

# Original article

## A new modification of transanal Swenson pull-through procedure for Hirschsprung's disease

XU Zhi-lin, ZHAO Zheng, WANG Long, AN Qun and TAO Wen-fang

**Keywords:** anal canal; megacolon; pull-through operation; new method

**Background** The one-stage pull-through procedures for Hirschsprung's disease (HD) have become popular because it is well accepted by surgeons and mothers with no visible scar and a short hospital stay. It represents the latest development in the concept of a minimally invasive surgery for HD. We introduce a new method of transanal one-stage pull-through for Hirschsprung's disease, different from the transanal Soave procedure.

**Methods** One hundred and thirty-four patients aged 9 days to 5 years underwent a transanal one-stage pull-through procedure. The diagnosis was definite by barium enema or rectal biopsies preoperatively. The patients were anesthetized and placed in the lithotomy position. A urinary catheter was optional. Giving anorectal dilatations for half a minute, a pull-through of the rectum above the peritoneal reflection and into the intussusception was performed. Fine silk suturing was performed circumferentially at the level of that point which was used for traction for the distal end. Another circumferential suture was performed parallel 0.5 cm distance above the original one and used for traction for the proximal intestines. The full-thickness rectal wall was truncated between the above two circumferential sutures with cautery. The proximal intestines were pulled down and the mesenteric vessels were dissected with ligation until normal intestines were accessed; the presence of ganglion cells was determined by intraoperative rapid frozen section. The distal end was dissected anteriorly 2.5–3.5 cm above the dentate line. The posterior rectal wall was split longitudinally and dissected to a point 0.5–1.0 cm above the dentate line. The segment of the lesion was resected. The length of bowel resected ranged from 12 to 50 cm (median 16.5 cm). An oblique anastomosis was made.

**Results** The mean operating time was 70 minutes. Postoperative rectal dilation was not required. The patient tolerated feeding on the first postoperative day. Eighty-eight patients were followed-up. All these patients had 2–3 bowel movements per day at postoperative month 1. They were discharged within 4.5 days after the operation. Six patients presented with complications. All recovered by reoperation or conservative treatments.

**Conclusion** The modification of the transanal Swenson pull-through procedure for Hirschsprung's Disease is an easy adaptation to a well-established technique and has a reasonable result.

*Chin Med J 2008;121(23):2420-2423*

Since De la Torre-mondragon L et al<sup>1</sup> published their report in 1998, one-stage pull-through procedures for Hirschsprung's disease (HD) become popular.<sup>2-5</sup> It represents the latest development in the concept of the minimally invasive surgery for HD.<sup>6,7</sup> While there are many kinds of procedures, most centres perform the one-stage totally transanal Soave procedure. We designed a new method of transanal one-stage pull-through procedure for HD. From April 2000 to July 2007, we have performed this procedure on 134 cases and obtained a satisfactory outcome.

### METHODS

#### General data

Group 1: Between April 2000 and July 2007, we performed transanal one-stage pull-through procedures on 134 patients (95 boys and 39 girls) with HD. The patients' ages at operation ranged from 9 days to 5 years (mean 7.6 months) and in which 111 were under 6 months. In almost all of the patients, the diseases were presented with delayed meconium and abdominal distention after birth, and sometimes with vomiting and costiveness as

the main symptoms. The preoperative definitive diagnosis was established by barium enema and rectal biopsies. The aganglionic segment was located in the rectosigmoid colon in 76 patients and in the proximal and middle rectum in 58 patients. Preoperative laboratory findings were at normal levels.

Group 2: At the same time, we performed a traditional transabdominal Swenson operation on 126 patients (79 boys and 47 girls) with HD. Their ages at operation ranged 7 months to 15 years (mean 3.3 years).

#### Preoperative preparation

All patients had saline colonic irrigation performed once everyday for 5–10 days. As a routine, oral antibiotic for bowel preparation were administered 3 days before the

Department of Pediatric Surgery, First Hospital Affiliated to Harbin Medical University, Harbin, Heilongjiang 150001, China (Xu ZL, Zhao Z, Wang L, An Q and Tao WF)

Correspondence to: Dr. ZHAO Zheng, Department of Pediatric Surgery, First Hospital Affiliated to Harbin Medical University, Harbin, Heilongjiang 150001, China (Tel: 86-13796652459. Email: zszylxh@hotmail.com)

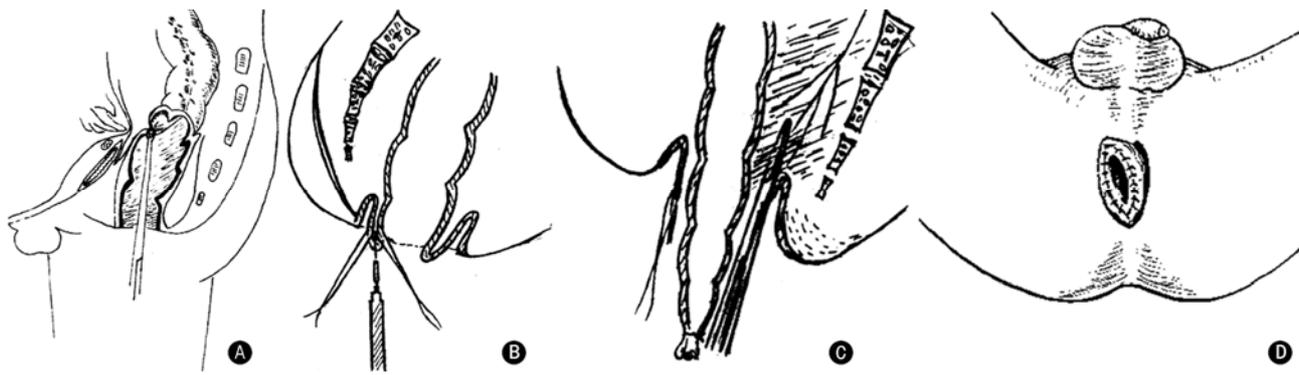


Figure. Operative procedure.

operation. A routine preoperative nasogastric tube was placed on the morning of operation day.

### Operative procedure

The patient was anesthetized and placed in the lithotomy position. A urinary catheter was optional. Given anorectal dilatations half a minute, the right index finger was inserted into the rectum and pressing the anterior rectum-wall onto the above pubic symphysis. The left index finger pressed the abdominal-wall onto the corresponding site above the pubic symphysis, joining the two fingers together. This was the usual peritoneal reflection on children. Then with the right hand holding oval forceps through the anus, inserted forceps into the rectum and touched the left index finger then clipped the rectal wall. Slowly pulled the anterior-rectal wall down to the anus (Figure A) to produce an artificial intussusception between the rectum and the distal sigmoid colon. Fine silk suturing was performed circumferentially at the level of that point which would be used for traction for the distal end. Another circumferential suture was performed parallel 0.5 cm distances above the original one and used for traction for the proximal intestines. The full-thickness rectal wall was truncated between the above two circumferential sutures with cautery, avoiding damaging adjacent tissues when the abdominal cavity was open (Figure B). The full thickness of rectum and sigmoid colon was mobilized although the anus and the mesenteric vessels were carefully dissected and ligatured (Figure C). The colon was divided until at 15 cm above the most proximal normal site. A definite resection line where ganglion cells were present was determined by intraoperative rapid frozen section. The distal rectum was pulled eversion and was dissected anteriorly 2.5–3.5 cm above the dentate line. The posterior rectal wall was split longitudinally and dissected until 0.5–1.0 cm above the dentate line. The residual segment was resected. After an oblique routine anastomosis was performed (Figure D), the large intestine was pulled back and an anal tube was placed.

### RESULTS

In group 1, a total of 134 cases of transanal one-stage pull-through procedures were performed. The mean volume of intraoperative hemorrhage was 10 ml. No

patient required a blood transfusion. The operation duration ranged from 50 to 115 minutes (average 70 minutes). The length of bowel resected ranged from 12 to 50 cm (mean 16.5 cm). No procedures were converted to open laparotomy. All children began drinking and oral feedings at 8 hours postoperatively. The stomach tube was extracted when the patients did not have abdominal distention. Antibiotics were administered intravenously for 3–4 days. Anorectal dilatation was not necessary for the postoperative patients. Hospital stay averaged 4.5 days after operation. Digital examination of the rectum was performed to evaluate the anastomotic situation before discharge. Follow-up was performed between 5 months and 5 years in 88 of 134 cases. All children had 5 to 10 bowel movements per day at first 3 weeks after discharged and 2 to 3 bowel movement per day at postoperative month 1. According to the method of Teitelbaum,<sup>8</sup> 84 of those 88 patients have good control of bowel moments, accounting for 95%. In the total 134 cases, 128 patients had satisfactory results without any complications. One patient was found to be slightly encopresis postoperatively. The cause was thought to be from longitudinal incisions inside the posterior rectal muscular cuff lying so near to the dentate line that excessive sphincter was broken. The misdissected sphincter was sutured at postoperative month 1 and the stooling function returned to normal. One patient was found with fresh bloody stool at postoperative 5 days, and rectal examination showed a wound tear of about 1.0 cm that was located on the posterior side of the anastomosis. Conservative management was effective. Another four patients presented with enterocolitis and all recovered after conservative treatment. Cosmetic results are excellent with a non-visible scar in the patients. The same results were reported by Langer's group.<sup>9</sup> At follow-up, all the children were growing and developing normally. The results of group 2 were summarized in Table.

### DISCUSSION

Hirschsprung's disease is a congenital anomaly of the colon affecting about 1:5000 livebirths.<sup>10</sup> Surgical treatment of Hirschsprung's disease has changed significantly during the last 2 decades. The previous gold standard of two- or three-stage pull-through with preliminary stoma has gradually been replaced by one-stage approaches. The

**Table.** Comparison of situations between groups 1 and 2

Different aspects	Traditional laparotomy	The modified procedure
Hospital stay (days)	10.0	4.5
Tolerated feeding (hours)	56	8
Cost (RMB)	8500	6300
Blood loss (ml)	60	10
Wound infection ( <i>n</i> )	1	0
Disruption of wound ( <i>n</i> )	1	0
Abdominal cavity infection ( <i>n</i> )	1	0
Abdominal adhesion ( <i>n</i> )	2	0
Anastomotic leak ( <i>n</i> )	1	0
Enterocolitis ( <i>n</i> )	5	4

following procedures have been used in clinic: 1. one-stage totally transanal Soave procedure.<sup>1</sup> 2. The modified transanal Soave pull-through procedure, in which the muscular cuff was split in the posterior midline<sup>11</sup> or was split by a "V" incision.<sup>5,12</sup> The aim of the modification was to decrease the incidence of postoperative complications. 3. The primary Swenson pull-through operation that was reported by Weidner et al<sup>13</sup> in 2003. A Swenson pull-through was performed via transanal dissection, a full-thickness, circumferential incision was made at the dentate line, and an anastomosis was made between the colon and rectum. In the meantime, A 2 to 3 cm left lower quadrant incision was made to help to dissect the peritoneal reflection. 4. In 2003 Peterlini et al<sup>14</sup> described a modified technique of primary a transanal rectosigmoidostomy for Hirschsprung's disease, using a Swenson like procedure to perform the anastomosis between the colon and the rectum. The rectal mucosa and submucosa was incised circumferentially, using cautery to perform muscular rectal dissection 1.5 cm above the dentate line. And an anastomosis was performed, using a seromuscular polyglactin 4-0 separate-stitch suture. 5. Georgeson<sup>15</sup> reported a surgical technique-primary laparoscopic- assisted endorectal colon pull-through for Hirschsprung's disease in 1998, using a laparoscope to dissect the colon and rectum.

The authors describe a new method of pull-through of the colon at the point above the peritoneal reflection and the rectum was made into intussusception status. Then a full-thickness, circumferential incision was made. The anatomic grounds of this procedure are as follows. The inferior one third of the rectum is completely outside of the peritoneum. The middle one third of the rectum is an extraperitoneal organ, whose peritoneum is located in the middle one third of the anterior rectal-wall and is folded to shape peritoneal reflection. The superior one third of the rectum is an interperitoneal organ and is located above the peritoneal reflection. The rectal wall has good elasticity, the lower bottom of the pelvis has lower and loose perirectal tissue rarefaction, making the transrectal pull-through procedure convenient and easy to be performed in neonates and infants. In our experience we have not encountered the situation in which the rectum can not be pulled out.

The indications of this procedure are as follows: 1. this

procedure is suitable for patients under 5 years of age. The most suitable age is from birth to 3 years old; and 2. patients with common and short-segment HD, in which the aganglionic segment is shorter than 25 cm, suitable for this procedure. In order to avoid the possibility of conversion to laparotomy, the length of the aganglionic segment must be estimated exactly before operation.

During operation, we have taken some steps to avoid anastomotic leak: 1. for avoiding tension on the anastomotic stoma, the seromuscular layer suture is very important; 2. make sure of the blood supply of the anastomotic stoma; 3. avoid fatty tissue plugging the anastomotic stoma; and 4. prevent postoperative infection inside the pelvic cavity.

We also find that the transanal one-stage Soave procedure remains a muscular cuff which can produce chronic constipation, enterocolitis or infection inside the cuff.<sup>7,16</sup> Sometimes a daily dilatation was required. This procedure is different from the Soave procedure; it does not have the complications of chronic constipation and infection inside the cuff. So dilatation is not necessary. Both procedures have a rapid return of bowel function, as they do not require intra-abdominal manipulation.<sup>3</sup> From the results of Table, we concluded the superiority of this procedure compared with the traditional transabdominal operation.

We summarize the superiority of this procedure as: 1. inducing a slight wound with less pain, early oral feeding, a simple procedure and early recovery; 2. less tension in the anastomosis, no muscular cuff remained, and an oblique anastomosis which is anterior high and posterior low coinciding to physiological requirements; 3. less postoperative ileus and adhesion formation owing to the transanal approach; 4. dissecting the intestines near to the rectal-wall and away from mesenteric vessels to avoid damaging the ureter and the pelvic nerves; and 5. eliminating the possibility of a functional disturbance of urination and defecation.

Above all, the modification of the transanal Swenson pull-through procedure for Hirschsprung's Disease is a safe and effective approach and worthy of developing in clinic.

#### REFERENCES

1. De la Torre-mondragon L, Ortega-Salgado JA. Transanal endorectal pull-through for Hirschsprung's disease. *J Pediatr Surg* 1998; 33: 1283-1286.
2. Van der Zee DC, Bax KN. One-stage Duhamel-Martin procedure for Hirschsprung's disease: a 5-year follow-up study. *J Pediatr Surg* 2000; 35: 1434-1436.
3. Liu DC, Rodriguez J, Hill CB, Loe WA Jr. Transanal mucosectomy in the treatment of Hirschsprung's disease. *J Pediatr Surg* 2000; 35: 235-238.
4. Teeraratkul S. Transanal one-stage endorectal pull-through for

- Hirschsprung's disease in infants and children. *J Pediatr Surg* 2003; 38: 184-187.
5. Gao Y, Li GC, Zhang SC, Xü Q, Guo ZT, Zhen BJ, et al. One-stage transanal rectosigmoidectomy for Hirschsprung's disease: a preliminary of outcome 15 cases. *Chin J Pediatr Surg (Chin)* 2001; 22: 21-23.
  6. Shankar KR, Losty PD, Lamont GL, Turnock RR, Jones MO, Lloyd DA, et al. Transanal endorectal coloanal surgery for Hirschsprung's disease: experience in two centers. *J Pediatr Surg* 2000; 35: 1209-1213.
  7. Höllwarth ME, Rivosecchi M, Schleef J, Deluqqi S, Fasching G, Ceriati E, et al. The role of transanal endorectal pull-through in the treatment of Hirschsprung's disease – a multicenter experience. *Pediatr Surg Int* 2002; 18: 344-348.
  8. Teitelbaum DH, Drongowski RA, Chamberlain JN, Coran AG. Long-term stooling pattern in infants undergoing primary endorectal pull-through for Hirschsprung's disease. *J Pediatr Surg* 1997; 32: 1049-1052.
  9. Langer JC, Minkes RK, Mazziotti MV, Skinner MA, Winthrop AL. Transanal one-stage Soave procedure for infants with Hirschsprung's disease. *J Pediatr Surg* 1999; 34: 148-152.
  10. Skinner MA. Hirschsprung's disease. *Curr Probl Surg* 1996; 33: 389-460.
  11. Albanese CT, Jennings RW, Smith B, Bratton B, Harrison MR. Perineal one-stage pull-through for Hirschsprung's disease. *J Pediatr Surg* 1999; 34: 377-380.
  12. Li AW, Zhang WT, Li FH, Cui XH, Duan XS. A new modification of transanal Soave pull-through procedure for Hirschsprung's disease. *Chin Med J* 2006; 119: 37-42.
  13. Weidner BC, Waldhausen JH. Swenson revisited: a one-stage, transanal pull-through procedure for Hirschsprung's disease. *J Pediatr Surg* 2003; 38: 1208-1211.
  14. Peterlini FL, Martins JL. Modified transanal rectosigmoidectomy for Hirschsprung's disease: clinical and manometric results in the initial 20 cases. *J Pediatr Surg* 2003; 38: 1048-1050.
  15. Georgeson KE, Cohen RD, Hebra A, Jona JZ, Powell DM, Rothenberg SS, et al. Primary laparoscopic-assisted endorectal colon pull-through for Hirschsprung's disease: a new gold standard. *Ann Surg* 1999; 229: 678-683.
  16. Wester T, Rintala RJ. Early outcome of transanal endorectal pull-through with a short muscle cuff during the neonatal period. *J Pediatr Surg* 2004; 39: 157-160.

(Received March 21, 2008)

Edited by HAO Xiu-yuan and JI Yuan-yuan