

NEW RADIOLOGICAL AND SURGICAL APPROACH OF REDUCTION OF INTUSSUSCEPTION GUIDED U. S

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ABSTRACT:

Hydrostatic reduction of intussusception was attempted in 30 patients during the years 1992 up to 1995. They included 24 males and 6 females (from 6 months to 35 years of age). Reduction was done by using water soluble contrast enema under ultrasound (US) control after diagnosis of intussusception and finally checked by image amplifier. Diligent clinical observation was mandatory after reduction for at least 24 hours. Hydrostatic reduction was successful in 16 patients (53.3%). Eight patients required laparotomy. In 6 patients surgery was indicated after unsuccessful reduction and two patients required laparotomy because of recurrent intussusception. It is concluded that hydrostatic reduction of intussusception under surgical supervision is recommended as an initial step in patients with intussusception in the early stages and in those without complications. Thus it could be achieved in a high proportion of patients and so operation.

INTRODUCTION:

Intermittent abdominal pain, vomiting, blood with mucus in the stools, lethargy and apathy are the early manifestations of intussusception (Heldrich 1986 Avinoam et al 1987). These early manifestations together with palpable tumour are diagnostic. Upper respiratory tract infections, fever and diarrhea may mislead the physician and surgeon (Franklen et al 1982). Intussusception is a common abdominal emergency especially in infants and children and there have been considerable debates as to the best method of its diagnosis and treatment. Recently, several

studies have emphasized the value of ultrasound as an initial screening procedure in patients suspected of having intussusception. Furthermore some investigators introduced a new therapeutic method for hydrostatic reduction of intussusception (Soon Ok Choi et al 1994). A widely accepted criterion for successful hydrostatic reduction of an intussusception is reflux of contrast into the terminal ileum. Reflux may not occur in the presence of oedema of the ileocecal valve and this may lead to an unnecessary laparotomy. The indications for operative reduction of intussusception after contrast enema are incomplete reduction or perforation. Op-

eration or repeated contrast enema are considered in a patient with apparent complete reduction and oedema of the ilio-cecal valve if there is no clinical improvement (A. Pierro et al 1993).

PATIENTS and METHODS

This study was based on thirty patients including 24 males and 6 females presented with intussusception with their ages ranged from 6 months to 35 years. All patients were referred from the surgery out patient clinic and from the casualty department at Al-Hussin and Bab-Alsharia University Hospitals and insurance hospitals during the years 1992 up to 1995. In all patients the symptoms and physical findings recorded. Before reduction is attempted the abdomen was examined for masses and signs of peritonitis and the patient adequately hydrated after intravenous access is obtained and analgesic premedication administered if the patient is agitated (Crying, straining or in agonising pain) or there were other causes that will increase the intraabdominal pressure.

Contra-indications for reduction:

- 1) Hypovolaemic shock,
- 2) peritonitis
- 3) perforation

Recurrent intussusception is not contra-indication although the success rate of radiologic reduction may be lower and complications are higher. In this study shocked patients or patients with peritonitis or perforation diagnosed before reduction were excluded from this study.

Technique of enema reduction of intussusception by hydrostatic pressure under ultrasound guidance:

Specific echogram of intussusception:

On transverse scans concentric circles (target shaped) and sleeve shape on longitudinal scans were present (Guang et al 1988). The characteristics of transverse echogram were high echo centre or mixed with lower echo surrounded by a wide echo ring. This result from the oedematous mucosa of intussusception (Bowerman et al 1989). The parts of both intussusceptum being close to each other and the round centre was composed of intussusceptum. Features of ilio-ileo-colic intussusception demonstrated a high echo centre inside which was very dense mass of super echo caused by ilio ilial intussusception (Guang et al 1988). After diagnosis of intussusception, barium suspension made up of one part barium to three parts water was warmed to body temperature. The patient is immobilized and a large-bore rubber catheter was inserted into the rectum. The buttocks are taped firmly around this catheter with airtight seal. The reservoir elevated to form one foot to three feet above the table top. Barium was run through a rectal catheter until the head of the intussusception is met and the diagnosis confirmed. If the intussusception was identified the reservoir is then raised to 3 feet above the table top and the barium mixture retained within the bowel at this stage (Levick et al 1972). The field of view during fluoroscopy should be small and the pelvis should be visualized intermittently (to detect distal colonic perforation). The hallmark of successful reduction of intussusception is the free flow of contrast into the terminal ileum. A postevacuation film should be obtained to document successful reduction and the terminal ile-

um should be palpated under fluoroscopy. If hydrostatic reduction failed the patient proceeds to the operating room (Mackay et al 1987)

Changes of Echogram during hydrostatic enema:

According to Bowerman et al 1982, if concentric circles of target shaped features were shown on transverse scans hydrostatic reduction can be performed. With the increase of perfusing pressure on the transverse scans the size of the noecho area located between the walls of intussusception and intussusceptum enlarged little by little accompanied by a decrease in the size of the intussusceptum that disappeared finally. At the same time the mass of the intussusception shifted gradually to the ileo-cecal region. At the beginning of reduction the "cuplooon" appeared between the liquid dark area of the colon and the leading part of the intussusceptum on longitudinal scan. With the increase of pressure atypical cervix" can be seen. The above mentioned signs appeared repeatedly as the mass of intussusception shifted gradually to ileo-cecal region. Owing to increasing hydrostatic pressure on longitudinal scan the liquid area in the ilio-cecal region become larger and larger and surrounded the mass of intussusception like a peninsula extending into the sea (peninsula sign). The size of the peninsula becomes ilio-cecal valve. When reduction continues liquid was perfused into the ileum, the cecum and terminal ileum figures could be distinguished easily. The edematous ileo-cecal valve was moving as a "crab claw". The "ravine shape" was also found on longitudinal scan of terminal ileum as well as "cooper coin" like shape on crossing section. These changes

were seen and recorded at this study.

Criteria of successful reduction:

Dilatation of the terminal ileum between the ilio-cecal valve and the mass of ileo-ilial intussusception, opening of ileo-cecal valve rigidly, a large volume of liquid in the colon entering the ileum in a second with sudden disappearance of the mass, the crab claw-like movement of the ileo-cecal valve and the ravine shape of the terminal ileum. Hydrostatic pressure varies from 50-90 mm Hg.mm.

We used lower pressure at first and increased it gradually over 80 or 90 mm Hg is contraindicated. Following hydrostatic reduction, all patients were admitted to the surgical department for 24 hours and diligent clinical observations were done. The patients who improved were discharged when tolerating a regular diet, patients with failed hydrostatic reduction underwent operation. Indications for laparotomy:

The enema reduction was indicated as long as there is no serious dehydration, no serious abdominal distension or peritonitis. In the presence of liquid in the abdominal cavity disappearance of liquid from the colon and the bowel floating in the upper abdominal cavity. diagnosis of perforation must be made. After trial of hydrostatic reduction, patients were divided into groups:

Groups A: included all patients with successful reduction. This group included two subgroups group A₁: included 16 patients with successful reduction and followed up during the study time.

Group A₂: included 6 patients with successful reduction but unfortunately they can not be followed up.

Group B: Included 8 patients who were in need for surgery either urgently or during the follow up and observation period. They included two subgroups

Group B₁: included 6 patients with failed hydrostatic reduction and were referred immediately to surgery for laparotomy. Group B₂: included 2 patients with recurrent intussusception either during the early 24 hours or during the following up period. Patients who were in need for laparotomy as the primary treatment without trial of hydrostatic reduction included 9 patients and those were excluded from the study.

RESULTS

This study included 24 males and 6 females, their age range was 6 months to 35 years with 23 patients (75%) were less than 20 years old. 8 patients (24%) presented with abdominal pain, 12 patients (40%) with vomiting, bleeding per rectum and palpable abdominal mass. 10 patients (33%) presented with diarrhea. History of viral infection was positive in 12 patients (40%). 4 patients (13%) presented with an atypical history and findings. The duration of symptoms was significantly shorter for patients with successful reduction as compared with those in whom reduction attempt failed. Plain X-ray (supine) was done in 12 patients (40%) to exclude other pathology and was diagnostic for intussusception in 10 patients (33.3%). In 3 patients (11%) the plain film showed the head of intussusception. In 5 patients (16%) the plain film demonstrated a soft tissue mass. In 4 patients (13%) the plain radiograph was normal. So the normal plain radiograph did not exclude the diagnosis of intussusception. In one patient it demonstrated the features of small

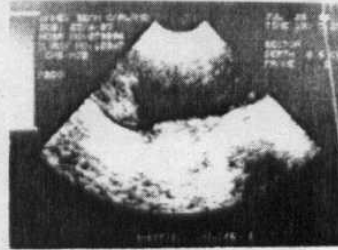
bowel obstruction. Successful hydrostatic reduction guided by ultrasound was achieved primarily in 22 patients (73.3%). Of these group 6 patients with successful hydrostatic reduction unfortunately cannot be followed up and the other 16 patients were followed up during the study. In the last group reduction was checked up with ultrasound and the signs of reduction were clear except in two patients where the sonographic signs were absent and those were confirmed by barium enema X-ray and observed clinically for 24 hours until regular diet was allowed and the abdomen was normal. 7 patients (23.30%) experienced episodes of recurrent intussusception during the study period. Three of them had more than one recurrent episode. All these patients were readmitted and all recurrences were successfully managed by contrast enema. Only two patients with recurrence were in need for laparotomy. In 6 patients (20%) hydrostatic reduction was unsuccessful, and laparotomy was performed. So the total number of patients operated upon were 8 patients (26.6%). 6 patients with unsuccessful hydrostatic reduction and two patients with recurrent intussusception. Of the 8 patients with laparotomy, 3 of them were in need of manual reduction only. Right hemicolectomy was done in 3 patients because of gangrenous bowel with peritonitis and perforation was found. In the last two patients with recurrent intussusception, one had an inflamed Meckel's diverticulum where resection anastomosis of the intestine done with removal of Meckel's diverticulum. The other patient had a hamartomatous polyps where segmental resection of small bowel done. Complications (adhesive obstruction, wound infection and



1- Left tissue mass across epigastrium



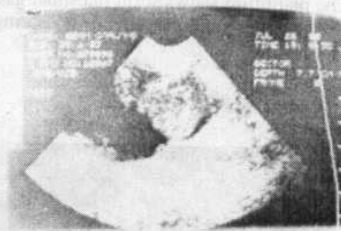
2- U/S Longitudinal section through intussusception "sandwich" appearance.



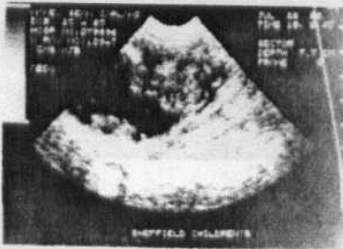
3- Reduction under U/S control. Fluid (black) is pushing the intussusception back along transverse colon.



4- The intussusception is new transverse colon.



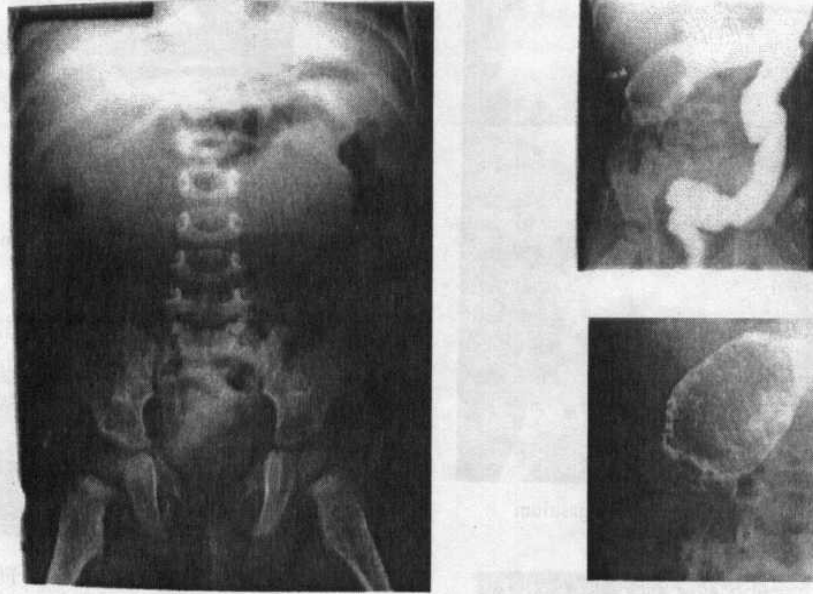
5- Slight hold up in the caecum.



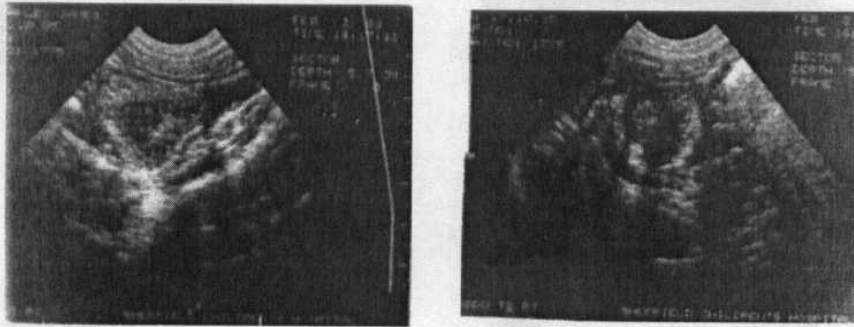
6- Slight hold up in the caecum.



7- U/S caecal area-fluid has suddenly drained and the intussusception has disappeared.



The plain film shows scant intestinal gas & a suspected mass in the left hypocondrium (arrows), note the characteristic spiral ring or bedspring shadow of the barium sheath in the lumen of external layer of colon.



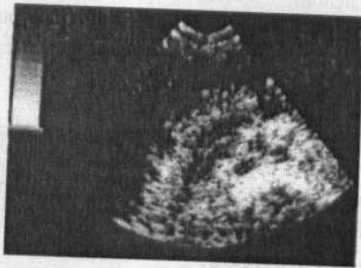
Note the oedema of intestinal wall, there is some fluid within the bowel lumen. It is difficult to exclude an intussusception in this scan.



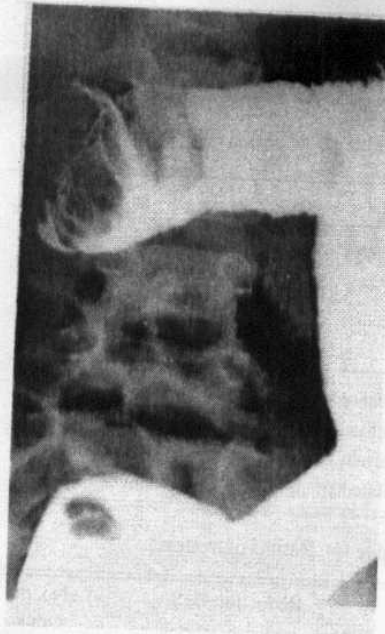
1- plain film abdomen - shows the head of the intussusception is outlined by air just before the splenic flexure.



2- u/s intussusception in transverse section.



3- u/s intussusception in longitudinal section.



The reduction of the intussusception failed to progress under u/s control. Plain film confirms the presence of the mtussusception in the transverse colon.

Table (1): Relation between successful reduction and duration of symptoms.

Duration of symptoms / hours	No of patient	Successed reduction
4	8	8
6	6	6
8	5	3
12	4	1
24	3	1
48	3	-
more	1	-
Total	30	

Table (2): Clinical finding of intussusception

Clinical finding	No. of cases
Vomiting	27
Current jelly stool	18
Palpable mass (sausage)	9
Abdominal distension	15
Total	30

Table (3): X-ray finding

Findings	No. of cases
Head of intussusception on plain	10
Soft tissue mass	6
Normal gas distribution	8
Dilated small bowel and fluid level	6

Table (4): Results of treatment.

Reduction U. S.	No. of cases
Successful reduction	16
Reduction checked by Ba. enema	2
Failed reduction (two with recurrent)	8
Operative reduction	8
Recurrent intuss. (Total recurrence)	7

Table (5): Results of surgical treatment.

No. of patients	Surgical management
6 patients with unsuccessful reduction (surgery was needed soon after failure of reduction.)	3 patients : gangrenous ilio-colic intussusception Procedure: done right-hemi-colectomy. 3 patients: ilio-colic intussusception without gangrene Procedure: manual reduction of intussusception
2 patients with recurrent intussusception (failed repeated hydrostatic reduction)	one patient had an ilio-colic intussusception with inflamed Mickle's diverticulum. Procedure: resection of Mickle's diverticulum and anastomosis of the intestine. One patient had a hamartomatous polyp of the terminal ileum. Procedure: segmental resection of the affected segments with end to end anastomosis.

pneumonia) were observed in 3 patients. There were no deaths.

DISCUSSIONS:

Hydrostatic reduction of intussusception under U.S. guidance was described by Kim et al 1982., Some investigators reported its efficacy using saline or water soluble contrast medium and Wang and Liu reported a success rate of up to 95.5% .However this new technique is still not familiar throughout the world (Soon Ok Choi et al 1994) The rate of success of hydrostatic reduction is

thought to be inversely related to the duration of symptoms and the same findings were recorded by Raudkivi et al (1981)

The need for operative management of intussusception can be minimized by the use of hydrostatic reduction. The success rate of reduction by hydrostatic contrast enema varies widely from 36% to 82% in recent series (A. pierro et al 1993). From a review of literature Collins et al calculated that the average over all success rate for reduction by hydrostatic enema was 57%. In our series successful hydrostatic reduction was achieved in (53.3%) of patients including these with recurrences and repeated reduction by hydrostatic enema. Various authors reported a higher success rate of 73% to 93% using insufflation with air (A. Pierro et al 1993) The incidence of bowel perforation during contrast enema reduction increases concomitantly with the success rate of hydrostatic reduction. In our series only one patient had bowel perforation during reduction by contrast. In this patient and as a result of close cooperation between the surgeon and radiologist perforation had been diagnosed and laparotomy performed without delay and there was no post-operative complications apart from wound infection.

In our experience diagnosis of complete reduction was checked Ultrasonographically in 14 patients and confirmed in the other two patients by barium enema X-ray examination. These criteria of diagnosis plus clinical observation for at least 24 hours make the procedure safe and if complications occurred could be discovered early and managed accordingly. Our indications for operation after contrast enema reduction for intussusception are in-

complete reduction or complications we would consider repeat contrast enema reduction or operation in a patient with apparent complete reduction and edema of the ileo-cecal valve if there was no clinical improvement. This approach is justified by the complete recovery and absence of complications observed in patients diagnosed as having edema of the ileo-cecal valve and the presence of intussusception in all patients who underwent operation. Advantages of US-guided hydrostatic reduction are lack of radiation exposure for patients and examiner and the changes of the mass can be traced closely both in transverse and longitudinal scans and provide a clearer echogram. Ileo ileo-colic intussusception can be diagnosed during reduction. The intussusception reduction performed safely (by notice the patient during examination) intestinal perforation during reduction can be accurately recognized at once and the management is simple, safe and reliable. Lastly, it is non-operative treatment.

We concluded that we expect further improvement in the success rate, especially when the patient is diagnosed early and with further experience.

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اتجاه جديد بالأشعة والجراحة لعلاج حالات التداخل المعوي مسترشداً بالسونار عبدالنبي بيومي (الأشعة) - محمود أبو الفضل (الأشعة) محمد كامل (الجراحة) - محمد عبدالرسول (اطفال)

اجرى البحث على ٣٠ مريضاً تتراوح اعمارهم من ٦ شهوراً إلى ٣٥ عاماً (٢٤ رجلاً وطفلاً ٦ اناث) في الفترة من ١٩٩٣ إلى نهاية عام ١٩٩٥ وذلك باستخدام صبغة الجاستروجرافين ذات التركيز العالي مع رؤية ذلك على شاشة جهاز الأشعة فوق الصوتية وتتبع مراحل ارتجاع التداخل المعوي وتم تحويل المرضى من العيادة الخارجية لأقسام الجراحة والاطفال بمستشفيات الحسين وباب الشعرية الجامعي ومستشفيات التأمين.

وفور تحويل الحالة إلى قسم الأشعة وفي وجود الجراح يتم عمل الأشعة العادية بالأوضاع المختلفة وذلك لتحديد نوع التداخل وبيان عدم وجود هواء داخل اليريتون. وكانت الأشعة تبدو طبيعية في حوالي (٢٥٪ من الحالات) أي ٨ مرضى وامكن تحديد حجم وكتلة التداخل المعوي في ١٨ مريض (٦٠٪).

وكانت نسبة نجاح حالات ارتجاع التداخل المعوي ٦٠٪ (١٦ مريض تم ارجاع التداخل المعوي مسترشداً بالسونار وحالتين الباريوم بينما فشل الفحص في حالات (٢٠٪) وتم ارتجاع الانسداد جراحياً في حالتين يشكى المريض بأعراض معوية منذ أكثر من ٢٤ ساعة واثنين آخرين من مضاعفات الانسداد المعوي.

والحالات التي كان يتم فيها الارتجاع بنجاح كانت تعاد إلى قسم الجراحة مرة ثانية لتوضع تحت الملاحظة لمدة ٤٢ ساعة بينما الحالات التي تحتاج إلى تدخل جراحى كانت تعالج جراحياً مباشرة بعد تشخيص وحسب تشخيص كل حالة .