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Laparoscopic-assisted versus complete transanal pull-through using Swenson technique in treatment of Hirschsprung's disease

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Abstract

Background The aim of this study is to compare outcomes for neonates and infants with Hirschsprung's disease undergoing a laparoscopically assisted transanal pull-through (LAPT) with those undergoing a complete transanal pull-through (TERPT) using Swenson procedure in both groups.

Method Forty patients with Hirschsprung's disease were operated between January 2018 and January 2022. Twenty patients underwent transanal endorectal pull through TERPT while the other 20 patients underwent laparoscopic assisted pull through (LAPT) using Swenson procedure (TERPT) in both groups.

Age at operation, presenting symptoms, operative time complications, and degree of continence were evaluated. Bowel functions were assessed using the Cleveland Clinic Incontinence Score.

Results The mean age of the patients at the time of operation were 18.9 months for the transanal group versus 21.3 months for the laparoscopic group. The mean follow-up period was 6 months, ranging from 3 to 12 months. The rate of enterocolitis occurred in 15% of cases in transanal group versus 10% of cases in the laparoscopic group. Constipation was found in 25% of cases of TERPT group versus 10% of cases in the LAPT group. The rates of normal continence (score 0:4) was 60% vs 50% for TERPT vs LAPT respectively while the rate of severe incontinence (score 15:20) was 20% vs 5% for TERPT vs LAPT respectively.

Conclusion The functional outcomes after LAPT was satisfactory in term of fecal soiling compared to trans anal approach this may be due to less pelvic dissection compared to transanal pull through.

Keywords TERPT, LAPT, Hirschsprung's disease, Incontinence

Background

Since the first description of Harald Hirschsprung in 1889 [1], the choice of rectal dissection technique is controversial, although the three primary options remain full-thickness dissection with end-to-end anastomosis as described by Swenson in 1948 [2], and Duhamel's retrorectal anastomosis or Soave's extra-mucosal dissection which were developed later [3, 4]. During the 1980s, one-stage (primary) procedures were proposed for uncomplicated cases, thereby avoiding the morbidity associated with stoma formation [5]. In 1995, Georgeson et al. [6] described a minimally invasive approach using laparoscopy for colonic biopsies and mobilization followed by transanal endo-rectal dissection of the rectum using submucosal dissection (Soave technique) and then colo-anal anastomosis. Subsequently, laparoscopic Swenson and

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Duhamel-type procedures have been described [7, 8]. In 1998, De La Torre et al. reported the first entirely transanal primary endorectal pull-through without laparoscopic assistance. The transanal Swenson-type procedure has been reported but no case-controlled data have been published [9, 10].

Benefits of entirely transanal primary endo-rectal pull-through include utilization of a single incision and the avoidance of abdominal wall scarring, with the potential for better cosmoses and reduced postoperative pain, a shorter operating time and the suitability of this technique for use in resource-poor settings which may lack equipment for laparoscopy [11–13]. Potential disadvantages regarding a totally transanal approach include the possible impact of prolonged dilation of the sphincter muscles on fecal continence [14, 15], the risk of colonic torsion, and the inability to confirm the histological transition zone prior to starting mobilization of the colon as many surgeons would change their operative approach when faced with longer segment aganglionosis [16].

Aim of the study

The aim of this study is to compare outcomes for patients with Hirschsprung's disease undergoing a TERPT procedure with those undergoing a laparoscopically assisted transanal pull-through (LAPT) using Swenson procedure in both groups.

Patients and method

The study included forty patients with HD disease operated on from January 2018 to January 2022. Twenty patients were operated upon using (TERPT) and twenty patients were operated using (LAPT).

Exclusion criteria

1. Patients with associated co-morbidity
2. Previous surgery for Hirschsprung's disease.
3. Patients with suspected other cause of chronic constipation
4. Patients presented with enterocolitis or obstruction.
5. Patients with associated major gastrointestinal anomalies.

Preoperative evaluation

After detailed history and full physical examination, each patient underwent the proper investigations to confirm the diagnosis and assess the fitness for surgery. Consent is taken after discussing with the parents the details of the procedure, expected benefits and possible intra- and postoperative complications. Also, parents were told that the results of this study will be published, and consent for publication is taken. Detailed history was taken from all of our patients as sown in Tables 1 and 2.

Rectal examination for empty collapsed rectum with absent rectal ampulla, tight anal sphincter and impacted stools. Also, to exclude signs of enterocolitis. Investigations was done in the form of full laboratory investigations and radiological imaging in the form of plain abdominal X-ray films erect and supine and unprepared (unprepared to prevent transient dilatation of the

Table 1 Main presenting symptoms of patients

Presenting symptoms	Total ($n=40$)	TERPT($n=20$)	LAPT ($n=20$)	*P* value
Chronic constipation	30 (75%)	17 (85%)	13 (65%)	0.14
Delayed meconium passage	28 (70%)	12 (60%)	16 (80%)	0.16
Abdominal distension	15 (37.5%)	9 (45%)	6 (30%)	0.32
Preoperative enterocolitis	17 (42.5%)	8 (40%)	9 (45%)	0.74
Neonatal bilious vomiting	4 (10%)	2 (10%)	2 (10%)	1

Table 2 Socio-demographic data of included patients

	TERPT group (20 patients)	LAPT group (20 patients)	*P* value
Socio-demographic	Mean ± SD/Frequency	Mean ± SD/frequency	.12
Age (months)	18.9 ± 2.1	21.3 ± 3.1	
Sex:			.23
Male	12 (60%)	13 (65%)	
Female	8 (40%)	7 (35%)	
Follow-up period	7.5 ± 1.2 months	5.6 ± .8 months	.08

Table 3 Intra-operative outcomes of included patients

	TERPT (20 patients)	LAPT (20 patients)	*P* value
Operative time	120 ± 25 (min)	90 ± 18 (min)	.001
Need of blood transfusion	No cases	No cases	.99
Bleeding intraoperative	1 (5%)	No cases	.21
Postoperative hospital stay	5.3 ± .4 days	3.3 ± .2 days	.02
Conversion to open	nil	Nil	

Table 4 Postoperative outcomes of included patients

	TERPT (20 patients)	LAPT (20 cases)	*P* value
Anal stenosis	No cases	No cases	.99
Enterocolitis	3 (15%)	2 (10%)	.23
Cleveland Continence Score			
Mild incontinence	6 (30%)	4 (20%)	.07
Sever incontinence	4 (20%)	2 (10%)	.02
Constipation	5 (25%)	2 (10%)	.001
Intestinal obstruction	No cases	No cases	.99
Abscess formation	No cases	No cases	.99

aganglionic segment) single contrast enema were done to confirm the diagnosis by revealing the "transition zone" or the funnel shaped area between the narrowed aganglionic distal segment and the dilated ganglionic proximal segment, with special attention to the lateral views in contrast study for accurate assessment of the distal colorectal segment. Delayed X-ray film after 24 h if transition zone is not identified. If significant barium is still present in the colon, it increases the suspicion of Hirschsprung's disease. Contrast injection was done under screen to inject a moderate amount of barium. Antero-posterior and lateral views usually taken immediately, and delayed films were taken 24 h later. Anorectal manometry was not routinely indicated, but rather obtained based on the patient's medical history and underlying illness. Partial thickness rectal biopsy was done for all patients to confirm the diagnosis by the absence of ganglion cells in the diseased segment. These biopsies were taken under general anesthesia before the definitive procedure.

Operative procedures

Group "A" patients will be subjected to laparoscopic assisted transanal Swenson pullthrough operation according to the following steps: insertion of laparoscopic trocars with abdominal insufflation colon mobilization, and control of mesenteric vessels with monopolar or bipolar cautery in infants or the ultrasonic scalpel in older children.

A circular incision is made in the rectal mucosa 10 to 20 mm above the dentate line, mucosal edge above the incision are sutured with silk for traction. Dissection with Swenson technique for the stenotic segment. Excision of the stenotic segment with restoration of the bowel continuity.

Group "B" patients are subjected to complete transanal Swenson pull-through according to the following steps: a circular incision is made in the rectal mucosa 10 to 20 mm above the dentate line, mucosal edge above the incision are sutured with silk for traction. Dissection with Swenson technique for the stenotic segment. Excision of the stenotic segment with restoration of the bowel continuity.

Statistical analysis

The data obtained were analyzed using SPSS (statistical package for social science) version 19.0 (SPSS Inc., Chicago, IL) on IBM (International Business Machines Corporation, Armonk, NY) compatible computer.

Two types of statistics were done:

Descriptive statistics [e.g., percentage (%), mean (x) and standard deviation (SD)],

Analytic statistics: to compare between different groups.

Results

The mean age of the patients at the time of operation were 18.9 months for the transanal group versus 21.3 months for the laparoscopic group. Patients were reviewed retrospectively. The mean follow-up period was 6 months, ranging from 3 to 12 months.

The mean operative time was less in the trans anal group versus laparoscopic group 90 min and 120 min respectively. The postoperative hospital stay was more in transanal group compared to the laparoscopic group (5.3 days versus 3.3 days) respectively. Intraoperative bleeding occurred in only one case of LAPT group vs no cases in the trans anal group. This case was controlled laparoscopically without need to convert to open surgery as shown in Table 3.

Regarding the early postoperative complications, none of the cases in both groups developed anal stenosis after dilatation. Three cases 15% developed postoperative enterocolitis in the trans anal group while 2 cases 10% of the cases of the laparoscopic group developed this complication in the early postoperative period. Bowel control was assisted for patients older than 3 years. Functional assessment was performed using the Cleveland Clinic Incontinence (CCI) score [13]. In this scoring system, the frequency of incontinence, in addition to the extent to which a person's life is altered, is evaluated using 5 questions assessing the type of incontinence (solid, liquid, gas, wears pad, lifestyle alteration). The frequency with which each type of incontinence occurs is rated on a scale from 0 (never) to 4 (always or 1/day). The frequencies are added to yield a total score, which can range from 0 to 20, with higher scores indicating higher levels of incontinence. A good outcome was considered when the patient was continent (score 0–4) or had mild incontinence (score 5–9). Poor outcome patients were those presenting with moderate (score 10–14) or severe (score 15–20) incontinence. Regarding our results, In the trans anal group 50% had normal continence, 30% of cases had mild incontinence and 20% had severe incontinence while the laparoscopic group had better outcomes regarding the degree of incontinence 70% of cases had normal bowel control, 20% had mild incontinence and only 10% had severe incontinence. Episodes of constipation occurred in 25% of case in the trans anal group versus 10% of cases in the laparoscopic group as shown in Table 4. None of our cases developed abscess formation, intestinal obstruction, intestinal ischemia, and enteric fistula formation.

Discussion

Since the first reports in the late 1990s, the transanal pull-through has become a popular procedure worldwide for Hirschsprung's disease management and either totally transanal or by the aid of laparoscopy [12, 17].

First laparoscopic-assisted transanal pull-through was done 1995 by Georgeson and first totally transanal pull-through was done by De La Torre 1998, both used soave technique for the dieesection of the transanal part. The modified Swenson procedure has been first reported and been modified in China by Xu et al. [7] in 2008. Now, the transanal pull-through Soave and Swenson procedures with or without laparoscopic assistance have become popular all over the world and both have many supporters. The rationale of the Soave operation is to decrease the risk of injury to pelvic structures, including autonomic nerves, urethra, prostate, or vagina, which can lead to devastating sequelae. The Swenson approach has the advantage of removing the affected rectal wall more thoroughly and inclines a lower risk of anastomotic strictures. The Swenson procedure reduces postoperative obstructive symptoms better than a Soave procedure [12, 14]. The majority of patients underwent Swenson procedures would not suffer from constipation for a long period of time.

There are several studies comparing transanal pull-through to LAPT using either submucosal dissection or Swenson techniques in the transanal part in relation to many factors as operative time, blood loss, early postoperative complications as abscess formation, anastomotic leak, complete disruption of coloanal anastomosis and late complications as anal stenosis, incontinence, eneterocolitis presence of obstructive defecation, and constipation [13].

In general, there was a significant difference related to duration of surgery demonstrating a significantly shorter duration of operation time for the transanal approach compared with LAPT similar to our study. This may be due to avoidance of time spent accessing the abdomen with a laparoscopically assisted procedure and concords with results from studies comparing open abdominal procedures with transanal pull-through [18]. It may be likely to be subject to a degree of case selection, it is possible that cases with shorter, less-complicated disease segments were preferentially chosen for the transanal approach.

Other relevant outcome assessed was the incidence of Hirschsprung's associated enterocolitis (HAEC) and functional gastrointestinal outcomes. We found no evidence to suggest any difference in rates of postoperative HAEC between TERPT and LAPT procedures in our study 15% versus 25% respectively while incidence of HAEC ranged from 10 to 45% across studies; this compares to a reported incidence of 5–35% from previous studies [19, 20]. The variable rates of HAEC reported may relate to inconsistent definitions between studies. Kim et al.(21) used a previously validated scoring system to assess severity and utilized a Delphi score to 'further secure uniformity' of the diagnosis of HAEC. Van de Ven et al. [22] also used a Delphi score to diagnose HAEC. Neither Ishikawa et al. [23] or Dahal et al. [24] included definitions for the diagnosis of HAEC.

In our study we found that there is significant difference between both groups in terms of fecal continence. The laparoscopic group had better outcomes regarding the degree of incontinence 70% of cases had normal bowel control compared to 50% in the trans anal group while in the other studies there was no difference in rates of fecal incontinence or constipation between TTERPT and LAPT groups. of crucial importance in the assessment of incontinence and constipation is an adequate period of follow-up to allow assessment of children at an age when continence should be expected and they

have gained the necessary level of maturity and communication skills to report these outcomes. Follow- up durations were variable in the four studies that assessed these outcomes. In our study we reviewed only cases that was more than 3 years similar to Kim et al. [21] who restricted their analysis to infants over 3 years of age and Ishikawa et al. (23) included only infants with three or more years of postoperative follow-up. Van de Ven et al. [22] included all infants with follow-up longer than 3 months. Dahal et al.[24]. did not set a minimum follow-up period, with an age range from 6 to 171 months. In all studies, the method used to assess fecal incontinence include an element of subjectivity. In our study we used the Cleveland Clinic Incontinence (CCI) score, while Kim et al. employed a previously published parental telephone interview survey of bowel function with investigators blinded to the patient's operative arm. Ishikawa et al. did not detail how follow-up data were obtained. There is some evidence that bowel function following definitive surgery for Hirschsprung's disease continues to improve until adolescence [25].

Dahal et al. acknowledge that the decision to utilize TTERPT or LAPT depended on results of barium enema, with longer segment disease more likely to be treated with a LAPT procedure. Reliance on a contrast enema to select patients for TTERPT introduces another potential difficulty for the surgeon as recent reports suggest that 10–31% of infants have no radiologically identifiable transitional zone (TZ) and a further 8–38% of reported TZs are discordant with the confirmed pathological length of aganglionosis [26].

Mark Levitt et al. stated that their data support the fact that a modification of Swenson's original transabdominal technique concept using the described tatally transanal procedure is an excellent technique for Hirschsprung's disease management, and produces good long-term results for fecal and urinary continence, and seems to preserve erectile function [27].

Conclusion

Laparoscopic transanal pull-through represent a lifeboat for neonates and infantes with Hirschsprung specifically with relatively long segment for feasibility of dissection and mobilization of colon. Laparoscopic approach achieved less complication with the same efficacy with transanal pullthrough. The functional outcomes after LAPT were satisfactory in term of fecal soiling compared to trans anal approach this may be due to less pelvic dissection compared to trans anal pull through.

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Authors' contributions
ML participated in the design and alignment of the study. AR participated in the sequence alignment and drafted the manuscript. AN participated in the design of the study and performed the statistical analysis. TF is the corresponding author and responsible for the publication and participated in the design of the study and drafted the manuscript. All authors participated in surgical procedures, read and approved the final manuscript.

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Availability of data and materials
The datasets used and/ or analyzed during this study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Prior to the inclusion of the patients in the study, an ethical clearance was sought from the competent authority of Menoufia University Hospitals by an informed consent from the patients' guardians.

Consent for publication
Another written informed consent was obtained from patients' guardians for publication of this research at the competent authority of Menoufia University Hospitals.

Competing interests
The authors declare that they have no competing interests.

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