

LAPAROSCOPY-ASSISTED REDUCTION OF INTUSSUSCEPTION

By

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ABSTRACT:

Purpose: To evaluate laparoscopic assisted reduction of intussusception in children.

Patients And Methods: Twenty cases with diagnosis of intussusception were enrolled for laparoscopic-assisted pneumatic reduction (LAPR) or laparoscopic-assisted hydrostatic reduction (LAHR). For LAPR, concomitant air insufflation and gentle traction was repeated until smooth transition along the serosa ensured complete reduction. For LAHR, warm saline was infused into the rectum with a 16-18 F Foley catheter and a drip set till the intussusception was reduced. Data collected included; age, sex, location (type) of intussusception, operative duration, perioperative complications and length of hospital stay.

Results: There was no significant difference between both techniques regarding comparison of demographic data, preoperative clinical signs, the type of intussusception, mean operative time, hospital stay, and complications (P-value > 0.05). The laparoscopic-assisted reduction of intussusception was completed in 16 patients (80%) (8 patients in each group). In 4 patients (2 in LAPR group, and 2 in LAHR group), conversion to open technique was mandatory.

Conclusion: Reducing intussusceptions with laparoscopic assistance is safe and effective approach. Proper patients selection for laparoscopic approach (pneumatic or hydrostatic) results in reduced operative time, reduced hospital stay, minimal complications and low rate of conversion to open surgery.

KEYWORDS:

Intussusception
Hydrostatic reduction.

Laparoscopy

Pneumatic reduction

INTRODUCTION:

Intussusception is one of the most common causes of bowel obstruction in the pediatric population. Approximately 85% of these cases are reduced by pneumatic or hydrostatic enema¹. With the advent of minimally invasive surgery, some authors have considered laparoscopy to be a valid treatment for irreducible intussusception²⁻⁴. However, its effectiveness for such cases remains doubtful⁴. Available reports claim advantages of laparoscopic over the open approach, such as less postoperative pain, reduced wound complications, minimal scarring, shorter hospital stay and an earlier return to normal

activities^{2,5&6}. Therefore, we attempted to evaluate role, merits and demerits of laparoscopic-assisted reduction for early cases of infantile intussusception.

PATIENTS AND METHODS:

Between August 2010 and April 2011, twenty patients with diagnosis of intussusception were presented to the emergency surgical unit of El-Minia university hospital and proven to be early detected both clinically and radiologically with failed non operative reduction (pneumatic or hydrostatic) after three trials, uncertainty of 100% reduction and / or multiple recurrences (the 3rd episode) with no obvious cause of this

recurrence were included in our study after determination of their fitness for our technique according to the inclusion and exclusion criteria.

The inclusion criteria for laparoscopic-assisted reduction include: patient age 6 month - 3 years, time between appearance of symptoms and presentation is less than 48 hours, absence of signs of toxicity, peritonitis, and /or peritonism, absence of radiological signs of complications e.g. free air under diaphragm indicating perforated loops, and fitness for anesthesia. The exclusion criteria include: duration of symptoms more than 48 hours, age less than 6 month or more than 3 years, clinical or radiological evidences of gangrenous or perforated bowel loops, severe abdominal distention, massive rectal bleeding, and high grade fever > 38.5 C, high WBCs Count $> 20.000/cc.$, dehydration, coagulopathy, and anemia. Data collected included; age, sex, location (type) of intussusception, operative duration, perioperative complications and length of stay.

Laparoscopic techniques:

In laparoscopic-assisted pneumatic reduction group (LAPR), all patients had the catheter for air insufflation fixed trans-anally before starting the procedure. A 5mm port was placed through the umbilicus for the camera and pneumoperitoneum was established at 10-12 mmHg. Two 5mm ports were placed for working instruments one in the left lower quadrant and the other in the upper left or right quadrant depending on site of the mass after inspection of the abdomen. After identification of the intussusception, air insufflation through the colon was carried out. With the help of atraumatic graspers, the invaginating loop was carefully

pulled with some degree of gentle traction, the process of concomitant air insufflation and gentle traction was repeated until smooth transition along the serosa ensured complete reduction. The proximal bowel was then carefully inspected for the presence of a lead point. Elective appendectomy was carried out in most patients according to surgeon's preference at time of operation.

In laparoscopic-assisted hydrostatic reduction group (LAHR), warm normal saline was infused into the rectum with a 16-18 F Foley self-retaining catheter with the bulb inflated and an intravenous drip set maintaining the level of the bottle at 80 cm above the operating table. Under laparoscopic vision, hydrostatic pressure on the intussusceptum was increased by gradually increasing the height of the saline bottle. The bowel grasper was used only to displace the dilated bowel loops for better vision of the intussusception and never to handle the intussuscepted bowel. The hydrostatic pressure was transmitted to the intussusceptum and caused reduction of intussusception. The completeness of reduction, vascularity of reduced bowel and presence of secondary lead points were assessed before withdrawing the telescope.

Decision to convert the procedure to open surgery should be made in the following conditions: signs of bowel necrosis or perforations, compromised vascularity, presence of a lead point that cannot be managed laparoscopically, limited working space due to much bowel distension, bowel perforations during trials of reduction, or when the number of pneumatic reduction trials exceeded 3 times with failure of laparoscopic mechanical help.

Postoperative care: After the laparoscopic technique was applied, The patients continued on I.V. fluids and the Ryle's tube remained inserted till the intestinal motility was returned as detected by passing feces or flatus or by auscultation of intestinal sounds. After discharge, they were followed-up at least once after discharge in the outpatient clinic.

Statistical analysis: Statistical data were presented as (mean \pm SD) or number (percentage) as appropriate. T-student or Chi-square test was used to compare independent data. *P*-value was considered significant if it was < 0.05 .

RESULTS:

The laparoscopic-assisted reduction of intussusception was applied to 20 patients (13 males and 7 females) with mean age of 11.5 (± 6.7) months. Ten patients underwent LAPR and the other ten patients underwent LAHR. In LAPR group (7 males and 3 females) the mean age was mean 10.5 (± 4.1) months, while in LAHR (6 males and 4 females) the mean age was 12.6 (± 8.7) months. There was no significant difference between both techniques regarding comparison of demographic data and preoperative Signs of general, abdominal, and rectal examination (*P*-value > 0.05) (Table 1).

Table 1: Demographic and examination data

Signs	LAPR (n=10)	LAHR (n=10)	Total (n=20)	P-value
Age (months)	10.5 \pm 4.1	12.6 \pm 8.7	11.5 \pm 6.7	0.50 NS
Sex (M/F)	7/3	6/4	13/7	0.63 NS
Dehydration, low grade fever and tachycardia	2 (20%)	3 (30%)	5 (25%)	0.52 NS
Sausage shaped mass	3 (10%)	2 (20%)	5 (25%)	0.52 NS
Abdominal distention	1 (10%)	1 (10%)	2 (5%)	1 NS
Red currant jelly stool	10 (100%)	9 (90%)	19 (95%)	0.74 NS
Prolapsed intussusception mass	1 (10%)	0 (0%)	1 (5%)	0.15 NS
Felt apex of the mass	2 (20%)	2 (20%)	4 (20%)	1 NS

Data are expressed as mean \pm SD or number (%). NS: non significant difference.

The types of intussusception detected at our study are shown in *table (2)*. There was no significant difference

between both techniques regarding comparison of the types of intussusception (*P*-value > 0.05) (*Table 2*).

Table 2: Types of intussusception

Types	LAPR (n=10)	LAHR (n=10)	Total(n=20)	P-value
Ileo-cecal	8 (80%)	9 (90%)	17 (85%)	0.73 NS
Ileo-colic	1 (10%)	1 (10%)	2 (10%)	1 NS
Ileo-ileo-colic	1 (10%)	0 (0%)	1 (5%)	0.15 NS

Data are expressed as number (%). NS: non significant difference

The mean operative time of all patients was 31.7 (± 8) minutes. It was 30 (± 8.2) minutes in LAPR group, and 33.3 (± 7.8) minutes in LAHR group. The mean hospital stay was 1.9 (± 0.3) days. It was 1.8 (± 0.3) days in LAPR group, and 2.1 (± 0.2) days in LAHR group. There was no significant difference in mean operative time and

hospital stay between LAPR and LAHR techniques (P -value > 0.05).

There was no significant difference in the incidence of intraoperative and postoperative complications between LAPR and LAHR techniques (P -value > 0.05) (*Table 3*).

Table 3: Complications of laparoscopic assisted pneumatic versus hydrostatic reduction.

Complication	LAPR (n=10)	LAHR (n=10)
Perforation of bowel loops	1	0
Multiple serosal tears	2	2
Liver injury	1	0
Prolonged ileus	3	1
Conversion to open surgery	2	2
Fever	3	2
Diahrea	2	3

The laparoscopic-assisted reduction was completed in 16 patients (80%) (8 patient in each group). In 4 patients (2 in LAPR group, and 2 in LAHR group), the technique turned to open surgery due to: intussusception was ileo-cecal type with perforation at the terminal ileum, inflamed Meckel's diverticulum, iatrogenic perforation of the terminal ileum during traction, and failure of reduction after 3 trials of ileo-ileo-colic type as defined on laparotomy.

DISCUSSION:

Intussusception is the most common cause of small bowel

obstruction in children⁷. Non-operative reduction of intussusceptions is the established first line of therapy, with a high success rate up to 85-90%⁸. Laparoscopic reduction is feasible, but complications such as serosal tearing and frank bowel perforation have also been described^{9,10}.

Intussusception occurs most commonly in infants aged 5–9 months (67% occur by age 1 year)¹¹. In the current study, we tried to evaluate the benefits of laparoscopic intervention in early cases of infantile intussusceptions in selected patients that would have maximum benefits and to avoid

side effects of laparoscopic intervention which result from aggressive handling of intestine by intestinal graspers. Patients above age of 3 years were excluded as they have high incidence of gangrenous intussusceptions. Patients presented with prolonged history more than 2 days symptoms were excluded from our study because increased incidence of intussusceptions mass to be gangrenous.

The mean operative time of our patients was 31.7 minutes. It was 30 minutes in pneumatic reduction group, and 33.3 minutes in hydrostatic reduction group, which is comparable to that reported by Chandrasekharam et al.¹² (38.5 min.) who evaluated laparoscopy-assisted hydrostatic reduction of intussusceptions, and Poddoubnyi et al.¹³ (32.6 min), who used the help of atraumatic graspers along with air enema to reduce intussusceptions. However, Kia et al.² reported longer operating times for both laparoscopic and open approaches (45.00 ± 24 vs. 49 ± 26 min, respectively), which was probably because their study group involved cases with previous failed radiologic reduction.

The mean duration of hospital stay in our study was 1.9 days for all patients, 1.8 days for pneumatic reduction, and 2.1 days for hydrostatic reduction. Also, after successful laparoscopic reduction, resumption of full diet was much earlier than the open group in other studies^{12,14}. As reported by other investigators and the current study, laparoscopic procedures has benefits such as less postoperative pain, reduced wound complications, shorter hospital stay and an earlier return to normal activities^{2,5,12}.

In our study, the laparoscopic-assisted reduction of intussusception

was completed in 16 patients (80%), however other studies reported higher success rate as reported by Kia et al. (87.5%), Cheung et al. (86.7%), Bujronrappa et al. (85%) and Chandrasekharam et al. (90.9%)^{2,9,12,14}. Although the success rate is higher in other studies, our study offers synergism between laparoscopic reduction and saline or air enema reduction that was achieved by application of both laparoscopic reduction and saline or air enema reduction at the same time. A larger number of patients would show a greater difference in success rate between our study and other studies.

The main advantages of laparoscopic maneuver in our study include: (a) avoid the patient unnecessary laparotomy by all its intra and post operative complications, (b) concomitant pneumatic and laparoscopic reduction make the patient get advantages of both maneuvers, (c) abolish dangerous disadvantages of pneumatic or hydrostatic reduction including uncertainty of complete reduction, missing of lead points and uncertainty of viability of reduced bowel loop, (d) decreasing incidence of recurrences by detecting lead points and application of appendectomy without open surgery, (e) decreasing incidence of laparoscopic perforation of bowel loops by limiting its manipulation, (f) in case of failed non operative reduction, laparoscopy provides a good alternative to open surgery regarding post operative short term and long term complication and more cosmetic than open surgery, and (g) shorten the post operative recovery period and post operative stay.

Our study has certain limitations for laparoscopic reduction of intussusception, some of which related to laparoscopy itself. These limitations

include: (a) risk of bowel wall perforation still present although limited manipulation of intestine, (b) in patients younger than 6 month, the maneuver will be so difficult due to narrow working space and immature cardiac muscles that may not tolerate physiological changes in response to pneumopertoneium, (c) risk of visceral injury during peritoneal access or intestinal manipulations, (d) loss of tactile sensation so intraluminal lead points couldn't be discovered and may be missed, (d) laparoscopic intervention in complicated cases increase intraoperative and postoperative morbidity. So, the maneuver will be valuable in early non complicated cases only, (e) patients with respiratory or cardiac diseases can't tolerate pneumopertoneium and subsequently can't tolerate laparoscopic pneumatic reduction, and (f) operative time may be prolonged in some cases.

In conclusion, reducing intussusception with the laparoscopic approach is highly successful and can be performed first for stable patients requiring surgical intervention. Well selection of patients for laparoscopic reduction of intussusception (pneumatic or hydrostatic) in children results in reduced operative time, reduced hospital stay, minimal complications and low rate of conversion to open surgery.

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إستخدام منظار البطن لرد تداخل الأمعاء

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الغرض من الدراسة :

تقييم استخدام منظار البطن للمساعدة في رد تداخل الأمعاء في الأطفال.

المرضى والوسائل:

شملت الدراسة عشرون طفلاً مصاباً بتداخل الأمعاء وتم إدراجهم للرد التحفظي باستخدام حقن الهواء أو المحلول الملحي من خلال الشرج وبمساعدة منظار البطن . لرد تداخل الأمعاء باستخدام حقن الهواء يجب حقن الهواء من خلال الشرج مع الشد على الجزء المتداخل بمساعدة منظار البطن حتى التأكد من فك التداخل و في حالة استخدام دفع المحلول الملحي يتم حقن المحلول الملحي للمستقيم عن طريق تركيب قسطرة فولى متصلة بجهاز محاليل مع الشد على الجزء المتداخل بمساعدة منظار البطن حتى التأكد من فك التداخل. شملت البيانات التي تم تحليلها السن والنوع و تحديد نوع التداخل والوقت اللازم لإتمام الجراحة و حصر لنسبة المضاعفات و حساب وقت الإقامة بالمستشفى.

النتائج:

لم يتضح من خلال الدراسة وجود فرق واضح بين كلا الطريقتين فيما يختص بالبيانات الديموجرافية أو نتائج الفحص الإكلينيكي أو نوع التداخل أو الوقت اللازم لإتمام الجراحة أو نسبة حدوث المضاعفات أو مدة الإقامة بالمستشفى. تم استكمال التدخل بمساعدة منظار البطن بنجاح لستة عشرة مريضاً بينما استلزم الأمر التحول إلى الجراحة التقليدية لأربعة من المرضى.

الاستنتاج:

يعتبر استخدام منظار البطن للمساعدة في رد تداخل الأمعاء في الأطفال وسيلة آمنة وفعالة كبديل للجراحة التقليدية. كما أن حسن انتقاء المرضى الملائمين لمنظار البطن يقلل من الوقت اللازم لإجراء التدخل و مدة الإقامة بالمستشفى و يقلل من نسبة المضاعفات ومعدل التحول إلى الجراحة التقليدية.

الكلمات الدالة:

تداخل الأمعاء- منظار البطن- رد تداخل الأمعاء باستخدام حقن الهواء- رد تداخل الأمعاء باستخدام حقن المحلول الملحي.