Original Article

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A comparison of manual versus hydrostatic reduction in children with intussusception: Single-center experience

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ABSTRACT

Objective: In recent years several techniques have been recommended for intussusception treatment. In this study, an evaluation was made of intussusception cases that presented at our clinic and had reduction applied together with saline under ultrasonography (USG) and cases, which were surgically treated. **Patients and Methods:** A retrospective evaluation was made of the records of 72 cases treated for a diagnosis of intussusception between January 2010 and July 2012. Patients were evaluated demographics, clinical presentation, management strategy, during the hospitalisation and outcome. **Results:** A total of 72 cases which consists of 44 male and 28 female with age range between 5 and 132 months were treated with a diagnosis of intussusception. USG was applied to all cases on initial presentation. As treatment, hydrostatic reduction (HR) together with USG was applied to 47 cases. Of these, the HR was unsuccessful in 13 cases. Surgical treatment was applied to 38 cases. Of these cases, ileocolic intussusception was observed in 30 cases, ileoileal in seven cases and colocolic in one case. Meckel diverticulum was determined in five of these cases, polyps in two cases, lymphoma in two cases, lymph nodule in one case and 28 cases were observed to be idiopathic. There was no mortality in any case. **Conclusion:** HR together with USG is a safe technique in the treatment of intussusception, which also shortens the duration of hospitalisation and significantly reduces the treatment costs.

Key words: Hydrostatic reduction, intussusception, treatment, ultrasonography

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INTRODUCTION

Intussusception was first described in 1692.[1] It is one of the most significant causes of acute intestinal obstruction in childhood accounting for 18% of cases presenting with intestinal obstruction.[1] Although the incidence is between 0.3 and 4/1000, high complication rates are most often seen in developing countries.[2] When treatment is delayed, vascular congestion and oedema in the intestinal wall leading to intestinal necrosis and perforations may result in the disease being fatal.[1]

Surgical and non-surgical techniques are used in the treatment of intussusception. The general view is to firstly apply non-operative reduction. There is a long history supporting the treatment of intussusception with non-operative reduction techniques, with the oldest record going back to Hirschsprung in 1876, when reduction was made with water. Between 1871 and 1904, 107 cases were published.[1] Although the surgical mortality rate was 80% in this series, it was 35% of cases which had undergone reduction with water.

With the onset of the widespread use of ultrasonography (USG), several centres world-wide started to use hydrostatic reduction (HR) in the treatment of intussusception. The perforation risk of HR has been reported as 0.1-3%.[3] Despite the advantages of HR, in cases where clinical complaints have continued for more than 48 h and for infants with severe ileus and peritonitis it is a safer choice to admit directly for surgery.[2]

We were performed manual reduction (MR) in almost all cases with intussusception, until recently. We have performed ultrasound guided HR with normal saline and/or MR; therefore, we aimed to evaluate and compare the demographic, clinical and radiological characteristics of cases with a diagnosis of invagination treated by MR with those treated by HR.

PATIENTS AND METHODS

The records were retrospectively examined of 72 cases diagnosed with intussusception who had presented at the Paediatric Surgical Clinic between January 2010 and July 2012. The information was evaluated in terms of type of treatment, age, gender, duration of hospitalisation, seasonal distribution, presence of a lead point (LP) and results. Inclusion criteria patients who were admitted paediatric surgery ward.

Following the anamnesis and physical examination of patients presenting with a preliminary diagnosis of intussusception, laboratory tests of haemogram, biochemical and blood group were examined. Radiological tests were performed of standing direct abdominal radiograph and USG. Patients with a target sign on the USG or a pseudo kidney view were diagnosed with intussusception. A surgical approach was applied without attempting HR to cases in shock, with peritonitis, findings of perforation and a history of more than 72 h and those aged over 3 years or below 1 month. Surgery was planned for cases aged over 3 years or below 1 month as the possibility of a LP was high.

Nasogastric and urinary catheters were applied and when hydration was sufficient, the patient was taken to the USG room. After insertion of the appropriately numbered Foley catheter into the rectum, the balloon was inflated with saline solution. The saline, pre-heated to 37°C, was administered through the Foley catheter in the rectum of the patient in a supine position. The saline was kept at a height of 100 cm. Retrograde administered fluid was monitored by USG with the same group of radiologist. No additional sedation was applied. The procedure was evaluated as successful when the fluid administered was seen to have passed the cecum and been distributed in the small intestine.

Disappearance of the target sign was not expected and there was no time limit for the procedure. During the procedure, the general status of the patient, abdominal sensitivity and defence were monitored by a paediatric surgeon. Patients in whom invagination continued following the HR procedure were then admitted for surgery. HR was not attempted a 2nd time. After a successful reduction, the intestines were emptied and the patient was kept under observation. Cases where findings of intussusception (unsuccessful HR) continued were admitted for open surgery. If there were unsuccessful HR after 2nd time, patient's findings in more than 72 h and patient who were older than 3 years, they underwent open surgery.

The antibiotics (Gentamycin + Ampicina + Metranidazol) were administered pre- and post-procedure to the cases undergoing HR for prevents bacterial translocation. Administration was made intravenously pre-procedure and patients with successful reduction continued with oral antibiotic as a wide spectrum antibiotic at home for 5 days.

The measurement of a successful reduction was evaluated as the heated saline administered through the anal canal being visualised under USG monitorisation as having passed to the proximal of the invaginated segment. In this study, a comparison was made of non-surgical HR technique, surgical MR and resection anastomosis (RA).

Data collection and evaluation was made by computer software package (Statistical Package for the Social Sciences for Windows 11.5, SPSS Inc, USA). The Mann-Whitney *U*-test and the Chi-square test were used in data evaluation. $P < 0.05$ was accepted as statistically significant.

RESULTS

The study comprised of 72 cases aged 28.29 ± 0.59 months (range: 5-132 months). The cases were 44 male (61.1%) and 28 female (38.9%) [Figure 1]. There was no statistically significant difference between the groups in term gender ($P > 0.05$). There was statistically significant difference between the groups in term of age ($P < 0.05$). Of the cases diagnosed with intussusception according to the full abdomen USG results, there was abdominal pain in 44 cases (61.1%), abdominal distension in 38 (52.8%), bloody stool in 30 (41.7%), vomiting in 11 (15.3%) and discomfort in 23 cases (31.9%) [Figure 2].

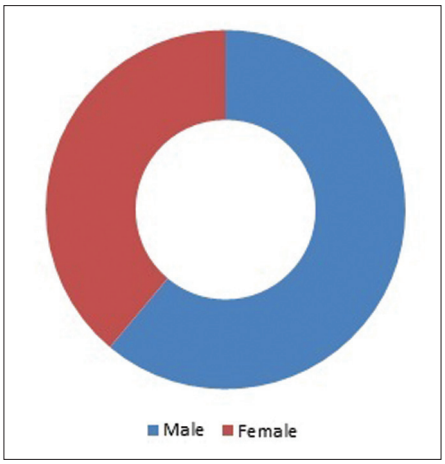


Figure 1: Male/female ratio of cases diagnosed with intussusception

The seasonal distribution of intussusception cases was determined as 20 (27.8%) in spring, 14 (19.4%) in summer, 19 (26.4%) in autumn and 19 (26.4%) in winter [Figure 3]. There was no statistically significant difference in terms of seasonal distribution ($P > 0.05$). Abdominal USG was applied to all cases on first presentation. In the evaluation made according to the USG results, ileocolic intussusception was observed in 30 patients (78.9%), ileoileal invagination in seven patients (18.4%) and colocolic intussusception in one patient (2.6%) [Figure 4].

Cases to whom HR was applied had a mean age of 13.79 ± 0.17 months, the mean age of MR cases was 23.92 ± 0.20 months and the mean age of RA cases was 83.81 ± 0.59 months. Cases where HR was not successful and those with findings of shock, peritonitis or perforation and those aged over 3 years were admitted directly for surgery.

Of the surgical cases, Meckel diverticulum was determined in 5 (13.1%), polyps in 2 (5.2%), lymphoma in 2 (5.2%), lymphodenopathy in 1 case and 28 cases were observed to be idiopathic Abdominal USG was applied to all cases. HR was attempted in 47 cases and successful reduction was achieved in 34 (72.3%) cases. At the 4-h USG monitoring, the 13 cases with continuing target sign and clinical findings were admitted for surgery.

A total of 38 cases were treated surgically; 27 (37.5%) with MR and 11 (15.3%) with RA. The mean duration of hospital stay was 13 ± 0.05 h for non-surgical HR patients, 42 ± 0.13 h for surgically applied MR patients and 172 ± 0.22 h for RA patients. The duration of medical treatment was determined to be mean 5.5 days for HR, mean 9 days for surgical MR and mean 14 days for RA. A statistically significant difference was determined between HR and the other groups of MR and RA in terms of treatment duration ($P < 0.05$).

DISCUSSION

Intussusception is the telescopic penetration of the proximal intestine segment into the distal segment.[4] Although invagination is most frequently observed in infants of 5-9 months and more often in males.[1,5]

The mean age of the cases in the current study at 28-29 months was a little higher than the mean age reported in literature. In previous studies of respiratory and gastrointestinal infections, peaks occurred in the summer and winter months.[6] However, in the current study, there was no difference in the frequency of intussusception between seasons. In previous studies, the ileocolic region has been reported to be the area most affected[7] and in the current study, ileocolic intussusception was determined in 88.9% of patients according to the evaluation of the USG results.

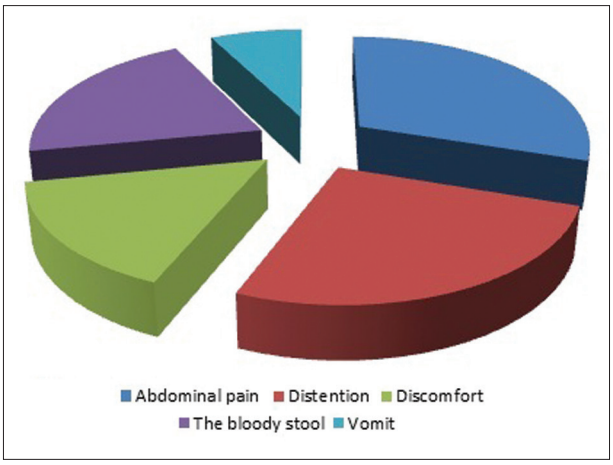


Figure 2: Symptoms of cases diagnosed with intussusception

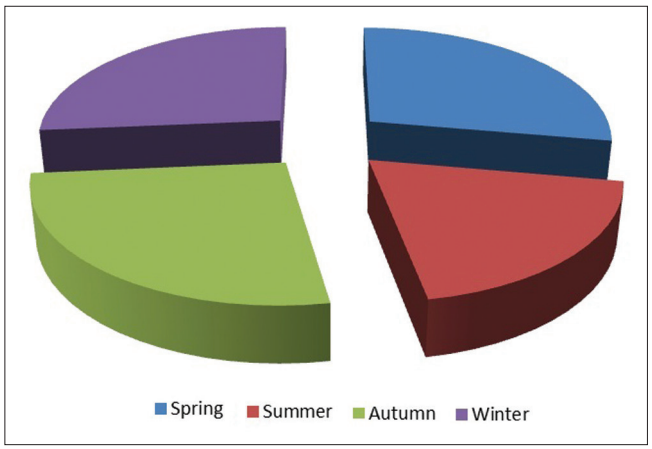


Figure 3: Seasonal distribution of cases diagnosed with intussusception

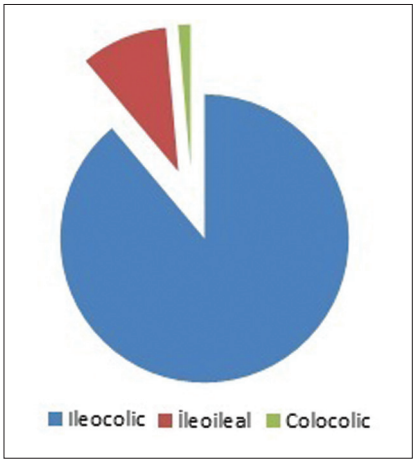


Figure 4: The location of the intussusception segment in the cases diagnosed with intussusception from the full abdominal ultrasonography

The majority of findings in intussusception cases are non-specific.[8] Presentation may be with the classic triad of abdominal pain, bloody stool and vomiting, but cases may also present with findings of perforation, sepsis and peritonitis, associated with delay. In the current study, most of the cases did not present with the classic triad. The findings on presentation were general discomfort, abdominal pain, distension and bloody stool. Therefore, as USG is nearly 100% sensitive and specific in diagnosis, it is used at the same time for treatment purposes on suitable cases.[8] In the current study, USG was applied for diagnostic purposes to all patients on first presentation.

The age limit in HR application was not taken into consideration because the incidence of LP increases with age. Although an LP was determined as the cause of intussusception in only 3% of the cases where intussusception was seen below the age of 1 year, this rate may increase to 57% in children aged over 3 years.[2,9,10] In the current study, during surgery was observed LP in 13.9% of cases.

Previous studies have reported positive results from the use of antibiotics.[11] Therefore, to prevent bacterial translocation, antibiotics were administered in the current study. Emergency intussusception treatment is surgical (open or laparoscopic) or non-surgical. When speaking of non-surgical methods for the treatment of intussusception, barium, PR or HR are suggested.

Previous studies have reported success rates of 70-92% from barium and pneumatic reduction.[8,12,13] While previous studies have reported success rates of 80.39%[2] for HR, the success rate of the cases in the current study was 72.3%. The history of the cases in the present study was also longer than that reported in literature. In general in literature, application is made to cases of 48 h or less,[8] but in the current study a limit of 72 h was accepted. In some previous studies, low success rates of HR and high rates of perforation have been reported.[14] However, perforation was not seen in any cases of the current study.

Although the time to presentation was longer in the cases of the current study, no perforation was seen. This could be explained by the fluid having been administered at a specific temperature and level. When the fluid did not enter after a certain time, the procedure was terminated and the patient was admitted for surgery. The reason for the low rate is that HR was only attempted once to the cases of this study and opening the invaginated segment was not forced with HR. There was no observed negative exploration in the present study. The incidence of morbidity was determined to be lower in the cases of reduction applied with laparoscopy. Another advantage of laparoscopy in the treatment of intussusception is LP resection.[15] Comparedwith open surgery, laparoscopy enables earlier, pain-free treatment leading to fewer cosmetic complaints.[15] Open surgery also carries the risk of brid ileus formation. However, in the present study, all operated cases underwent open surgery. Due to surgeons of in the present study don't have laparascopy skills. In the present study, there was no recurrence following HR and cases with unsuccessful HR were admitted for surgery.

Several limitations should be considered when evaluating the results of this study. The number of patients was low and as a retrospective study, only the information in the records was evaluated. As well as, the data collected were from a single centre; therefore, the results may not be representative of intussusception in other centres.

The application of HR is seen to reduce the socio-economic burden of both the hospital and the family by shortening the duration of hospitalisation and the duration of the medical treatment administered. Morbidity and mortality rates associated with anaesthesia and surgery are reduced and particularly when surgical and anaesthesia-related complications are considered, the attempt at HR would seem to have evident superiority over MR rates. Intussusception is a condition, which can be treated by non-surgical methods when diagnosis is made early and appropriate indications are included.

CONCLUSION

HR together with USG is a safe technique for initial application to infants aged 1 month to 3 years in the treatment of intussusception. The morbidity and mortality rates, complications arising from surgery and costs of the application can be considered indisputable.

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