Comparative study between one-stage total transanal endorectal pull-through and assisted transanal Soave for treatment of rectosigmoid Hirschsprung's disease

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Purpose
The aim of this study was to compare one-stage total transanal endorectal pull-through (TEPT) and assisted transanal Soave (either by minilaparotomy or by laparoscopy) for treatment of rectosigmoid Hirschsprung's disease.
Patients and methods
This study was conducted on 40 pediatric patients with rectosigmoid Hirschsprung's disease. The patients were divided into two groups: group A, consisting of 20 cases that underwent one-stage total TEPT, and group B, consisting of 20 cases that underwent assisted transanal Soave [10 cases underwent minilaparotomy (B_1) and 10 cases underwent laparoscopy (B_2)].
Results
The mean age of the patients was 20.01 months in group A and 17.14 months in group B. The male to female ratio was 3 : 1. *P* values less than 0.001 were considered highly significant. The mean operative time in group A was 102 min, whereas that in group B was 117 min. The mean onset time of oral feeding in group A was 1.7±0.86 days and that in group B was 2.25±0.97 days. The mean postoperative hospital stay in group A was 4.2±1.73 days and that in group B was 5±1.87 days. As regards the postoperative complications, they were more common in group B than in group A, and more common in subgroup B_1 than in subgroup B_2.
Conclusion
TEPT is characterized by a shorter operating time, less bleeding, shorter hospital stay, less morbidity, and earlier recovery compared with similar open pull-through procedures.

Keywords:
assisted transanal, rectosigmoid Hirschsprung's disease, transanal endorectal pull-through

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Introduction

Hirschsprung's disease (HD) is a congenital aganglionosis of the submucosal and myenteric neural plexuses principally affecting the rectosigmoid or rectal segments of varying lengths. Most cases manifest during the neonatal period, but in rare instances the disease is initially diagnosed in older children and adult patients [1].

Since the seminal description of HD in 1889, there has been a gradual evolution in the surgical management of this condition. Recognition that HD arises from functional obstruction in the distal, aganglionic colon led Swenson to advocate resection of this segment. Later, Duhamel described a retrorectal anastomosis and Soave an extramucosal dissection, to minimize the risk for neurovascular injury. Primary endorectal pull-through without enterostomy has gained in popularity since first described, being further modified to include minimally invasive approaches [2].

The one-stage transanal endorectal pull-through operation (TEPT) was introduced in the late 1990s and has rapidly replaced traditional procedures in infants and young children in many surgical centers around the world [3].

Single-stage pull-through, both with and without laparoscopic assistance, has enabled surgeons to perform definitive surgical correction at an earlier age than previously possible [4].

Minimally invasive laparoscopic techniques gained popularity because of their superior cosmetic results and shorter hospital stay. A completely transanal approach without any intra-abdominal dissection has generated considerable interest. This procedure

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has the potential advantages of lower cost, less risk of damage to pelvic structures, lower incidence of intraperitoneal bleeding and adhesion formation, and absence of any abdominal incision [5].

Routine laparoscopic visualization or minilaparotomy is not necessary with the transanal approach, but it should be used in children who are at higher risk for long-segment disease or if any difficulties are encountered during the procedure [6]. The limitation of transanal pull-through is aganglionic segment extending proximal to the sigmoid colon because of difficulty in achieving adequate mobilization of the colon [5].

The aim of this work was to study and compare one-stage total TEPT and assisted transanal Soave (either by minilaparotomy or by laparoscopy) for treatment of HD.

Patients and methods

This study was conducted during the period from January 2013 to June 2015 at the Department of General Surgery (Pediatric Surgery Unit), Banha University Hospital, after obtaining approval from the local ethical committee and fully informed consent from the parents after discussing with them the operative procedure and the possible intraoperative and postoperative complications. The study included 40 pediatric patients who were suffering from rectosigmoid HD. The patients were divided into two groups: group A, consisting of 20 cases managed with one-stage total TEPT, and group B, consisting of 20 cases managed with assisted transanal Soave [10 cases underwent minilaparotomy (B_1) and 10 cases underwent laparoscopy (B_2)].

Inclusion criteria

Children with HD with transitional zone (TZ) in the rectosigmoid area (classic type) were eligible for participation in the study.

Exclusion criteria

(1) Having undergone previous colorectal surgery for HD other than rectal biopsy.
(2) Associated congenital syndromes (e.g. Down's syndrome).
(3) Ultrashort or total colonic aganglionosis.
(4) General unsuitability due to other causes as congenital heart diseases, etc.

Preoperative assessment

Full clinical history taking

All cases presented with chronic constipation and abdominal distension. They had a history of delayed passage of meconium (>48 h).

Clinical examination

This included examination of the general condition, weight, and abdominal examination including abdominal distension, palpable colon, and rectal examination (presence of fecal matter, gush of stools, anal tightness, and sphincteric state).

Routine laboratory tests

Routine laboratory tests were performed in the form of complete blood count, coagulation profile (prothrombin time, partial thromboplastin time, and international normalized ratio), and liver and renal function tests (aspartate transaminase, alanine transaminase, albumin, and sodium, potassium, urea, and creatinine).

Radiological examination

Contrast (barium or gastrografin) enema was done without colonic preparation to demonstrate the TZ, retained contrast on a postevacuation film, and abnormalities of the rectal mucosal folds.

Rectal biopsy

All patients were submitted to full-thickness rectal biopsies taken 1, 2, and 3 cm above the dentate line under general endotracheal anesthesia. The definitive diagnosis of HD is based on histological evaluation of a rectal biopsy, looking for the presence or absence of ganglion cells and the finding of hypertrophied nerve fibers and trunks.

Operative procedure

Preoperative preparation

The nutritional status, hydration, electrolytes, and acid–base balance were adjusted to be optimal. All patients were examined by a pediatrician to rule out other associated congenital anomalies. Proper bowel preparation [warm saline colonic enemas (20 ml/kg/enema) performed every 6 h] was carried out before surgery.

All patients were on clear oral intake for 24 h. After that they were kept in fasting state, and intravenous fluids were started for another 24 h. An intravenous intestinal antiseptic (metronidazole 15 mg/kg infused over 1 h) and third-generation cephalosporin (cefotaxime 50 mg/kg/day) were used at induction of anesthesia.

Operative technique

Technique of total transanal endorectal pull-through

After induction of general endotracheal anesthesia a urinary catheter of proper size was inserted and the patient was placed in the Lloyd–Davies position with the legs apart at the end of the operating table.

An anal star retractor was placed, and retraction was achieved using eight perianal retraction 3-0 or 4-0 silk sutures to evert the anus and expose the rectal mucosa (Figs 1 and 2).

Before commencement of the procedure a 1 : 200 000 adrenaline solution was infiltrated into the submucosal plane to give better hemostatic effect and act as a hydrostatic dissector. The mucosal cuff was tagged with multiple fine sutures, which were used for traction, and then the rectal mucosa was circumferentially incised using electrocautery ~5–20 mm from the dentate line, and a submucosal plane was created (Figs 3 and 4).

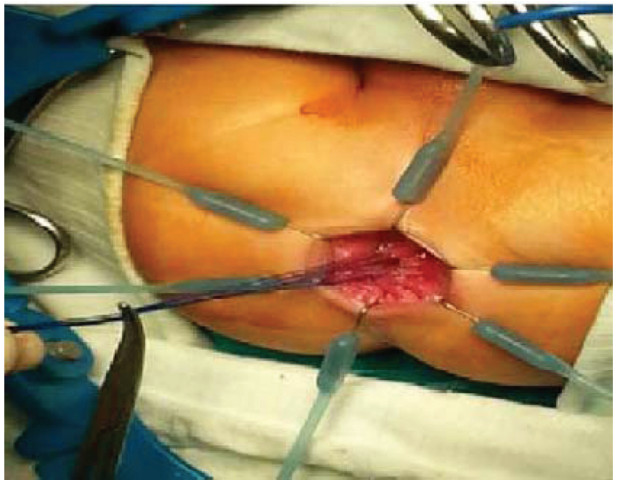
Endorectal dissection was then carried out proximally, staying in the submucosal plane. When the submucosal dissection had extended proximally to a point above the peritoneal reflection, the rectal muscle was divided circumferentially and the full thickness of the rectum and the sigmoid was mobilized out through the anus. This required division of rectal and sigmoid vessels, which could be done under direct vision using cautery or ligatures. When the TZ was encountered, full-thickness biopsy sections were taken, and frozen section confirmation of ganglion cells was obtained (Figs 5 and 6).

The resection of the aganglionic segment was extended ~5–10 cm proximal to the identified TZ. This modest extension of the dissection allowed for removal of dysfunctional bowel, which was often present proximal

Figure 1

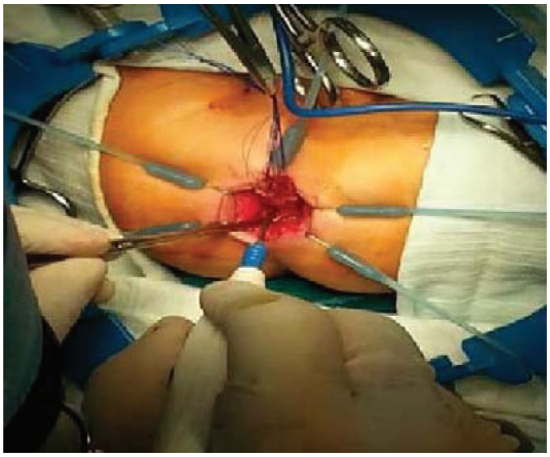
An anal retractor is placed (lone star type).

Figure 2



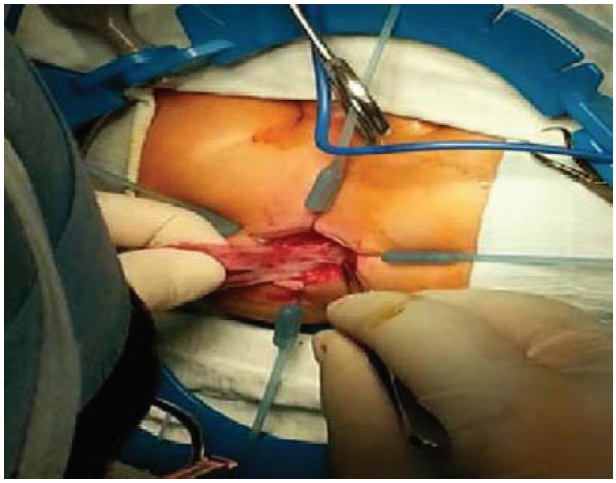
Mucosal cuff is tagged with multiple fine sutures.

Figure 3



Rectal mucosa is circumferentially incised.

Figure 4

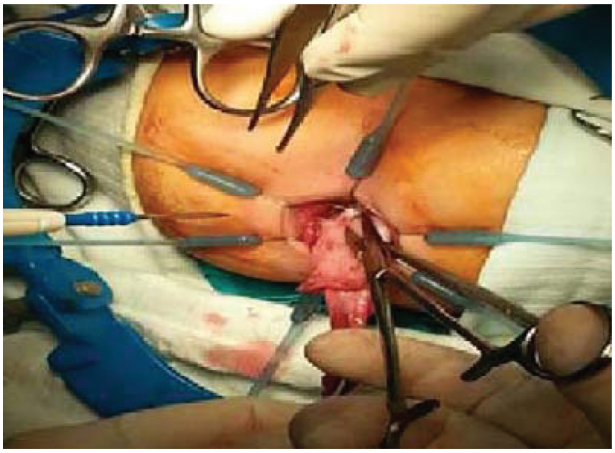


The submucosal plane is developed.

to the TZ and not readily identified by rapid frozen section biopsy. The rectal cuff was grasped with Allis clamps on either side of the intended point of transection anteriorly or posteriorly. The intussuscepted cuff was trimmed and then returned to the pelvis (Fig. 7).

The colon was then divided, and a standard Soave–Boley anastomosis was performed. The anastomosis was performed using absorbable suture (4-0 Vicryl; Ethicon Johnson & JohnsonSomerville, New Jersey, USA) (Figs 8–10). This anastomosis should be water tight to avoid leakage and cuff abscess formation. Care has to be taken to minimize tension on the pull-through segment after anastomosis. Tension on the pull-through segment increases the anorectal angle, thereby increasing the potential risk for incontinence. No drains were placed.

Figure 5

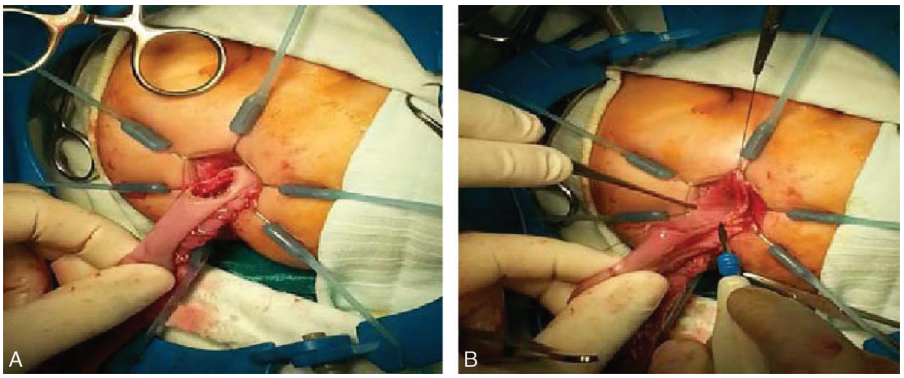


The rectal muscle is divided circumferentially.

Figure 6

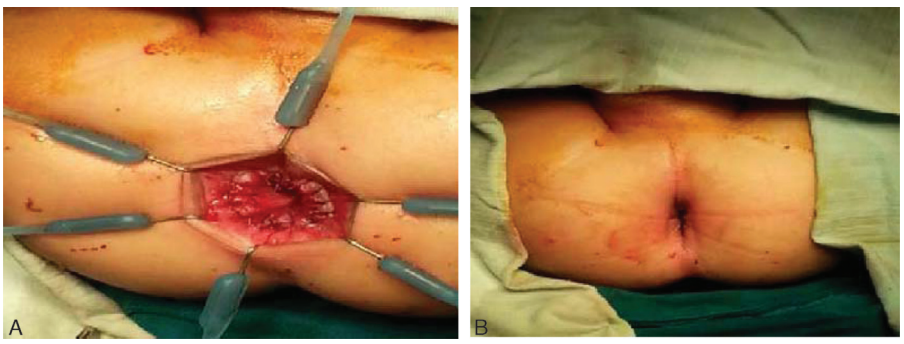
Rectum and sigmoid are pulled out through the anus.

Figure 7



Resection of the aganglionic segment.

Figure 8



Colo-anal anastomosis is performed using absorbable vicryl suture.

Technique of minilaparotomy-assisted transanal pull-through

Through a small 5-cm transverse lower abdominal skin crease incision, we identified the TZ. This was followed by mobilization and devascularization of the colonic segment to be resected.

Before completing the perineal pull-through, the minilaparotomy incision was used to ensure the following:

(1) There was no intra-abdominal bleeding.
(2) The colon was not overstretched and anastomosis was not under tension.
(3) There was no colonic torsion.
(4) There was no mesenteric defect to allow internal hernia to occur.

Technique of laparoscopic-assisted transanal pull-through

The TZ was located visually when possible. A seromuscular biopsy was obtained with laparoscopic metzenbaum scissors for histologic leveling. Again, the resection of the aganglionic segment extended ~5–10 cm proximal to the identified TZ.

Once inside the peritoneal cavity, the perineal and laparoscopic dissection planes were joined circumferentially. The muscular cuff was divided. The rectum and colon were pulled down through the anus until the selected site of proximal colon resection was identified. Thereafter, coloanal anastomosis was done as mentioned in pure transanal pull-through.

Postoperative follow-up

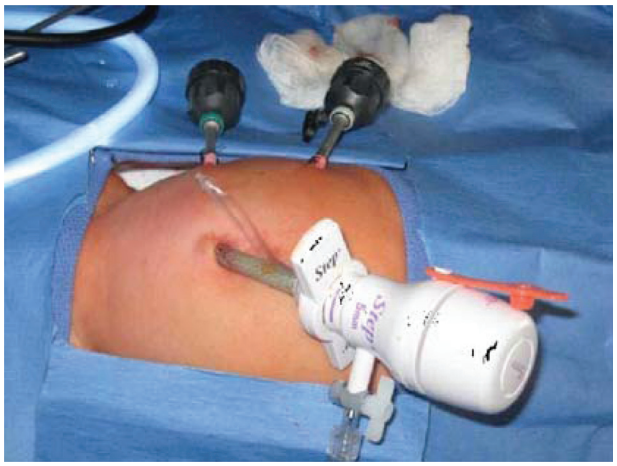
Diet was started when there was evidence of bowel function. Prophylactic oral metronidazole was given for 1–2 weeks postoperatively to avoid enterocolitis in the early postoperative period. Patients were scheduled for regular postoperative follow-ups at 1, 6 months, and 1 year.

Results

Statistical analysis

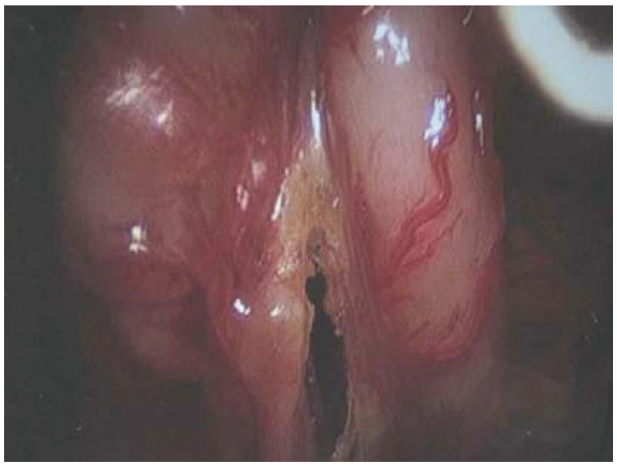
The collected data were summarized as mean±SD and range for quantitative data and as number and percentage for qualitative data. Comparisons between the study groups were carried out using the Student *t*-test to compare mean differences between the two groups; the test of proportion (the *Z*-test) was applied to compare two proportions, and the χ^2-test and Fisher's exact test were applied to compare more than two proportions as appropriate. Pearson's correlation coefficient (*r*) was used to assess the correlation of the studied data when normally distributed. Statistical significance was accepted at *P* values less than 0.05 (Fig. 11).

Figure 9



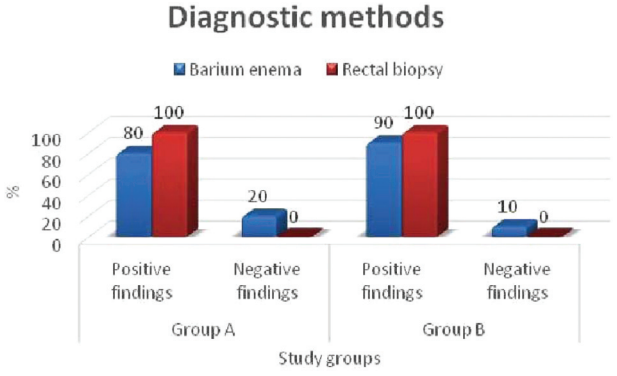
Photograph showing port placement for this operation.

Figure 10



A window created through the rectosigmoid mesocolon.

Figure 11



Diagnostic methods.

Table 1 Barium enema was diagnostic in 34 cases (85% of cases): 16 cases in group A (80%) and 18 cases in group B (90%), and eight cases in B_1 (80%) and 10 cases in B_2 (100%). The TZ was present at the rectosigmoid junction in 30 cases (88.2% of cases with barium-positive findings: 16 cases in group A and 14 cases in group B; five cases in B_1 and nine cases in B_2), at the proximal part of the rectum in three cases in B_1 (8.8% cases with barium-positive findings), and at the proximal part of the sigmoid colon in one case in B_2 (3% cases with barium-positive findings).

Operative data

Table 2 shows there is no statistically significant difference between the two groups regarding operative data including incision above the dentate line, TZ from anal verge, and total length of the resected colon.

Table 3 shows that the mean operative time in group A was 102 min and that in group B was 117 min. The minimum operative time in group A was 60 min (in a 2-week-old newborn) and the maximum was 140 min (in a 6-year-old child). The minimum operative time in group B was 80 min (in a 2-week-old newborn) and the maximum was 180 min (in a 3-year-old child). There was no statistically significant difference between the two groups (P=0.08).

Postoperative follow-up

Table 4 shows the onset of oral feeding, which ranged from 1 to 3 days in group A, with a mean of 1.7±0.86 days, and from 1 to 4 days in group B, with a mean of 2.25±0.97 (B_1=2.4 and B_2=2.1) days. The P value of groups A and B was 0.06, whereas the P value of subgroups B_1 and B_2 was 0.50, which is statistically nonsignificant.

Table 5 shows the mean postoperative hospital stay, which in group A was 4.2±1.73 days and in group B was 5±1.87 (B_1=5 and B_2=5.6, with P=0.49) days. There was no significant difference between the two groups (P=0.06). The minimum postoperative hospital stay in group A was 2 days and the maximum was 7 days, whereas in group B the minimum was 3 days and the maximum was 9 days.

As regards the postoperative complications (Table 6), two (10%) patients in group A had mild ileus, which responded to the application of a nasogastric tube and

Table 1 Diagnostic methods

Groups	Diagnostic methods [*n* (%)]			
	Barium enema		Rectal biopsy	
	Positive findings	Negative findings	Positive findings	Negative findings
Group A (*n*=20)	16 (80.0)	4 (20.0)	20 (100.0)	0 (0.0)
Group B (*n*=20)	18 (90.0)	2 (10.0)	20 (100.0)	0 (0.0)
B_1 (*n*=10)	8 (80.0)	2 (20.0)	10 (100.0)	0 (0.0)
B_2 (*n*=10)	10 (100.0)	0 (0.0)	10 (100.0)	0 (0.0)

Table 2 Comparison between the two groups regarding operative data

Groups	Incision above the dentate line (mm)		Transitional zone from anal verge (cm)		Total length of resected colon (cm)		t_1 and P_1	t_2 and P_2	t_3 and P_3
	Mean±SD	Range	Mean±SD	Range	Mean±SD	Range			
Group A (*n*=20)	9.7±3.29	5–15	13.05±5.39	5–23	25.1±7.52	10–34	1.52 and 0.14	0.96 and 0.34	1.88 and 0.07
Group B (*n*=20)	11.65±4.70	5–20	11.55±4.38	4–18	20.9±6.54	10–30	1.31 and 0.21	0.65 and 0.52	0.81 and 0.43
B_1 (*n*=10)	13±5.46	5–20	10.9±4.36	4–18	19.7±6.11	10–28			
B_2 (*n*=10)	10.3±3.59	5–15	12.2±4.54	5–18	22.1±7.05	10–30			

t_1 and P_1 for incision above the dentate line; t_2 and P_2 for transitional zone from anal verge; t_3 and P_3 for total length of resected colon.

Table 3 Comparison between the two groups in relation to total operative time

Groups	Total operative time (min)		*t*	*P*-value
	Mean±SD	Range		
Group A (*n*=20)	102±20.8	60–140	1.79	0.08
Group B (*n*=20)	117±31.09	80–180	1.01	0.33
B_1 (*n*=10)	110±35.82	80–180		
B_2 (*n*=10)	124±25.47	80–160		

Table 4 Comparison between the two groups in relation to postoperative onset of oral feeding

Groups	Postoperative onset of oral feeding (days)		*t*	*P*-value
	Mean±SD	Range		
Group A (*n*=20)	1.7±0.86	1–3	1.90	0.06
Group B (*n*=20)	2.25±0.97	1–4	0.68	0.50
B_1 (*n*=10)	2.4±1.17	1–4		
B_2 (*n*=10)	2.1±0.74	1–3		

GIT rest within 2 days, and three (15%) patients of group B had ileus (two patients in subgroup B_1 and only one in B_2). Two patients in subgroup B_1 started oral feeding after 4 days and tolerated it well and did not need any further interference.

Two (10%) patients in group A and four (20%) patients in group B (three patients in subgroup B_1 and only one in B_2) had mild wound infection that responded to antibiotic therapy.

Anal stricture affected five patients in this study (12.5%): two (10%) patients in group A and three (15%) patients in group B (two patients in subgroup B_1 and one patient in B_2). Actually the anal stricture occurred despite the routine regular dilatation to all the patients in the study (routine anal dilatation was performed in all patients of both groups once or twice weekly for at least 3 weeks), and the five patients responded well to the anal dilatation that extended beyond the 3 weeks.

Ten (25%) patients [four (20%) in group A and six (30%) in group B (four patients in subgroup B_1 and two patients in B_2)] suffered from recurrent mild attacks of constipation after the pull-through procedure, which responded to the transient use of laxatives.

There was no mortality in our study, nor were there instances of other complications such as postoperative bowel obstruction, anal incontinence, pelvic or intra-abdominal abscesses, retraction or prolapse of the pull-through segment, or wound dehiscence.

Table 5 Comparison between the two groups in relation to postoperative hospital stay

Groups	Postoperative hospital stay (days)		*t*	*P*-value
	Mean±SD	Range		
Group A (*n*=20)	4.2±1.73	2–7	1.93	0.06
Group B (*n*=20)	5.3±1.87	3–9	0.71	0.49
B_1 (*n*=10)	5±1.88	3–9		
B_2 (*n*=10)	5.6±1.9	3–9		

Discussion

This study was conducted on 40 pediatric patients with rectosigmoid HD, in whom TEPT was indicated. The patients were divided into two groups: group A, containing 20 cases that underwent one-stage total transanal endorectal pull-through, and group B, consisting of 20 cases with assisted transanal Soave [10 cases underwent minilaparotomy (B_1) and 10 cases underwent laparoscopy (B_2)].

There were 30 boys and 10 girls in this study. Group A included 14 (70%) boys and six (30%) girls and group B included 16 (80%) boys and four (20%) girls (B_1 included seven boys and three girls and B_2 included nine boys and one girl with a male to female ratio of 3 : 1; $P<0.001$, highly significant).

This finding is in agreement with the literature, which describes a predominance of HD in boys (from 3 : 1 to 4 : 1) [7].

The most common presentation in this study was constipation (100% in both groups), followed by inability to pass meconium (85% in group A and 90% in group B), then abdominal distension (75% in both groups) and lastly bilious vomiting (25% in group A and 20% in group B). These findings were comparable to those of García and Ceciliano [8] study on 130 patients at the National Children's Hospital during the period 2000 to 2010. They identified bloating as the most frequent, followed by bilious vomiting, terminal meconium, and constipation (74, 52, 36, and 19%, respectively) [8].

Barium enema was diagnostic in 34 (85%) cases [16 (80%) cases in group A and 18 (90%) cases in group B; eight (80%) cases in B_1 and 10 (100%) cases in B_2]. The TZ was present at the rectosigmoid junction in 30 cases (88.2% of cases with barium-positive findings: 16 cases in group A and 14 cases in group B; five cases in B_1 and nine cases in B_2), at the proximal part of the rectum in three cases in B_1 (8.8% cases with barium-positive findings), and at the proximal part of sigmoid colon

Table 6 Comparison between the study groups regarding postoperative complications

Groups	Wound infection [*n* (%)]	Ileus [*n* (%)]	Stricture [*n* (%)]	Constipation [*n* (%)]	Fecal incontinence [*n* (%)]
Group A (*n*=20)	2 (10.0)	2 (10.0)	2 (10.0)	4 (20.0)	0 (0.0)
Group B (*n*=20)	4 (20.0)	3 (15.0)	3 (15.0)	6 (30.0)	0 (0.0)
B_1 (*n*=10)	3 (30.0)	2 (20.0)	2 (20.0)	4 (40.0)	0 (0.0)
B_2 (*n*=10)	1 (10.0)	1 (10.0)	1 (10.0)	2 (20.0)	0 (0.0)
Z_1 and P_1^*	0.88 and 0.37	0.48 and 0.63	0.48 and 0.63	0.73 and 0.46	–
Z_2 and P_2^*	1.12 and 0.26	0.63 and 0.53	0.63 and 0.53	0.97 and 0.33	–

*Obtained using the test of proportion (*Z*) for two samples; Z_1 and P_1 for group A versus group B; Z_2 and P_2 for group B_1 versus group B_2.

in one case in B_2 (3% cases with barium-positive findings).

The accuracy of barium enema as a diagnostic tool was reported to be 63% by Hussain and Di Lorenzo [9]. Ideally, all patients should undergo mucosal suction biopsy with acetyl cholinesterase staining of the nerve fibers (Rahman *et al.* [10]).

Unfortunately, we did not have this facility. Therefore, we relied mostly on full-thickness rectal biopsy with H&E staining, which was diagnostic in all cases.

The operative time was favorable in group A compared with group B (102 vs. 117 min; P=0.08). It was also favorable in group B_1 compared with group B_2 (110 vs. 124 min; P=0.33). Although the operative time was favorable in group A, there was no statistically significant difference between the two groups (P=0.08). There was also a significant positive correlation between operative time and onset of oral feeding (P<0.001). There was a significant positive correlation between operative time and postoperative hospital stay (P<0.001).

The mean operative time in group A (102 min) was significantly shorter when compared with that in the Egyptian multicenter study of Elhalaby *et al.* [11] (120.2±27.8 min) and with that of Teeraratkul [12] (140 min). This difference may be attributed to increasing learning curve and experience.

The difference in operative time between the studies is because the operative time is influenced by many factors including age (the younger the age, the less the time needed), preoperative enterocolitis, adherent musosa, and intraoperative bleeding (the older the child, the more the bleeding) (Hadidi [13]).

The onset of oral feeding ranged from 1 to 3 days in group A, with a mean of 1.7±0.86 days, and from 1 to 4 days in group B, with a mean of 2.25±0.97 (B_1=2.4 and B_2=2.1) days. The P value of groups A and B was 0.06 and that of subgroups B_1 and B_2 was 0.50, which was statistically nonsignificant.

Most of the studies on both totally transanal and assisted transanal pull-through concur with ours with respect to the start of postoperative oral feeding. Shabbir *et al.* [14] (in their study of transanal pull-through) started postoperative oral feeding 1–3 days postoperatively.

The mean postoperative hospital stay in group A was 4.2±1.73 days and that in group B was 5±1.87 (B_1=5 and B_2=5.6; P=0.49) days. There was no significant difference between the two groups (P=0.06). The minimum postoperative hospital stay in group A was 2 days and the maximum was 7 days, whereas in group B the minimum was 3 days and the maximum was 9 days. There was a significant positive correlation between age and postoperative hospital stay (P<0.001).

Most of the studies regarding both totally transanal and laparoscopic-assisted transanal pull-through concur with ours with regard to postoperative hospital stay. Hadidi [13] (in his study of transanal pull-through) reported that postoperative hospital stay ranged around 3 days. Shabbir *et al.* [14] (in their study on transanal pull-through) reported that postoperative hospital stay ranged around 5 days. As regards the postoperative complications, complications were more common in group B than in group A, and were more common in subgroup B_1 than in subgroup B_2. However, there were no statistically significant differences between the two groups. Two (10%) patients in group A had mild ileus that responded to nasogastric tube and GIT rest within 2 days and three (15%) patients in group B had ileus (two patients in subgroup B_1 and only one in B_2). Two patients in subgroup B_1 started oral feeding after 4 days and tolerated it well and did not need any further interference.

Two (10%) patients in group A and four (20%) patients in group B (three patients in subgroup B_1 and only one in B_2) had mild wound infection that responded to antibiotic therapy.

It is believed that postoperative routine anorectal bouginage is an effective tool to prevent the occurrence of anal stricture and to decrease both the frequency as well as the severity of enterocolitis, particularly in neonates and young infants (Hussam [15]).

Anal stricture affected five patients in this study (12.5%): two (10%) patients in group A and three (15%) patients in group B (two patients in subgroup B_1 and one patient in B_2).

Rouzrokh *et al.* [16] reported an incidence of anal stricture of 14% in their study on the TEPT procedure.

Ten (25%) patients [four (20%) in group A and six (30%) in group B (four patients in subgroup B_1 and two patients in B_2)] suffered from recurrent mild attacks of

constipation after the pull-through procedure, which responded to the transient use of laxatives.

Constipation may be expected to improve over time. Lifschitz and Bloss [17] noted that 33% suffered from constipation after the initial operation, but only 9% reported persistent constipation after an average of 5 years.

There was no mortality in our study and there were no instances of other complications such as postoperative bowel obstruction, anal incontinence, pelvic or intra-abdominal abscesses, retraction or prolapse of the pull-through segment, or wound dehiscence.

Continence is a very important parameter that should be assessed as regards the treatment of HD, but unfortunately we could not assess it in this study because of the short period of follow-up and also because all the patients in the study were 3 years or younger, with 75% of them under 1 year, and to assess continence one needs a large number of patients with varying ages and a long period of follow-up. This was also reported by Hadidi [13] in his study in which the follow-up ranged from 3 months to 3.5 years. He reported that this duration of follow-up was too short to fully assess bowel function, sexual function, and continence.

Conclusion

The advantages of totally transanal pull-through include its feasibility, improved cosmesis, the fact that the procedure does not damage the pelvic structures, reduced hospital costs, hospital stay, operating time, and overall improved quality of life, but overstretching of the internal anal sphincter remains a critical issue, which may impact the long-term continence outcome.

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Conflicts of interest
There are no conflicts of interest.

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