
Childhood Intussusception: A Study of 55 Cases

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Abstract:

Background: Intussusception occurs when a portion of the alimentary tract is telescoped into an adjacent segment. It is the most common cause of intestinal obstruction between 3 months and 6 years of age. The majority of cases in children are idiopathic.

Objective: To study the importance of different presenting clinical signs and symptoms, outcome, and to evaluate the efficacy of imaging procedures in diagnosis.

Methods: Prospective study of patients aged (4-48 months) with signs and symptoms consistent with intussusception were studied during the period from the 1st of Feb. to the 31st of July 2009. History was taken including; name, sex, age, duration of illness, clinical manifestation, examination, erect plain abdominal X-ray and abdominal ultrasound and CT scan of abdomen was done in selected cases. Data were collected to evaluate abdominal X-ray, ultrasound and CT scan as guidance for diagnosis of intussusceptions in children. All patients were treated by surgical reduction and notes were taken regarding type of intussusceptions and the presence of underlying pathology.

Results: Fifty five patients were studied; their mean age was of 12±3 months. Males were more than females with a male:female ratio of 1.6:1. Most of patients presented with vomiting, blood in stool and abdominal pain. Pain, fever, constipation, diarrhea and intestinal prolapse through anus were less frequent presentations of the study group. During examination an abdominal mass was found in 63.6% of cases, while current jelly by per-rectal examination was found in 38.2%. We found that most common sign detected by abdominal ultrasound was the presence of abdominal mass (67.3%), further more ultrasound can be used to detect peritonitis and detect the presence of underlying pathology. X-ray was also helpful in making diagnosis, while CT scan was used in 2 cases suspected to have lymphoma. Surgical reduction was done to all cases. Six of cases had bowel ischemia who were presented after 48 hours.

Conclusion: Intussusceptions is more common in boys than in girls. Vomiting, bleeding in stool and abdominal pain were the commonest presenting symptoms and the characteristic abdominal mass and red current jelly stool is not always present. X-ray, ultrasound of abdomen are useful methods in the diagnosis, while CT scan which is highly sensitive is not routinely used

Introduction:

Intussusception occurs when a portion of the alimentary tract is telescoped into an adjacent segment. It is a common cause of intestinal obstruction between 3 months and 6 years of age^[1,2]. The majority of cases in children are idiopathic. Intussusception is the most common cause of intestinal obstruction in children between 3 months and 6 years of age. Approximately 60% of children are younger than one year, and 80 percent are younger than two years. Intussusception is less common before three months and after six years of age. In a population-wide survey in Switzerland, the yearly mean incidence of intussusception was 38, 31, and 26 cases per 100,000 live births in the first, second, and third year of life respectively^[3,4].

Intussusception has male predominance, with a male: female ratio of 3:2. Intussusception has been associated with some forms of rotavirus vaccine^[4,5]. Approximately 30% of patients experience viral illness before the onset of intussusception. A strong association with adenovirus infection has been shown in a variety of populations^[6,7]. Approximately 75% of cases of intussusception in children are considered to be idiopathic, which is most common between three months and five years of age^[3,6]. While in 25% of cases, an underlying disease causes a pathological lead point for the intussusception, which is common in children younger than three months or older than five years^[1,3,5,6,8].

A variety of conditions have been associated with intussusception, including Meckel diverticulum^[9], polyps^[10], small bowel

lymphoma^[11], inverted appendiceal stumps^[12], parasites (eg, *Ascaris lumbricoides*)^[13], Henoch-Schönlein purpura, and cystic fibrosis^[14,15].

Patients develop sudden onset of intermittent, severe, crampy abdominal pain, accompanied by inconsolable crying and drawing up legs towards abdomen. The episodes usually occur at 15 to 20 minute intervals. They become more frequent and more severe over time. Vomiting may follow episodes of abdominal pain. Between the painful episodes, the child may behave relatively normally and be free of pain. In 70% of cases, the stool contains gross or occult blood, a mixture of blood and mucous, giving it the appearance of currant jelly^[1,2,3]. Palpation of the abdomen usually reveals a slightly tender sausage-shaped mass, while in about 30% of patients do not have a palpable mass.^[1]

Aim of study

1. To study the importance of different clinical signs, symptoms and presentations in intussusceptions.
2. To evaluate efficacy of imaging procedures in diagnosis.

Patients and methods

Prospective study of 55 patients aged 4-48 months with signs and symptoms consistent with intussusception were studied in Child Central Teaching Hospital, surgical department of Children Welfare hospital and surgical department of Al-Yarmouk hospital over the period 1st of Feb. to the 31st of July 2009. History was taken including; name, sex, age, duration of illness, clinical

manifestation (abdominal pain, vomiting, bloody stool, fever, lethargy, diarrhea, constipation, and intestinal prolapse through anus). Systemic examination was done focusing on the presence of abdominal mass (sausage mass); also digital rectal examination was done looking for the presence of bloody mucus (currant jelly stool).

Erect plain abdominal X-ray was done to all patients looking for the following;

1. Multiple dilated loops of small intestinal obstruction
2. Absence of gas and soft tissue density in right upper quadrant
3. Target sign (meniscus sign) of intussusception in proximal transverse colon (two concentric radiolucent circles superimposed on the right kidney)
4. Pneumo-mediastinum in cases of bowel perforation

Abdominal ultrasound was done to detect:

1. Target sign in transverse section (concentric rings of tissue representing components of the bowel wall), sometimes referred to as the doughnut sign

2. Pseudo-kidney sign in longitudinal section (roughly ovoid mass with different tissues appearing layered longitudinally)
3. Peritonitis
4. Underlying pathology (lymphoma).

Barium enema was not done routinely because most patients may be diagnosed more than 24 hours.

Abdominal CT scan was used in 2 patients, who were presented with signs and symptoms of lymphoma.

Data were collected to evaluate abdominal X-ray, ultrasound and CTscan as guidance for diagnosis of intussusception in children. All patients were given intravenous fluid to correct their dehydration and surgical reduction was done and all had appendectomy. Surgical notes were taken including information regarding type of intussusceptions and the presence of underlying pathology. Kapa test was used to check the degree of agreement between the positive findings found by ultrasound and plain x-ray. Data was processed using Pearson Chi-square test at 0.05 level of significance.

Results

Epidemiology

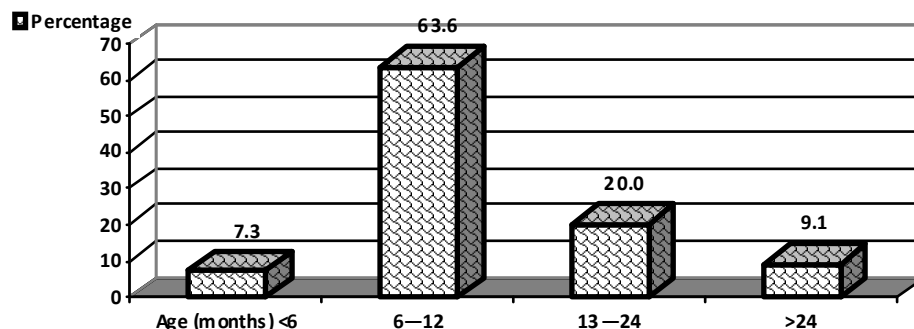


Figure 1: The age distribution of children with intussusceptions

Total no. of patient included in this study was 55; their age was between 6-8 months. The majority of patients (63.6%) were between 6-12 month of age with mean age

of 12 ± 3 mo. Twenty one (38.2%) of patients were female and thirty four (61.8%) of them were males with a female: male ratio of 1:1.6 as shown in the figure below

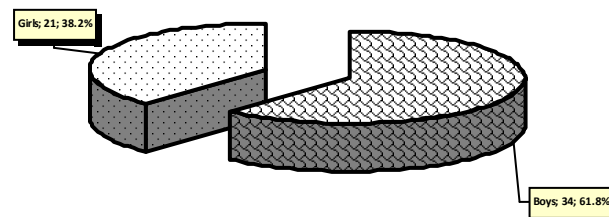


Figure 2 : The gender distribution of children with intussusception

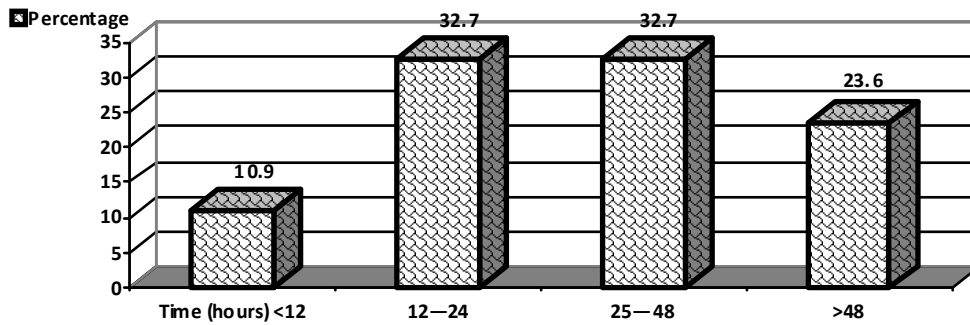


Figure 3: The duration (hours) distribution of children with intussusception

On many occasions family of patients seeked medical help after a period of 12 hours while only 10% seeked medical help before this period, as shown in the figure above.

Table 1: The gender distribution and time of presentation in children with intussusception in relation to their age

		Age ≤ 1 year		Age > 1 year		P value
		No.	%	No.	%	
Gender	Male	25	73.5	9	26.5	0.586
	Female	14	66.7	7	33.3	
Time (hours)	<12	-	-	6	100.0	0.001*
	12-24	15	83.3	3	16.7	
	25-48	14	77.8	4	22.2	
	>48	10	76.9	3	23.1	

The above table shows the non-significant male:female distribution and the highly significant time of presentation in relation to age of patients using Pearson Chi square test at 0.05 level of significance

Pathogenesis

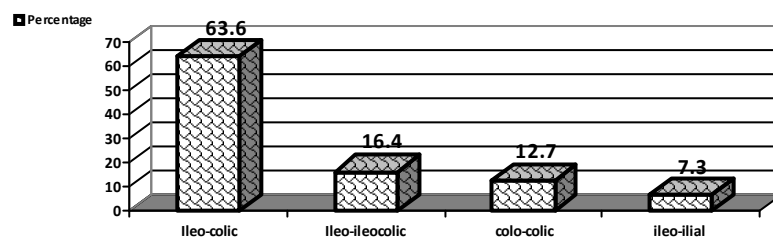


Figure 4 : The types of intussusception

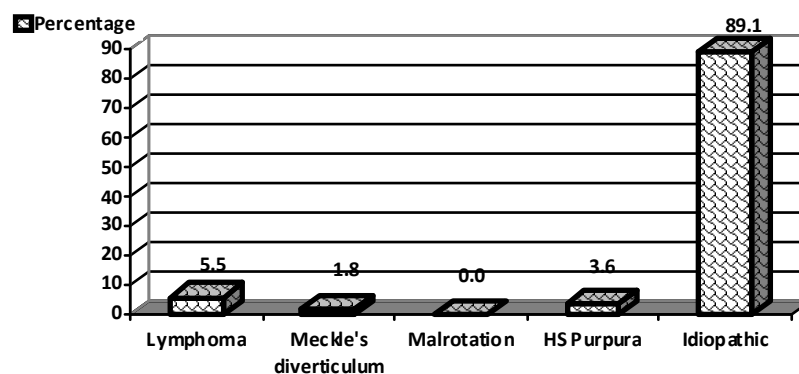


Figure 5 : The underlying pathology for intussusception

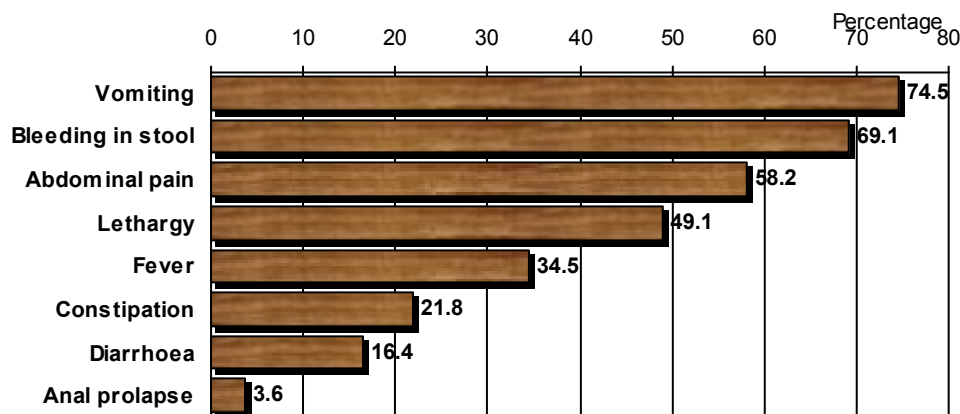
Figure 4 shows the types of intussusceptions and were mostly ileo-colic, and figure 5 shows the underlying pathology was mostly idiopathic

Table 2: the relation between the underlying pathology for intussusception and age of patients

Pathology	Age ≤ 1 years		Age >1 years		P Value
	No	%	No	%	
Pathology Lymphoma	-	-	3	100.0	Not significant
Meckle's diverticulum	-	-	1	100.0	
Malrotation	-	-	-	-	
Henoch-Schönlein purpura	1	50.0	1	50.0	
Idiopathic	38	77.6	11	22.4	

Using Pearson Chi square test at 0.05 level of significance, P value was of small undetected range

Clinical manifestations

**Figure 6 :** The symptoms of children with intussusception

Most of patients presented with vomiting (74.5%). Blood in stool (69.1%) and abdominal pain found in 49.1% of patients while fever, constipation, diarrhea

and anal prolapse were less frequent presentations of our patients study group.

Table 3: Clinical manifestation of children with intussusception in relation to their age

Symptoms		Age (years)				P value
		≤ 1 year		>1 year		
		No	%	No	%	
Vomiting	Yes	27	65.9	14	34.1	0.158
	No	12	85.7	2	14.3	
Abdominal pain	Yes	16	50.0	16	50.0	-
	No	23	100.0	-	-	
Bleeding in stool	Yes	26	68.4	12	31.6	0.544
	No	13	76.5	4	23.5	
Lethargy	Yes	16	59.3	11	40.7	0.062
	No	23	82.1	5	17.9	
Fever	Yes	10	52.6	9	47.4	0.030*
	No	29	80.6	7	19.4	
Constipation	Yes	6	50.0	6	50.0	0.071
	No	33	76.7	10	23.3	
Diarrhoea	Yes	4	44.4	5	55.6	0.056
	No	35	76.1	11	23.9	
Intestinal prolapse through anus	Yes	-	-	2	100.0	0.024*
	No	39	73.6	14	26.4	

* Significant using Pearson Chi- square test at 0.05 level of significance

In the table above we compared between 2 age groups (below and above one year), the presentation shows that patients whose age was less than 1 year

were presented more frequently with vomiting (65.9%) bleeding in stool (68%) lethargy (59.3%) and fever (52.6%).

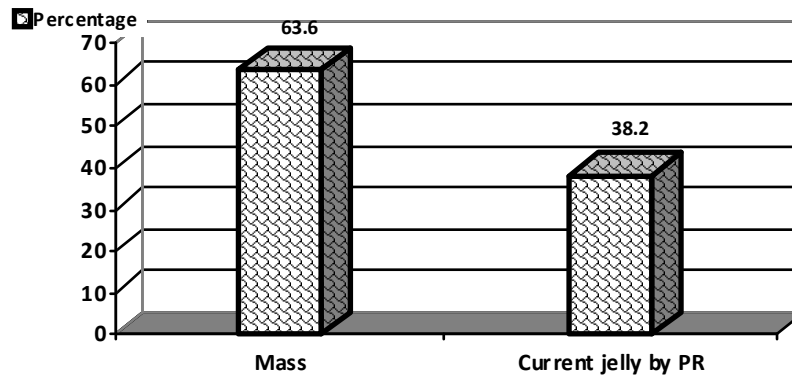


Figure 8 : The clinical examination findings of children with intussusception
During examination an abdominal mass was found in 63.6% of cases, while current jelly stool by per rectal examination was found in 38.2% of them.

Table 4: The clinical findings of children with intussusceptions in relation to their age

Findings on examination		Age (years)				P value
		≤ 1		>1		
		No	%	No	%	
Mass	Yes	26	74.3	9	25.7	0.466
	No	13	65.0	7	35.0	
Current jelly by per rectal examination	Yes	14	66.7	7	33.3	0.586
	No	25	73.5	9	26.5	

In the previous table we compared two age groups above and bellow 1 year and the findings during examination using Pearson Chi- square test at 0.05 level of significant.

Diagnosis

Table 5: Plain abdominal x-ray and ultrasound findings for diagnosis of intussusception

Erect abdominal X ray findings	No	%
Multiple dilated loops of small intestine obstruction	8	14.5
Absence of gas and soft tissue density in right upper quadrant	11	20.0
Target sign (meniscus sign) of intussusceptions in proximal transverse colon	2	3.6
Pneumo-mediastinum	1	1.8
Inconclusive	33	60.0
Abdominal ultrasound findings		
Target sign in transverse section or pseudokidney sign in longitudinal section (abdominal mass)	37	67.3
Peritonitis	5	9.1
Underlying pathology (lymphoma)	2	3.6
Inconclusive	6	10.9
Not done	5	9.1

We found that the most common sign detected by abdominal ultrasound was the presence of abdominal mass (67.3%), further more it can be used to detect peritonitis (9% of cases) and detect the

presence of underlying pathology (3.6%) of cases. In the next table we used Kappa test to find out the degree of agreement between abdominal ultrasound and plain x-ray.

Table 6: The agreement between x-ray and ultrasound findings

X ray findings	Ultrasound findings			
	Positive		Inconclusive	
	No	%	No	%
Positive x-ray findings	17	38.6	2	33.3
Inconclusive x-ray findings	27	61.4	4	66.7

P=0.802 (Not significant), Kappa test=0.019 (Weak agreement) of not significant type

CTscan was used in 2 cases suspected to have lymphoma and in both of them it gave us valuable informations about lymphoma and intussusceptoin

Treatment: Surgical reduction was done to all cases (100%)

Complications

a. Six of cases had bowel ischemia, all of these six cases were presented after 48 hours

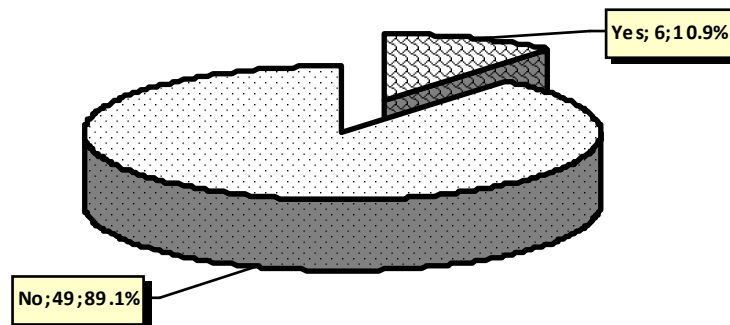


Figure 8 : The presence of ischemia in children with intussusception

Table 7: Presence of ischemia in relation to age

Presence of ischemia in relation to age	Age (years)				P value
	≤ 1		>1		
	No.	%	No.	%	
Yes	4	66.7	2	33.3	0.808
No	35	71.4	14	28.6	

b. Recurrence: only one case.

c. Perforation: only one case.

Outcome

Fifty-four (98.2%) of patients improved, only one (1.8%) died because of septicemia post-operatively.

Discussion

This small cross sectional study shows that the incidence of intussusception was higher among children between 6-12 months of age (63.6%).

Nassir J.A^[16] and Mohammed DA^[17] also found approximately similar result, this may be explained by the assumption that introduction of new food proteins results in swollen Payer Patches in the terminal ileum^[1]. Males were affected more than females with a ratio of 1.6:1, the same result was reported by Nassir J.A^[16] who found that the ratio of male to female in his study was 1.5:1. Most of patients presented between 12-48hr (64%) while only 10% and 23% of them where presented <12hour and after 48hour respectively , similar findings were also encountered by Nassir J.A^[16] & Mohammed^[17],with no significant relation between age and time of presentation.

In our study, intussusception occurs most often near the ileocecal (ileocolic):63.6% While ileoileocolic, colocolic and ileoileal have been present less frequently, these are similar to that found by AL-Malki:TA^[18].

30% of patients had history of upper respiratory tract infection in the proceeding week and 9% of

them had history of acute gastroenteritis a finding that is similar to that of AL-Malki:TA^[18],they may be explained by the lymphoid nodular hyperplasia, lymphadenitis and swollen payer patches during period of these illnesses^[1,2]. Ninety percent of cases of intussusception are considered to be idiopathic because there is no clear disease or pathological lead point, while 6(10%) of cases had clear underlying pathology, these values approximates results of konecki^[19] who also found that obvious pathology occurs more frequently in children above 2 years of age, a finding that is inconsistent with our study as we couldn't find significant association with age as shown in table 2.

Vomiting (74.5%),bleeding in stool(69%) and abdominal pain (58.2%) were the most common presenting clinical symptoms. Co-existing lethargy, fever ,constipation, diarrhoea, and intestinal prolapse through anus were present in less frequency these are similar to those of Giak CL^[20]. Vomiting, bleeding in stool, and lethargy were more frequent in children who were less than 1 year of age while intestinal prolapse through anus occurred only in children >1 year age, while abdominal pain, constipation and diarrhoea were present equally in different age groups.

On examination; abdominal mass was found in 35(36.6%) of cases of those 26(3/4) were under 1 year, while current jelly stool detected by per rectal examination in 21(38.18%) of cases,14(2/3) were

under 1 year, this value indicate that with younger patients (<1 year) it is more likely to find a mass or current jelly stool ,this finding was not explained by the relation of age, time of presentation (i.e late presentation in younger infant may lead to increased likelihood of mass and current jelly) as our study showed no significant relation as mentioned earlier .

X-ray and abdominal ultrasound were used for diagnosis of intussusceptions with positive findings by x-ray detected in 40% of cases while ultrasound was informative in 79% of cases with abdominal mass was detected in most of them (67.3%), it had also informed us about the presence of underlying pathology like lymphoma, these values are little lower than that of Verschelden P and Ko HS ^[21, 22], which may be due to technical or personal causes , as both depend mainly on the person interpreting them in addition to the technique and the type and model of device used.

X-ray and ultrasound had weak agreement by using kappa test this means that a non-conclusive x-ray findings don't necessitate a non-conclusive ultrasound and vice-versa. CT scan was used in 2 cases whom were suspected to have lymphoma and was informative in both of them, Peh CG and Roskind CG ^[23, 24] also demonstrate that CT scan is a sensitive examination for diagnosis of intussusceptions and demonstration of the presence of associated lead point, in addition it provided an excellent preoperative evaluation of the possible extension and/or dissemination of a malignant tumor, nevertheless during his study CT scan was not used routinely for all patients.

All cases were treated surgically while during the study of Nassir J^[25] 25% of cases underwent pneumatic reduction successfully ,the preference of our surgeons toward surgical reduction was based on the fact that the longer duration of symptoms (>24hr) the lower the likelihood of successful non-operative reduction ,decreased reduction rates are also reported in children with small bowel obstruction and these under 3 months of age ^[25,26].

Ischemia occurred in 6 cases (10.9%) all of them presented after 48hr, this is a fact: the latter the presentation the higher the risk of ischemia ^[1,2]. Age has a significant relation to the risk of ischemia.

Recurrence occurred only in one patient(1.8%) within 3 months of first presentation ,while recurrence rate (10%) was estimated by Varavithya W.^[27] this lower ratio may be due to the use of surgical reduction in all of our cases which is known to have lower risk of recurrence^[1-2].

Perforation only one case had perforation 1.8% approximately similar to that of Varavithya W^[27].

Fifty-four (98.2%) of patients improved, only one (1.8%) died because of post-operative septicemia this is lower than the mortality rate reported by Mohammed DA^[17]

Conclusions

1. Intussusception is more common in boys than girls.
2. Idiopathic intussusception is more common than Meckle's diverticulum and Henoch-Schönlein purpura as an underlying pathology in our study.
3. Vomiting, bleeding in stool and abdominal pain are the commonest presentations and the characteristic abdominal mass and red current jelly stool are not always present.
4. History and examination are most useful for early diagnosis.
5. Surgical reduction is the only treatment used in our hospitals.
6. Ischemia was present in 10.9% of cases, and were more at age of <1year, early diagnosis reduce risk of ischemia

Recommendations

1. Every pediatrician should keep intussusception in his mind, as early diagnosis and early treatment improves outcome and decrease mortality.
2. Pneumatic reduction should be performed for those presented less than 24hours.

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