

Original Research Article

The Role of Ultra Sound in Diagnosis of Intussusceptions in Children in Baghdad 2012_2013

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Abstract

Intussusceptions' is the acquired invagination of one portion of the intestine into the adjacent bowel. It is described by the proximal, inner segment of intestine (intussusceptum) first and the outer distal, receiving portion of intestine (intussusciens).

This study of 50 cases of intussusceptions in the children welfare teaching hospital at medical city in Baghdad September 2012-September 2013. All patient underwent history, physical examination and investigation (radiological include plain abdominal x-ray and ultrasonography). The patient divided into two age groups (infant younger than 10 months age, infant older than 10 months age). Thirty eight patients (79.17%) were equal or below 10 months and ten patients (20.83%) were above 10 months. Female to male ratio was 1.2:1. The diagnostic tool used was the ultrasound for fifty patients, in forty three cases diagnosis was made by characteristic ultrasonic findings of intussusceptions (target sign or pseudo kidney sign), all of them had a classical intussusceptions mass during operative procedure. The remaining 7 patients had negative ultrasonic findings for intussusceptions, 2 of them were truly negative ultrasonic findings on laparotomy, while the other 5 patients had an intussusceptions mass during laparotomy. The ultra sound sensitivity was 90%. For that reason the ultrasound still the good diagnostic tool for diagnosis of intussusceptions.

Key words: Intussusception, Ultrasound, Children.

الخلاصة

تداخل الأمعاء هو حاله مرضيه ناتجة عن دخول جزء من الأمعاء داخل تجويف أمعاء التالي له . تتضمن الدراسة المقطعية عينة من ٥٠ حالة تداخل أمعاء في مستشفى حماية الأطفال التعليمي/مدينة الطب في بغداد للفترة ما بين شهر أيلول ٢٠١٢ لغاية أيلول ٢٠١٣ تتراوح أعمارهم ما بين أقل من ١٠ أشهر (٧٩.١٧%) وفوق ١٠ أشهر (٢٠.٨٣%) وكانت نسبة الإناث إلى الذكور ١.٢:١. تم إجراء فحص الأمواج فوق الصوتية إلى ٥٠ مريض . التشخيص تم مع صفه مميزه لتداخل الأمعاء (كتله شبه كلوية) ثلاث وأربعون مريضاً كانت لديهم العلامات المميزة لتداخل الأمعاء (كتله) خلال العملية الجراحية . سبعة مرضى لم يتم تشخيصهم بواسطة الأمواج فوق الصوتية على وجود حالة تداخل للأمعاء. اثنان منهم لم يتم إيجاد حالة تداخل أمعاء أثناء العملية الجراحية , إما باقي الخمسة فقد تبين وجود حالة تداخل الأمعاء خلال العملية الجراحية. ان حساسية فحص الأمواج فوق الصوتية في تشخيص مرض تداخل الأمعاء كان بنسبة ٩٠%. وان خبرة طبيب السونار وكفائته بالإضافة إلى كفاءة جهاز السونار تلعب دور مهم في التشخيص.

Introduction

Intussusception is the acquired invagination of one portion of the intestine into the adjacent bowel. It is described by the proximal, inner segment of intestine (intussusceptum) first and the

outer distal, receiving portion of intestine (intussusciens) last [1,2].

This disease had been recognized since the last three centuries, It was firstly described by Poul Babette of Amsterdam in 1674 and suggested operative reduction [1,2]. In the 19th century,

reductions from below by means of enema, injection of air or gas or manipulation were all attempted. By the mid-19th century, the disease remained fatal in most infants and children but occasionally responded to inflation of the intestine with bellows or to enemas[3]. Jonathan Hutchinson reported the 1st successful operation for intussusception in a 2 years old child in 1873 Ravitc[3] and McCune popularized hydrostatic reduction of intussusception with barium enema in 1948. The 1st successful resection of an intussusception in a child was by Clubbe in Australia in 1897 and the 1st successful resection in US was reported by Peterson in 1908[1].

It is usual to speak about two types of intussusception:

1. A primary type in which no lead point is identified.

2. A secondary type in which a lead point is identified [1]. The most common pathologic lead point is a Meckel's diverticulum followed by polyps and duplications. Other benign lead points are the appendix, hemangiomas, foreign bodies, ectopic pancreas or gastric mucosa. Lipomas[5], Leiomyoma [6], Adenoma[6], Juvenile polyposis syndrome, diffuse juvenile polyposis of infancy[7], juvenile polyposis col[8], hamartoma (Peutz-Jegher syndrome) and lymphoid polyps[9]. Malignant causes, which are very rare, include lymphomas[2,5], lymphosarcomas[10,11], small bowel tumors, and melanomas. carcinoid tumors[5]. some studies suggest that the incidence of a lead point increase with age[12].

It can be diagnosed by Plain abdominal film, Barium enema, Abdominal ultrasonography, Computed tomography (CT) and MRI[13]. Between 55% and 95% of intussusception are reducible by hydrostatic or pneumatic methods (Non-operative management) under fluoroscopic control. Laparotomy is required in children with signs of shock or peritonitis and in those who have

incomplete reduction by either technique[14-17].

The Aim of study was to determine the accuracy and reliability of ultrasound in diagnosis of intussusception by a comparison between diagnosing Intussusception by ultrasound with and operative findings.

Materials and Methods

A prospective study of 50 cases with suspected intussusception was done in the Children Welfare Teaching Hospital in Baghdad-medical city complex from September 2012 to September 2013. We collected a 50 cases that present to our hospital with clinical features of intussusception in which a clinical trial of cramping abdominal pain, vomiting, and bleeding per rectum were the presenting symptoms. History was taken carefully about an attack of upper chest infection or gastroenteritis preceding this triad. Every patient was examined regarding general condition, hydration status. Also abdominal examination was done to all patients regarding inspection if there is any distention or asymmetry, if there is any palpable mass, rectal examination for a palpable mass or bleeding. All patients were fully investigated like general stool examination to exclude a bacterial or amebic cause of bloody stool & urine exam, blood counts, blood urea, serum electrolytes, chest radiograph, abdominal radiograph and abdominal ultrasonography.

Ultrasound study had been performed for all the included cases in this study by different doctors who were in charge in outpatient clinic or emergency room with different machines.

Collected cases in which the diagnosis of intussusception was done either by Ultrasound or by clinical examination supported by Ultrasound study. We divided the patients into two age groups:

- 1- Infants younger than 10 months' age.
 - 2- Infants older than 10 months' age.
- This study also includes the gender, presenting symptoms, seasonal distribution, type of presentation and results of surgical procedures.

By using SPSS software for windows, data of the 50 cases were entered and analyzed with appropriate statistical tests. Descriptive statistics were presented as frequencies (number of cases) and percent. Chi-square test was used to assess the significance of differences, Sensitivity, specificity, accuracy; positive predictive value (PPV) and negative predictive value (NPV) were calculated according to the standard equations by using the Epi. Calc 2000 statistical package software. Level of significance of ≤ 0.05 was considered as significant. The presence of pseudo-kidney sign, target sign are important

finding for Ultrasound diagnosis of intussusceptions as in figures 2,3

Results

1. Age and gender distribution:

A total of 50 cases suspected intussusception were enrolled in this study, 48 of them were truly discovered intussusception intra-operatively. They were 26 females (54%) and 22 males (46%), with a female to male ratio of 1.2:1, figure 4.

Thirty eight patients (79.17%) aged ≤ 10 months and the remaining 10 patients (20.83%) aged > 10 months. From other point of view, among females, those who were aged ≤ 10 months were 20 represented (76.9%), compared to 81.9% of males, this findings indicates that the intussusception was more prevalent among males under the age of 10 months, however, the difference was statistically not significant in between both sexes, $P > 0.05$. table 1.

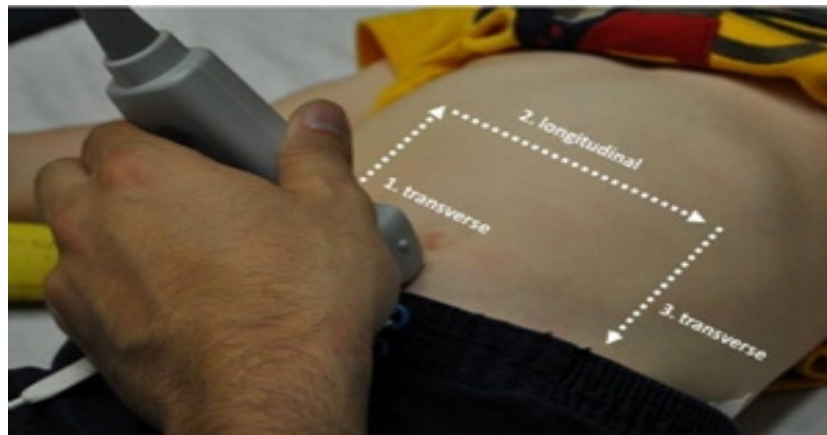


Figure 1: How to do abdominal ultrasound for intussusceptions

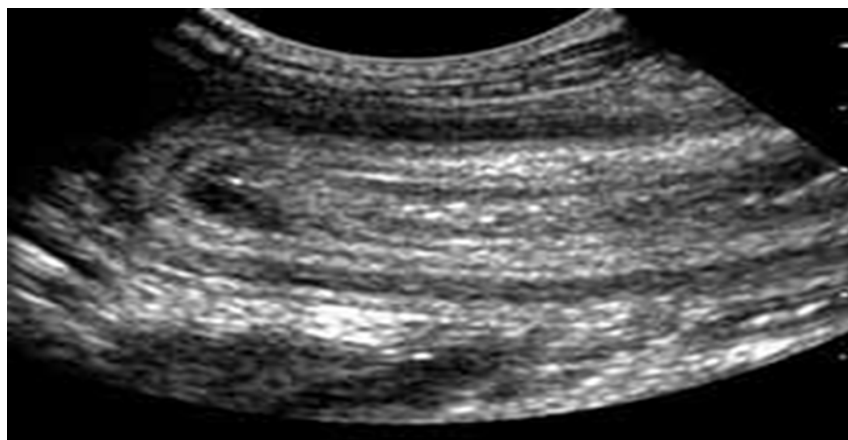


Figure 2 : Pseudo-kidney sign

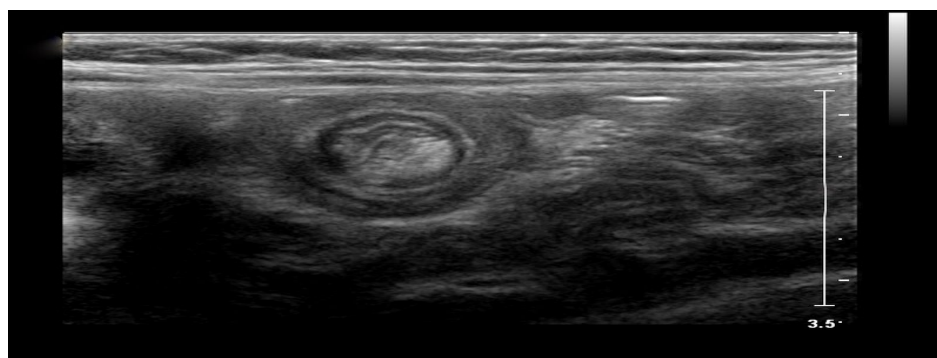


Figure 3: Target sign

Table 1: Gender and age distribution

Age group	Female		Male		Total	
	No.	%	No.	%	No.	%
≤ 10 months	20	76.9	18	81.9	38	79.17
> 10 months	6	23.1	4	18.1	10	20.83
Total	26	100.0	22	100	48	100.0
P. value = 0.49 (not significant)						

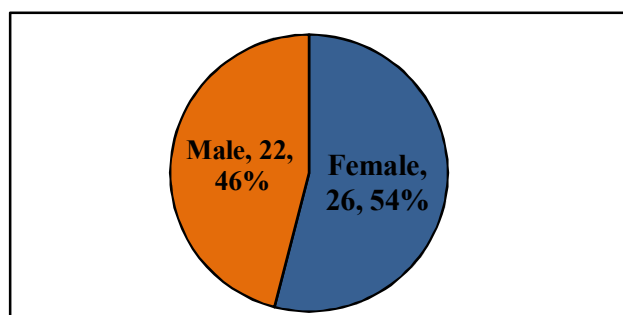


Figure 4: Gender distribution of 48 patients with intussusception

Seasonal Distribution

As it shown in table 2 and figure 5, it had been significantly found that the higher incidence was during Spring; 25 cases (52%) followed by Summer; 13 cases (27%), and the lowest incidence was

during winter; 4 cases (8.5%), this indicating that the peak incidence of intussusception had been found in Spring and Summer and the lower incidence during Autumn and Winter, $P=0.011$.

Table 2: Seasonal variation in incidence of intussusceptions

Season	No. of cases	%
Spring	25	52.0
Summer	13	27.0
Autumn	6	12.5
Winter	4	8.5
Total	48	100.0

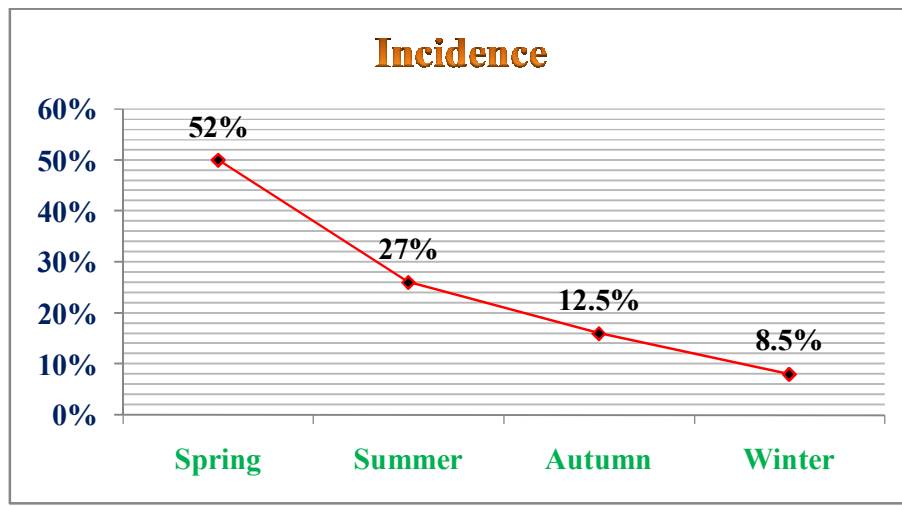


Figure 5: Seasonal variation in incidence of intussusception

2. Symptoms & Signs:

Table 3 shows the frequency distribution of signs and symptoms among patients, it had been found that Cramping abdominal pain was the most frequent; in all the patients, followed by

Bleeding /Red currant jelly per rectum in 45 patients (90%), then vomiting in 39 patients (78%), abdominal mass in 33 patients (66%) and the least frequent was Prolapsing intussusceptum in only 4 cases (8 %), $P.value < 0.001$.

Table 3: Frequency Distribution of signs and symptoms of 48 patients with primary intussusceptions (N=48)

Symptoms or signs	No. of cases	%
Cramping abdominal pain	50	100.0
Bleeding /Red currant jelly per rectum	45	90.0
Vomiting	39	78.0
Abdominal mass	33	66.0
Prolapsing intussusceptum	4	8.0
P.value < 0.001		

3. Ultrasound value in Diagnosing intussusception:

Table 4 shows the comparison of ultrasonographic findings vs. surgical findings; 48 cases had positive surgical findings on laparotomy, ultrasound was correctly identify 43 of them to have positive findings (true positive), giving a sensitivity of ultrasound of 89.6% . Two patients had negative finding on

laparotomy and ultrasound was correctly identify them as negative, giving a specificity of 100%.

The accuracy of ultrasound was 90%, Predictive value of +ve result was 100% and the Predictive value of -ve result was 28.6%.These findings indicating that ultrasound was highly sensitive and highly specific.

Table 4: Comparison of ultrasound vs. Laparotomy in diagnosis of intussusceptions

Test		Laparotomy		Total
		Positive	Negative	
Ultrasound	Positive	43	0	43
	Negative	5	2	7
Total		48	2	50
Sensitivity		89.5%		
Specificity		100%		
Accuracy		90%		
Predictive value of +ve result		100%		
Predictive value of -ve result		28.6%		
P.value = 0.011				

4. Types of intussusceptions' depending on operative findings:

According to the final diagnosis by laparotomy, among the 48 cases with primary intussusception, the most frequent type of intussusception was Ileo-colic, it was present in 34 patients

(70.83%), followed by Ileo-ileal in 9 cases (18.75%) then Colo-colic type in 3 cases (6.25%) and the least frequent type was the Ileo-Ileo-colic in only 2 cases (4.16%), these findings are shown in table 5.

Table 5:Types of Intussusception according to the operative findings of 48 cases with primary intussusception

Type	No. of cases	%
Ileo-colic	34	70.83
Ileo-ileal	9	18.75
Colo-colic	3	6.25
Ileo-Ileo-colic	2	4.16
Total	48	100.0

5. Types of lead points:

The most common specific lead point causing intussusception was meckel's diverticulum found in 3cases (6%) distributed as 1 case 6 months old and the other 2 cases in more than 2 years. The other common lead points were polyps in age group of more than 2 years, they were found in 2 cases (4%),

one of them was having multiple polyps along the large bowel and presented as acute abdomen with delayed presentation and the patient died immediately after operation. The other sporadic cases were due to volvulus 2 cases (4%) and duplication of the bowel 1 case (2%).P value < 0.002

Table 6 : Types of lead points

Lead point	No. of cases	%
Meckel's diverticulum	3	6%
Polyps	2	4%
Volvulus	2	4%
Duplication	1	2%
Total	8	16.6%

Pvalue < 0.002

Discussion

The current study was conducted during a period of one year. In this study enrolled 50 cases, 48 patients were truly discovered intussusception during surgery.

In this study seventy nine percent of the cases aged ≤ 10 months, and about 21% aged > 10 months. The total gender distribution was nearly equal in the present study in which 26 female patients (54%) is nearly equal to 22 male patients (46 %) with a female to male ratio of 1.2:1. However, the difference was

statistically not significant in between both genders, $P>0.05$. [Table 1]. This is coincide with west African study in 1994 by Magnete and Allison [18], however, American study in 2010 by Paul M. Columbani and Stefan Scholz[1], does not agree with that when they stated preponderance of male over female in a ratio 3:2 . In the current study cases were collected in one year and we got females who were aged ≤ 10 months represent 76.9% compared to 81.9% males.

Regarding seasonal variation, we found that a significant incidence of

intussusception was during Spring and Summer 52% and 27% respectively. These results coincide with other studies in united states and Africa by Arnold Coran Scott Azickayne Eli [19], and SigmundEin[20]. This seasonal variation might be attributed to that; in spring and summer babies are more vulnerable for upper respiratory tract infection or gastroenteritis due to viral infection like Rota virus or Adenoviruses[4].

Classically, a previously healthy infant presents with colicky abdominal pain and vomiting. Between episodes the child initially appears well, Later on, the patient may pass a bloody stool. Rectal exam may reveal red currant jelly stool or rarely the apex of intussusceptum may be felt[1]. Classical picture of abdominal pain, vomiting and bleeding per rectum (red currant jelly stool) of intussusception in this study was as follows pain 100%,bleeding 90% and vomiting 78%. These results were similar to the findings of Momoh[21]in Nigeria 1987 and Akram Jawad[22] in Saudi Arabia 1997 [Table 3].

All of our patients were fully investigated like general stool examination and it was negative for bacterial or amebic cause of bloody stool. All the 50 patients were subjected to abdominal ultrasound examination. Laparotomy was done for all of them with positive and negative findings on abdominal ultrasound, because both groups had the classical clinical picture of intussusception. Among 50 patients who were undergone laparotomy, 43 cases have positive findings (true positive). So ultrasound was highly sensitive (about 90% sensitivity).Two patients had clinical picture of intussusception but negative ultrasound finding and negative laparotomy for intussusception, in one of them we found an appendicular mass and the other one was a case of malrotation with volvulus, so ultrasound was correctly identified them as negative, giving specificity of 100%.Unfortunately the rest 5 cases had been diagnosed as a

negative ultrasonic findings but an intussusception mass were discovered during laparotomy.The PPV results was 100%, while the NPV results was about 29 % and accuracy of ultrasound in was 90%. [Table 4].

In the current study we see that ultrasound has high sensitivity 90% which is slightly lower than that of results done by Lewis Spitz & Arnold Coran [1], with a sensitivity of 98%-100%in United States of America[14].

This may be related to the well trained personnel and good ultrasound equipment in western countries, while in our study we depended on different ultrasonographers and different machines.

According to the final diagnosis by laparotomy, among the 48 cases with primary intussusception, the most frequent type of intussusception was Ileocolic, it was present in (70.83%), followed by Ileo-ileal in (18.75%) then Colo-colic type in (6.25%) and the least frequent type was the Ileo-Ileo-colic in only (4.16%) [Table 5]. The most common specific lead point causing intussusception was meckel's diverticulum found in 3cases (6%) distributed as 1 case 6 months old and the other 2 cases in more than 2 years. The other common lead points were polyps in age group of more than 2 years, they were found in 2 cases (4%), one of them was having multiple polyps along the large bowel and presented as acute abdomen with delayed presentation and the patient died immediately after operation. The other sporadic cases were due to volvulus 2 cases (4%) and duplication of the bowel 1 case (2%). [Table 6]. Ultrasound didn't diagnose any lead points per se but only as a target or pseudo-kidney signs. These results were similar to studies done by:Al-Khalidi[23] in Iraq-Mosul city 2001 and British study by Ein [24]and Park, et al[25], in 2007

In this study, we focused on the role of ultrasound in diagnosing intussusception regardless the causes of intussusception

whether primary or secondary or the association with lead points or not.

Conclusion

There was no significant difference in incidence between male and female patients in our study. There is seasonal predominance during summer and spring. Ultrasound is a good diagnostic tool for detection of an intussusception mass with a sensitivity of 90%.

Different ultrasound machines and different ultrasonographers may influence the accuracy of results, so if well trained personnel with good ultrasound machine, a diagnosis of intussusception may not be missed.

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