120 months old. All patients clinically diagnosed with a unilateral inguinal hernia underwent a clinical examination of both inguinoscrotal regions followed by ultrasonography to elucidate CPPV in both sides. Herniotomy was then performed on the hernia site with laparoscopic evaluation of CPPV. Contralateral herniotomy was performed in 44 patients with Chin's type III CPPV while the rest were followed-up for three years to detect the appearance of any contralateral inguinal hernia. ***Results:*** The current study included 158 boys and 42 girls (ratio of 3.8:1.0). Hernia was more common on the right side (n = 136) than the left side (n = 64). Bilateral herniotomy was performed on 44 patients with Chin's type III CPPV, while the remaining 156 patients underwent unilateral herniotomy. During the follow-up period, contralateral hernia appeared in 58 patients; the remaining 98 patients, proved to have CPPV did not complain of a clinical hernia during that period. ***Conclusions:*** Inguinal herniotomy for CPPV seems not to be necessary in all cases. This would decrease the use of anesthesia and surgical morbidity in young infants and save hospital resources through avoidance of unnecessary operations.

Inguinal exploration in infants or children with unilateral hernias has been an important issue for more than half a century since the high incidence of contralateral patent processus vaginalis (CPPV) was first reported.[1–3] Routine exploration of the contralateral groin is not without complication. It is therefore recommended not to perform routine bilateral exploration.[4,5] To resolve this debate, numerous preoperative and intraoperative diagnostic approaches to assess the contralateral groin have been described.[6–8]

Groin ultrasonography (US) was reported to have 93% correct results in diagnosing unilateral and/or bilateral inguinal hernia in children and/or patent processus vaginalis (PPV).[5,8,9] Laparoscopic inguinal exploration of the asymptomatic contralateral side was first reported in 1992 with 96% accuracy.[10] Many reports of transinguinal laparoscopic examination of the contralateral groin in pediatric hernia repair were published confirming the accuracy of this method.[11–13] However, these reports did not investigate the result of leaving CPPV on the occurrence of hernia later on.

We sought to investigate the hypothesis of whether CPPV mandates a herniotomy.

## METHODS

This study was conducted on 200 pediatric patients, who were treated and followed-up for a period of at least three years, commencing from January 2012 to June 2015. The children were aged 2–120 months old with a mean age of 45.0±5.0 months. All studied patients underwent a thorough history including demographic data, symptoms, and clinical diagnosis for those who suffered a groin bulge with stress. Routine preoperative laboratory investigations were performed in all patients. Abdominopelvic ultrasound was requested to diagnose the patency of processus vaginalis in both sides.[9]

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Laparoscopy was then done to explore the contralateral inguinal ring either through the hernial sac or umbilicus. The result was considered positive if there was a visual PPV or if carbon dioxide bubbles or fluid could be expressed via the processus vaginalis. Laparoscopy was performed via the hernial sac after opening the inguinal canal on the affected side during identification and dissection, which was approached classically through a short transverse lower inguinal skin crease incision. The sac was opened at the fundus, then a 5.5 mm laparoscopic sheath was inserted through the sac into the peritoneal cavity, and a rubber band was placed around the neck of the sac to produce an airtight seal.

A carbon dioxide pneumoperitoneum was created, and the intra-abdominal pressure was raised ranging from 5 to 12 mmHg. The Goldstein test[14] was then performed by placing a small catheter into the peritoneal cavity through the hernial sac's opening and filling the peritoneal cavity with gas. The contralateral groin was then examined for a bulge or crepitus, which suggests a PPV.

A 5 mm telescope (70 degrees) was introduced via the laparoscopic sheath to examine the contralateral internal ring, which was identified in boys by following the meeting of the vas deference with spermatic vessels at the internal ring and in girls by using the round ligament to identify the internal ring. Helpful maneuvers for visualizing the base of the ring were lifting the skin of the lower abdomen, compressing the ipsilateral groin, and applying mild traction to the spermatic cord.

In patients with a small hernial sac or associated umbilical hernia, laparoscopy through the umbilicus was performed. A 3 mm incision was made in the inferior rim of umbilicus, and a Veress needle was inserted. Intraperitoneal position was confirmed, and the abdomen insufflated with carbon dioxide to create pressure ranging from 5 to 12 mmHg. The needle was replaced by a 5.5 mm laparoscopic sheath through which a 5 mm (0 degrees) telescope was inserted. The vas deferens on the contralateral side was located and followed over the pelvic brim to identify the contralateral internal ring.

The morphological type of internal ring was classified according to Chin's classification[15] into three types. Type I, a flat ring, covered with peritoneum in the exit to the spermatic cord or the round ligament; type II, a shallow ring with a visible base under an elevated peritoneal fold; and type III, the internal ring was wide and deep, PPV appears to be a hole.

**Table 1:** Demographic and clinical manifestations of the studied cases (n = 200).

| Variables | Patients, n | Percentage, % |
|---|---|---|
| **Age, months** | | |
| 2–24 | 80 | 40.0 |
| 24–48 | 72 | 36.0 |
| 48–72 | 38 | 19.0 |
| 72–120 | 10 | 5.0 |
| **Sex** | | |
| Male | 158 | 79.0 |
| Female | 42 | 21.0 |
| **Side** | | |
| Right | 136 | 68.0 |
| Left | 64 | 32.0 |
| **Clinical manifestation** | | |
| Intermittent groin swelling | 138 | 69.0 |
| Constant groin swelling | 62 | 31.0 |
| **Associated congenital anomalies** | | |
| Umbilical hernia | 14 | 7.0 |
| Undescended testicle | 4 | 2.0 |
| Hydrocele | 14 | 7.0 |
| None | 168 | 84.0 |

All children underwent herniotomy for their clinically manifested hernia, and only 44 children with Chin's type III CPPV underwent herniotomy on their contralateral side at the time of laparoscopy. The remaining 156 children were followed-up at two weeks, two months, six months, 12 months, and three years. Children who showed a non-patent contralateral processus vaginalis, and those lost during follow-up, were not included in the study.

## RESULTS

We enrolled 200 pediatric patients with unilateral inguinal hernia who underwent surgical hernial repair in our departments and were followed-up for at least three years. We had 158 boys and 42 girls in the study giving a boy to girl ratio of 3.8:1.0. Patients' were aged 2–120 months old with a mean age of 45.0±5.0 months. Right-sided hernia was seen in 136 patients, while 64 showed a left-sided hernia. Clinical manifestations were an intermittent groin swelling in 138 patients, and a constant groin swelling in 62 patients. The hernia clinically presented as a huge

**Table 2:** Laparoscopic port of entry and the clinical side of inguinal hernia.

| Port of entry | Patients, n | Hernia side, n | |
|---|---|---|---|
| | | Right | Left |
| Hernial sac | 124 | 74 | 50 |
| Umbilicus | 76 | 62 | 14 |
| Total | 200 | 136 | 64 |

groin mass in 44 right-sided hernias while 18 patients had the same condition on the left side. Associated congenital anomalies included an umbilical hernia in 14 patients, undescended testicles in four patients, and hydrocele in 14 patients [Table 1].

All 200 patients underwent diagnostic US to verify the presence of a hernia and elucidate the PPV. Sonographic results verified the clinical diagnosis; they showed CPPV in all 200 patients. One hundred and twenty-four patients had undergone laparoscopy via the hernial sac to explore the CPPV, while 76 patients had laparoscopy through the umbilicus [Table 2]. All children were proven to have CPPV. According to Chin's classification, 28 patients as type I, 94 patients as type II, and 78 patients (44 males and 34 females) were classified as type III [Table 3].

There was a clinically significant difference between those patients with Chin's type III with right-sided inguinal hernia compared to those with a left-sided inguinal hernia. There was no significant difference regarding age. Herniotomy was done for all patients in the clinically diagnosed and apparent side, while only 44 patients with Chin's type III CPPV underwent herniotomy for their contralateral side. However, follow-up continued for at least three years for those who showed Chin's types I, II, and the rest of type III CPPV's children. During the follow-up period, contralateral hernia appeared in 58 patients; 50 boys and eight girls. All patients were treated surgically.

## DISCUSSION

Controversy does exist whether bilateral exploration is required in children presenting with unilateral hernia. The majority opinion favors an approach restricted to the side of presentation in boys; albeit in girls bilateral groin exploration was recommended.[16] Moreover, the literature contains many contradicting opinions regarding the necessity of bilateral surgery in girls.[17]

The mean age of the children in our study (45.0±5.0 months) was similar to other published data, where the mean ages were 48, 44, 36, and 32 months.[13,15,18,19] On the other hand, some studies reported mean younger[2,20,21]and older ages.[22,23]

In our study, the male to female ratio was 3.8:1.0 This ratio was not in accordance with other reported data, where the male to female ratio was 8.6:1.[15,18] Others reported a ratio of 2:1.[11,12,19,21,24,25]

In both boys and girls, approximately 60% of inguinal hernias occur in the right side, 30% in the left and 10% occur bilaterally (with bilateral hernias more common in girls).[26] In our study, 136 patients (68.0%) showed a right-sided hernia and 64 had left-sided hernias. This higher incidence of right-sided hernias corresponds to previously reported data.[11,15,19–22,25]

Our current data showed likewise that CPPV was correctly detected by US, which is a noninvasive and accurate method for evaluating its presence coinciding with other previously published literature.[1,8,9] US remains, however, to be dependent on the operator experience and upon the availability of a high-resolution unit. Although invasive, laparoscopic simultaneous contralateral exploration could be considered a safe and effective method of detecting CPPV.

One hundred and twenty-four patients underwent laparoscopy via the hernial sac to explore CPPV, while 76 patients had laparoscopy through

**Table 3:** Correlation between age, contralateral patent processus vaginalis (CPPV), and clinically elucidated contralateral hernia.

| Age, months | Laparoscopic type of CPPV, n | | | Contralateral hernias, n | | | *p*-value |
|---|---|---|---|---|---|---|---|
| | Type I | Type II | Type III | Type I | Type II | Type III | |
| 2–24 | 10 | 28 | 20 | 6 | 8 | 10 | > 0.010 |
| 24–48 | 6 | 30 | 26 | 2 | 6 | 8 | |
| 48–72 | 4 | 20 | 23 | 0 | 6 | 6 | |
| 72–120 | 8 | 16 | 9 | 0 | 2 | 4 | |
| Total | 28 | 94 | 78 | 8 | 22 | 28 | |

the umbilicus. These data can be compared to other authors who performed both techniques in their study, and yet, 40% of their cases had their laparoscopic exploration through the hernial sac and 60% through the umbilicus.[27]

Concerning the morphology of contralateral internal ring (according to Chin's classification), we had 28 cases (14.0%) of type I, 94 cases (47.0%) of type II, and 78 cases (39.0%) of type III. These results are comparable to other studies that reported 45% of cases as type I, 22% as type II, and 33% as type III.[15]

Some of our patients with type III Chin's classification randomly underwent a simultaneous contralateral herniotomy immediately at the end of the laparoscopy. Follow-up continued for a minimum of three years for those having type I and II as well as the remaining children with type III. During that follow-up period, contralateral hernia appeared in 58 patients; 50 boys and eight girls. These data would authenticate and rather appeal to the previously reported concept, stating that CPPV is not equal to a future symptomatic hernia.[4,28–30] Only 5.8% to 11.6% PPV cases were presented as hernia.[28]

To answer the question, which patient would develop a hernia? It is tough to formulate a valid hypothesis or speculate in the future. A valid scoring system to predict the future occurrence or development of hernia is missing, and the fate of the PPV remains obscure. Spontaneous closure may be a plausible explanation.

## CONCLUSION

CPPV may not always necessarily mean a clinically pronounced inguinal hernia and the 'wait and see concept' should be deliberately in all conscience applied to those patients through a comprehensive follow-up study.

*Disclosure*

The authors declared no conflicts of interest. No funding was received for this study.

## REFERENCES

1. Given JP, Rubin SZ. Occurrence of contralateral inguinal hernia following unilateral repair in a pediatric hospital. J Pediatr Surg 1989 Oct;24(10):963-965.
2. Bhatia AM, Gow KW, Heiss KF, Barr G, Wulkan ML. Is the use of laparoscopy to determine presence of contralateral patent processus vaginalis justified in children greater than 2 years of age? J Pediatr Surg 2004 May;39(5):778-781.
3. Steven M, Greene O, Nelson A, Brindley N. Contralateral inguinal exploration in premature neonates: is it necessary? Pediatr Surg Int 2010 Jul;26(7):703-706.
4. Wang JH, Zhang W, Tou JF, Huang SJ, Liu WG, Xiong QX, et al. Incidence of pediatric metachronous contralateral inguinal hernia in children aged ≥1 year. World J Pediatr 2012 Aug;8(3):256-259.
5. Othersen HB Jr. The pediatric inguinal hernia. Surg Clin North Am 1993 Aug;73(4):853-859.
6. Powell RW. Intraoperative diagnostic pneumoperitoneum in pediatric patients with unilateral inguinal hernias: the Goldstein test. J Pediatr Surg 1985 Aug;20(4):418-421.
7. Hashish AA, Mashaly EM. Ultrasonographic Diagnosis of Potential Contralateral Inguinal Hernia in Children. Ann Pediatr Surg 2006 Jan;2(1):19-23.
8. Toki A, Ogura K, Miyauchi A. Ultrasonographic diagnosis of inguinal hernia in children. Pediatr Surg Int 1995;10(8):541-543.
9. Erez I, Kovalivker M, Schnider N, Glaser E, Lazar L, Motovic A. Elective sonographic evaluation of inguinal hernia in children – an effective alternative to routine contralateral exploration. Pediatr Surg Int 1993;8(5):415-418.
10. Lazar DA, Lee TC, Almulhim SI, Pinsky JR, Fitch M, Brandt ML. Transinguinal laparoscopic exploration for identification of contralateral inguinal hernias in pediatric patients. J Pediatr Surg 2011 Dec;46(12):2349-2352.
11. Chung KL, Leung MW, Chao NS, Wong BP, Kwok WK, Liu KK. Laparoscopic repair on asymptomatic contralateral patent processusvaginalis in children with unilateral inguinal hernia: a centre experience and review of the literature. Surg Pract 2011 Feb;15(1):12-15.
12. Lee SL, Sydorak RM, Lau ST. Laparoscopic contralateral groin exploration: is it cost effective? J Pediatr Surg 2010 Apr;45(4):793-795.
13. Geisler DP, Jegathesan S, Parmley MC, McGee JM, Nolen MG, Broughan TA. Laparoscopic exploration for the clinically undetected hernia in infancy and childhood. Am J Surg 2001 Dec;182(6):693-696.
14. Christenberry DP, Powell RW. Intraoperative diagnostic pneumoperitoneum (Goldstein test) in the infant and child with unilateral inguinal hernia. Am J Surg 1987 Dec;154(6):628-630.
15. Chin T, Liu C, Wei C. The morphology of the contralateral internal inguinal rings is age-dependent in children with unilateral inguinal hernia. J Pediatr Surg 1995 Dec;30(12):1663-1665.
16. Manoharan S, Samarakkody U, Kulkarni M, Blakelock R, Brown S. Evidence-based change of practice in the management of unilateral inguinal hernia. J Pediatr Surg 2005 Jul;40(7):1163-1166.
17. Deeb A, Hughes IA. Inguinal hernia in female infants: a cue to check the sex chromosomes? BJU Int 2005 Aug;96(3):401-403.
18. Liu C, Chin T, Jan SE, Wei C. Intraoperative laparoscopic diagnosis of contralateral patent processus vaginalis in children with unilateral inguinal hernia. Br J Surg 1995 Jan;82(1):106-108.
19. Pellegrin K, Bensard DD, Karrer FM, Meagher DP Jr. Laparoscopic evaluation of contralateral patent processus vaginalis in children. Am J Surg 1996 Nov;172(5):602-605, discussion 606.
20. Wolf SA, Hopkins JW. Laparoscopic incidence of contralateral patent processus vaginalis in boys with clinical unilateral inguinal hernias. J Pediatr Surg 1994 Aug;29(8):1118-1120, discussion 1120-1121.
21. Wulkan ML, Wiener ES, VanBalen N, Vescio P. Laparoscopy through the open ipsilateral sac to evaluate presence of contralateral hernia. J Pediatr Surg 1996 Aug;31(8):1174-1176, discussion 1176-1177.
22. Pavlovich CP, Gmyrek GA, Gardner TA, Poppas DP, Mininberg DT. Flexible transinguinal laparoscopy to assess the contralateral ring in pediatric inguinal hernias. Tech

Urol 1998 Sep;4(3):141-144.

23. Saya A, Piro E, Borsellino A, Basilico GB, Pinciroli RL, D'Alessio A. [Use of mini-laparoscopy in intraoperative diagnosis of contralateral inguinal hernia in children]. Pediatr Med Chir 1999 May-Jun;21(3):125-127.
24. Kaufman A, Ritchey ML, Black CT. Cost-effective endoscopic examination of the contralateral inguinal ring. Urology 1996 Apr;47(4):566-568.
25. Schier F, Danzer E, Bondartschuk M. Incidence of contralateral patent processus vaginalis in children with inguinal hernia. J Pediatr Surg 2001 Oct;36(10):1561-1563.
26. Rowe MI, Clatworthy HW Jr. The other side of the pediatric inguinal hernia. Surg Clin North Am 1971 Dec;51(6):1371-1376.
27. Yerkes EB, Brock JW III, Holcomb GW III, Morgan WM III. Laparoscopic evaluation for a contralateral patent processus vaginalis: part III. Urology 1998 Mar;51(3):480-483.
28. Toki A, Watanabe Y, Sasaki K, Tani M, Ogura K, Wang ZQ. Adopt a wait-and-see attitude for patent processus vaginalis in neonates. J Pediatr Surg 2003 Sep;38(9):1371-1373.
29. Sözübir S, Ekingen G, Senel U, Kahraman H, Güvenç BH. A continuous debate on contralateral processus vaginalis: evaluation technique and approach to patency. Hernia 2006 Mar;10(1):74-78.
30. Klin B, Efrati Y, Abu-Kishk I, Stolero S, Lotan G. The contribution of intraoperative transinguinal laparoscopic examination of the contralateral side to the repair of inguinal hernias in children. World J Pediatr 2010 May;6(2):119-124.