



HYDROSTATIC REDUCTION OF INTUSSUSCEPTION WITH NORMAL SALINE USING THE GRAVITY AIDED METHOD IN A NIGERIAN TEACHING HOSPITAL.

✉ MA ABDULSALAM*, BO BALOGUN**, RI OSUOJI***, OO OLOFINLADE**, OM FABOYA*, MA BANKOLE*

* Department of surgery, Lagos state University teaching Hospital, LASUTH, Ikeja

** Department of Radiology, Lagos state University teaching Hospital, Ikeja, Lagos.

*** Department of surgery, Lagos state college of medicine, LASUCOM, Ikeja.

Corresponding author email: mormurphy@yahoo.com

ABSTRACT

BACKGROUND

The non-operative treatment of intussusception has evolved over the years. One of such treatment modalities is ultrasound guided hydrostatic reduction using barium, saline and other water soluble agents. Despite the benefits of this method, surgery remains the mainstay of treatment in our hospital as well as in many other Nigerian hospitals.

AIM: To evaluate the success rate of ultrasound guided hydrostatic reduction of intussusception using the gravity aided saline reduction method.

METHOD: This is a prospective study of hydrostatic reduction of intussusception using the gravity aided saline reduction method. Patients were seen between January and December 2015.

RESULTS: Thirty five cases who were confirmed to have intussusception by ultrasonography were seen but only 12 were suitable for the procedure. Seven patients (58.3%) had successful hydrostatic gravity aided saline reductions while five (41.7%) had failed reductions. One patient had a recurrence. Bowel perforation complicated the procedure in one patient, who required a laparotomy for further management.

CONCLUSION: Ultrasound guided hydrostatic reduction with normal saline by gravity method is a reliable and safe method of reducing intussusceptions in carefully selected cases. Thus, it should be recommended as the primary mode of treatment provided there are no features of peritonitis.

Key words: Intussusception; ultrasound guided gravity and saline reduction;

INTRODUCTION

Intussusception is defined most commonly as the invagination or telescoping of a proximal portion of an intestine (intussusceptum) into an adjoining or receiving distal intestinal segment of bowel (intussusciens), rarely in a distal to proximal portion invagination. It is the most common cause of intestinal obstruction in infants between 3 and 9 months of age¹. The treatment modalities have evolved over the years², operative in times past and recently, non-operative after appropriate case selection. Ultrasound guided saline reduction have gained popularity over the years as the initial procedure because it is non-invasive and it does not expose the child to ionizing radiation as opposed to fluoroscopy which has been used to monitor hydrostatic reductions in the past².

Despite the benefits of ultrasound guided hydrostatic reduction, surgery remains the mainstay of treatment in our hospital as well as many other Nigerian hospitals³⁻⁷. In fact, all the patients who presented to the Lagos State University Teaching Hospital (LASUTH) before January 2015 had operative intervention. This is because majority of our patients would have been misdiagnosed initially as “dysentery” before referral, hence present to us with features that compel operative intervention. However, for those who present early, the increased collaboration between the paediatric surgical unit and the interventional radiological unit of the hospital has led to this new paradigm shift in our hospital.

Various methods have been used to achieve this saline reduction.^{8,9} The aim of this study therefore is to evaluate the use of ultrasound guided hydrostatic gravity aided saline reduction method for the treatment of intussusception in selected patients.

MATERIALS AND METHODS

This was a prospective study involving the use of ultrasound guided gravity aided saline reduction of intussusception to treat patients who presented to the Lagos State University Teaching Hospital, Ikeja, Lagos between January and December 2015. Thirty-five cases of intussusception were seen within the study period but only twelve (34.3%) patients qualified for the hydrostatic reduction with the gravity aided normal saline method (including one recurrence).

Children with symptoms less than four days with no significant abdominal distension or sign of peritonitis were included in the study. Patients with prolapsed intussusception, those less than three months and over 1 year were excluded from the study because of increased incidence of lead points¹⁰. All cases were confirmed with abdominal ultrasound.

The patients were resuscitated with intravenous fluids and antibiotics commenced to cover for aerobes and anaerobes. Blood was taken for the evaluation of serum electrolytes, urea and creatinine. A nasogastric tube and a urethral catheter were passed in all patients. The procedure was explained to the parents of

the children in this study group and an informed consent obtained. A double set up technique⁸ was employed such that patients who failed hydrostatic reduction proceeded to theatre for an immediate laparotomy. After adequate resuscitation, patients were transferred to the radiology suite for the procedure.

In the radiology suite, each patient was sedated with 0.3mg/kg of diazepam, and a pre-reduction ultrasound scan done to confirm the diagnosis, note the apex of the intussusceptum and color Doppler introduced to assess for signs of bowel ischemia. In the supine position, a well lubricated Foleys catheter [18-20 F] was introduced per rectum, the balloon of the Foleys catheter was inflated with 25-30 ml of distilled water and its position confirmed with ultrasound. The buttocks were strapped together to prevent loss of the distending pressure. A 500ml enema bag (warm normal saline bag) with the roof opened and hung on a drip stand positioned about 120cm above the patients couch was used. The saline was allowed to flow by gravity through the infusion set into the rectum and movement of the fluid column and reduction process monitored by using an ultrasound machine with a 7-10 MHz transducer (Digiprince- DP 9900 plus).

Disappearance of the intussusceptum and visualisation of reflux of fluid and air bubbles through the ileocaecal valve into the ileum were considered signs of complete reduction. (See figure 1). After a complete reduction, the fluid was evacuated from the colon by connecting a drainage bag to the rectal tube and allowing the

fluid to drain under gravity into the drainage bag. The abdomen was then re-examined for any residual lesion or recurrence of intussusception. The procedure was abandoned if there was persistence of the mass at the initial point and failure to move proximally, if the mass did not reduce beyond the caecum, absence of free flow of Normal Saline and if the child strains continuously.

After a successful reduction, patient was admitted back into the paediatric surgical ward, monitored closely, and allowed to feed usually, after passage of first stool post reduction. They underwent repeat abdominal USS after 24hours to rule out incomplete reduction or recurrence and subsequently discharged to be followed up in the surgical out-patient clinic.

RESULTS

The procedure was conducted on twelve patients (including 1 recurrence). There were 8 males and 3 females. Male to female ratio is 2.6: 1. Ages ranged between 4 and 11 months with a median age of seven months. One patient had recurrence after 2months and represented within 24hours of onset of symptoms. He was managed with repeat saline reduction.

Eight patients presented with symptoms less than 48hours while four patients presented with symptoms greater than 48hours. Of those presenting less than 48hours, 6 (75%) patients had successful hydrostatic reduction while only one (25%) had successful reduction after 48hours of presentation.(see Table 1)

Abdominal pain (100%), vomiting (91.7%) and passage of red currant jelly stool (91.7%) were the most common symptoms. Abdominal mass was palpated in 11 (91.7%) patients. Clinically, the masses were located in the right hypochondrium in 2 patients (16%), left hypochondrium, 5 (42%) patients and in the left iliac fossa, 5 (42%) patients.

Seven patients (58.3%) had successful hydrostatic saline enema reductions while 5 (41.7%) patients had failed hydrostatic saline enema reductions. The duration of the procedure ranged between three and thirty minutes. On the average, it took four to five minutes from when the normal saline was released to achieve a successful enema reduction. The average volume of normal saline used to achieve reduction was about 450mls. Of the 5 patients (41.7%) who had failed hydrostatic reduction and proceeded to have surgery, two had laparotomy with manual reduction, and two had laparotomy with operative resection and bowel anastomosis while the remainder had a negative laparotomy. The mass had reduced following two attempts at hydrostatic reduction. One patient had bowel perforation which was confirmed at operation.

DISCUSSION

Intussusception can be diagnosed clinically by a triad of acute onset intermittent colicky abdominal pain, passage of red currant jelly stool per rectum and a palpable abdominal mass. This triad may be present only in about 61% of cases⁴.

The use of ultrasound can both be diagnostic and therapeutic. The ultrasound diagnosis of intussusception is established by the demonstration of doughnut or target sign on transverse views and pseudokidney sign on longitudinal views of the intussusception. (See figure 2) Other findings include various layers of concentric rings which may denote mesentery and bowel wall that has been drawn into the intussusciens; fluids, enlarged lymph nodes, and dilated proximal bowel loops.

Intussusception reduction by ultrasound-guided saline enema was described initially by Kim et al in 1982¹¹. Besides normal saline, other fluids which have been used for hydrostatic reduction include barium, tap water¹², ringers lactate, hartmanns solution¹³ and other water soluble contrast media.

Saline is now the preferred fluid¹² because if bowel perforation occurs, the extravasation of the saline enema into the peritoneal cavity would not have either the irritative effects of barium (chemical peritonitis) or the risk of tension pneumoperitoneum, which can be a complication of the air enema.¹⁴ Normal saline, is cheap and readily available.

Ultrasound has been used to diagnose as well treat the disease. It has many advantages. It is cheap, non-invasive and readily available. It can document the presence or absence of a pathologic lead point. It can be used to monitor the reduction process and visualize it.

Pacros et al¹⁵ in 1987 reported 100% accuracy with the use of Ultrasound to diagnose intussusception and this has been verified by several other authors.

Intussusception reduction rates with barium range from 70% to 85%.¹⁶ However, success rate with ultrasound-guided reduction with saline ranges between 80% and 91%.^{17,18}

In our study, using the hydrostatic reduction by gravity aided method, the average volume of normal saline used was 450mls and the average duration to achieve reduction was four minutes starting from when the fluid was released to when reflux of fluid into the terminal ileum was noted. This is comparable to results obtained by Krishnakumar et al.¹²

With our gravity method, successful hydrostatic reduction was achieved in seven out of the twelve patients with a success rate of 58.3%. This was similar to the findings of Ogundoyin et al⁸ in Ibadan who used kamann's syringe to manually inject the saline into the rectum while maintaining pressure.

The success rates with the gravity method have been noted to be higher in similar studies. It ranged between 75% and 91%.¹⁷⁻²⁰ These high rates may be because of the vast experience with its use.

Also, late presentation, with duration of symptoms greater than 48hours correlate more with increased risk of failure of hydrostatic reduction but should not be a contraindication to initial attempts at hydrostatic reduction provided there are no features of peritonitis¹². This may also explain why Ekenze et al¹⁹ said "surgery will remain our main stay of treatment until deficiencies leading to delay in time to diagnosis and presentation are addressed". One patient had bowel perforation while those who had failed reductions were operated on.

In conclusion, ultrasound guided hydrostatic reduction with normal saline by gravity method is a reliable and safe method of reducing intussusceptions in carefully selected cases. Thus, it should be recommended as the primary mode of treatment provided there are no features of peritonitis.

LEGENDS

Table 1. Duration of symptoms and the treatment outcome

	Outcome		Total
	Successful	Unsuccessful	
Duration of symptoms			
<48	6(75.0)	2(25.0)	8(100.0)
>48	1(25.0)	3(75.0)	4(100.0)

Figure 2A. (Transverse view) showing intussusceptum going into the intussusciptent – The typical doughnut or pseudokidney sign and B. (Longitudinal view) of same.

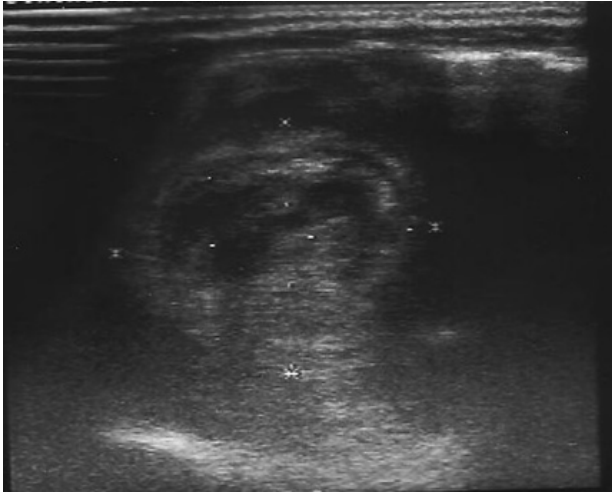


Figure 2B.



Figure 3. Showing successful reduction, evidenced by fluid filled small bowel loops.



Figure 4. Set-up for hydrostatic reduction by gravity method.



REFERENCES

1. Osuji RI, Idika OC, Abolarinwa AA et al. Intussusception in infancy and childhood in Lagos, Nigeria : *J Med Res Pract* 2012;1;10-13
2. Daneman A, Navarro O. Intussusception. Part 2: an update on the evolution of management. *Pediatr Radiol* 2004;34:97-108
3. Ekenze SO, Mgbor SO, Okwesili OR. Routine surgical intervention for childhood intussusception in a developing country. *Ann Afr Med* 2010; 9:27-30.
4. Bode CO. Presentation and management outcome of childhood intussusception in Lagos: A prospective study. *Afr J Paediatr Surg* 2008; 5:24-8.
5. Abdur-Rahman LO, Yusuf AS, Adeniran JO, Taiwo JO. Childhood intussusception in Ilorin: A revisit. *Afr J Paediatr Surg* 2005; 2:4-7.
6. Osifo OD, Evbuomwan I, Osime OO, Nene AO. Paediatric intussusceptions in Benin City, Nigeria. *Afr J Paediatr Surg* 2007; 4:12-5.
7. Talabi AO, Sowande OA, Etonyeaku CA, Adejuyigbe O. Childhood intussusception in Ile-ife: What has changed? *Afr Paed Surg* 2013;10:239 - 242
8. Ogundoyin OO, Atalabi OM, Lawal TA, Olulana DI. Experience with Sonogram-guided hydrostatic reduction of Intussusception in Children in South-West Nigeria; *J West Afr Coll Surg.* 2013; 3(2): 76–88.
9. Danuta Roik, Katarzyna C, Aleksandra J, Michal B. Hydrostatic reduction under ultrasound guidance- our first choice method of intussusception reduction. IPR LONDON 2011.
10. 24. Ong NT, Beasley SW. The leadpoint in intussusception. *J Pediatr Surg* 1990;25:640-643
11. Kim YG, Choi BI, Yeon KM, Kim CW. Diagnosis and treatment of childhood intussusception using real-time ultrasonography and saline enema: Preliminary report. *J Korean Soc Med Ultrasound* 1982;1:66-70.
12. Krishnakumar, Hameed S. Ultrasound guided hydrostatic reduction in the management of intussusception : *Indian J Pediatr* 2006; 73: 217- 220
13. Peh WCG, Khong PL, Chan KL, Lam C, Cheng W, Lami W W M, et al. Sonographically Guided Hydrostatic Reduction of Childhood Intussusception Using Hartmann's Solution. *AJR* 1996;167:1237-1241
14. Tander B, Baskin D, Candan M, Bafiak M, Bankoglu M. Ultrasound guided reduction of intussusception with saline and comparison with operative treatment. *Turkish Journal of Trauma & Emergency Surgery* 2007;13:288-293
15. Pracros P, Tran-Minh VA, Morin DE, et al: Acute intestinal intussusception in children: Contribution of ultrasonography (145 cases). *Ann Radiol* 1987;30:525-530

16. Chan KL, Saing H, Peh W, et al: Childhood Intussusception:Ultrasound-guided hartmann's solution hydrostatic reduction or barium enema reduction?*J Pediatr Surg*; 1997;32:3-6
17. González-Spínola J, Del Pozo G, Tejedor D, Blanco A. Intussusception: the accuracy of ultrasound-guided saline enema and the usefulness of a delayed attempt at reduction. *J Pediatr Surg* 1999;34:1016-20
18. Bai YZ, Qu RB, Wang GD, Zhang KR, Yong Li, Ying Huang et al. Ultrasound-guided hydrostatic reduction of intussusceptions by saline enema: a review of 5218 cases in 17 years *Am J Surg*. 2006 : 192 ; 273–275
19. Ekenze SO, Chukwubuike KE, Ezomike UO, . Okere PC, Onuh AC. Pediatric Intussusception and Interventional Radiology in a Developing Country: Experience and Challenges of Ultrasound Saline Reduction Complementary to Primary Surgery. *Int Surg*: 2015;100: 1301-1307
20. Y. Mensah, H Glover-Addy, V. Etwire, W. Appeadu-mensah ,M. Twum : ultrasound guided hydrostatic reduction of intussusception in children. An initial experience :*Ghana med j* 2011 (3);128 – 131