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Hydrostatic Reduction Supported With External Manuel Reduction In Treatment Of Intussusception: A New Technical Synthesis

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ABSTRACT

Intussusception treatment is routinely performed in our clinic using ultrasound-guided hydrostatic reduction (USGHR). Because of the difficulties seen in technique and its less-than-ideal success rate, alternative methods are searched. In this study, we would like to discuss using external manual reduction (EMR) in combination with USGHR in intussusception treatment.

This retrospective study was completed in Pediatric Surgery Department of Van Training and Research Hospital, between February2018 and May 2018. Patients that treated with USGHR marked as Group 1 and Patients that treated with combination of USGHR and marked as Group 2. Patient age, gender, symptoms, treatment techniques, complications and hospitalization periods were noted.

In Group 1; 14 patients were treated with a single session and 2 were treated with 2 sessions. 4 patients were treated with surgery. Mean reduction time was calculated as 16 minutes, the fluid volume required for each reduction was 84 ml/kg and mean hospitalization period was calculated as 33 hours.

In Group 2; 18 out of 20 patients were treated in the first session and 2 required a secondary session. Mean reduction time was calculated as 13 minutes, the fluid volume required for reduction was 65 ml/kg and mean hospitalization period was calculated as 25 hours.

The results were statistically assessed by using SPSS version 24. Normality controls were done using Shapiro-Wilk Test.

As an alternative; USGHR supported by EMR can be beneficial in increasing the treatment success rate in intussusception treatment and decreasing negative laparotomy rates, especially in partial reduction cases.

Key Words: Intussusception, external manual reduction, hydrostatic reduction, pediatric surgery

Introduction

Intussusception, which is defined as telescopic insertion of proximal bowel segment into distal bowel segment, can be cured completely with surgical intervention. However, this treatment increases morbidity and mortality rates (4-9). Therefore, global first-line treatments for intussusception include ultrasound-guided hydrostatic reduction (USGHR) or fluoroscopy-guided air-enema reductions (1-9).

There are various non-surgical techniques described in intussusception treatment such as air or liquid enemas, oral or topical treatments as well as manual manipulation of rectum (12,13). Vazquez (2) described and recommended ultrasound-guided external manual reduction (EMR) for intussusception treatment. The most successful treatment techniques out of those non-surgical alternatives are still unclear (12,13). According to our hypothesis, USGHR supported with external manual maneuvers can be used for reducing telescopically interlocked bowel segments in lower liquid pressures.

This study assesses the effect of using EMR with USGHR on hydrostatic reduction of intussusception as a new synthesized treatment method. According to our knowledge; this is the first study that use combinations of non-surgical methods for intussusception treatment in the literature.

Materials and Methods

Forty patients who were diagnosed and treated non-operatively for intussusception in Pediatric

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Table 1. Distribution of data according to treatment methods

Parameters	USGHR	USGHR and EMR	p
	Mean±SD	Mean±SD	
Reduction time (minute)	16.21 ± 0.59	13.13 ± 0.71	0.03
Fluid volume(ml/kg)	84.11 ± 3.32	65.53 ± 2.84	< 0.001
Hospitalization period (hour)	33.68 ± 5.01	25.13 ± 2.96	0.02

Surgery Department of Van Training and Research Hospital, between February 2018 and May 2018 were included to the study. All patients were diagnosed with ultrasonography. Patients with additional conditions such as leading point, bowel necrosis or peritonitis were excluded from the study.

In this study randomly chosen 20 patients that treated with USGHR using normal saline marked as Group 1 and 20 patients that treated with combination of USGHR and EMR which performed by using normal saline and external manuel maneuvers marked as Group 2.

Patient age, gender, symptoms, treatment techniques, complications and hospitalization periods were noted. All patients received intravenous 0.9% Normal Saline 20 ml/kg/hour and midazolam (0,01 mg/kg) was given as a premedication. Due to perforation risks, antibiotic prophylaxis was given in a single dosage of 50 mg/kg cephazolin and 30mg/kg metronidazole. With the patient lying on right lateral position; a 14–18 Fr Foley's catheter was introduced into the anal canal and the balloon was inflated with 15-25 ml of saline. Foley's catheter size was chosen according to patient body size. Then the balloon of the catheter was placed in anal seal to avoid leaking back of the fluid. The on call radiologist used high resolution ultrasound IU22 (Philips, Netherlands) to image the intussusception. A clinician from Pediatric Surgery department remained in attendance in the suite.

In group 2, additionally milking, pressing and/or jiggling maneuvers were gently applied while ultrasound guided hydrostatic reduction was performed. When the saline enema was given from the anal canal, right-hand clockwise reversal massage was started. Thus; more saline enema with a low and under controlled pressure is inserted between the invaginated intestinal walls.

The results were presented mean±standard deviation Data were analyzed by using SPSS (ver:24) and statistically significant level was considered as %5. Normality controls were done using Shapiro-Wilk Test. Groups were compared in terms of fluid volume used in reduction, reduction time and hospitalization periods using independent sample t-test. Statistical significance level was set as $p<0.05$. Ethical acceptance was taken from the local ethic committee.

Results

Main complaints of the patients included pain, emesis, crying jags, bloody stool or abdominal distention. Mean age of 40 (24 male-16 female) patients was calculated as 16 (6-36) months.

A mean fluid volume of 84 ml/kg for each session was administered using anal route in USGHR group. Mean reduction time was 16 minutes. 14 of the patients were treated within first session whereas 2 were treated in second session. After a failed third session and persistent target-sign appearance in USG, 4 patients required surgical intervention. In total, 30 reductions were done in this patient group. 2 of the 4 patients who required surgery showed spontaneous reduction whereas other 2 were treated with intraoperative manual reduction. Leeding point was not detected in any of these patients. One patient who had surgical approach was hospitalized 2 months later again for subileus mean hospitalization period was calculated as 33 hours.

In the other group, patients were treated with a combination of USGHR and EMR. Mean administered fluid volume was calculated as 65 ml/kg. 18 out of 20 patients in that group were treated in the first and the other 2 patients were treated in the 2nd session. Total number of reductions performed in this group was 22. Mean reduction period was calculated as 13 minutes and mean hospitalization period was calculated as 25 hours.

It was seen that EMR-supported USGHR significantly decreased used fluid volume, reduction period and hospitalization period in intussusception treatment ($p<0.05$) (table).

Discussion

Intussusception is the second common pediatric abdominal emergency after appendicitis with an

incidence rate of 1.5-4.3/1000 (2-4). It is the most common reason for bowel obstruction in infants with 18% (2-4). Patients are usually brought to clinic with refractory emesis and intermittent abdominal cramping pain with changes in severity. Some of the patients might show rectal bleeding in the form of "strawberry jam" (5,6). USG is the most reliable and frequently used diagnostic tool (7,8). Target sign, concentric circle and sandwich appearances, which are caused by the interlocked bowel segments' laminated echogenic structure reflections, are the main signs that point to diagnosis (5). Because of its relatively lower morbidity and mortality rates, non-surgical treatment options are the first considered options in treatment (6-8-10). Air or liquid enemas, oral or topical treatments, manual rectum manipulation and barium are some of the non-surgical treatment approaches (11-13). One of the non-surgical techniques is EMR, which was developed by Vazquez et al. (2). Vazquez et al. (2) described this method as standardized maneuvers of milking, pressing and/or jiggling following premedication and sedation of patients and they reported successfully treatment of intussusception patients with these. In the same study, the authors also reported that if this technique fails, hydrostatic reduction can also be used to continue treatment (2).

Because of its reliability, safety, low cost and ease of access, we routinely use saline USGHR method in the treatment of intussusception. Previous studies reported 77% success rate for this technique (12,13). Due to difficulties in application of technique in addition to relatively low success rate, we think that new methods which facilitate application, prevent complications and increase success rates are necessary. As we cannot associate any additional complications with it, we recommend using external maneuvers described by Vazquez et al. (2) with USGHR in treatment of invagination cases. In this study, we were able to show that using USGHR in conjunction with EMR significantly decreased fluid volume used in reduction, reduction time and hospitalization periods. In addition, using EMR with USGHR was also shown to provide a safer and more reliable reduction by decreasing perforation risk, surgical intervention requirements and complication rates.

The limitation of our study is the low number of patients. A prospective, multicenter study with a large number of patients may be useful to demonstrate the effectiveness of this new technique. Complications of this synthesis are similar to other non-surgical methods when administered uncontrolled. Predictable complications include respiratory distress, intestinal perforation, vomiting and aspiration.

Using EMR with USGHR allows us to achieve reduction in lower fluid pressures. This technique reduces negative laparotomy rates, especially in cases with partial reduction, by increasing the efficacy of USGHR in intussusception treatment. Related with lower morbidity and mortality rates associated with anesthesia and surgical intervention; hospitalization periods were also reduced. To sum up, using EMR to support USGHR in intussusception treatment as a new technique was seen to increase success rates.

Conflict of Interest: None

Funding: None

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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