

Contralateral Patent Processus Vaginalis Repair in Boys: Healing or Killing the Possible

Jinxiang Liu (✉ 461900909@qq.com)

Linyi Central Hospital

Qingwei Cao

Qingdao University

Yunqiang Xia

Linyi Central Hospital

Shenghua Qiu

Linyi Central Hospital

Haiyang Liu

Linyi Central Hospital

Chengliang Liu

Linyi Central Hospital

Meng Xu

Linyi Central Hospital

Research Article

Keywords: Inguinal hernia, Contralateral patent processus vaginalis, Laparoscopy

Posted Date: March 28th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1213367/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Objective: To check the contralateral patent processus vaginalis (CPPV) prevalence in life, and the significance for the treatment.

Data sources: We performed a retrospective review of all inguinal hernia (IH) cases who underwent repair in our hospital from 2014 to 2018.

Study design: We analyzed the occurrence and treatment regularity in boys. Checked and compared the history, initial sides of hernia, CPPV and prognoses in different age groups.

Data collection: We checked all IH cases repaired in our hospital, picked out the male cases, including boys and men, recurrent cases were not enrolled.

Principal findings: A total of 3243 cases were enrolled, 2489 (right-sided IH 1411 (56.69%) vs left-sided IH 975 (39.17%), bilateral IH 103 (4.14%)) in children, and 754 (right-sided IH 485 (64.32%) vs left-sided IH 236 (31.30%), bilateral IH 33 (4.38%)) in adults. 1124 CPPV were checked in children with unilateral inguinal hernia (2386), 12 in adults of 267 ($p < 0.0001$). There were no significant differences in recurrence rate between the blocks in children ($p > 0.05$).

Conclusions: The incidence of inguinal hernia in boys was significantly higher than men. The number of cases declines rapidly with age in boys. Processus vaginalis obliterates and involutes, last for a long period, routine exploration on contralateral may kill the possible of self-obliterating capability.

Introduction

What is known on this topic inguinal hernia needs to be repaired to prevent incarceration include children and adults. With the introduction and promotion of laparoscopic repair in children, a large number of CPPV were exposed and repaired. Whether the CPPV need to be fixed is debatable. What this study adds is we believe the CPPV should not be repaired routinely.

During laparoscopic hernia repair, CPPV is closed with the concept of simultaneous closure of an open processus vaginalis¹. A number of studies showed the incidence of CPPV is 50%-70%^{2,3}, the incidence of IH and CPPV is age dependent^{4,5}. In this study, we investigated the characteristics of CPPV lifetime.

The states of our work

Almost all incarcerated IH in children and adults would be reduced by gentle manual pressure first if the patients state permitted. Regular operation was not recommended for children younger than 6 months old, unless there was a strong demand from the parents. It's not because we can't do it, this strategy can reduce the risk of anesthesia, and some children may self-healing. The hospital is Regional Medical Center, comprehensive Grade 3A hospital. Pediatric Surgery and General Surgery are two separated

departments of the hospital. Laparoscopic hernia repair in children began in 2004, and began in 2017 in adults.

Patients And Methods

Patients

A retrospective study was carried out on all male-patients with IH to the hospital, between 2014 and 2018. Below 15 years old was children group, repaired in pediatric surgery ward

the rest was adult group, repaired in general surgery ward. Recurrence cases were excluded from this study. The medical history and condition of boys provided by their parents or guardian, adults were provided by themselves or their close relatives.

Groups comparisons

Children Group and Adult Group

The variables evaluated were sex, age at operation, history, initial side of hernia, development of contralateral hernia (Fig. 1).

Younger Group and Elder Group of children

Younger than 18 months and older than 60 months in children were selected and divided into younger group and elder group. The variables evaluated were sex, age at operation, history, initial side of hernia, development of contralateral hernia.

Follow up

All children were followed up lasted 2 years at least. Follow-up form included Telephone surveys, WeChat and out-patient referrals. After the IH repaired, we given instructions on how to monitor for hernia recurrence, if there were clinical manifestations like these, come back to out-patient as soon as possible.

Statistical analysis

Demographic data such as age, medical history, side of hernia, number of CPPV detected by laparoscopy, were collected. Continuous data were expressed as mean (s.d.) and analysed using two-sample t test. χ^2 tests were used to determine significance of differences in the incidence of CPPV with regard to side. All tests were two-sided and $P < 0.05$ was considered statistically significant.

Results

Clinical data

From 2014 to 2018, a total of 3,243 cases were recorded, mean age was 14.74±23.14 years, the minimum age was 4 months—the oldest age was 93 years old; mean medical history was 1.63±5.62 years, the longest was 70 years, was a 78-year-old man, appearance of the initial symptoms when he was 8 years old (51 cases onset-age less than 15 years old, ratio to 6.76%).

2489 cases in children group, mean age was 3.36±2.47 years, mean medical history was 0.74±2.71 years, right-sided IH 1409 (56.69%) cases, left-sided IH 975 (39.17%), bilateral IH 103 (4.14%) (Table 1).

Statistics show, both onset age-case and repair age-case declined rapidly at younger ages ($R^2=0.9715$, 0.8806) (Fig.2).

754 cases in adult group, mean age was 53.65±17.40 years, mean medical history was 4.57±10.00 years (children VS adults, $t=17.10$, $p < 0.0001$), right-sided IH 487 (64.32%) cases, left-sided IH 236 (31.30%) (children VS adults, $\chi^2 =15.39$, $P < 0.0001$), bilateral IH 33 (4.38%) ($\chi^2 =0.082$, $P =0.7747$) (Table 1). The case ratio of children VS adults was 3:1, the age-range ratio of the groups was 1:5.

Table 1 Clinical details included in the study.

	Boys		Men		t / χ^2	P
Total(T)	2489		754			
Mean age(years)	14.73±23.14					
Team mean age(years)	3.36±2.47		53.65±17.40			
Min age(months)	4					
Max age(years)			93			
Team median age(years)	2.5		55			
Median age(years)	8		54			
Case ratio	3:1					
Age-range ratio	1:5					
Right(R)/%	1411	56.69	485	64.32	15.39	0.0001 #
Left(L)/%	975	39.17	236	31.30		
Bilateral(B)/%	103	4.14	33	4.38	0.082	0.7747 ##
History(years)	0.74		4.57		17.10	< 0.0001 ###

χ^2 test, ##(R+L) VS B, χ^2 test, ###Unpaired t test.

Children vs Adults

At laparoscopy, 1124 (47.11%) CPPV were checked in 2386 unilateral IH of children, just 12 (4.49%) CPPV in 267 unilateral IH of adults ($\chi^2=178.1$, $P<0.0001$). The CPPV on the right side was identified in 50.77% of the children with left unilateral IH, compared with 44.58% on the left in children with right inguinal hernia ($\chi^2=8.869$, $P=0.0029$). Just 5.26% in right-sided IH vs 4.19% in left-sided IH of adult ($\chi^2=0.1463$, $P=0.7021$). The incidence of CPPV was significant difference between the same-sided of groups (Left IH: $\chi^2=58.55$, $P<0.0001$; Right IH: $\chi^2=114.6$, $P<0.0001$) (Table 2).

Table 2 Clinical details of unilateral IH in boys and men included in the study.

	boys		men		χ^2	p
T	2386		267			
R/%	1411	59.14	191	71.54		
L/%	975	40.86	76	28.46	15.43	< 0.0001
CPPV/%	1124	47.11	12	4.49	178.1	< 0.0001
CPPV-L/%	495	50.77	4	5.26	114.6	< 0.0001
CPPV-R/%	629	44.58	8	4.19	58.55	< 0.0001
					8.869#	0.0029
					0.003##	0.9560

CPPV-R: CPPV of right-sided IH; CPPV-L: CPPV of left-sided IH; #CPPV-R vs CPPV-L in boys, ## T (theoretical frequency)=3.42, Chi-square with Yates' correction, CPPV-R vs CPPV-L in adult.

Younger vs Elder of children

Two groups were generated: younger group including younger than 18 months with a total of 576 cases, right-sided IH 311 (53.99%) cases, left-sided IH 225 (39.06%), bilateral IH 40 (6.94%), mean age was 13.72 ± 3.48 months, mean medical history was 4.92 ± 4.54 months; elder group including children older than 60 months with a total of 538 cases, right-sided IH 275 (51.12%) cases, left-sided IH 253 (47.03%) (right-sided VS left-sided, $\chi^2=3.792$, $P=0.0515$), bilateral IH 10 (1.86%) ($\chi^2=16.78$, $P<0.0001$), mean age was 87.15 ± 25.30 months, mean medical history was 16.10 ± 25.71 months ($t=10.26$, $p<0.0001$).

256 (47.76%) CPPV were checked in 536 unilateral IH of younger group, 225 (42.61%) CPPV in 528 unilateral IH of elder group ($\chi^2=2.845$, $P=0.0916$). The CPPV on the right side was identified in 48.89% of the younger group with left unilateral IH, compared with 46.95% on the left in children with right inguinal hernia ($\chi^2=0.1977$, $P=0.6566$). 49.01% in left-sided IH vs 36.73% in right-sided IH of elder group ($\chi^2=8.132$, $P=0.0043$). The incidence of CPPV was significant difference on right-sided between the groups (Left IH: $\chi^2=0.0007206$, $P=0.9786$; Right IH: $\chi^2=6.249$, $P=0.0124$) (Table 3).

Table 3 Clinical details of younger and elder boys included in the study.

	Younger		Elder		t / χ^2	p
Age range(months)	≤18[4-18]		≥60[60-180]			
T	576		538			
R/%	311	53.99	275	51.12		
L/%	225	39.06	253	47.03	3.792	0.0515
B/%	40	6.94	10	1.86	16.78	< 0.0001
CPPV/%	256	47.76	225	42.61	2.845	0.0916
CPPV-L/%	110	48.89	124	49.01	0.000721	0.9786
CPPV-R/%	146	46.95	101	36.73	6.249	0.0124
					0.1977#	0.6566
					8.132##	0.0043
History(months)	13.72		16.08		2.182###	0.0293

#CPPV-R vs CPPV-L in younger, ##CPPV-R vs CPPV-L in elder, ### Unpaired t test.

Follow up

A total of 2329 (93.57%) children was followed up at least 2 years by the ways, recurrence rate of children was 0.73% (17 of 2329). Recurrence rate of contralateral clogged processus vaginalis (PV) at laparoscopy was 0.32% (4 of 1262), the rate of repair-sided was 0.35% (13 of 3716), the rate of IH-sided was 0.39% (10 of 2592), the rate of CPPV-sided was 0.35% (3 of 1124), there were no significant differences between the blocks (Fig.3).

Discussion

The development of inguinal hernia in boys is associated with the physiological process of testis during embryonic period⁶, the testis descends from its retroperitoneal occurs between 25 and 35 weeks of gestation, incomplete involution results in a patent processus vaginalis (PPV)⁷. The existence of PPV is highest during infancy and declines with age⁵, as high as 80% in term male infants, declines to 20-30% in adult⁸.

The younger-aged, the higher of the clinical incidence of PPV, the incidence of IH in premature infants can be as high as 30%⁹, 3%-5% in full-term infants⁵, 0.8%-4.4% in children less than 18 years of age¹⁰. Although our statistics was not started from newborns, both onset-case and repair-case showed an

aggregation at the young age, and the numbers of the both declined rapidly in earlier ($R^2 = 0.88$ and 0.97), all the data implicate parts of the PPV obliterated with age.

The left testis descends before the testis on the right¹¹, so the Involution of the left PV precedes that of right, consistent with the observation that 60% of inguinal hernias occur on the right side⁵, but IH mostly present with bilateral IH in preterm infants⁹, the Involution of both-sided PV precedes with age, and left PV obliterates first normally. Our data shown the CPPV in left-sided IH more than right-sided IH.

Inguinal hernias in children are not caused by structural factors in the abdominal wall, because the PV did not close or atresia occurred during the growth process, isolated high ligation of the hernia sac can cure inguinal hernias in children¹². Over the past decade, laparoscopic techniques have been applied widely in the management of common pediatric diseases¹³. Laparoscopic repair in children is considered safe, effective and more convenient technique^{14,15}, what's more CPPV can be discovered and repaired to prevent the formation of metachronous inguinal hernia (MIH)¹⁶. A number of studies showed the incidence of CPPV is 50%-70%^{2,3}, but the benefit from the repair was tiny, maybe just 1/10¹⁷, 1/18¹⁸, 1/21¹⁹. However, there was no evidence that repair in CPPV can reduce the postoperative recurrence rate^{20,21}. And explore data showed there was no statistic difference between LP and OP²². And observation has a lower risk of morbidity compared with contralateral exploration²³. But by laparoscopic, a unilateral inguinal hernia child had 50% to repair the other side, and the preventive surgery does not prevent or reduce the recurrence incidence²², the recurrence incidence of repaired CPPV is similar to contralateral clogged PV and IH-sided. The repairs do not decrease or increase the risk of inguinal hernia development in adulthood²⁴. What's more, the general consensus states that prevention of incarceration of inguinal hernia per se is not a proper indication to perform surgery²⁵, almost all incarcerated inguinal hernias can be reduced by gentle manual in children²⁶. Although the repair technique is convenient, it may bring some serious complications to patients, such as spermatic cord injury, testicular atrophy, chronic pain and infertility in adulthood^{5,24,27-31}, and with a 10-fold increase for recurrent repaired³². So we consistent with the authors' previous study, There was no indication for contralateral routine exploration^{24,28,33-36}.

In addition to described above, 15–37% of PPV with no clinically apparent hernia in autopsy studies in adults, and 12% (our data was 4.49%) during the laparoscopic operation¹⁵. Compare with children, the incidence of PPV is lower. In consequence, CPPV could be asymptomatic presence majority, obliterated with age partly, the incidence of developed to hernias similar to the incidence of hernia recurrence, so we hold the opinion that LP in CPPV results in overtreatment.

Conclusions

Inguinal hernias in children are caused by the PV did not obliterate and involute, PV is formed in the embryo and closed with age-growth, but not terminated after birth. CPPV may develop metachronous inguinal hernia (MIH), asymptomatic presence, or closed with age-growth. In the long term, most closed

before adulthood, a few are asymptomatic, less develop to MIH eventually. So laparoscopic inguinal hernia repair in children results in overtreatment.

Declarations

Competing interests

All authors declare that they have no competing interests.

Medical ethics statement

All cases covered in the submission were signed the informed consent by the patients and/or their legal relatives. The signed medical records were kept in the medical records room of Linyi Central Hospital. The Clinical diagnosis and treatment were in line with the World Medical Association Declaration of Helsinki and the Council for International Organizations of Medical Sciences International Code of Biomedical Ethics Involving Human Beings.

References

1. Schier, F. Laparoscopic herniorrhaphy in girls. *J Pediatr Surg* **33**, 1495–1497 (1998).
2. Sumida, W., Watanabe, Y., Takasu, H., Oshima, K. & Komatsuzaki, N. Incidence of contralateral patent processus vaginalis in relation to age at laparoscopic percutaneous extraperitoneal closure for pediatric inguinal hernia. *Surg Today* **46**, 466–470 (2016).
3. ROTHENBERG, R. E. & BARNETT, T. Bilateral herniotomy in infants and children. *Surgery* **37**, 947–950 (1955).
4. Tackett, L. D. *et al.* Incidence of contralateral inguinal hernia: a prospective analysis. *J Pediatr Surg* **34**, 684-687; discussion 687-688 (1999).
5. Wang, K. S., Committee on Fetus and Newborn, American Academy of Pediatrics & Section on Surgery, American Academy of Pediatrics. Assessment and management of inguinal hernia in infants. *Pediatrics* **130**, 768–773 (2012).
6. Hughes, I. A. & Acerini, C. L. Factors controlling testis descent. *Eur J Endocrinol* **159 Suppl 1**, S75-82 (2008).
7. Skandalakis, J. E., Colborn, G. L., Androulakis, J. A., Skandalakis, L. J. & Pemberton, L. B. Embryologic and anatomic basis of inguinal herniorrhaphy. *Surg Clin North Am* **73**, 799–836 (1993).
8. Pellegrin, K., Bensard, D. D., Karrer, F. M. & Meagher, D. P. Jr. Laparoscopic evaluation of contralateral patent processus vaginalis in children. *Am J Surg* **172**, 602-605; discussion 606 (1996).
9. Burgmeier, C., Dreyhaupt, J. & Schier, F. Comparison of inguinal hernia and asymptomatic patent processus vaginalis in term and preterm infants. *J Pediatr Surg* **49**, 1416–1418 (2014).
10. Miltenburg, D. M., Nuchtern, J. G., Jaksic, T., Kozinetiz, C. & Brandt, M. L. Laparoscopic evaluation of the pediatric inguinal hernia—a meta-analysis. *J Pediatr Surg* **33**, 874–879 (1998).

11. Brandt, M. L. Pediatric hernias. *Surg Clin North Am* **88**, 27-43, vii-viii (2008).
12. Tabrizian, F., Raisolsadat, S. M., Houshmand, B. & Yaghubi, M. A. Assessment of the necessity of sac high ligation in inguinal hernia open surgery among children. *J Pediatr Surg* **48**, 547–549 (2013).
13. Celebi, S., Uysal, A. I., Inal, F. Y. & Yildiz, A. A single-blinded, randomized comparison of laparoscopic versus open bilateral hernia repair in boys. *J Laparoendosc Adv Surg Tech A* **24**, 117–121 (2014).
14. Abdulhai, S., Glenn, I. C. & Ponsky, T. A. Inguinal Hernia. *Clin Perinatol* **44**, 865–877 (2017).
15. Abdulhai, S. A., Glenn, I. C. & Ponsky, T. A. Incarcerated Pediatric Hernias. *Surg Clin North Am* **97**, 129–145 (2017).
16. Jessula, S. & Davies, D. A. Evidence supporting laparoscopic hernia repair in children. *Curr Opin Pediatr* **30**, 405–410 (2018).
17. Kokorowski, P. J., Wang, H. H., Routh, J. C., Hubert, K. C. & Nelson, C. P. Evaluation of the contralateral inguinal ring in clinically unilateral inguinal hernia: a systematic review and meta-analysis. *Hernia* **18**, 311–324 (2014).
18. Muensterer, O. J. & Gianicolo, E. Contralateral processus closure to prevent metachronous inguinal hernia: A systematic review. *Int J Surg* **68**, 11–19 (2019).
19. Zhao, J. *et al.* Potential value of routine contralateral patent processus vaginalis repair in children with unilateral inguinal hernia. *Br J Surg* **104**, 148–151 (2017).
20. Bowling, K., Hart, N., Cox, P. & Srinivas, G. Management of paediatric hernia. *BMJ* **359**, j4484 (2017).
21. Chong, A. J., Fevrier, H. B. & Herrinton, L. J. Long-term follow-up of pediatric open and laparoscopic inguinal hernia repair. *J Pediatr Surg* **54**, 2138–2144 (2019).
22. Gibbons, A. T. *et al.* Recurrence after laparoscopic high ligation in adolescents: A multicenter international retrospective study of ten hospitals. *J Pediatr Surg* (2020).
23. Burd, R. S., Heffington, S. H. & Teague, J. L. The optimal approach for management of metachronous hernias in children: a decision analysis. *J Pediatr Surg* **36**, 1190–1195 (2001).
24. Zendejas, B., Zarroug, A. E., Erben, Y. M., Holley, C. T. & Farley, D. R. Impact of childhood inguinal hernia repair in adulthood: 50 years of follow-up. *J Am Coll Surg* **211**, 762–768 (2010).
25. de Goede, B. *et al.* Watchful Waiting Versus Surgery of Mildly Symptomatic or Asymptomatic Inguinal Hernia in Men Aged 50 Years and Older: A Randomized Controlled Trial. *Ann Surg* **267**, 42–49 (2018).
26. *J Pediatr Surg* **19**, 44-46 (1984).
27. Sharp, E., Roberts, M., Żurada-Zielińska, A., Zurada, A., Gielecki, J., Tubbs, R. S. & Loukas, M. The Most Commonly Injured Nerves at Surgery: A Comprehensive Review. *Clin Anat* (2020).
28. Ein, S. H., Njere, I. & Ein, A. Six thousand three hundred sixty-one pediatric inguinal hernias: a 35-year review. *J Pediatr Surg* **41**, 980–986 (2006).
29. Skinner, M. A. & Grosfeld, J. L. Inguinal and umbilical hernia repair in infants and children. *Surg Clin North Am* **73**, 439–449 (1993).

30. Harvey, M. H., Johnstone, M. J. & Fossard, D. P. Inguinal herniotomy in children: a five year survey. *Br J Surg* **72**, 485–487 (1985).
31. Hecker, W. C. & Ring-Mrozik, E. [Results of follow-up of operations in pediatric patients with indirect inguinal hernia]. *Langenbecks Arch Chir* **371**, 115–121 (1987).
32. Jenkins, J. T. & O'Dwyer, P. J. Inguinal hernias. *BMJ* **336**, 269–272 (2008).
33. Erdoğan, D., Karaman, I., Aslan, M. K., Karaman, A. & Cavuşoğlu, Y. H. Analysis of 3,776 pediatric inguinal hernia and hydrocele cases in a tertiary center. *J Pediatr Surg* **48**, 1767–1772 (2013).
34. Pini Prato, A. *et al.* Inguinal hernia in neonates and ex-preterm: complications, timing and need for routine contralateral exploration. *Pediatr Surg Int* **31**, 131–136 (2015).
35. Simons, M. P., de Lange, D., Beets, G. L., van Geldere, D., Heij, H. A. & Go, P. M. [The 'Inguinal Hernia' guideline of the Association of Surgeons of the Netherlands]. *Ned Tijdschr Geneesk* **147**, 2111–2117 (2003).
36. Shabbir, J. *et al.* Contralateral groin exploration is not justified in infants with a unilateral inguinal hernia. *Ir J Med Sci* **172**, 18–19 (2003).

Figures

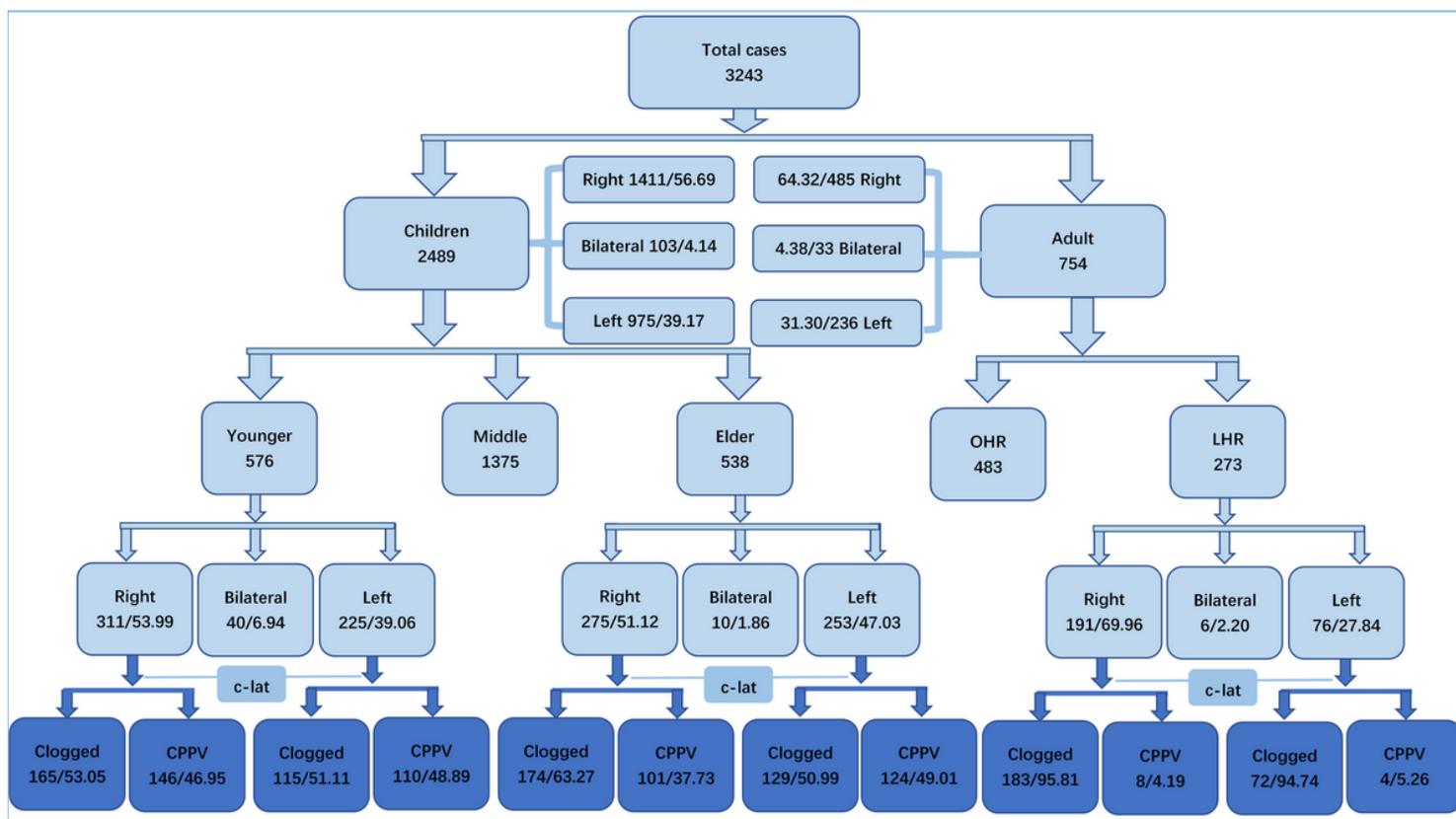


Figure 1

The incidence of CPPV in different groups.

Younger: aged ≤ 18 months, Elder: aged ≥ 60 months, c-lat: contralateral.

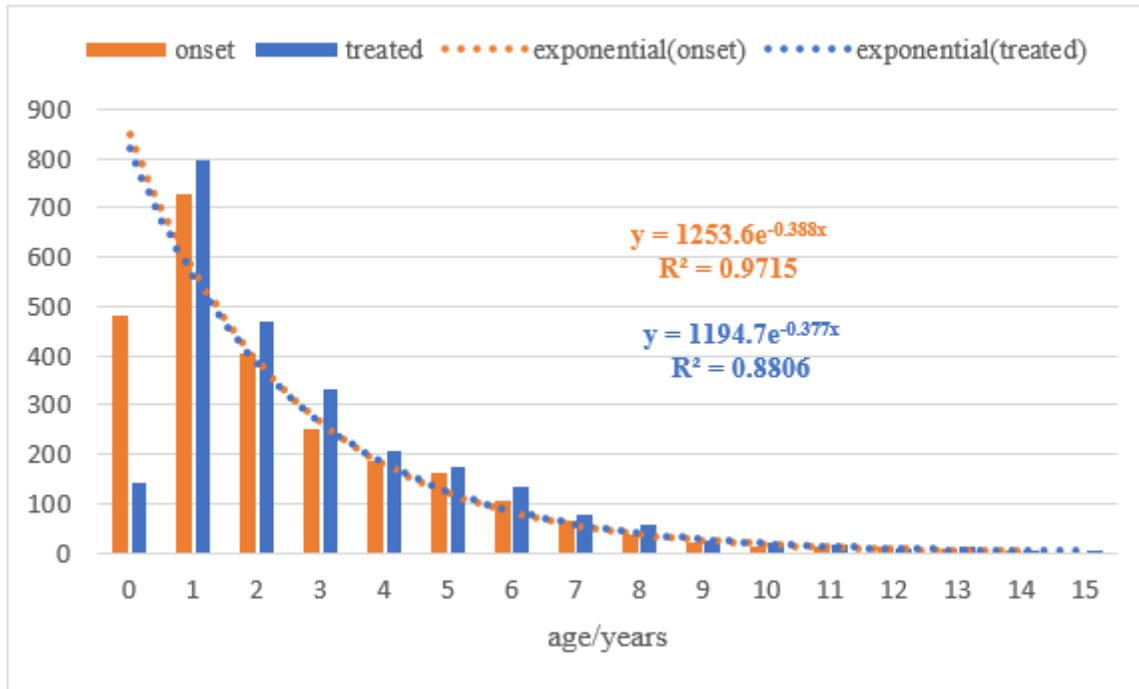


Figure 2

Children onset - treatment age trend chart.

Within a few years of birth, both onset age-case and treated age-case declined rapidly.

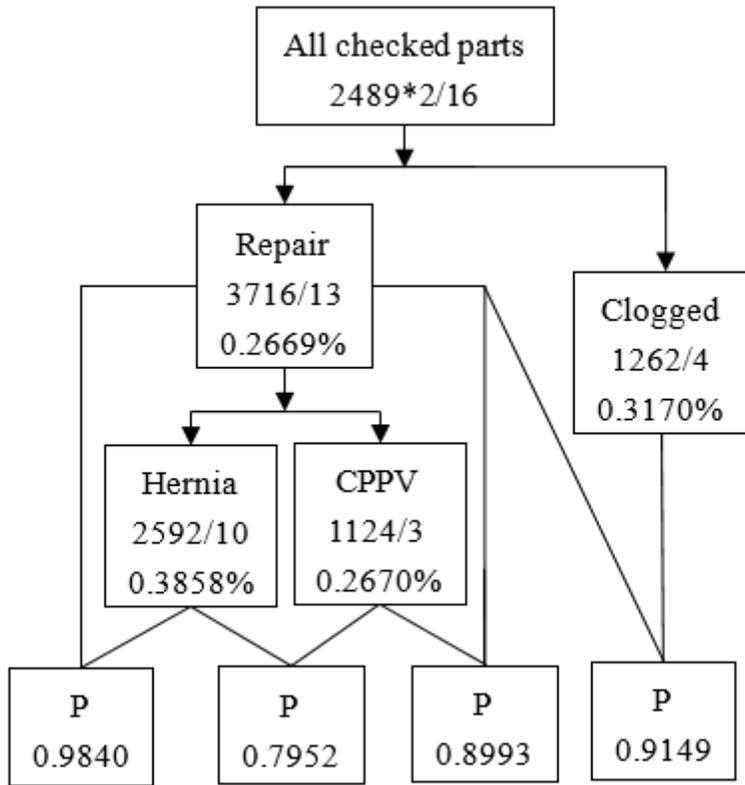


Figure 3

Recurrence rate of the blocks in the study.