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Original Article

Laparoscopic assisted transanal pull through and Duhamel pull through for the treatment of short segment Hirschsprung's disease: A comparative study of outcome

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Abstract

Background: The goal of surgical management for Hirschsprung's disease is to remove the aganglionic bowel and reconstruct the intestinal tract by bringing the normally innervated bowel down to the anus while preserving normal sphincter function.

Objectives: Present study aimed to determine a better procedure of pull through operative procedure for Hirschsprung's disease by a randomized comparison.

Patients and Methods. This interventional study was performed in the department of Paediatric Surgery, Rajshahi Medical College Hospital, Rajshahi, Bangladesh, over a period of one year (from March 2022 to April 2023). A total of 53 patients who were suffering from short segment Hirschsprung's disease, were included in present study as per inclusion and exclusion criteria and randomized into two groups under study, namely; Laparoscopic assisted transanal pull-through and Duhamel pull-through operations. Primary outcome measured by persistent obstructive symptoms, anastomotic strictures, persistent or acquired aganglionosis and fecal incontinence.

Results: Early per operative and postoperative complications, including bleeding, infection, injury to adjacent organs were not troublesome but differences in two groups under study, were significant and findings were in favour of laparoscopic procedure. Persistent obstructive symptoms and aganglionosis occurred in greater percentage in Duhamel procedure but anastomotic strictures and fecal incontinence were commoner in percentage in the laparoscopic variant.

Conclusion: The advantages of laparoscopic assisted transanal pull-through include its improved cosmesis, reduced hospital costs, hospital stay, operating time. But anastomotic strictures and fecal incontinence remain as a critical issue for long term outcome.

Key words: Hirschsprung's disease, Laparoscopic, Pull through, Duhamel, Proctocolectomy, Short segment, Trans anal.

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Introduction

Hirschsprung's disease is a common cause of neonatal intestinal obstruction that is of great interest to pediatric surgeons throughout the world, occurs in approximately one in 5000 live born infants.[1,2]

The basic pathophysiological feature in Hirschsprung's disease is a functional obstruction caused by a narrowed distal aganglionic colonic segment that prevents the propagation of peristaltic waves.[3,4] It is characterized by absence of ganglion cells in the distal bowel beginning at the internal sphincter and extending proximally for varying distance.[5]

The goals of surgical management for Hirschsprung's disease are to remove the aganglionic bowel and reconstruct the intestinal tract by bringing the normally innervated bowel down to the anus while preserving sphincter function. There have been many operations devised to accomplish these goals, but the most commonly performed at the present time are the

Swenson, Duhamel, and Soave procedures.[6,7] Although there have been many published series comparing these operations, none have been either prospective or controlled, and it is therefore difficult to determine if there are any significant advantages of one over the others.[8]

The Duhamel technique was advanced in 1956 to avoid the tedious pelvic dissection of the Swenson procedure, and to protect the Nervi erigenti, which may be found lateral and anterior to the rectum. The procedure has undergone several modifications, the most important of which was by Martin and included the use of an automatic stapling device. It is fairly straightforward and continues to be popular today.[9]

Over the past decades, however with the evolution of minimal access surgery, the one-stage trans-anal and laparoscopic procedures have become increasingly popular.[10] The study objectively evaluated the outcomes of two surgical techniques. The ultimate objective was to find out a better procedure of pull through procedure in Hirschsprung's disease.

Materials and methods

This interventional study was performed in the department of Paediatric Surgery of Rajshahi Medical College Hospital, Bangladesh, over a period of one years (March 2022 to April 2023). On clinico-radiological suspicion of Hirschsprung's disease, all patients, aged between 2 to 13 years underwent primary decompressing colostomy with multiple levelling biopsy from the, collapsed bowel, transition zone and colostomy site. All these patients were histopathologically confirmed. Fully informed consent from the parents after discussing with them the operative procedure and the possible intraoperative and postoperative complications was obtained. The study included 53 pediatric patients, who were suffering from short segment Hirschsprung's disease (affected the recto-sigmoid region of the colon). The patients were divided into two groups by random method.

Outcome measures

Primary outcome measure

1. Persistent obstructive symptoms, anastomotic strictures, persistent or acquired aganglionosis, fecal incontinence [time frame: 6 months] patients were assessed at 1 week, 6 week and six months to detect presence of persistent obstructive symptoms, anastomotic strictures, persistent or acquired aganglionosis and fecal incontinence.

Secondary outcome measures

- Post-operative complications including wound infection, post-operative ileus. [Time frame: 2 weeks]
- Per operative complications –bleeding, injury to other organs [Time frame: during operation]
- Operating time [Time frame: during operation], defined as, time from initial skin incision to complete wound closure.
- Length of hospital stay [Time frame: from day of procedure to discharge]

Inclusion criteria

Children with Hirschsprung's disease involving the rectosigmoid region of the colon (short segment type) were eligible for participation in the study.

Exclusion criteria

- Having undergone previous colorectal surgery for Hirschsprung's disease other than rectal biopsy and colostomy.
- Associated congenital syndromes (e.g. Down's syndrome).
- Ultra short or total colonic aganglionosis, having acute enterocolitis
- General unsuitability due to other causes as congenital heart diseases, etc

Operative procedure (laparoscopic assisted pull through)

After general anesthesia the complete lower body was prepared and draped, including the abdomen and the perineum. The monitor was placed near the left leg. The surgeon stood on the right, the assistant on the left side.

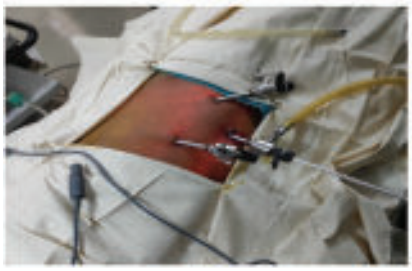

Fig. 1: *Port insertion.*

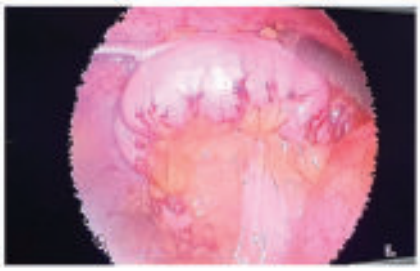

Fig. 2: *Visualization of mesocolon*

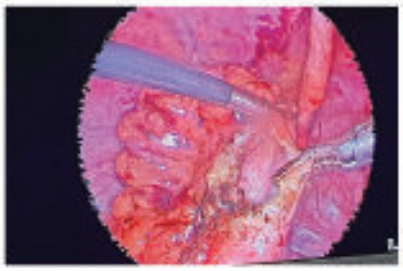

Fig. 3: *Coagulation of mesosigmoid*

The umbilical port was inserted using an open technique, and the other ports were introduced under direct visualization. The telescope was placed through the 5 mm port in the right upper abdomen for better visualization of mesocolon. A urinary catheter was introduced to decompress the bladder. The table was tilted to head down.

The sigmoid was pulled up towards the spleen in order to spread its mesocolon. The mesosigmoid was coagulated and opened with either a monopolar hook, biplarforcep or ligasure. Dissection was limited to a few millimeters away from the bowel wall proximally and the marginal artery along the bowel wall was preserved . At the rectum the posterior wall of the rectum was only dealt with. Perineal part of the pull through was performed as per classic transanal procedure.

Fig.-4: *Transanal procedure*

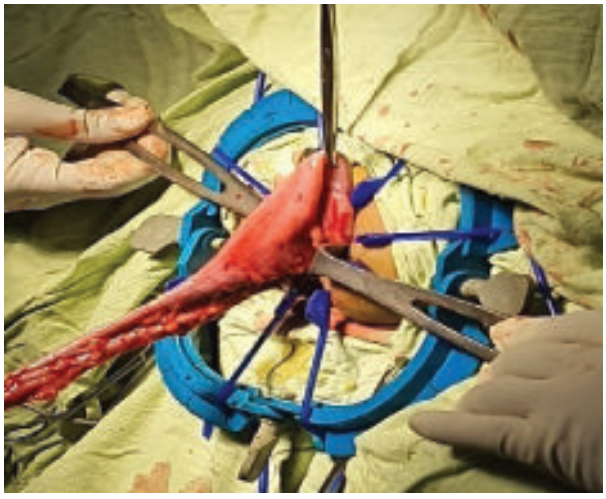

Fig.-5: Completion of transanal pull through

Duhamel procedure

Initially, biopsies were taken at appropriate sites by a staged laparotomy- biopsy technique. The sigmoid colon and upper rectum were mobilized after opening the lateral peritoneum. The rectum was divided just above or at the peritoneal floor, similar to Hartmann's operation by linear stapler or hand sewing. The narrowed aganglionic zone and the megacolic segment were mobilized simultaneously. Most of the dilated portion of the colon was resected in order to allow an easier anastomosis.

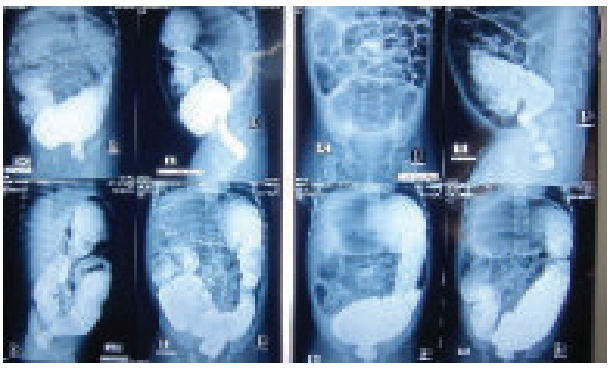

Fig.-6: *Enema X ray of colon*

Fig.-7: *Visualization of transitional zone.*

Fig.-8: *Creation of common channel.*

The opening of the mesorectum provided good access to the retrorectal space. This space was cleaved down to the pelvic floor. A posterior semicircular incision was made, just above the dentate line . The proximal portion of the colon was then grasped and pulled downwards into the retrorectal space without twisting and through the posterior anal incision, creating an end-to-side colorectal anastomosis, linear cutter stapler was used for side to side anastomosis and creation of common channel.

Methods of data collection and analysis

In each case, detail information about the patient was collected from the parents or accompanying guardians. All these informations were gathered systematically and put into questionnaire of protocol. These included name, age, address, antenatal, natal, postnatal history, family history, consanguinity etc. Collected data were arranged in systemic manner, presented in various tables and figures and statistical analysis was made to evaluate the objectives of this study.

Statistical analysis was performed using SPSS software (version 16). The significance of differences and comparisons among the mean values were determined by Duncan's multiple range tests (DMRT) formulation at 5% level, P value was reached by Chi Square test, and unpaired t-test ($p<0.05$).

Results

The important observations were tabulated and hereby briefly described.

Table I

Age distribution for laparoscopic assisted transanal pull through and Duhamel pull through operations

Age distribution	Lap assisted pull through	Duhamel pull through	Total
2-5	7	6	13
6-9	11	8	19
10-13	9	12	21
Total	27	26	53

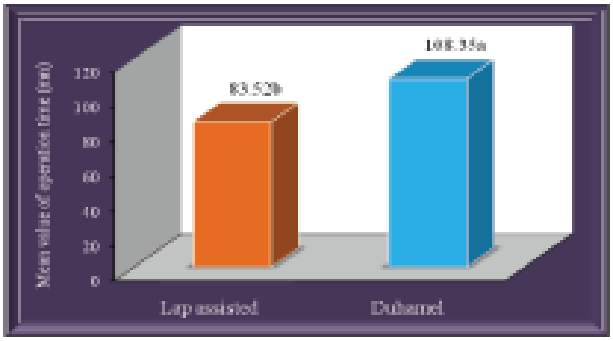

Fig.-1: *Comparison of operation time (minutes) for laparoscopic assisted transanal pull-through and Duhamel pull through operations. The value followed by different letter is significantly different at P<0.05 according to Duncan's multiple range test (DMRT).*

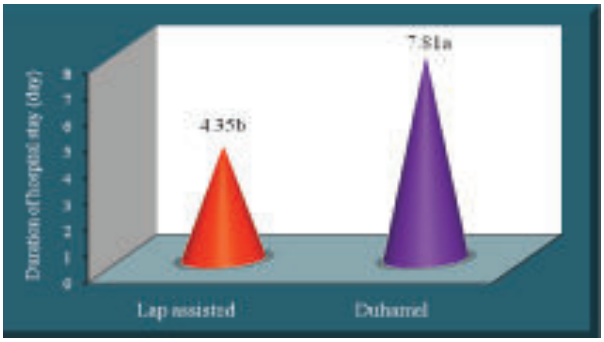

Fig.-2: *Comparison of duration of hospital stay (day) after operation for laparoscopic assisted transanal pull through and Duhamel pull-through operations. The value followed by different letter is significantly different at P<0.05 according to Duncan's multiple range test (DMRT).*

Table II

Per-operative and early post-operative complications

Name of operation	Lap assisted pull through		Duhamel pull through		P-value
early complications	N(27)	%	N(26)	%	
Bleeding,	3	11.11	5	19.23	0.013
Injury to adjacent organs	0	0.0	0	0.0	
Infection	2	7.41	7	26.92	
Post op Ileus above 36 hours	2	7.41	6	23.08	

P-value reached from chi square test. The difference is significant ($p<0.05$).

Table III
Outcome measures

Outcome measures	Lap assisted pull through		Duhamel pull through		P-value
	N(27)	%	N(26)	%	
Anastomotic leak	1	3.70	2	7.69	0.032[S]
Anastomotic strictures	4	14.81	0	0.0	0.001[S]
Persistent obstructive symptoms	2	7.41	5	19.23	0.004[S]
Persistent or acquired aganglionosis	1	3.70	3	11.53	0.019[S]
Fecal incontinence	3	11.11	1	3.85	0.021[S]

S = Significant; NS = Non-significant; P value reached from unpaired t-test ($p<0.05$).

Discussion

The operative treatment for Hirschprung's disease has progressed from Swenson's first description in 1949, where he recommended rectosigmoidectomy with preservation of the sphincters.[4] Multi-staged procedure had become the standard of care for several decades. Over the years the treatment of Hirschprung's disease has become less invasive[11]. Duhamel operation was designed to avoid injury to pelvic vessels and nerves and protect the internal sphincter, all of which are theoretically at risk during the Swenson and Soave procedures[12].

There is little doubt that the laparoscopic variant of the sugery leads to less pain, a quicker recovery, and better cosmesis, but the question arises whether the operation is as safe as the open one and whether the functional results are comparable[13].

In this study, age group of the patients ranged from two to thirteen years. Though there is no age limit for definitive surgery for Hirschprung's disease, in the present study, age was limited up to thirteen years.It was due to admission criteria of paediatric units in the hospitals of Bangladesh, where paediatric units deals with patients up to thirteen years of age, at present.

Expertise of operating surgeon is an important variable that affects outcome. Being placed in the northern part of world's most populous country, Rajshahi Medical College Hospital had a bed occupancy rate 249.7% and paediatric surgeons had to deal with more cases routinely, than the expert criteria[14]. As this criterion was uniform in two groups, surgeon-dependent variables,did not affect the outcome. Hospital stay and operation times are indirect measures of economic burden of the treatment. In present study laparoscopic assisted transanal pull-through group was associated with a significantly lower operation time and hospital stay than the other group under study. This findings had a similar reflection with studies of Ahmedet al.2017 and Singh S, et al.2017[15,16].

In the present study per-operative and early post-operative complications including; bleeding, Injury to adjacent organs, wound infection, Post-operative ileus above 36 hours etc. were not troublesome and differences in two groups under study were significant and findings were in favour of laparoscopic procedure.

Serious sepsis was rare, but mild and localized infection occurred. Causes of sepsis could be compromised vascularity and proximity to a potentially contaminated area. Severe sepsis was prevented by preoperative povidine iodine scrubbing, use of prophylactic antibiotics, avoidance of hematoma and atraumatic handling of tissue as recommended by Meir and Livne[17].

Persistent obstructive symptoms, fecal incontinence, persistent or acquired aganglionosis precludes the goal of pullthrough surgery. In the present study these clinically obvious symptoms were picked up and compared. Persistent obstructive symptoms and aganglionosis occurred in greater percentage in Duhamel procedure. In some cases, the child had a good response to surgery and then developed obstructive symptoms later. In other cases the child had not any improvement in the postoperative period. The major reasons for persistent obstructive symptoms include mechanical obstruction, recurrent or acquired aganglionosis, disordered motility in the proximal colon or small bowel, internal sphincter achalasia or functional megacolon caused by stool-holding behavior[18].

Mechanical obstruction often results from a stricture or a retained aganglionic spur of Duhamel procedure; which fill with stool and obstruct the pulled-through bowel [19]. In present study mechanical obstruction was prevented by a shortened spur In Duhamel procedure.

Anastomotic strictures was commoner in percentage in the laparoscopic variant and was managed by serial dilatation. Some children had persistent aganglionosis. This might be due to pathologist error or a transition zone pull-through and in some cases there may be ganglion cell loss after a pull-through[20]. It was managed by a rectal biopsy on the pulled-through bowel, to determine whether there were normal ganglion cells present, and if there were not, a repeat pull-through was performed.

Kuwahara M et al. reported that, there are three main reasons for a child to be incontinent after a pull-through: abnormal sphincter function, abnormal sensation, or "overflow" incontinence . Abnormal sphincter function may be due to sphincter injury during the pull-through. They further reported that, most children with incontinence after a pull-through have overflow of stool because of ongoing constipation[21]. In the present study one sphincter injury and a problem with sensation had been ruled out, the child was worked up and treated for obstructive symptoms.

Conclusion

The advantages of laparoscopic assisted transanal pull-through include its feasibility, improved cosmesis, reduced hospital costs, hospital stay, operating time, and overall improved quality of life. But anastomotic strictures and fecal incontinence were less common in percentage in the Duhamel variant. In the present study evidence is insufficient to acclaim one technique over the other. We recommend for a systematic review on large scale over an extended time period to find out a safer procedure.

Conflict of interest: None

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