Fecal incontinence after single-stage Soave's pull-through: abdominal versus transanal endorectal pull-through

Ossama M. Zakaria[a], Gouda M. El Labban[b] and Mohammed E. Shams[b]

Purpose **To compare the postoperative fecal continence and bowel functions between patients who underwent a single stage - Soave's endorectal pull through operations whether via the classic abdominal endorectal pull through approach (TAPT) or trans-anal endorectal pull through approach (TERPT).**

Patients and Methods **This retrospective study was performed on 50 HD consecutive patients who had undergone surgery during a period of 5 years from January 2002 to January 2007. They were two equal groups; group I (n=25) including patients who underwent TAPT; group II (n=25) including patients who underwent TERPT. Demographic, clinical data, preoperative investigations, operative records, postoperative outcome were studied. Post operative fecal continence score rate (FCSR) was assessed in children over the age of 4 years. Moreover, those with poor FCSR were further investigated by magnetic resonance imaging (MRI). Electromyography (EMG) and anorecatal manometery (AM) were also used in follow-up.**

Results **Twenty six patients (52%) had an excellent FCSR and eighteen patients (36%) showed good FCSR. However, 5 patients (10%) had a fair FCSR and only 1 patient (2%) suffered of a poor FCSR. There was no statistical significant difference between the two groups in neither anal manometry nor EMG. MRI did not show any abnormalities on pelvic floor and anal muscle complex on those patients who had fair or poor FCSR.**

Conclusion **The incidence of fecal incontinence is very low after Soave's pull-through operations whether TAPT or TERPT approaches with no statistical significant difference. *Ann Pediatr Surg* 8:5–8 © 2012 Annals of Pediatric Surgery.**

Annals of Pediatric Surgery 2012, **8**:5–8

Keywords: fecal continence, Hirschsprung's disease, Soave's operation, transanal endorectal pull-through

[a]Division of Pediatric Surgery and [b]Department of Surgery, Faculty of Medicine, Suez Canal University, Ismailia, Egypt

Correspondence to Ossama M. Zakaria, MD, PhD, Division of Pediatric Surgery, Department of Surgery, Faculty of Medicine, Suez Canal University, Ismailia, Egypt
Tel: +03 5740853; fax: + 03 5740853; e-mail: ossamaz2004@yahoo.com

Received 28 July 2011 **accepted** 22 October 2011

Introduction

Endorectal pull-through, originally described by Soave [1], is one of the standard operative procedures for Hirschsprung's disease (HD). Different surgical approaches for endorectal pull-through are available for the treatment of HD [1–5]. The choice often depends on the surgeon's preference. Good postoperative results have been reported by several authors [6–8]. However, it does have some technical disadvantages that the abdominal endorectal dissection between the mucosa and the seromuscular cuff is time-consuming and often difficult [7]. The remaining, relatively long seromuscular cuff is aganglionic, which may cause functional problems [1].

Transanal endorectal pull-through (TERPT) with or without laparoscopic assistance for HD has been widely applied as it has a low degree of invasiveness [5,7].

Recently, there have been several reports that compare long-term bowel function for TERPT procedure and conventional abdominal procedures [7,8]. However, many of these bowel function evaluations are based on clinical evaluations alone.

Herein, we report our comparison of fecal continence after a conventional Soave endorectal pull-through procedure whether through the transanal pull-through (TAPT) or TERPT approach using not only a clinical evaluation method, but also using some investigatory tools including anorectal manometery and electromyography and also MRI for those with fair or poor fecal continence score rate. We also aimed to investigate the effect of age at surgery on the postoperative outcome.

Patients and methods

This is a retrospective study that was performed on 50 consecutive patients with HD proved by barium enemas and verified through rectal biopsies. These patients had undergone Soave's endorectal pull-through operation during a period of 5 years from January 2002 to January 2007. They were randomly categorized into two equal groups: group I ($n = 25$) including patients who underwent TAPT and group II ($n = 25$) including patients who underwent TERPT operation. All patients in the TREPT group were having the narrow segment at or below the level of the rectosigmoid junction as shown in preoperative barium studies. Patients with Down's syndrome were excluded, as their postoperative outcome may be variable, along with those who underwent colostomy as an initial line of HD management. The patients who proved to have a short or an ultrashort segment HD were also excluded.

After approval of the hospital ethical committee on the study methodology, patients' files were studied thoroughly regarding demographic data including age of presentation, sex, history of consanguinity, similar cases in the family, clinical data including natal and postnatal history, delayed

1687-4137 © 2012 Annals of Pediatric Surgery DOI: 10.1097/01.XPS.0000407759.30719.57

passage of meconium, neonatal intestinal obstruction and/or chronic constipation, and fecal soiling and/or encopresis in older children. Records were also reviewed for the data of clinical examination including anthropometric measurements including patients' weight, height, and BMI.

The preoperative preparations tools were also recorded, including frequency of colonic wash out and chemical rectal preparations used before surgery, investigations including conventional radiological investigations or rectal biopsies, and operative data including the technique used, the mean operative time, and intraoperative difficulties or complications if any.

Postoperative outcome and results of follow-up for a period of at least 4 years after surgery were studied, including some common complications such as enterocolitis and fecal incontinence. FCSR using the Wingspread scoring system was applied to all patients at least 6 months after surgery. This scoring system has been widely used for postoperative continence evaluation in patients with anorectal anomalies, although some did use it in patients with HD [9].

In this Score, an excellent or a very good score means a totally continent or very occasional stress-related soiling of underclothes without constipation. Toilet trained with no medication. A good score was considered if the patient rarely soils, except during exercise or constipation that is amenable to management with medication, whereas a fair score means intermittent soiling, urge incontinence, frequent loose stools, or constipation that requires enema. A poor score means constant fecal soiling and smearing and constipation only responsive to enema.

A formal written consent was obtained from patients' guardians before postoperative AM and EMG were applied in 25 patients who did not show an excellent FCSR ranging from good to poor. These procedures were performed in not less than 1 year after surgery.

AM evaluated the maximum resting pressure, where a normal value was considered to range between 50 and 80 mmHg, and a normal maximum squeeze pressure between 90 and 180 mmHg. A low maximum resting and squeeze pressure indicate weak anal sphincter muscles. All EMG results were also reviewed thoroughly. Data were collected, revised, and entered coded into a computer statistical program. MRI was performed in six patients who showed a fair and poor FCSR.

The Statistical Package for Social Sciences (SPSS version 17 SPSS; Chicago, Illinois, USA) was used for both data tabulation and analysis. Data were presented as appropriate in the form of frequencies and percentages, mean and SD; a χ^2-test was used for qualitative data, and Student's *t*-test was used for quantitative data. The level of significance selected for this study is $P \leq 0.05$.

Table 1 Age at pull-through among both groups ($n=50$)

Age at pull-through	TERPT (%)	TAPT (%)	Total (%)
6 months	12 (48)	3 (12)	15 (30)
1 year	6 (24)	4 (16)	10 (20)
2 years	4 (16)	7 (28)	11 (22)
3 years	2 (8)	3 (12)	5 (10)
4 years	1 (4)	8 (32)	9 (18)
Mean ± SD	2.1 ± 0.9	3.7 ± 1.2	50

TAPT, transanal pull-through; TERPT, transanal endorectal pull-through.
Statistical significant ($P<0.01$).

Table 2 Family history characteristics of all the studied patients ($n=50$)

	Number	Percentage
Family history of Hirschsprung's disease		
Yes	4	8
No	46	92
Total	50	100
Consanguinity		
Yes	21	42
No	29	58
Total	50	100

Table 3 Operative time among both groups of the study ($n=50$)

Operation time (hours)	TERPT	TAPT	*P* value
Mean ± SD	1.7 ± 0.4	2.6 ± 0.5	<0.001*
Range	1.5–2	2–3	

TAPT, transanal pull-through; TERPT, transanal endorectal pull-through.
*Statistically significant ($P<0.05$).

Results

Fifty patients were included in this study. They were 27 men and 23 women, with a male to female ratio of 1.2 : 1. Of those patients, 14 and 13 men underwent TERPT and TAPT, respectively, whereas 11 and 12 women underwent TERPT and TAPT, respectively.

The mean age of the patients studied was 2.9 ± 2.2 years, with 30% of the patients aged between 6 months and 1 year.

TAPT was performed on older children compared with those who underwent TERPT. The age was 3.7 ± 1.2, 2.1 ± 0.9 in TAPT and TERPT groups, respectively. This was statistically significant ($P = 0.04$) (Table 1).

Older children needed more frequent days (2.3 ± 1.6) for colonic preparations to get their colon evacuated compared with younger children (4.1 ± 0.8).

A positive family history of familial similar conditions was seen in 8% of patients, whereas consanguinity was positive in 42% of the sample (Table 2). There was no statistically significant difference between patients subjected to TAPT or TERPT regarding percentiles of height, weight, and BMI.

All patients in both groups underwent an erect abdominal radiograph followed by barium enema without preparation at the lateral view delineating the classic narrow segment of HD for leveling purposes.

The narrow segment was present at or below the rectosigmoid junction in the TERPT group, and this was the prime reason to use this technique in surgery.

In 13 patients (26%), the barium enema results were not conclusive. Yet, all of the studied patients have undergone rectal biopsies to prove the presence of an

Table 4 Relation between Wingspread system scoring system for incontinence and age at surgery ($n=50$)

	Group I			Group II			
Age (years)	Excellent	Good	Fair	Excellent	Good	Fair	Poor
<1	7	1	0	6	1	0	0
1–2	4	7	0	6	3	1	0
>2	1	4	1	2	2	3	1
Total	12	12	1	14	6	4	1
Spearman (r)	−0.564 ($P=0.003$)*			−0.516 ($P=0.008$)*			

*Significant, $P<0.05$.

aganglionic segment. In TAPT patients, the mean operative time was significantly longer than in the TERPT group (Table 3).

All of our patients were available for follow-up through the study period, with no follow-up losses.

Moreover, postoperative course showed recurrent admission of two patients of the TAPT group because of adhesive intestinal obstruction that was relieved conservatively. Other patients suffered from postoperative fever due to wound contamination.

The only patient older than 6 years at the time of surgery was estimated to have poor continence according to the Wingspread scoring system for incontinence. In contrast, all patients aged 6 months to 1 year at the time of surgery proved to have either an excellent or a good FCSR when performed after reaching the age of 4 years. The mean age when FCSR was estimated in all patients was 4.9 years.

Five patients including this 6-year-old boy suffered from postoperative enterocolitis during their follow-up. They were amenable to conservative treatment, including colonic wash out with intravenous metronidazole after being readmitted to the hospital without any needed colostomies (Table 4).

Out of the 25 patients who underwent AM, the maximum resting pressure and maximum squeeze pressure were estimated to be abnormal in only two patients (4%).

All of the 25 patients showed normal EMG, except three patients in whom EMG showed myopathy and neuropathy with no statistically significant difference between both groups. In contrast, none of the six patients with a fair or a poor continence score rate showed any abnormal MRI findings of the pelvic floor or the anorectal muscle complex.

Discussion

Soave used the endorectal dissection technique for the treatment of HD to avoid pelvic manipulations completely by making the dissection within the rectal wall, leaving the aganglionic muscular cuff to protect the anastomosis. The same rationale has been used in the TERPT operation. However, there has been increasing recognition that some children experience long-term problems with obstructive symptoms, fecal incontinence, and constipation with intermittent incontinence and enterocolitis. It was reported that more than 20% live with undesirable complications [10].

In our current study, we evaluated fecal continence after the most recent surgical techniques for the management of HD in pediatrics: TERPT and the classic TAPT approaches. In the group of TERPT, most of the patients have been operated at the age of 6 months up to the age of 4 years, whereas more patients in the TAPT group underwent operation at a higher age as they were operated upon during the early study period when most of our team was not yet fully familiarized with the TERPT. As the transanal approach is more popular now, there was no bias toward this approach with younger patients. This does not affect the follow-up and the true outcome. This may be due to the surgeon's preference to use the TERPT in younger patients because of the feasibility and easiness of the technique in younger age, especially on uncolostomiesed patients.

In this series, the higher age at the time of definitive surgery compared with the data in the literature is attributed to the fact that most of our patients came from rural areas with poor resources where they had been neglected and/or treated for habitual constipation.

The mean operative time was significantly shorter in TERPT as it lasted from 1.5 to 2 h, whereas TAPT operation took from 2–3 h. Among all of the studied patients, poor continence was found in only three patients and fair continence among seven patients. No statistically significant difference was detected between TERPT and TAPT procedures during the follow-up period regarding the results of the Wingspread scoring system when performed after having reached the age of 4 years during follow-up.

Only one patient had a poor Wingspread score. He had been operated by TAPT, at an age above 6 years. This finding may be due to the older age while performing the operation rather than due to causes related to the procedure itself. We have evaluated all patients through results of postoperative anal manometry, measuring the maximum resting and squeeze pressures and EMG. Patients who were estimated to have poor and fair Wingspread scores were further evaluated through MRI.

In our series, TERPT proved to be superior to TAPT as the risks of contamination and adhesion formation are eliminated. It also does not damage the pelvic structures. It is not expensive, and has the most optimal cosmetic results. This has also been concluded in some published data [2–4,11].

Although our findings did not show any significant change in continence between TAPT and TRAPT patients, some published data have shown significantly better (two-fold) results regarding the continence score for the abdominal approach compared with the TAPT. The stool pattern and enterocolitis scores were somewhat better in the TERPT group. Their findings raise an important issue about the current surgical management of HD; yet, more cases will need to be studied before a definitive conclusion can be drawn [12]. Nevertheless, in newly published data of a multicentric study, it was concluded that TERPT was associated with fewer complications and fewer episodes of enterocolitis. In contrast to prior studies, TERPT patients did not have a higher rate of incontinence [13].

One potential problem in the TERPT procedure is the greater amount of traction on the anal sphincters to perform the endorectal dissection and anastomosis. Such a manipulation of the anal canal has been associated with significant problems in adult patients [3].

Interestingly, in a previously published study, short-term manometric findings and stool patterns showed no differences between the TAPT and the TERPT approaches. Specifically, no significant difference was noted on comparing the postoperative anal resting pressure [14].

This finding is consistent with our results, as we have reported that the postoperative manometric findings were not statistically significant among both groups. Both maximum resting and squeeze pressures were found to be normal among all patients but for two patients who underwent TAPT; those patients showed a poor continence score rate (one patient) and a fair continence score rate (one patient).

Moreover, we found no significant differences between total scores in the two groups. This is inconsistent with two studies performed on adults, documenting changes in manometric findings after similar transanal procedures [8,15]. In one study, 21 patients underwent a transanal rectocele repair, and in the other study, 40 patients were selected at random for a hemorrhoidectomy with or without the use of an anal retractor. Both of these reports showed lower resting anal pressures and squeeze pressures postoperatively compared with controls [8].

In addition, in a large multicenter study [2], it was reported that transient soiling and increase in bowel movements do exist in a significant number of patients; the cause was attributed to the overstretching during surgery that led to a transient soiling.

Other authors claimed that another possible cause of poorer continence in the TERPT procedure is the consistently very low coloanal anastmosis that might damage the very delicate sensory nerves in the mucosa just above the dentate line. These critical nerves are responsible for differentiating between gas, solid, and liquid stool and play a very important role in continence mechanisms [15].

Our results of EMG were very important as they showed that three patients with abnormal results described as myopathy and neuropathy were all operated upon by TAPT and had poor (one patient) and fair (two patients) Wingspread scores.

This may be explained by many previous reports [1–3] documenting that there is probably a preexisting neuromuscular disorder among patients with HD that persists after the surgical correction and resulted in the abnormal EMG findings as in our study.

MRI was normal in patients with poor and fair Wingspread scores, ensuring that there is no obvious muscular cause of the incontinence among them.

On the basis of our current results, it may be concluded that neither TAPT nor TERPT is favored over the other regarding continence, and still both showed high levels of success. The reported incontinence was not associated with anatomical disruption as noted by results of MRI, but it was associated with abnormal EMG results, denoting that the reported fecal incontinence after HD surgery may not be due to surgical reasons. EMG and anorectal manometery, even if not feasible in younger children, should be tried in those around the age of 3 years or lesser as they proved effective in our series.

It is recommended that the earlier the surgical management of HD, the lower the incidence of fecal incontinence. Health education and counseling with parents are essential to clarify the importance of performing the surgery as early as possible to avoid postoperative complications, especially fecal incontinence.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

References

1 Langer JC, Seifert M, Minkes RK. One-stage Soave pull-through for Hirschsprung's disease: a comparison of the transanal and open approaches. *J Pediatr Surg* 2000; **35**:820–822.

2 Krivchenya DY, Silchenko MI, Soroka VP, Pritula VP, Khursin VN. Endorectal pull-through for Hirschsprung's disease: 17-year review of results in Ukraine. *Pediatr Surg Int* 2002; **18**:718–722.

3 Elhalaby EA, Hashish A, Elbarbary MM, Soliman HA, Wishahy MK, Elkholy A, *et al*. Transanal one-stage endorectal pull-through for Hirschsprung's disease: a multicenter study. *J Pediatr Surg* 2004; **39**:345–351, discussion 345–351.

4 Langer JC, Durrant AC, de la Torre L, Teitelbaum DH, Minkes RK, Caty MG, *et al*. One-stage transanal Soave pullthrough for Hirschsprung disease: a multicenter experience with 141 children. *Ann Surg* 2003; **238**:569–583, discussion 583–585.

5 Kohno M, Ikawa H, Konuma K, Masuyama H, Fukumoto H, Ogawa E, *et al*. Comparison of the postoperative bowel function between transanal endorectal pull-through and transabdominal pull-through for Hirschsprung's disease: a study of the feces excretion function using an RI-defecogram. *Pediatr Surg Int* 2009; **25**:949–954.

6 Ishikawa N, Kubota A, Kawahara H, Hasegawa T, Okuyama H, Uehara S, *et al*. Transanal mucosectomy for endorectal pull-through in Hirschsprung's disease: comparison of abdominal, extraanal and transanal approaches. *Pediatr Surg Int* 2008; **24**:1127–1129.

7 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.

8 Van Tets WF, Kuijpers JH, Tran K, Mollen R, van Goor H. Influence of Parks' anal retractor on anal sphincter pressures. *Dis Colon Rectum* 1997; **40**:1042–1045.

9 Morabito A, Lall A, Gull S, Mohee A, Bianchi A. The impact of Down's syndrome on the immediate and long-term outcomes of children with Hirschsprung's disease. *Pediatr Surg Int* 2006; **22**:179–181.

10 Obermayr F, Szavay P, Beschorner R, Fuchs J. Outcome of transanal endorectal pull-through in patients with Hirschsprung's disease. *Eur J Pediatr Surg* 2009; **19**:220–223.

11 De la Torre L, Ortega A. Transanal versus open endorectal pull-through for Hirschsprung's disease. *J Pediatr Surg* 2000; **35**:1630–1632.

12 El Sawaf MI, Drongowski RA, Chamberlain JN, Coran AG, Teitelbaum DH. Are the long-term results of the transanal pull-through equal to those of the transabdominal pull-through? A comparison of the 2 approaches for Hirschsprung's disease. *J Pediatr Surg* 2007; **42**:41–47.

13 Kim AC, Langer JC, Pastor AC, Zhang L, Sloots CEJ, Hamilton NA, *et al*. Endorectal pull-through for Hirschsprung's disease-a multicenter, long-term comparison of results: transanal vs. transabdominal approach. *J Pediatr Surg* 2010; **45**:1213–1220.

14 Kubota M, Suita S, Kamimura T, Ito Y, Szurszewski JH. Electrophysiological properties of the aganglionic segment in Hirschsprung's disease. *Surgery* 2002; **131(1 Suppl)**:S288–S293.

15 Vorm HN, Jensen SI, Qvist N. Lateral sphincteromyotomy in patients with outlet obstruction after surgery for Hirschsprung's disease and short-segment disease. *Pediatr Surg Int* 2002; **18 (5–6)**:368–370.