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ADDIS ABABA UNIVERSITY
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DIAGNOSTIC ACCURACY OF ULTRA SOUND REPORTS OF INTUSSUSCEPTION AND FACTORSAFFECTING TREATMENT OUT COME AMONG PEDIATRICPATIENTS IN TIKUR ANBASSA HOSPITAL, TAH, ADDIS ABABA, ETHIOPIA

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Abstract

BACKGROUND: Intussusception is one of the main abdominal emergencies in children. Ultrasonography, is widely available, easily performed, does not produce radiation and can be used to screen suspected cases and diagnosis of intussusceptions.

OBJECTIVE: To retrospectively evaluate the accuracy of ultrasound investigation reports in the diagnosis of intussusceptions and factors which affect treatment outcome of intussusceptions among pediatric patients in TikurAnbassaHospital, TAH, Addis Ababa, Ethiopia

MATERIALS AND METHODS: Between September 2002 and Aug 2004 EC, 47 children were managed for intussusception at TAH and 42 patients underwent screening US for suspected intussusception. The mean age of the patients was 8 months.

RESULT: Out of forty seven patients, Forty two underwent screening US and surgery. Thirty eight patients had a positive US result; 34 (89.5%) were true positive and 4(10.5%) were false positive. Four patients had a negative US result; all were false negative. The sensitivity of the ultrasound examination was 89.5%.

CONCLUSIONS: It is a concern in our environment causing considerable morbidity and mortality due to late presentation.

We conclude that ultrasonography can be used as a rapid, sensitive screening procedure in the diagnosis or exclusion of childhood intussusceptions. The sensitivity of ultrasound examination is shown to decrease in our situation when compared to others, For this to be effective, effort may have to be intensified toward training more specialized personnel.

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List of Abbreviations

AAU **Addis Ababa University**

TAH **TikurAnbassa Hospital**

US **Ultrasound**

ESCHEthioSwedish child health

1. Introduction

1.1 Back ground

Intussusception is the most common cause of acute intestinal obstruction in infants and young children. It occurs when a segment of bowel invaginates into the distal bowel, resulting in venous congestion and bowel wall edema. The classical clinical triad, consisting of abdominal colic's, red jelly stools and a palpable mass, is only present in approximately 50% of cases, 20% of patients are symptom free at clinical presentation.(1)

Accuracy of clinical diagnosis is poor and in only 30-40% of cases is the clinical diagnosis of intussusception confirmed. Many unnecessary barium enemas are performed due to clinical misdiagnosis. (2)

Rectal bleeding was reported in a higher proportion of patients in studies from developing countries (median, 79%; range, 17%-100%) compared with developed countries (median, 53%; range 14%-72%) ($P< 0.001$) Rectal bleeding occurs commonly in young infants with intussusception occurring in 96% of infants less than 4 months of age. (3)

The vast majority of symptomatic intussusception in children arises in the ileum and is either ileocolic or ileoileocolic. The clinical diagnosis of these "idiopathic" intussusception may be difficult to make
The imaging diagnosis of intussusception can be made with sonographic or plain abdominal radiographs or by contrast (including air) enema examinations of the colon. (4)

Sonography can demonstrate intussusception, is widely available, easily performed, does not produce radiation and can be used to screen suspected cases. (5)

Ultrasound is a reliable imaging modality for the diagnosis of intussusception, which enables the diagnosis or exclusion of intussusception at sensitivity of 98–100%, specificity of 88% and a negative predictive value of 100 %.(6)

Intussusception has a characteristic sonographic appearance. This is described as an abdominal mass with a target sign, doughnut sign or concentric ring sign on transverse section and a pseudo kidney or sandwich sign on longitudinal section. Abdominal ultrasound may assist in

the definition of a pathologic lead point and monitor the success of enema reduction without the need for radiation exposure. A lack ofColor Doppler flow in the bowel wall has been reported to assist in the prediction of irreducibility of the intussusception by enema (7)

In emergency cases, additional plain films are necessary to detect potential intestinal perforation, to identify intestinal obstruction or other diseases mimicking the clinical presentation.

Once the diagnosis of intussusception is established, non-surgical reduction (NSR) is used. A surgical approach is chosen in patients with signs of perforation, shock or peritonitis.

Depending on the choice of guiding imaging technique, different contrast media are used for NSR. Barium suspension or air with fluoroscopic guidance, or saline only or mixed with water-soluble contrast under sonographic guidance, has to be used. Regardless of the used contrast medium, NSR is an effective technique, being successfully employed in more than 90% of cases (4).

Failure to make a prompt diagnosis and initiate appropriate treatment may lead to bowel ischemia, perforation, peritonitis, shock and even death. The clinician, therefore, may have to rely on imaging procedures to diagnose or exclude the presence of intussusception promptly and accurately. (8)

Hence, the need for early medical advice, diagnosis and intervention should reduce the mortality due to intussusception in children. (9)

1.2 Statement of the problem

It is mentioned that intussusception is the most common cause of acute intestinal obstruction in infants and young children. So far only two studies have been done in Black Lion Hospital, one is on adolescence and adults which showed the magnitude of mortality due to intussusceptions and the other is on children, a ten year review showed increased mortality trend(9,10)
Ultrasound has been shown to be a sensitive and reliable imaging method for diagnosis of intussusception in children but various studies indicated low utility of US to diagnose intussusception

Therefore analyzing the accuracy of ultrasound reports with its surgical correlation will initiate further studies on how to improve ultrasound utilization.

1.3 Rationale of the study

Though, there is a concern in TikurAnbassa Hospital for the considerably increasing morbidity and mortality due intussusception among pediatric patients, there are few studies on intussusception in Ethiopia.

Probably we should look into ways toward those factors affecting treatment outcome and ultra sound diagnostic repot accuracies on suspected intussusceptions in children, hence this situation propelled me to conduct a study on this perspective of the clinical practice in TAH.

2. Literature review

Intussusception in children are important to consider especially, when working in a pediatric emergency department due to the potential serious complications in case there is a delay in diagnosis or even misdiagnosis

Intussusception is the most common cause of intestinal obstruction in young children, and delayed diagnosis may lead to bowel perforation. Hence, the diagnosis of intussusception should be suspected in all children, under the age of 3 years, with acute colicky abdominal pain(2, 11).

The majority of cases are idiopathic and in only 10% of patients will a pathological lead point be found, that is, they do not have a demonstrated anatomic abnormality that functions as a lead point except for hypertrophied lymphoid tissue. Intussusceptionlead points such as a Meckel diverticulum, duplication cyst, polyp, or tumor (e.g., lymphoma) are uncommon in infants (<5% of cases). Intussusceptionlead points are more common in neonates (<30 days old), older children (>5 years old), and cases restricted to the small intestine (2, 11)

Although lead points can be detected with a contrast enema study, they can easily be missed or even reduced with this technique. US allows better detection and characterization of lead points than does a contrast enema study

One would be in error to wait for the classical triad presentation before beginning the appropriate diagnostic testing (12).

The incidence of intussusceptionin infants and children is reported to be between 0.3 and 2.5 cases per 1,000 live births in North America, Europe and Australasia. Although mortality resulting from intussusceptionis uncommon in developed countries, case fatality rates up to 50% have been reported in some developing countries(3).

Although intussusception-associated infant deaths in the United States have declined substantially over the past 2 decades, some deaths seem to be related to reduced access to or delays in seeking health care and are potentially preventable intussusceptions.

Intussusception-associated hospitalizations were uncommon in the first 2 months of life, peaked from 5 to 7 months of life, and showed no consistent seasonality. Intussusception-associated infant mortality rates declined from 6.4 per 1,000,000 live births during 1979–1981 to 2.3 per 1,000,000 live births during 1995–1997 (relative risk = 2.8, 95% CI =1.8_4.3)

Infants whose mothers were <20 years old, nonwhite, unmarried, and had an education level below grade 12 yearswere at an increased risk for intussusception-associated death. Studies on time of presentation after onset of symptoms indicated late presentation. (13)

A record review study of infancy and childhood intussusception at King Fahad National Guard Hospital in the Kingdom of Saudi Arabia from January 1984 through December 2000 showed, the clinical features included rectal bleeding (81%), vomiting (78%), abdominal colic/pain (65%) and abdominal mass (62%). All cases were ileocolicintussusception with no leading point.

Seventy percent of the cases presented within 24 hours of onset of symptoms. The 4 recurrences in 3 children had successful enema reduction. There was no mortality but 3 operative cases required late surgery for adhesive intestinal obstruction including one requiring bowel resection (14).Idiopathic intussusception commonly presented as classical, rectal bleeding being the most common. The majority presented within 24 hours of onset of symptoms and barium enema reduction was successful in 20 out of 36 cases in which it was attempted. Since most intussusceptions were already in the cecum at surgery after failed enema reduction, a repeat or delayed enema reduction was considered in stable cases. Recurrentintussusception occurred in 3 non-operated cases and adhesive intestinal obstruction in 3 Laparotomy cases (14)

In a study on Intussusception in children studied at Muhimbili National Hospital, Dares Salaam, majority of the children presented late, >48 hours from the onset of symptoms and diagnosis was mainly based on clinical symptoms and signs of intestinal obstruction and confirmed with presence of multiple fluid levels on a plain erect abdominal X-ray. All children were then managed by surgery, 11(39.3%) underwent bowel resection. Histopathology reports of those available did not show cause of intussusception. Seven patients died postoperatively, hospital mortality of 25 %(15).

A retrospective study on treatment outcomein the University of Port Harcourt Teaching Hospital, Nigeria conducted from October 1985 to September 1992 on infant and child whose diagnosis was made clinically and confirmed at operation, All 69 patients had laparotomy as reduction using barium enema was not attempted. Of the 35 patients who required resection, 27 (77.1%) had gangrenous bowel and 2 (2.8%) had perforation. Mortality was 11.6%. The high mortality rate appears to be related to the long interval between onset of symptoms and commencement of definitive treatment (16).

Even though there is inadequate available study or data on infancy and childhood intussusceptions in Ethiopia, a three -year retrospective review of adolescent and adult patients' record with intra operative diagnosis of intussusception in three teaching Hospitals in Addis Ababa, Ethiopia, i.e. TikurAnbassa (TAH), Princess Zewditu Memorial (ZMH) and St. Paul's Hospitals (SPH), shows the magnitude of mortality due to intussusception.

In this study, the median duration of illness was 144 hours with a range of 6-720 hours. The Ileo-colic type was identified in 14 (56%) of the cases. Fifteen (60%) cases were primary (Idiopathic). Benign conditions represented the majority (67%) of the identified lead points. Intra operative reduction was successful in only 6 (24%) of the cases, all of which were idiopathic. Four of their patients died giving an overall mortality rate of 16%. All of the deaths were from the idiopathic variety. Irreversible septic shock with multi organ failure was the cause of death (9).

Regarding mortality rate of intussusception in Ethiopia, in 1993 a ten year review showed increased mortality trend. Sixty six cases of intussusceptionwere admitted to ESCH, Addis Ababa over a 10 year period.

Males dominated in the series. Age distribution showed that 69.7% of the cases were < or = 1 year old, and 85% were < or = 2 years old. Abdominal pain, vomiting, bloody mucoiddiarrhea and mass palpated abdominally and/or rectally were the commonest modes of presentations.

Intussusceptions occurred more often in well-nourished children, but were rare in severely malnourished ones. An underlying intestinal pathology was found in two cases only. The mortality was high probably because the majority of cases presented late for medical attention. The need for early medical advice, diagnosis and intervention should reduce the mortality (10)

Ultrasound has been shown to be Sensitive and reliable imaging method for diagnosis of intussusceptions in children (1-4) but various studies indicated low utility of Ultrasound to diagnose intussusceptions.

Despite, sensitivity and specificity,that approach 100%, there is still reluctance on the parts of some physicians to trust US fully for exclusion of the condition particularly in patients with disconcertion symptoms such as rectal bleeding. Others have questioned the wisdom of performing a diagnostic ultrasound study in patients with high probability of intussusceptions when an enema examination, which could serve as both a diagnostic and therapeutic procedure will be performed eventually which decreasing the number of patients who undergo double examination(17).

3. Objective

3.1 General objective

To assess accuracy of ultra sound (US) investigation reports in the diagnosis of intussusception and factors affecting treatment outcome of intussusception among pediatrics patients inTikurAnbassa hospital, TAH, Addis Ababa, Ethiopia

3.2 Specific objective

- To analyze accuracy of ultrasound (US) investigation reports of pediatric patients retrospectively with intra operative diagnosis of intussusceptions

- To assess factors which affect treatment outcome of pediatric patients with suspected intussusceptions in TikurAnbassa hospital

4. Methods

4.1 Study area

TikureAnbessa Hospital is a university referral hospital and the largest general public hospital in Addis Ababa.

4.2 Study designand period

The study was facility based, analytical cross sectional study design with retrospective review of pediatric patients' record with intra operative diagnosis of intussusception over a period of three years (Sept 2002 to Aug 2004EC)

4.3 Study population

- **Source population** – all pediatric patients in TAH
- **Study population** - patients in pediatric surgery ward with suspected case of intussusceptions

4.4Sample units – pediatric surgical patients included in the sample

- **Inclusion criteria:** pediatric patients who underwent surgery and had confirmed case of intussusceptions.
- **Exclusion criteria:** patient diagnosis miscoded, history lost and insufficient clinical data recorded to allow assessment by the clinical case definition.

4.5 Sample size

All cases of pediatrics surgery patients with post operative discharge summery for whom ultrasound done was included in the study

4.6 Sampling procedures

A non-probability purposive method, i.e. all consecutive medical record of confirmed cases of intussusceptions that underwent surgery during the study period were reviewed

4.7 Data collection procedure and materials:

Patients' card review was done using structured check list from the case notes, ultrasound reports, discharge summaries, and theatre records.

4.8 Data analysis procedure

After the data collection, the principal investigator coded each question and data entry was made using spss version 16. Descriptive statistics and summary measures were employed to the data. The association of study variables was assessed.

4.9 Data quality control

- The data entry and cleaning was made by the principal investigator.
- Frequency output was used to check missing values and cleaning was done using original code number.

5. RESULT

During 3 years, 47 confirmed cases of intussusceptions in children <84 months of age were identified, 5 were excluded from the study since u/s was not done in these patients.

There were 27 (64.3%) males and 15 (35.7%) females with a median age of 8.0 months .The ages ranged from 4 months to 7 years.31 (74%) of the patients were one year old or less.

The main presentations were vomiting (*n* = 40, 95.2%), rectal bleeding (*n* = 30, 71.4%) and abdominal pain (*n* = 11, 26.2%), Abdominal distension was observed in 11 (26.2%) children and the intussusceptions was palpable as abdominal mass (*n* = 6, 14.3%). A combination of abdominal pain, vomiting, and rectal bleeding (classical triad of symptoms of intussusceptions) occurred in 6 (14.3%).

We did not detect any significant differences in the distribution of symptoms by age or sex.No statistically significant changes in the monthly occurrence of intussusceptions were found.

35 cases (83.3%) were admitted >24 hours after symptoms onset and had features of intestinal vascular compromise or venous congestion such as passage of blood per rectum or blood on rectal examination 30(71.4%).
Intussusception was clinically a preoperative diagnosis in 40 patients (95.2%), intestinal obstruction and acute appendicitis each in 1 patient (2.4%).

Ultrasonography was the most frequent diagnostic method, and was not done in1 because the patient was being resuscitated for shock and in 4 because of economic problems and plain abdominal radiography in these patients showed signs of intestinal obstruction.

Ultrasonography showed Intussusceptionin 38 (90.5%) of children. All cases underwent surgery, a reduction of Intussusception by air or contrast enema was not attempted in any of patients.

Out of 38 patients who had a positive ultrasonographic result; 34(89.5%) intussusceptions were confirmed by surgery (True positive) and 4(10.5%) had no intussusceptions at surgery(false positive) of which at one case surgery revealed impacted stool and in two mesenteric lymphadenitis misdiagnosed by ultrasound as an intussusceptions mass .

All 4 (10.5%) patients who had a negative ultrasonographic result were positive for intussusceptions during surgery (False negative).

At operation, 18 (47.4%) children had ileocolic, ileiocolocolic 16(42.1%) , and 2 (5.3%) ileoileal and Ileoileocolic intussusceptions each. Four (9.5%) children had Meckel's diverticulum, one (2.4%) appendix was found which acted as lead point, In 18(42.9%) cases, there was no identifiable pathology in the intestines, while 20 (47.6%) children had mesenteric lymphadenopathy and inflamed Peyer′s patches.

Normal bowel wall was found in 27 (64.3%) and successful surgical reduction of the intussusceptions was possible. 14 (33.3%) children had devitalized bowel, and one Perforated required bowel resection.

Among 7 children admitted within the first 24 hours after the onset of illness, one patient had gangrenous bowel. However, 14 of 35 children admitted >24 hours after symptom onset had devitalized bowel and required bowel resection , with All deaths in these patients compared to no death in children admitted earlier to the hospital.

Four (9.5%) children died in the postoperative period. Two children had normal bowel and two gangrenous bowels. The cause of death was septicemia in these two and not mentioned in the latter two. The deaths occurred between the 1^{st} and 5^{th} postoperative days.

The mean duration of hospital stay was 7.2 days (range 1to 30 days) there was no recurrence of intussusceptions in those that survived.

6. Discussion

Epidemiology of intussusceptions in our study was similar to that described in other parts of the world. In almost all published studies the proportion of male patients was higher than that of female patients. The peak age at presentation was 4 to 8 months in most regions. (1)

The predominant sites for acute intussusceptions in infants under 1 year of age were ileo-caecal, ileo-colic or ileo-ileo-colic in almost all studies,the large amounts of lymphoid tissue in the terminal ileum during the first year of life, and the numerous glands normally present in the ileo-caecal region, would account for the age and regional distributions of intussusceptions. (2, 11, 14)

From this study, the majority of children with intussusceptionpresent for definitive treatment after 24 hours of symptoms. This seems to be common in many developing countries. Factors like ignorance, poverty, poor communication, and inadequate access between rural basic health facilities and the tertiary centers may contribute to late presentation. (15) The importance of delayed presentation in the management of intussusceptions lies in its tendency to predispose to bowel devitalization. The high proportion of irreducible intussusceptions and devitalized bowel among our cases may attest to this.

The diagnosis and nonoperative treatment of intussusceptions have been shown to rely a great deal on radiological imaging. Since the mid-1930s, barium enema has been applied as a diagnostic and therapeutic tool in many centers in developed countries. (3, 13) More recently, ultrasonography is used for definitive diagnosis and to guide hydrostatic reduction with saline enema. (2, 14,) in the present report, definitive diagnosis of intussusceptions was in most cases made at laparotomy. It was only recently that routine use of ultrasonography is applied in the diagnosis. These deficiencies may be related to lack of facilities and trained personnel, which is common in many developing countries. (15)

It is important to appreciate that non-operative treatment involves an initial confirmation of diagnosis with either ultrasonography or barium enema, after excluding peritonitis. This is followed by pressure reduction with barium, saline enema, or air enema. Executing such procedure presupposes the availability of requisite facilities, training, and personnel (4). From this study, it is evident that nonoperative treatment in our setting may be hampered by the unavailability of these requirements in addition to delayed presentation. The routine use of ultrasonography in our hospital might, however, engender interest in nonoperative treatment in select cases that present early. For this to be effective, effort may have to be intensified toward training more specialized personnel, and encouraging better collaboration among the radiologists, pediatricians, and pediatric surgeons.

Despite the reports on the benefits of nonoperative treatment, surgery still has a definite role in the management of intussusceptions. Such cases with features of peritonitis at presentation, or those that fail to reduce with nonoperative means, and patients with pathological lead points and/or bowel complications, may invariably require surgery. In the present report, a high proportion of the cases required resection for bowel complications. This implies that surgery might currently be inevitable in a good number of our cases.

The mortality of 9.5% obtained in this study and the 8-54% (15) from some earlier studies in developing countries is high. The true mortality may even be higher than these figures as some of the affected children may not survive to reach the tertiary hospitals. In contrast, the outcome in many developed countries is reported to be excellent. (15)

7. Conclusion

It is a concern in our environment causing considerable morbidity and mortality due to late presentation.

Excellent positive predictors of intussusception were identified, we conclude that ultrasonography can be used as a rapid, sensitive screening procedure in the diagnosis or exclusion of childhood intussusception but the sensitivity is shown to decreasein our situation when compared to others.

Surgery was the only means of treatment in our hospital due to apart from lack of facilities, the majority of the children presented late, >24 hours from the onset of symptoms

8. Recommendations

1. Efforts should be made to improve referring health facilities and improving the perioperative care of these cases may improve the outcome.
2. To increase the sensitivity of ultrasound, effort may have to be intensified toward training more specialized personnel.
3. Improving time for diagnosis and requisite diagnostic facilities may encourage the use of nonoperative treatment.

9. Limitation

The main limitation of this study is lack of organized data that limits the study period. Also it is limited by the retrospective design. A prospective study would have given explanations for the delayed presentation and the possible areas for intervention.

9. Annex: check list

Code of study unit (Case record) _____

Date of record review: _____

Name of record reviewer: _____

Part I- Socio demographic variables

1.1 Sex
   a. Male
   b. Female

1.2 Age of patient _____ (in month)

1.3 Weight
_____ (in kg)

1.4 Length
_____ (in cm)

1.5 Anthropometry
   a. Wt/age _____
   b. Wt/ht/ _____

1.6 Date (month) of visit
_____ (date/month/year)

Part II- case diagnosis modalities and treatment out comes review

2.1 Clinical presentation/ features of patient
a.coliky abdominal pain c.palpable mass
b.rectal bleeding d.vomitinge.others (specify)

2.2 Duration of illness (on set of symptoms)
a. less than 24hrsb.more than 24hrs

2.3 Initial impression/ DDx
a. Intussusception b.otherDx (specify)

US Investigation report

2.4 Location of .Intussusception
a.peri umbilical b.Right upper andLower Quadrant

2.5 Mean diameter and length of Intussusception

2.6 Lead point
a.Identifyed b. Not identifyed

Surgical findings

2.7 types
a.Ileoilealb.Ileocolic c..Ileoileocolic

2.8 status of bowel a.Normal b.Ischemic c. Perforarated

2.9 Length of hospital stay

a.<3days b. 3_7 days c.8_15 days

2.10 Any recurrence before the current intervention

a. Yes b.No

2.11 If the answer to Question 2.9 is Yes,

Frequency _____

2.12 Treatment out come of current intervention

a. Improved b.death

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