Original Article

Predictive Factors for Bowel Resection in Childhood Intussusception

Idrissa Salahoudine[1], Alaoui Othmane[1,2], Mahmoudi Abdelhalim[1,2], Khattala Khalid[1,2], Bouabballah Youssef[1,2]

[1]Department of Pediatric Surgery, University Hospital of Hassan II, [2]University of Sidi Mohamed Ben Abdellah, Fez, Morocco

Abstract

Background: Intestinal intussusception is the most common cause of intestinal obstruction in infants and children under 3 years of age. Any delay in diagnosis or management can lead to intestinal ischaemia and perforation. The aim of this study is to determine the sociodemographic and clinical risk factors associated with bowel resection in infants and children with intussusception. **Materials and Methods:** This is a retrospective analytical study of 118 patients operated at the Hassan II Hospital and University of Fez between 1 January 2008 and 1 January 2018. A comparison of risk factors between patients with and without bowel resection was performed using multivariate logistic regression. **Results:** One hundred and eighteen patients met the inclusion criteria. Of these, 44% had undergone bowel resection. Age >2 years ($P = 0.006$), duration of symptoms progression of more than 2 days ($P = 0.002$), bilious vomiting ($P = 0.04$) and palpation of an abdominal mass ($P = 0.01$) were significantly associated with bowel resection. Multivariate logistic regression showed that age <2 years (odds ratio [OR] =4.47 95% confidence interval [CI]: 1.12–17.78) and duration of symptom progression of more than 2 days (OR = 2.62 95% CI: 1.12–6.11) were independent risk factors for bowel resection. **Conclusion:** Intussusception that occurs in child old than 2 years of age, or which has progressed for more than 2 days, is associated with an increased risk of intestinal resection.

Keywords: Bowel resection, infant and children, intussusception

Introduction

Intussusception is the leading cause of intestinal obstruction in infants. It is rare before 2 months of age, its incidence increases to reach its peak between 6 and 9 months.[1] The aetiology of intussusception remains unknown; however, several studies have reported a correlation between the increased incidence of intussusception and certain viral infections, as well as rotavirus vaccination.[2-4] The diagnosis is suspected in the presence of paroxysmal abdominal pain (or crying), vomiting and rectal bleeding.[4,5] The combination of these three clinical signs, known as 'triad of intussusception', is reported in only one to two-thirds of cases.[2,6] Nevertheless, ultrasound remains the key investigation for the diagnosis of intussusception. Non-operative treatment (NOT) with air or liquid enema has the completely changed treatment of intussusception.[7-10] With a success rate of around 95%, NOT is currently the treatment of choice for intussusception.[10-13] Previous authors have investigated risk factors for ischaemia and intestinal resection (IR); however, the results of these studies are not agreed upon.[14-16] The aim of this study is to determine the sociodemographic and clinical risk factors for bowel resection in childhood intussusception.

Materials And Methods

A retrospective analysis of operated patients for intussusception was performed in the Department of Paediatric Surgery of the Hassan II Hospital and the University of Fez between 1 January 2008 and 1 January 2018. Inclusion criteria were: ultrasound diagnosis of intussusception, Operated patients for intussusception and age of patient range from 0 to 15 years. Exclusion criteria were: no intussusception detected during surgery, postoperative intussusception and incomplete medical record. Medical records of patients meeting the inclusion

Received: 22-03-2023 **Revised:** 03-06-2023 **Accepted:** 10-07-2023 **Available Online:** 13-09-2024

Access this article online

Quick Response Code:

Website: https://journals.lww.com/AJPS

DOI: 10.4103/ajps.ajps_42_23

Address for correspondence: Dr. Idrissa Salahoudine, Department of Pediatric Surgery, University Hospital of Hassan II, Fez, Morroco.
E-mail: salawidrissa@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Salahoudine I, Othmane A, Abdelhalim M, Khalid K, Youssef B. Predictive factors for bowel resection in childhood intussusception. Afr J Paediatr Surg 2024;21:254-6.

criteria were reviewed using the hospital computer system and the departmental archives. Patients who met the inclusion criteria are assigned to two groups: IR and without IR (WIR). The IR included patients with intestinal ischaemia, perforation or local pathology (Meckel's diverticulum, duplication, polyp), which required IR. The WIR is patients in whom, after surgical reduction, no bowel resection was performed. A comparison of the sociodemographic and clinical characteristics of patients with and without bowel resection was performed.

Data were entered into Microsoft Excel 2013 and imported into STATA version 12.0 (STATA 16.0 software (Stata Corp LLC, College Station, TX, USA). for statistical analysis. A descriptive analysis of sociodemographic and clinical parameters was performed, followed by univariate analysis to determine the association of all predictor variables with the primary dichotomou outcome (IR vs. WIR). The comparison between the two groups was performed using Pearson's Chi-square test (or Fisher's exact test when one of the theoretical numbers is <5) for categorical variables. Only predictors with $P < 0.2$ were considered for multivariate logistic regression. Odds ratios (ORs) for bowel resection were calculated by multivariate logistic regression analysis and expressed with 95% confidence intervals (CIs). $P < 0.05$ was considered statistically significant. Results are expressed as median (minimum–maximum).

Results

During the study period, 118 patients met the inclusion criteria. Fifty-six percent of the patients were male. The median age of patients at diagnosis was 7 months (3 months to 180 months). The median duration of symptoms before diagnosis was 72 h (2 h to 360 h). Abdominal pain or paroxysmal screaming was present in 112 (94.9%) patients. No-bilious vomiting in 110 (94.0%), bilious vomiting in 55 (47.0%), rectal bleeding in 97 (82.9%), fever in 25 (21.4%), lethargy in 39 (33.0%), an abdominal mass in 32 (27.1%) and a rectal mass in 16 (20.5%). A pathological lead point was found in 17 (14.4%) patients. Fifty-two (44%) patients had undergone bowel resection. Age over 2 years ($P = 0.006$), the duration of symptoms of more than 2 days ($P = 0.002$), bilious vomiting ($P = 0.04$) and an abdominal mass ($P = 0.01$) were significantly associated with bowel resection. In contrast, gender, abdominal pain, no-bilious vomiting, rectal bleeding, lethargy, fever and a rectal mass were not associated with bowel resection ($P > 0.05$). The univariate analysis of sociodemographic and clinical parameters according to whether or not a bowel resection was performed is summarised in Table 1. Multivariate logistic regression showed that age >2 years (OR = 4.47 95% CI: 1.12–17.78) and duration of symptoms >2 days (OR = 2.62 95% CI: 1.12–6.11) were independent risk factors for bowel resection [Table 2].

Table 1: Univariate analysis of sociodemographic and clinical parameters of the 118 patients according to intestinal resection or without intestinal resection group

	WIR (*n*=66), *n* (%)	IR (*n*=52), *n* (%)	*P*
Sex			
Male	31 (47.0)	21 (40.4)	0.47
Age group (months)			
>24	3 (4.6)	11 (21.2)	0.008*
Functional signs			
Abdominal pain	62 (93.9)	50 (96.1)	0.58
Food vomiting	60 (92.3)	50 (96.1)	0.46
Bilious vomiting	25 (39.7)	30 (58.8)	0.04*
Rectal bleeding	56 (86.1)	41 (78.8)	0.30
Physical signs			
Fever	12 (18.4)	13 (25.0)	0.39
Lethargy	20 (30.3)	19 (36.5)	0.47
Abdominal palpable mass	24 (36.4)	8 (15.7)	0.01*
Rectal mass	8 (16.3)	8 (27.6)	0.23
Duration of symptoms (h)			
>48	26 (39.4)	34 (68.0)	0.002*

*$P<0.05$. IR: Intestinal resection, WIR: Without IR

Table 2: Multivariate logistic regression according to intestinal resection or without intestinal resection group

	OR (CI 95%)	*P*
Bilious vomiting	1.67 (0.72–3.87)	0.23
Abdominal palpable mass	0.50 (0.18–1.37)	0.18
Age >24	4.47 (1.12–17.78)	0.03*
Duration of symptoms >48	2.62 (1.12–6.11)	0.02*

* = $P<0.05$ was considered statistically significant, OR: Odds ratio, CI: Confidence interval

Discussion

In this study, the prevalence of bowel resection was 44%, which is very high compared to reported figures in the literature.[17-19] However, higher bowel resection in childhood intussusception has been previously reported.[20-22] In fact, in low- and middle-income countries, the lack of health infrastructure leads to a delay in diagnosis and therefore, in the management of intestinal intussusception. This could explain the fairly high number of bowel resection cases reported by these countries. We found that age over 2 years was an independent risk factor for bowel resection. The incidence of secondary intussusception increases significantly after 2 years of age[1] and the risk of bowel resection is higher in older children.[18,23] In this study, the duration of intussusception symptoms for 2 days was significantly associated with the risk of bowel resection. It is clear that if not promptly managed, strangulation of the bowel leads to ischaemia and subsequent intestinal perforation. The relationship between the duration of symptom progression and the incidence of bowel resection is widely reported in the literature.[14,16,18,21,24,25]

It is important to note that amongst infants under 2 years of age, 39.4% underwent IR and that 28.5% of patients in whom management was relatively early (duration of symptoms was <2 days), IR was performed. Another example is the case of patients who are more than 2 years old or in whom the

duration of symptomatology exceeds 48 h but who have not undergone bowel resection. This reflects the existence of other parameters that could explain the occurrence of bowel resection independently of age or duration of disease progression. The risk factors for bowel resection identified in this study serve to alert clinicians to optimise the management of childhood intussusception. This study, like any retrospective study, is subject to bias. First, the information collected retrospectively about the patients' clinical signs was often recorded by young doctors, with the risk of bias that this involves. In addition, the sample size on which the study was done was small, and the number of patients needed to measure a statistical association was not calculated.

Conclusion

Our study corroborates the assertion that age and especially the duration of the evolution of the symptoms of intussusception are predictive factors of IR. This study could help improve decisions in the management of acute intestinal intussusception in children. However, it is important that prospective multicentre studies, including a sufficient number of patients, be carried out to obtain consensual conclusions on the risk factors for bowel resection.

Acknowledgements

To our masters of the paediatric surgery department and our radiologist colleagues of the Hospital and University Centre of Fez for their collaboration.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Franchi S, Martelli H, Paye-Jaouen A, Goldszmidt D, Pariente D. Acute intestinal intussusception in infants and children. EMC Pediatric 2005;2:45-57.
2. Khen-Dunlop N. Khen Dunlop N. Intestinal intussusceptions in children. J Pediatrics Childcare 2020;33:221-7.
3. Navarro O, Daneman A. Intussusception. Part 3: Diagnosis and management of those with an identifiable or predisposing cause and those that reduce spontaneously. Pediatr Radiol 2004;34:305-12.
4. Wong CW, Chan IH, Chung PH, Lan LC, Lam WW, Wong KK, *et al.* Childhood intussusception: 17-year experience at a tertiary referral centre in Hong Kong. Hong Kong Med J 2015;21:518-23.
5. Ugwu BT, Legbo JN, Dakum NK, Yiltok SJ, Mbah N, Uba FA. Childhood intussusception: A 9-year review. Ann Trop Paediatr 2000;20:131-5.
6. Sagna A, Camara S, Ly S, Fall I. Acute intestinal intussusception of the infant and the child: A 5-year study of 66 cases. Afr J Paediatr Surg 2018;15:138-41.
7. Kaiser AD, Applegate KE, Ladd AP. Current success in the treatment of intussusception in children. Surgery 2007;142:469-75.
8. Hu J, Liu M, Yu X, Xia Q, Wang K, Guo S, *et al.* Clinical characteristics of intussusception with surgical reduction: A single-center experience with 568 cases. J Gastrointest Surg 2019;23:2255-62.
9. Gluckman S, Karpelowsky J, Webster AC, McGee RG. Management for intussusception in children. Cochrane Database Syst Rev 2017;6:CD006476.
10. Hannon E, Williams R, Allan R, Okoye B. UK intussusception audit: A national survey of practice and audit of reduction rates. Clin Radiol 2014;69:344-9.
11. Jenke AC, Klaassen-Mielke R, Zilbauer M, Heininger U, Trampisch H, Wirth S. Intussusception: Incidence and treatment-insights from the nationwide German surveillance. J Pediatr Gastroenterol Nutr 2011;52:446-51.
12. Justice FA, Auldist AW, Bines JE. Intussusception: Trends in clinical presentation and management. J Gastroenterol Hepatol 2006;21:842-6.
13. Samad L, Marven S, El Bashir H, Sutcliffe AG, Cameron JC, Lynn R, *et al.* Prospective surveillance study of the management of intussusception in UK and Irish infants. Br J Surg 2012;99:411-5.
14. Fallon SC, Lopez ME, Zhang W, Brandt ML, Wesson DE, Lee TC, *et al.* Risk factors for surgery in pediatric intussusception in the era of pneumatic reduction. J Pediatr Surg 2013;48:1032-6.
15. Huang HY, Lin XK, Guo SK, Bao XZ, Lin ZX, Li ZR, *et al.* Haemostatic indexes for predicting intestinal necrosis in children with intussusception. ANZ J Surg 2021;91:1485-90.
16. Huang HY, Huang XZ, Han YJ, Zhu LB, Huang KY, Lin J, *et al.* Risk factors associated with intestinal necrosis in children with failed non-surgical reduction for intussusception. Pediatr Surg Int 2017;33:575-80.
17. Saxena AK, Höllwarth ME. Factors influencing management and comparison of outcomes in paediatric intussusceptions. Acta Paediatr 2007;96:1199-202.
18. Wong CW, Jin S, Chen J, Tam PK, Wong KK. Predictors for bowel resection and the presence of a pathological lead point for operated childhood intussusception: A multi-center study. J Pediatr Surg 2016;51:1998-2000.
19. Chen B, Cao J, Yan C, Zheng C, Chen J, Guo C. A promising new predictive factor for detecting bowel resection in childhood intussusception: The lymphocyte-C-reactive protein ratio. BMC Pediatr 2021;21:577.
20. Mangete ED, Allison AB. Intussusception in infancy and childhood: Analysis of 69 cases. East Afr Med J 1993;70:734-6.
21. Nisar MU, Sikander S, Khan NA, Javed N, Chaudhary MA, Abdullah Saif MA. Determinants of bowel resection in childhood intussusception. J Ayub Med Coll Abbottabad 2020;32:9-12.
22. Ogundoyin OO, Olulana DI, Lawal TA. Childhood intussusception: Impact of delay in presentation in a developing country. Afr J Paediatr Surg 2016;13:166-9.
23. Banapour P, Sydorak RM, Shaul D. Surgical approach to intussusception in older children: Influence of lead points. J Pediatr Surg 2015;50:647-50.
24. Yao XM, Chen ZL, Shen DL, Zhou QS, Huang SS, Cai ZR, *et al.* Risk factors for pediatric intussusception complicated by loss of intestine viability in China from June 2009 to May 2014: A retrospective study. Pediatr Surg Int 2015;31:163-6.
25. Johnson B, Gargiullo P, Murphy TV, Parashar UD, Patel MM. Factors associated with bowel resection among infants with intussusception in the United States. Pediatr Emerg Care 2012;28:529-32.