

Intussusception characteristics and ultrasound guided pneumatic reduction: A clinical experience in children less than 24 months old in Vietnam.

Linh Van Pham¹, Duc Minh Pham², Quynh Vu Ta³, Dat Tan Nguyen⁴, Phuong Minh Nguyen^{1*}

¹Faculty of Medicine, Can Tho University of Medicine and Pharmacy, Can Tho, Vietnam

²Hue University of Medicine and Pharmacy, Hue University, Hue City, Vietnam

³Can Tho Children's Hospital, Can Tho, Vietnam

⁴Faculty of Nursing and Medical Technology, Can Tho University of Medicine and Pharmacy, Can Tho, Vietnam

Abstract

Background: Intussusception is a common pediatric emergency, the leading cause of mechanical bowel obstruction in infants.

Objectives: We aimed to examine the clinical, ultrasound characteristics and to evaluate the treatment outcomes of pneumatic reduction of intussusception in children younger than 24 months old in Vietnam.

Materials and Methods: An intervention study design without a control group was conducted. 182 children younger than 24 months diagnosed with intussusception were treated with the pneumatic reduction at Can Tho Children's Hospital between January 1, 2017 and April 30, 2018. All patients were observed and recorded by the research members from initial hospitalization until discharge. Details of gender, age, intussusception history, the symptoms at hospitalization, clinical and ultrasound characteristics, and treatment results were obtained through structured questionnaires and medical records.

Results: Of the 182 patients, there were 105 males and 77 females with the age mean of 15.5 (SD 5.5) months. The main symptoms were abdominal pain (100%), vomiting (87.9%), a rectal examination with blood (23.6%), and touching the intestinal cage while a process of examining the belly (71.4%). 96.7% of cases were detected through an abdominal ultrasound. 96.6% of intestinal cage cases were found under the right rib and in which there were 69.9% of the image of steles and 4.6% of containing fluid on ultrasound. The success rate was 98.4%. After treating with the pneumatic reduction, there were 18.1% and 9.3% of relapse during hospitalization and after discharge respectively. All the relapse patients were successfully the second time treated with the pneumatic reduction. No side effects were found during the treatment.

Conclusions: Intussusception in children younger than 24 months old may be based on clinical or ultrasound signs to detect. Treating with the pneumatic reduction in these children has a high rate of success without side effects.

Keywords: Intussusception, Ultrasound, Pneumatic reduction, Children, Vietnam.

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Introduction

Intussusception is a common pediatric emergency, the leading cause of mechanical bowel obstruction in infants, accounting for the highest proportion in children aged 4 to 9 months. If not diagnosed early and treated promptly, intussusception results in ischemia, eventually leading to bowel necrosis, perforation, peritonitis, and potentially fatal [1]. The reported incidence of intussusception in some studies varies by time and geographic locations. Among studies reporting the incidence of intussusception in children, less than 1 year of age, the global mean incidence was 74 per 100,000 infant years (range: 9–328). While incidence in a majority (83%) of the studies was less than 100 per 100,000 infants. The higher incidence was observed in some populations including South Korea (328), Vietnam (302), and Israel (219). Incidence of intussusception was less than 20 per 100,000 infants in some populations from Finland (20), India (18), Malaysia (18), and Bangladesh (9) [2]. Overall in Vietnam, the reported incidence rate of intussusception

is about four times higher than the global average (287–302 per 100,000 infants versus 74 per 100,000 infants) [2-4]. Diagnosis determines the intussusception based on clinical and ultrasonographic characteristics [1,5-9].

Currently, the treatment of intussusception with non-surgical methods as the pneumatic reduction, hydro-static reduction. The pneumatic reduction is currently the most popular standard method with a high success rate, the contraindications for the pneumatic reduction are sepsis, peritonitis, shock, and bowel perforation [10-13]. Besides, limited published data are available on clinical management and outcome of intussusception in Can Tho City, Vietnam. We, therefore, aimed to examine the clinical, ultrasound characteristics and to evaluate the treatment outcomes of pneumatic reduction of intussusception in children younger than 24 months old.

Materials and Methods

An intervention study design without a control group was

applied in this study. It included 182 children younger than 24 months old diagnosed with intussusception and treated with the pneumatic reduction at Can Tho Children's Hospital from the 1st of January 2017 to the 30th of April 2018. Children diagnosed with intussusception would be indicated for treatment with pneumatic reduction if they were hospitalized before 6 hours after the onset and had a good overall status. The pneumatic reduction system has a safety valve and a pressure control system.

For anesthesia, most patients receive anesthesia through masks, and in some special cases, patients were anesthetized with a trachea. The maximum inflatable pressure was 120 mmHg, and the maximum pressure maintenance time was 5 minutes each time. Each patient was pumped with air only from 1 to 3 times.

The results were evaluated to be successful when the criteria were met: 1) the pressure dropped abruptly, 2) the abdomen of the patient was flat and round, 3) the air was through the nasal passages, 4) the intestine shapes honeycomb on x-ray, 5) the child can suck or drink, 6) there is no vomit, 7) diarrhea after 6 to 8 hours and the stool has no blood. The patient was discharged after 48 hours to 72 hours after the pneumatic reduction.

All the patients were observed and recorded by the research members from started hospitalization until discharge. Information on demographics, intussusception history, the symptoms at hospitalization, clinical and ultrasound characteristics, and treatment results were obtained through structured questionnaires.

Data were analysed via using descriptive statistics for demographic data and the Chi-squared test (χ^2) analysing categorical data with a p-value of less than 0.05 was considered statistically significant. Subjects with missing data were excluded from the respective analyses. All analyses were performed with SPSS version 18.0.

Ethical approval for the study was obtained from the Scientific and Technical Committee of the Can Tho University of Medicine and Pharmacy, which had the authority to approve both technical contents and ethical aspects of studies. All research subjects were explained in detail about the purposes and contents of the studies to voluntarily participate and cooperate in the research process. All information of the participants was kept confidential and only used for research purposes.

Results

Of the 182 infants, the rate of male/female was 1.4/1. These children from 13 months to <24 months accounted for the highest rate of 63.7% (116/182), the average age of 15.5 ± 5.5 months. Most patients going to the hospital within 24 hours after the first symptoms accounted for 85.5%. The length of symptoms was 17.7 ± 14.3 hour's average (Table 1).

The most common symptom observed was abdominal pain, found in 182 (100.0%) patients. Classic clinical triad (abdominal pain, vomiting, bloody stool) was reported only in 29 (15.9%) patients (Table 1).

An abdominal sonography, made in 182 (100%) patients,

detected intussusception in 176 (96.7%) patients. There was 96.6% of intestinal cage found under the right rib and in which there were 69.9% of the target sign/pseudo kidney sign and 4.6% of containing fluid on ultrasonography (Table 1).

Characteristics	n (%), N=182
Patient characteristics	
Male	105 (57.7)
Female	77 (42.3)
Age (mean \pm SD)	15.5 ± 5.5
5-12 months	66 (36.3)
13- <24 months	116 (63.7)
Duration of symptoms (mean \pm SD)	17.7 ± 14.3
< 24 hours	156 (85.5)
24-48 hours	14 (7.7)
> 48 hours	12 (6.6)
Clinical symptoms	
Abdominal pain	182 (100.0)
Vomiting	160 (87.9)
Bloody stool	32 (17.6)
Classic clinical triad*	29 (15.9)
Clinical signs	
Palpable abdominal mass	130 (71.4)
Rectal examination with blood	43 (23.6)
Ultrasonic characteristics	
Position intestinal cage under the right rib	170 (96.6)
Target sign/pseudo kidney sign	123 (69.9)
Intestinal cage containing fluid	8 (4.6)
*Classic clinical triad (abdominal pain, vomiting, bloody stool)	

Table 1. Patient characteristics, intussusception symptoms and ultrasonic characteristics.

The treatment results of intussusception with pneumatic reduction were successful with a high rate of 98.4%. The statistically significant correlation between the success rate of the pneumatic reduction and duration of symptoms was found (Table 2). The recurrence occurred in 33 patients (18.1%). There was 8.8% and 9.3% recurred during hospitalization and after discharge, respectively. Mean hospital stay was 2.8 ± 1.2 days after the pneumatic reduction.

Duration of symptoms	Number of patients n (%)	Successful pneumatic reduction	
< 24 hours	156 (85.524)	156 (100)	p* = 0,003
> 24 hours	26 (14.5)	23 (88.5)	
Total	182 (100.0)	179 (98.4)	
*Fisher's Exact Test			

Table 2. Duration of symptoms and treatment outcomes of pneumatic reduction.

Discussion

In our study, the mean age of patients was 15.5 ± 5.5 months, the minimum was 5 months. The most common age group is 13-24 months (63.7%). There were 36.3% of patients under 12 months. The majority of authors observed that lots of patients under 12 months of age were much higher than that of our study [14,15]. This difference may be due to our limited research: a

short study period, a small number of patients, and only patients <24 months old at a Paediatric hospital with the pneumatic reduction. Therefore, the results did not cover the whole of the situation of intussusception in children. The proportion of men is dominant, equivalent to the male/female ratio of most studies of other authors in Vietnam as well as in the world [6,7,16,17]. Our study had 9.3% of patients with a history of intussusception. The time from the onset of symptoms to hospitalization, before 24 hours group accounted for 85.7%. This demonstrates the family's understanding and interest in children's health as well as increasing diagnosis.

The most common symptoms at presentation in infants were abdominal pain, vomiting, and bloody stool. The abdominal pain was the leading symptom in 100.0% of cases, consisting of some studies observed in 93%-100% of patients [9,15,18-21]. This is the main symptom for parents to take their children to the hospital. Depending on the time of hospitalization, the abdominal pain manifests differently. The first stage of pain is clearly manifested that the more after the intestine is necrosis, paralysis, the pain no longer exists [1,5]. Vomiting, a common symptom of the intussusception, was observed in 53.1-94% of patients [9,15,18-21]. Bloody stools were usually a late presentation. Bloody stools manifested when the ischemic intestinal mucosa had sloughed off, which is a mixture of sloughed mucosa, blood, and mucus [1]. In our study, "classic triad" (abdominal pain, vomiting, bloody stool) was found in 15.6% of cases. The proportion of patients with the classic triad of our study is lower than that of the study's authors (Singh et al. 18.7% [19], Chalya PL, et al. 42.5% [20], Vujovic D. et al. 62% [15]). If the patient was diagnosed with intussusception when the patient had enough three symptoms, it could delay treatment and lead to many complications.

The presence of a palpable abdominal mass was reported to be the most reliable clinical feature on an examination. The detection of an abdominal mass in our study was reported in 71.4%. Some studies reported the incidence of an abdominal mass on the clinical examination was between 28% and 66.5% of patients [9,13,22,23]. Blood was detected on the rectal examination in 23.6% of cases, but only 17.6% had bloody stool. The importance of the rectal examination in the diagnosis of intussusception was highlighted [18,20,23].

Ultrasonography has become the diagnostic standard for confirmation of suspected intussusception. In our study, an abdominal sonography made in 182 (100%) patients detected intussusception in 176 (96.7%) patients, 170/176 (96.6%) of cases intestinal cage found under the right rib. Our study is consistent with previous findings of the high level of accuracy of ultrasound as a diagnostic tool, however, it requires an experienced sonographer [9,15,24-26].

In this study, the pneumatic reduction performed in 182 patients showed a high success rate of 98.4%, which coincided with other authors' results. The pneumatic reduction is the most popular method and is being advocated as a cleaner and faster technique, with a high success rate of 73%-93.5% [12,18,27]. Some studies did not show a high success rate (range 61%-68%), which may

be due to the symptom duration before hospital admission being a quite long period of time [13,28]. The mean of hospital stay was 2.8 ± 1.2 days after the pneumatic reduction. Okumus M, et al. the average length of stay for patients after the pneumatic reduction was 2 days [27]. During the hospitalization, the recurrence rate was 8.8% and 9.3% recurred after discharge in our study. The pneumatic reduction was the treatment method in all patients with recurrence without any problems. Risk factors for recurrence have not been clearly defined. The pneumatic reduction, a safe and effective method, should always be the first choice in pediatric intussusception if there were no definite contraindications. Patients can be safely discharged early without a long observation period [1,27].

Our study was limited by an intervention study design without a control group, so we cannot comment on the sensitivity, specificity, or other test characteristics of our findings. We only selected patients <24 months at Can Tho Children's Hospital with the pneumatic reduction, so the situation of intussusception in children was not fully covered. In addition, although our ultrasonography findings correlate with other studies, its usefulness may be dependent on an experienced sonographer's reading.

Ultrasound guided pneumatic reduction of intussusception is feasible in all children less than 2 years less contraindicated. The procedure can be done without sedation and has a high success rate. Ultrasound-guided pneumatic reduction of intussusception is feasible in all children less than 2 years unless contraindicated. The procedure can be done without general anesthesia safely and has a high success rate, minimal risk of bowel perforation with less peritoneal contamination, moreover, accurate pressure measurement is possible. The success rate is highly affected by the duration of symptoms and location of mass so that early diagnosis and referral to pediatric surgical centres will improve the results [28].

Conclusion

Intussusception in children younger than 24 months may be based on clinical or ultrasound signs to detect. The most common symptoms at presentation in infants with intussusception were abdominal pain, vomiting, and bloody stool. Treating with the pneumatic reduction in the children younger than 24 months diagnosed with intussusception has a high rate of success without side effects and decreases the length of hospital stay.

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***Correspondence to:**

Phuong Minh Nguyen
 Faculty of Medicine
 Can Tho University of Medicine and Pharmacy
 179 Nguyen Van Cu Street
 Can Tho, Vietnam
 Tel: +84914946198
 E-mail: nmphuong@ctump.edu.vn