นิพนธ์ต้นฉบับ

Bowel preparation for pull-through operation in Hirschsprung's disease

ประเสริฐ ปริธัญ[1]
ปิยวรรณ เชียงไกรเวช[1]
วรพงศ์ เชาวน์ชูเวชช[1]
ศักดา ภัทรภิญโญกุล[2]
สุรศักดิ์ สังขทัต ณ อยุธยา[2]

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Parithan P, Chiengkriwate P, Chowchuvech V, Patrapinyokul S, Sangkhathat S.
Pediatric Surgery Unit, Department of Surgery, Faculty of Medicine,
Prince of Songkla University, Hat Yai, Songkhla, 90110, Thailand
E-mail: Chiengkriwate_piyawan@hotmail.com

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Abstract:

Background/Purpose: *Mechanical cleaning of the bowel is an essential component of preoperative bowel preparation. The aim of this study was to compare the adequacy of bowel preparation and patient outcomes.*

Methods: *Medical records were retrospectively reviewed of 43 consecutive patients from 2001 to 2004 with Hirschsprung's disease who underwent a modified Duhamel's pull-through operation. Comparisons were made regarding adequacy of the bowel*

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[1]MD. (Surgery) [2]MD. (Surgery), Assist. Prof., Pediatric Surgery Unit, Department of Surgery, Faculty of Medicine,
Prince of Songkla University, Hat Yai, Songkhla, 90110, Thailand
รับต้นฉบับวันที่ 13 กุมภาพันธ์ 2550 รับลงตีพิมพ์วันที่ 4 กรกฎาคม 2550

preparation at the time of the pull-through procedure, operating time, operative morbidity and length of hospital stay.

Results: *Thirteen patients had a preoperative colostomy and 30 patients had no colostomy. At the time of the pull-through procedure, the adequacy of the bowel preparation was recorded as fair (83.7%) or poor (16.3%). The wound complication rates of the fair and poor bowel preparation cases were 13.9% and 14.3%, respectively. The creation of a preoperative colostomy had no statistically significant effect on bowel preparation quality or postoperative complications.*

Conclusions: *Mechanical bowel preparation showed no statistically significant effect in relation to bowel preparation quality or patient outcome. Thus good bowel preparation may not be necessary for elective colonic surgery in Hirschsprung's patients.*

Key words: *Hirschsprung's disease, Bowel preparation, Duhamel's pull-through*

บทคัดย่อ:

การเตรียมลำไส้ให้สะอาดเป็นส่วนประกอบที่สำคัญก่อนทำผ่าตัดในผู้ป่วย Hirschsprung's disease วัตถุประสงค์เพื่อเปรียบเทียบผลการเตรียมลำไส้ที่ได้กับผลในการดูแลผู้ป่วย

วิธีการศึกษาเวชระเบียนผู้ป่วย Hirschsprung's disease จำนวน 43 ราย ซึ่งเข้ารับการผ่าตัด modified Duhamel's pull-through operation ในระหว่างปี พศ. 2544-2547 โดย 13 ราย เคยได้รับการผ่าตัดรูทวารเทียมมาก่อน ส่วนที่เหลือ 30 ราย ไม่มีรูทวารเทียมมาก่อน นำผลการเตรียมลำไส้ที่ได้ในขณะผ่าตัด modified Duhamel's pull-through operation เปรียบเทียบกับผลในการดูแลผู้ป่วย ได้แก่ ภาวะแทรกซ้อนจากการผ่าตัด และระยะที่นอนโรงพยาบาล

การศึกษาพบว่าผลเตรียมลำไส้ระดับพอใช้ร้อยละ 83.7 และระดับแย่ร้อยละ 16.3 อัตราการติดเชื้อจากผลการเตรียมลำไส้ระดับพอใช้ร้อยละ 13.9 และระดับแย่ร้อยละ 14.3 โดยเมื่อเทียบระหว่างการมีรูทวารเทียมก่อนผ่าตัดกับไม่มีรูทวารเทียมก่อนผ่าตัด พบว่าผลการเตรียมลำไส้และอัตราการติดเชื้อในทั้งสองกลุ่มไม่ต่างกัน แต่ในกลุ่มที่มีรูทวารเทียมก่อนผ่าตัดพบว่าระยะเวลานอนโรงพยาบาลก่อนผ่าตัดน้อยกว่ากลุ่มที่ไม่มีรูทวารเทียมก่อนผ่าตัด

โดยสรุปผลการเตรียมลำไส้ก่อนผ่าตัด ไม่มีผลต่อการดูแลผู้ป่วย สำหรับผู้ป่วย Hirschsprung's disease ซึ่งเข้ารับการผ่าตัด modified Duhamel's pull-through operation

คำสำคัญ: *โรคลำไส้พร่องเซลล์ประสาท, การเตรียมลำไส้, การผ่าตัดโดยวิธี Duhamel's pull-through*

Introduction

The importance of efficient mechanical bowel preparation in preventing infectious complications and anastomotic dehiscence after colorectal surgery has been a dogma among surgeons for more than a century.[1] Surgical management of Hirschsprung's disease has changed significantly over the past few decades. Multistage surgical therapy, which includes temporarily diverting the stoma, has been gradually replaced by a single-stage procedure performed at an early age.[2-5] The adequacy of the preoperative bowel preparation is a concern for some practitioners who still question the feasibility of the primary approach in this early period.

The aims of bowel preparation for colonic surgery are to clean the bowel sufficiently and reduce the amount of local bacterial flora. It should be tolerable to the patient in terms of avoiding any discomfort and adverse effects. A question of concern is how clean is clean enough to prevent septic complications. The objective of this study was to explore the correlation between the adequacy of bowel preparation and patient outcomes in patients who undergo definitive surgery for Hirschsprung's disease.

Materials and methods

Patients

The case records were retrospectively reviewed for a consecutive series of patients who had been diagnosed with Hirschsprung's disease and then underwent a modified

Duhamel's pull-through operation by the Pediatric Surgery Unit of the Department of Surgery at Songklanagarind Hospital in Thailand between January 2001 and December 2004. Total colonic aganglionosis patients and cases with associated anorectal malformations were excluded from this study. The diagnosis of Hirschsprung's disease was confirmed by histological examination of rectal biopsies in all patients.

The patients were classified into two groups according to the operative approach. Group I consisted of 30 patients who had no previous colostomy and underwent a one-stage modified Duhamel's pull-through operation. Group II consisted of 13 patients who received a definitive pull-through operation following the establishment of a colostomy (two-stage approach).

Patient demographics, length of aganglionic segment, age and body weight at definitive management, adequacy of the bowel preparation at the time of the pull-through procedure, operative time, postoperative complications and length of hospital stay were compared between the two groups. Bowel preparation quality was defined as the primary outcome measurement. The results of bowel preparation were assessed by direct inspection of the colon by the attending surgeon at the time of the operation and recorded, and classified into three groups: a good preparation was free of particulate matter and fluid; fair was little particulate matter and fluid that could be controlled intraoperatively; and poor preparation was a moderate to large amount of liquid stool or solid feces.

Before the pull-through operation, all patients underwent mechanical bowel preparation according to our standard regimen (PSU-Pediatric Surgery PCT). Erythromycin and neomycin were used for intraluminal prophylaxis and a combination of gentamicin and metronidazole was commenced on induction of anesthesia (Table 1). All patients received an indwelling urinary bladder catheter. Most received adjunctive epidural anesthesia.

Clinical evaluation

Initial postoperative complications were defined as complications occurring within 60 days of surgery. Wound infection was defined as discharge of pus from the wound, or an intraperitoneal abscess or peritonitis along with an anastomotic dehiscence as seen by radiology or laparotomy. No effort was made to screen for asymptomatic leakage.

Data analysis

Data were analysed using STATA for Windows (v8.1). Parametric data are presented as median and range unless otherwise stated. Nonparametric variables were compared using the Mann Whitney U test and Fisher's exact tests; statistical significance was achieved with a P value less than 0.05.

Table 1 Standard bowel preparation protocol

Day 1
Date..... - Complete blood count, urinalysis, BUN, creatinine
- NSE OD at 6 pm. (Total NSS 50-100 ml/kg/time)
Via colostomy, not exceeding.....ml
Via anus, not exceeding.....ml
- MOM oral.....ml hs
- Low residual diet
Day 2
Date.....
- Matching/grouping
NSE, morning and evening
Via colostomy, not exceeding.....ml
Via anus, not exceeding.....ml
- Neomycin sulfate (20 mg/kg/dose).....mg oral at 1, 6, 11 pm.
- Erythromycin base (20 mg/kg/dose).....mg oral at 1, 6, 11 pm.
- Liquid diet, until 10 pm. and then start clear liquid diet
Day 3
Date.....
Preoperative order for .....
- NSE, morning
Via colostomy, not exceeding.....ml
Via anus, not exceeding.....ml
- NPO after.....
- Gentamicin.....mg and metronidazole.....mg to OR
- Assessment by medical physician, follow by guideline
- Pre-medication by anesthetist

Results

Forty-three patients (37 male and six female) underwent a modified Duhamel's pull-through procedure over the examined five-year period. In 41 patients, the age at surgery ranged from five days to 10 years, with a median age of four months. Weight at surgery ranged from 2.8 to 24.5 kg, with a median weight of 5.5 kg. Two patients were adult Hirschsprung's disease cases, aged 29 and 30 years old, weight 66 and 82 kg respectively. Operative time, including positioning, rectal cleaning, taking frozen sections, and all operating procedure, ranged from 120 to 300 minutes (median, 180 minutes).

Thirty patients were in group I while 13 cases were in group II. One patient in the staged pull-through group (group II) had cerebral palsy and two had trisomy 21; none of the other children had any significant associated anomalies. There were no statistically significant differences between the groups with respect to gender, age or weight at the time of the pull-through, or level of the transitional zone and operative time.

Table 2 Demographic characteristics, operative times, and hospital stay of the patients according to groups

Bowel preparation	**Fair (83.7%)**			**Poor (16.3%)**			**Total**
Group	**I**	**II**	**I&II**	**I**	**II**	**I&II**	
n	**24**	**12**	**36**	**6**	**1**	**7**	**43**
Age							
median (day)	64	202.5	100.5	487	97	227	141
range (day)	5-10977	64-3836		66-1335			
<1 month (n)	4	0	4 (11.1%)	0	0	0	4 (9.3%)
1-6 month (n)	11	6	17 (47.2%)	2	1	3 (42.8%)	20 (46.5%)
>6-12 month (n)	3	3	6 (16.7%)	1	0	1 (14.3%)	7 (16.3%)
>12 month (n)	6	3	9 (25.0%)	3	0	3 (42.8%)	12 (27.9%)
Body weight							
median (kg)	4.65	7.9	5.7	9.65	5.5	8	6.1
range (kg)	2.8-81.7	3.5-24.5		4.9-15.2			
<3 kg	2	0	2 (5.6%)	0	0	0	2 (4.7%)
3-10 kg	16	11	27 (75.0%)	3	1	4 (57.1%)	30 (69.7%)
>10 kg	6	1	7 (19.4%)	3	0	3 (42.9%)	11 (25.6%)
Operative time							
median (min)	170	210	180	200	230	205	180
range (min)	120-300	125-270		180-230			
Lesion							
rectum	17	4	21 (58.3%)	4	0	4 (57.1%)	25 (58.1%)
sigmoid	6	4	10 (27.7%)	1	0	1 (14.3%)	11 (25.6%)
decending	0	2	2 (5.6%)	0	1	1 (14.3%)	3 (6.9%)
splenic	1	1	2 (5.6%)	0	0	0	2 (4.7%)
transverse	0	1	1 (2.8%)	1	0	1 (14.3%)	2 (4.7%)
Hospital stay (day) median (range)							
Pre-operation	9.5 (3-32)	3 (2-84)	5	16 (4-18)	2	14	6
Post-operation	7 (5-26)	7 (5-77)	9	5 (4-6)	7	5.5	7
Total hospital stay	**18.5 (9-39)**	**9.5 (7-161)**	**15**	**22 (9-24)**	**9**	**18.5**	**15**

Table 3 Post-operative complications according to the adequacy of bowel preparation

Bowel preparation	Fair			Poor			Total
Group	I	II	I&II	I	II	I&II	
n	24	12	36	6	1	7	43
Postoperative complication							
Wound complication	3[a,a,b]	2[a,a]	5 (13.9%)	0	1[a]	1 (14.3%)	6 (13.9%)
Non specific fever	3	0	3 (8.3%)	0	0	0	3 (6.9%)
Pneumonia	0	1	1 (2.8%)	0	0	0	1 (2.3%)
Intestinal perforation	1	0	1 (2.8%)	0	0	0	1 (2.3%)
Partial fusion of rectal septum	1	0	1 (2.8%)	0	0	0	1 (2.3%)

[a]wound infection

[b]wound dehiscence

Evaluation of bowel preparation quality was based on the grading by the direct observation of the surgeon, intraoperatively. No patients achieved good preparation in this study (Table 2). Twenty-four out of 30 cases in group I (80%) and 12/13 cases (92.3%) of the group II were rated as fair preparation (p=0.412). The remaining patients were graded as poor preparation in both groups. The median duration of hospital stay in the colostomy group (9 days) was significantly less than the primary pull-through group (19 days) ($p<0.05$).

Post-operative complications occurred in 12 patients (Table 3). Four of the 13 patients in group II (30.7%) and 8/30 (26.7%) in group I had post-operative complications. The overall complications in patients who received fair preparation (30.5%) were higher than in patients with poor preparation (14.3%), but not at a statistically significant level (p=0.771). Wound complications occurred in six patients, 5/36 (13.9%) of cases with fair and 1/7 cases (14.2%) with poor preparation (p=0.529).

Discussion

In the past, colostomy has been an essential part of the standard treatment of Hirschsprung's disease for two main purposes: decompression of the functional obstruction and protection of the neorectum. Moreover, in some institutes where rapid pathological diagnosis is not available, a colostomy serves to verify the functioning portion of colon planned for the pull-down. Nowadays, with the possibility of early diagnosis, reliable frozen section service and advancements in modern pediatric anesthetic practices, a child with Hirschsprung's disease may undergo a definitive colorectal pull-through safely during the first few months of life without any need of a temporary stoma. However, a long intrapelvic anastomosis between the neorectum and native rectal stump leads to a concern that a primary pull-through with an inadequately prepared colon may result in a higher risk of anastomotic complications. Questions that are valid to the surgical practice concern the method and the endpoint of preparation.

Various methods have been employed to prepare the colon for elective major surgery. The usual method of mechanical cleaning of the colon involves 2-3 days of dietary restrictions and the repeated administration of cathartics and a saline enema. Our data demonstrated that the standard practice of three-day colonic preparation did not result in good bowel preparation quality. Even with full preparation, only fair and poor cleanliness qualities were achieved in our practice and the rates of wound infection in both fair and poor bowel preparation quality groups were similar. It seems that the 15% figure of wound complications might indicate that certain surgical methods might need to be improved, such as careful control of intra-operative spills. Recent studies have demonstrated the safety and effectiveness of whole gut irrigation with a polyethylene glycol electrolyte solution.[6-11] However, this method has not been popular in patients with extreme age, especially small infants.

Our study also showed that a stoma did not have a significant effect on the adequacy of mechanical bowel preparation. Considered together with the same incidence of postoperative complications between groups, the data supports the feasibility of a primary definitive operation in the pediatric pull-through procedure. It should be noted that 72% of the primary pull-throughs in our series were performed in patients less than one year old.

This study showed that a preoperative ostomy decreased both the preoperative and total hospital stay. However, the period of stay of the previous admission when the colostomy was established was not counted, nor was the fact that patients in this group also had the risk of complications from the stoma itself.

Conclusion

In summary, we reviewed our practice in pre-operative mechanical bowel preparation, which showed no statistically significant differences in the preparation, quality and patient outcome between the pre-colostomy and non-pre-colostomy groups, although the preoperative colostomy decreased preoperative hospital stay. Aggressive colonic preparation does not seem necessary for elective surgery in Hirschsprung's patients.

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