Original research

ONE-STAGE TRANSANAL ENDORECTAL PULL-THROUGH FOR TREATMENT OF HIRSCHSPRUNG'S DISEASE: IMPACT OF ADDITIONAL ABDOMINAL APPROACH

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ABSTRACT

Background: *The transanal one-stage endorectal pull-through (TOSEPT) procedure sometimes requires assistance by an abdominal approach to complete the operation. This study aims to rectify this by evaluating the impact of an assisted abdominal approach in the outcomes of the TOSEPT in children with HD.*

Methods: *A retrospective study was conducted at surgical pediatric department of Hue central hospital. All consecutive medial records of patients operated on for HD in our department between June 2010 and June 2018 were retrieved and analysed.*

Results: *66/446 (14.79%) patients with HD who required TOSEPT with an additional abdominal approach to complete the operation for inclusion in this retrospective study.Length of the resected colon: 13.30 ± 3.45 cm (open group) and 19.70 ± 4.50 cm (laparoscopic group). Average operative time: 156 ± 12 minutes (open group) and 170 ± 14 minutes (laparoscopic group). No deaths or intra-operative complications were recorded in this study. No postoperative complicationoccuredin the laparoscopic group. Grade II complication based on Dindo-Clavien classification occurred in 14 (21.21%) of the open group and one (1.51%) grade III complication. The length of hospital stay was shorter in the laparoscopic group at 5 ± 1.5 days compared to 7 ± 2.5 daysfor the open group.All of the complications were grade I or II, mainly enterocolitis at3-monthfollow-up.*

Conclusion: *Additional abdominal approach impacts on post-operative results of TOSEPT procedure for HD but not on outcome of disease. Laparoscopic surgery as the additional abdominal approach should be used to reduce the complications*

Keywords: *Hirschsprung's disease, Transanal one-stage endorectal pull-through, additional abdominal approach.*

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I. INTRODUCTION

Since its introduction more than two decades ago the transanal one-stage endorectal pull-through (TOSEPT) procedure has gained worldwide acceptance in thetreatment ofchildren with Hirschsprung's disease (HD) [1,2]. Laparoscopic endorectal pull-through has recently be proved a feasible and safe treatment for HD [3-7], however, TOSEPT is still the procedure of choice for patients with a mid-low rectosigmoid transition zone due to its simplicity and effectivenesscoupled with a short operative time and recovery duration [8-12].

Unfortunately, not all procedures could be performed entirely by TOSEPT, some cases require an additional abdominal approach to complete the surgery. This study aims to identify the causes for this additional step and evaluate the impact of an additional abdominal approachto outcomes in children with HD.

II. METHODS

A retrospective study was conducted at surgical pediatric department of Hue central hospital. This study was approved by the ethics committee of the hospital. All consecutive medial records of patients operated on for HD in our department between June 2010 and June 2018 were retrieved.

For each patient, the following data was collected. The patients were divided into 2 groups to analysis the surgical results.

- Age at surgery
- Length of resected segment
- Additional abdominal procedure required: laparoscopic or open procedure
- Causes of additional abdominal approach to TOSEPT
- Operative duration
- Any intraoperative events
- Immediate postoperative complications
- Length of hospital admission
- Complications at 3 months based on Clavien-Dindo classification [13].

Statistical analysis: Data was analysed in two groups dependent on if the patients had an open or a laparoscopic additional abdominal procedure.

Data are reported as mean and standard deviation. Chi-square or Fisher's exact test were usedto compare categorical data. Independent t-tests and analysisof variancewere used to compare among two groups.

III. RESULTS

A total of 446 consecutive patients operated on for HD with histopathological proof were retrieved from our databases, of whom 24 patients (5.38%) scheduled initially for a laparoscopic-assisted endorectal pull-through procedure so were excluded from the study. The 422 remaining patients were operated with TOSEPT in which 356 patients who only required TOSEPT. This left 66 (14.79%) patients with HD who required TOSEPT with an additional abdominal approach to complete the operation for inclusion in this retrospective study.

52 (78.79%) of these patients required an additional open procedure via a transverse incision in the left lower quadrant. The 14 remaining patients (21.21%) required a laparoscopic procedure with 4 ports (10 mm umbilical port and three 5 mm ports in left, right lower quadrant and right flank). Patients who underwent an open procedure had a mean age of 3 ± 1.2 months while patients who had a laparoscopic procedure had a mean age of 35 ± 6.5 months. Age distribution and the additionalabdominal procedurewas detailed in **(Table 1)**.

Table 1: Age distribution and additional procedures

Age (month)	Open, n (%)	Laparoscopic, n (%)
	52 (78.79%)	14 (21.12%)
< 1	22 (33.33%)	0 (0)
1-12	18 (27.27%)	4 (6.06%) *
> 12	12 (18.18%)	10 (15.16%)

*> 6 months

There were 4 reasons identified in this study which prevented the completion of the procedure by TOSEPT alone. These are detailed in **(Table 2)**.

Table 2: Reasons for additional abdominal approach being required

Reason	Age of patient			
	< 1 month	1-12 months	>12 months	Total
Sigmoid colon adherent to lateral abdominal wall		8	8	16 (24.24)
Pelvic inflammation	4	0	0	4 (6.06)
Extremely dilated rectum and colon	0	0	4	4 (6.06)
Long aganglionic segment	18	14	10	42 (63.63)
Total	22	22	22	66 (100)

All of 14 patients who had a laparoscopic additional abdominal procedure required this due to a long aganglionic segment

The meanlength of resected colon was 13.30 ± 3.45 cm in the open group and 19.70 ± 4.50cm in the laparoscopic group (p<0.0001). The average operative time was 159 ± 12 minutes overall with a mean operative duration of 156 ± 12 minutes for the open procedures and 170 ± 14 minutes (p=0.0004) for the laparoscopic procedure.

There were no deaths or intra-operative events for any of the patients in this study.

No post-operative complications occurred in the patients who underwent additional laparoscopic procedure. Of thesepatients who underwent an additional open procedure, there were 14 (21.21%) grade II postoperative complicationsand1(1.51%) grade III postoperative complication.

Duration of hospital stay was 7 ± 2.5 days in the open groupand 5± 1.5 daysin laparoscopic group (p=0.0059). Postoperative complications aredetailed in **(Table 3)**.

Table 3: Postoperative complications

Clavien-Dindo classification		Complication n (%)	
Grade II	Incisional infection	10 (15.15)	14 (21.21)
	Intestinal obstruction	2 (3.03)	
	Anastomotic infection	2 (3.03)	
Grade III	Abdominal evisceration	1 (1.51)	

The follow-up results at 3 months are showed in **(Table 4)**.

Table 4: Follow-up results at 3 months

The follow-up results at 3 months	Open group n (%)	Lap. group n (%)	Clavien-Dindo grade	Total n (%)	p
Enterocolitis	7 (10.61)	3 (4.55)	II	10 (15.15)	0.49
Anastomotic stenosis	2 (3.03)	0 (0)	II	2(3.03)	0.51
constipation	4 (6.06)	0 (0)	I	4(6.06)	0.34
Mucosal prolapse	3 (4.55)	1 (1,52)	I	4(6.06)	0.60
Total	16 (24.25)	4 (6.07)	I-II	20 (30.30)	

IV. DISCUSSION

Although the incidence of TOSEPT associated with an additional abdominal approach was low (14.79%), the impact of the additional abdominal approach on the surgical results were highlightedby the above data.

Preoperatively, the patients in this study were assessed as requiring TOSEPT alone however this was found not to be possible intraoperatively. The reasons for the additional abdominal approach being required in this study were found to be sigmoid colon adherent to lateral abdominal wall, pelvic inflammation, long aganglionic segment or an extremely dilated rectum and colon. Long aganglionic segment was the main reason for additional abdominal approach which acounted for 63.63% and appeare in all of period. Except in neonates where only 75% of patients with HD will demonstrate a transition zone on barium enema [9], the long aganglionic segment could be identified before surgery by careful evaluation of colonography [14] and laparoscopic approach considered initially in these cases [11]. On the other hand, this situation might still be encountered because most pediatric surgeons prefer TOSEPT to laparoscopy due to its simplicity and advantages in neonates, in whom fixation of colon to retroperitoneum is looser which allows the resection of long segment of descending colon through the anus, this in reverse to the more laborious procedure in older patients [10]. So, It is the opinion of the authors that the additional abdominal approach should be used without hesitation when the TOSEPT alone is insufficient and laparoscopic approach should be the method of choice [15].

There were no intra-operative complications in this study but the rate of post-operative complication was rather high. Most of the complications related to abdominal incisions.The postoperative complication rate was 22.72%, in which 21.21% of patients were classified as grade II and 1.51% grade III following the Clavien-Dindo classification **(Table 3)**.

In this study, no cases of anastomotic leakage or remaining aganglionic segment were reported, however these complications have been reported in other studies although the rate of these complication was low [4,8,12,16]. The 3-month follow-up complication rate was 24.25%, mainly enterocolitis which was similar to the TOSEPT alone approach [12,16]. There was no statistically significant difference between additional open and laparoscopic procedure **(Table 4)**. Importantly however in using an additional abdominal approach, these infants were definitively treated in one-stage, rather than undergoing a three stages surgery with the associated surgical complications, anaesthetic risk and requirement of stoma care.

Additional laparoscopy was used in 14 (21.21%) cases, most of these were in patientsolder than 12 months old (10 cases) with only 4 additional cases in patients between 6 months-12 months old. Additional laparoscopy was not utilized due to a lack of experience in pediatric laparoscopy among the operating surgeons, especially in newborn patients where small abdominal cavity combined with serious abdominal distention made the surgeons like open approach than laparoscopic approach although Georgeson has proved that laparoscopy is feasible and safe in neonates [1].

In the cases of extremly dilated rectum-colon which mainly occured in children older than 12 months, all patients required an open additional abdominal approach. This was because the operative time for these cases was already long and the surgeons did not want to prolong this further by using additional laparoscopy. In the authors'opinion, TOSEPT was not suitable for these cases, and laparoscopy should be initially indicated although Miyano also showed the significative longer operative time for older children [4].

A laparoscopic approach showed promise in this study with no intra-operative or post-operative complications recorded. The length of resected colon

was longer ($p<0.0001$) and hospital stay was shorter ($p=0.0059$) in comparison between additional laparoscopic and open surgery. The disadvantage of laparoscopic surgery was the operative time which was significatively longer than open group ($p=0.0004$), this has also been noted previously in other studies [2,3,5].

V. CONCLUSION

Additional abdominal approach impacts on post-operative results of transanal one-stage endorectal pull-through procedure for Hirschsprung disease but not on outcome of disease. Laparoscopic surgery as the additional abdominal approach should be used to reduce the complications.

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