

Received: 2008.06.27
Accepted: 2008.07.22

Intussusception in children: Hydrostatic reduction under US guidance – own experience

Danuta Roik¹, Michał Brzewski¹, Agnieszka Biejał¹, Jarosław Mądzik²,
Justyna Dusińska³, Andrzej Marciński¹

¹ Pediatric Radiology Department, Medical University of Warsaw, Warsaw, Poland

² Institute of Mother and Child, Warsaw, Poland

³ Pediatric Surgery Department, Medical University of Warsaw, Warsaw, Poland

Author's address: Danuta Roik, Pediatric Radiology Department, Medical University of Warsaw, 24 Marszałkowska str, Warsaw, Poland, e-mail: droik@o2.pl

Summary

Background:

Intussusception in children is a common abdominal emergency. Recent years have brought a new promising method of nonsurgical invagination treatment, hydrostatic reduction under sonographic (US) guidance. The major advantage of this method is lack of the ionized radiation.

Material/Methods:

The aim of our study is to assess the safety and effectiveness of hydrostatic reduction under US guidance used as a first choice method of invagination treatment in our department.

From July 2006 to December 2007, 33 procedures of hydrostatic reduction under US guidance were performed in 27 children, aged from 7 months to 6 years and 10 months. The procedure was performed in US room by radiologist and surgeon with the use of self-constructed set for saline enema. The sedation of patient was routinely performed.

Results:

The initial procedure was effective in 23 patients (pts) (85%). In 5 pts the recurrence of intussusception occurred and in 3 of them next attempt of the reduction was successful. In 4 cases the initial procedures failed, and those children were operated. Total amount of 6 pts underwent an operation. We do not observe any complications connected with the procedure.

Conclusions:

Hydrostatic reduction of children intussusception under US-guidance is safe and effective method. Our initial results meet the recommended limits of successful reduction rates. It encouraged us to evaluation and further implementation of this method. Water enema is a first choice method of invagination treatment in our hospital.

Key words:

Intussusception • US • water enema • child • neonate

PDF file:

<http://www.polradiol.com/fulltxt.php?ICID=874006>

Background

Intussusception is a common abdominal emergency in children but there are still considerable differences in the approach to diagnosis and treatment of this entity. The non-operative technique of intussusception treatment gained acceptance only in some parts of the world, however as it improved in the latter half of the twentieth century, image-guided enema gained widespread acceptance throughout the developed world [1,2].

Recently some authors advocated hydrostatic reduction of intussusception with saline enema under ultrasound (US) guidance [3,4].

The obvious advantage of sonography is that it does not involve ionized radiation and it monitors the reduction process with high accuracy and reliability [2]. Nonoperative method reduces invasiveness and costs of the treatment. The major disadvantage is the need for experienced radiologist familiar with this method [5].

Since July 2006 we use US-guided hydrostatic reduction as a first choice method of invagination treatment in children admitted to our hospital.

The aim of our study was to assess the safety and effectiveness of this method, this article describes our initial experience.

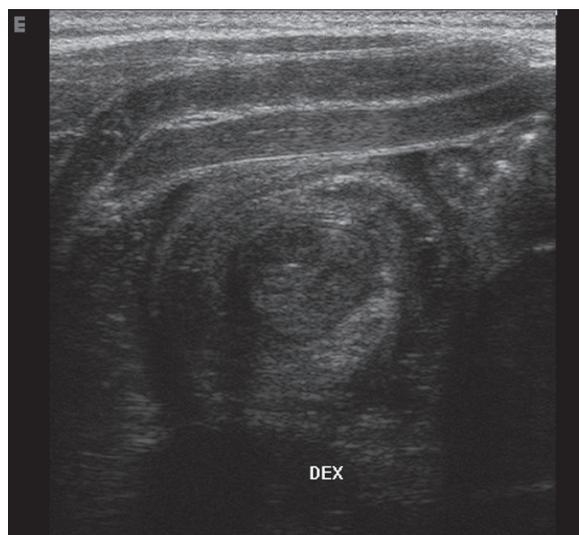


Figure 1. US examination of the abdomen with linear transducer shows typical target sign on transverse scan.

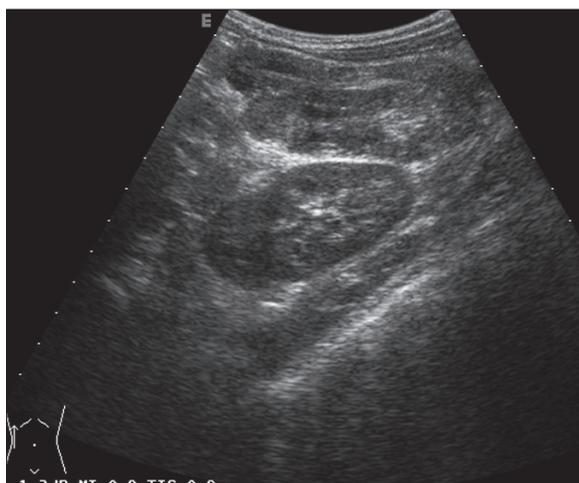


Figure 2. Pseudokidney appearance of intussusception on the longitudinal scan.

Material and Methods

From July 2006 to December 2007 invagination was recognized in 27 children admitted to our hospital with the symptoms and signs of intussusception. The diagnosis was made on the basis of US examination of the abdomen with linear (5.5–12.5 MHz) and convex (2.5–7 MHz) transducers, revealing typical sign of intussusception – target sign on transverse images (Figure 1) and pseudokidney appearance on the longitudinal scans (Figure 2). The Color Doppler (CD) was used to confirm the blood flow in the bowel wall (Figure 3). In 20 pts abdominal x-ray was also taken to exclude possible complication of the intussusception – perforation.

The population included 5 girls and 22 boys, aged from 7 months to 6 years and 10 months (mean, 2 years and 7 months). The duration of the invagination symptoms ranged from 4 hours to 3 days.

After the correction of dehydration and 15–20 minutes after the sedation was administered (rectal solution of chlo-

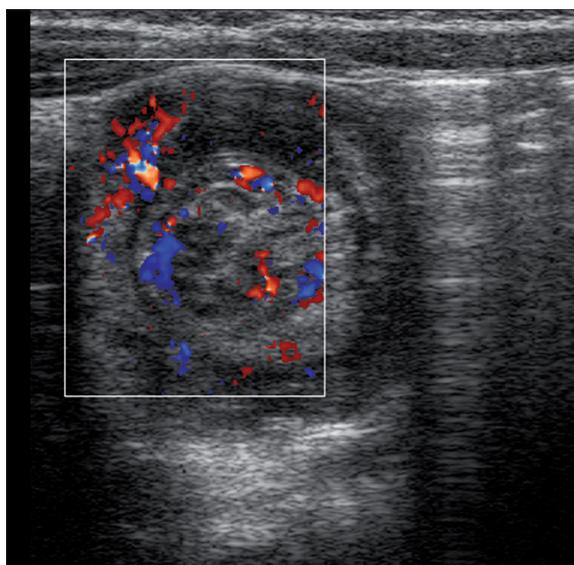


Figure 3. Color Doppler examination showing the blood flow in the wall of the intussusception.

ral hydrate, 50 mg/kg), the procedure of US-guided saline enema was performed. We used self-constructed set for water enema (Figure 4A,B), consisting of a plastic bag filled with warmed saline solution (0,9% NaCl), placed 100 cm above the patient, with the inlet connected to sphygmomanometer and the outlet to Foley catheter, placed in patient's rectum.

The procedure was performed in US-room, by both – radiologist, scanning the abdomen with US, and surgeon, who monitored patient's condition and checked the position of catheter and with assisted technician, who controlled enema's pressure.

If hydrostatic pressure did not cause reduction of the invagination, the pressure was increased to safe limit of 120 mmHg.

Ten radiologists were involved in our study. Their experience in pediatric ultrasonography ranged from 3 to 25 years.

We performed 33 procedures of US-guided hydrostatic reduction in 27 pts, 6 of them because of recurrences.

The effect of the reduction was considered as positive if the intussuseptum passed from the colon to ileum (Figure 5), the cecum and distal ileum filled with saline solution and ileocecal valve was clearly visible (Figure 6), with no residual intussusception.

Results

First procedure was effective in 23 pts (85%). In 4 cases the initial procedures failed, and those children were operated, with no other attempts of nonsurgical reduction.

In 5 pts the recurrence of intussusception occurred and in 3 of them another attempt of the reduction was successful. Total amount of 6 pts underwent an operation.



Figure 4AB. Saline enema set – a plastic bag filled with warmed solution of 0.9% NaCl, with the inlet connected to sphygmomanometer and the outlet to Foley catheter.



Figure 5. Monitoring of the procedure – the intussuseptum and saline solution in the cecum.

Finally the rate of successful nonsurgical reduction was 78%.

We do not observe any complication during and after the procedure.



Figure 6. Successful procedure – the ileocecal valve is clearly visible; the cecum and terminal ileum are filled with saline solution.

There were no pathologic points of the intussuseption found on US examination and in operated patients.

Discussion

Nonsurgical reduction of children intussusception is an important primary treatment due to high success rate and low incidence of complication [2]. In our department, like in many Western European countries [6], we used to reduce intussusceptions with air insufflation under fluoroscopic guidance [7], although the diagnosis of the intussusception was made on the basis of US examination, alone. The abdominal plain radiograph was used only to exclude possible perforation of gastro-intestinal tract. Trying to achieve ALARA criteria (as low as reasonably achievable), crucial for pediatric radiology, we started to reduce invagination with non-ionizing method – US-guided saline enema.

Our study approves high rate of successful reduction gained with this method. First procedures were successful in 23 from 27 pts (85%), despite, what must be emphasized, a large number of radiologists involved to the study and different level of their experience in pediatric US.

We observed 5 cases of intussusception recurrence, and in 3 of these cases (60%) another attempt of water enema was successful, what is also consistent with literature data [2].

Other 2 cases of the recurrences were operated, the decision was made by surgeon, in first child after 2 tries of enema reduction, in second one after 3 tries.

Finally the rate of successful nonsurgical reductions with water enema under US guidance was 78%.

We should aim to achieve reduction rates of at least 80% and even as high as 90%, as it is described in recent literature [2–4].

References:

1. McDermott VMG: Childhood intussusception and approaches to treatment: historical review. *Pediatr Radiol*, 1994; 24: 153–55
2. Danemann A, Navarro O: Intussusception. *Pediatr Radiol*, 2004; 34: 97–108
3. Woo SK, Kim JS et al: Childhood intussusception: US-guided hydrostatic reduction. *Radiology*, 1992; 182: 77–80
4. Riebel TW, Nasir R, Weber K: US-guided hydrostatic reduction of intussusception in children. *Radiology*, 1993; 188: 513–16
5. Del-Pozo G, Albillos JC, Tejedor D et al: Intussusception in children: current concepts in diagnosis and enema reduction. *Radiographics*, 1999; 19: 299–319
6. Schmit P, Rohrschneider WK, Christmann D: Intestinal intussusception survey about diagnostic and nonsurgical therapeutic procedures. *Pediatr Radiol*, 1999; 29: 752–61
7. Brzewski M, Marciński A, Gruchalska E: Wgłobienie jelitowe u dzieci – rozpoznawanie i leczenie „wlewem powietrznym”. *Pol J Radiol*, 1999; 64(1): 68–71
8. Beasley S: Intussusception. *Pediatr Radiol*, 2004; 34: 302–4

Our conclusion and modification implemented to enema reduction algorithm is that we should perform at least 3 tries of enema reduction, although there are no limitations of the number of attempts described in the literature [2]. The only limitations are possible contraindications, thus close cooperation with surgeons and careful monitoring of the patients condition are essential for this approach.

An absolute contraindication to nonsurgical reduction of invagination in our hospital is bowel perforation.

We have not repeated enema reduction in pts in whom the initial procedure was found to be unsuccessful, according to the criteria mentioned above, with residual intussus-septum seen in colon. Regarding to literature data [8] this group seems to be our target group for further improvement of the successful reductions rates.

US-guided saline enema is a safe method of intussusception reduction, we have not observed any complication either during or after the procedure.

Conclusions

Hydrostatic reduction of children intussusception under US guidance is safe and effective method.

This algorithm allows for substantial reduction of the radiation in children population.

Our results meet the recommended limits of successful reduction rates, what encouraged us to evaluation of the algorithm and father implementation of this method.

Water enema is a first choice method of invagination treatment in our hospital.