Original Article

Laparoscopic-assisted Transanal Pull-through for Hirschsprung's Children Older than 3 Years: A Case Series

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Abstract

Context: Hirschsprung's disease (HD) is a congenital anomaly affecting the enteric nervous system commonly the rectosigmoid region. Treatment is surgical where the aganglionic segment is resected, and bowel continuity is restored by a coloanal anastomosis. In 1999, Georgeson *et al*. proposed a new technique of primary laparoscopic-assisted pull-through for HD as a new gold standard. **Aim:** The aim of the study was to evaluate the outcome of the laparoscopic-aided transanal pull-through procedure for the management of HD in children older than 3 years of age. **Methods:** This study was conducted on 15 consecutive patients presented to a university hospital, diagnosed as having HD relying on their clinical features, barium enema study and rectal biopsy. In all cases, laparoscopic-assisted transanal pull-through was attempted. The laparoscopic part included transition zone identification, seromuscular biopsy for fresh frozen histopathology and sigmoid and rectal mobilisation as much as possible down the peritoneal reflection. The transanal part included mobilisation of the rectal lower segment by 2–3 cm, resection till the ganglionic segment, and full-thickness two-layer coloanal anastomosis was done. **Results:** Early complications occurred in eight cases: enterocolitis in four cases and perianal excoriation occurred in four cases. There were no cases of anastomotic leak. Late complications occurred in seven patients: four cases developed stricture at the site of coloanal anastomosis and three cases experienced enterocolitis at 6 and 9 months postoperatively. **Conclusion:** Laparoscopic-aided transanal pull-through procedure is a safe, feasible modality for the management of HD in children more than 3 years.

Keywords: Hirschsprung's disease, Laparoscopic assisted , Minimally invasive Surgery

Introduction

Hirschsprung's disease (HD) is a congenital anomaly affecting the enteric nervous system in which there is an absence of the parasympathetic ganglion cells in the intestinal submucous and myenteric plexuses, the rectosigmoid is the most involved region.[1,2] Treatment of HD is surgical where the aganglionic segment is resected, and bowel continuity is achieved by a coloanal anastomosis. Over the past years, many surgical procedures were developed by surgeons such as Swenson, Duhamel and Soave to correct this anomaly.[3] Transanal endorectal pull-through for HD is a safe procedure for both neonates and infants. However, overstretching the anal sphincter and sigmoid colon mesentery might have the potential risk for impaired defecation function.[4]

In 1999, Georgeson *et al*. proposed a new technique of primary laparoscopic-assisted pull-through for HD as a new gold standard.[1,2] In 2008, they published their new study with some technical modifications. It became an operative strategy of choice for rectosigmoid HD in some centres, but marked variation in practice remains for the right-sided HD.[5,6] The use of laparoscope allows taking biopsies to determine the level of aganglionosis, adequate mobilisation of the bowel with less trauma and bleeding and in addition, is cosmetically superior.[7,8]

The current study aimed to evaluate the surgical and functional outcome of the laparoscopic-aided transanal pull-through procedure for the management of HD in children older than 3 years.

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Methods

This prospective study was performed at the department of paediatric surgery of a tertiary referral university-based children's hospital between June 2017 and June 2018. The follow-up period was 6 months. Prior to starting the treatment, informed consent was obtained from all the candidates' guardians, and ethical approval was obtained via the departmental research ethics and scientific committee. Diagnosis of HD was documented by history, clinical examination and investigations. A detailed history was taken, including the time of passage of first meconium, periods of constipation and history of intestinal obstruction or enterocolitis. Clinical examination included general condition, presence of associated anomalies, abdominal examination for distention and signs of obstruction and rectal examination to detect the presence of impacted stools. Investigatory workup was done including routine laboratory tests, barium enema and rectal biopsy. Inclusion criteria included age older than 3 years.

Collected clinical data included age, sex, weight and frequency of presenting symptoms. All patients underwent barium enema to determine the site of probable aganglionic segment. Then, all patients underwent pre-operative rectal irrigations for 3 months using saline solution 20 ml/kg twice daily to decompress the dilated colon, 2 days preoperative, we did bowel preparation, rectal irrigation and all patients received prophylactic pre-operative antibiotics like amoxicillin and clavulanic acid and metronidazole.

Operative procedure

The lead surgeon stood at the right side of the patient; the cameraman was on the left side of the surgeon. Pneumoperitoneum was obtained using an open technique through the umbilicus with a pressure of 10–12 mm Hg. A 5 mm, 30° scope was introduced through a port placed below xiphisternum. One 5 mm port was placed in the right lower quadrant, and in only three cases, we needed an additional port in the left lower quadrant.

The operative procedure included two parts a laparoscopic part and a transanal part.

Laparoscopic part

After ports' placement [Figure 1], in all four groups, seromuscular biopsies were taken for fresh frozen section histopathological examination by endoscopic scissors [Figure 2], the sites of the biopsies were closed by vicryl violet 3/0 [Figure 3] to decide the level of pull-through, the transitional zone was determined before any attempt was made to devascularise or mobilise the colon and by sending biopsies to the frozen section pathological examination. In Groups I and II, these biopsies were obtained about 5 cm proximal to the suspected transition zone, while in Groups III and IV, biopsies were taken in an ascending manner (rectum then rectosigmoid, sigmoid and proximally) until we reached a ganglionated part which revealed that 3 of them were short segment and 2 of them were long segment.



Figure 1: Position and port sites

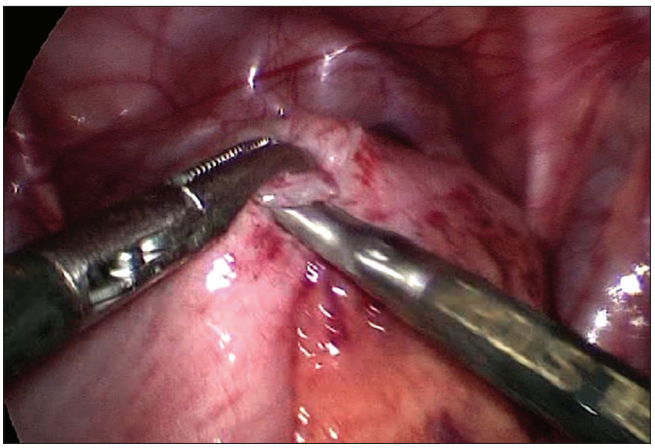


Figure 2: Seromuscular biopsies were taken for fresh frozen section histopathological examination by endoscopic scissors

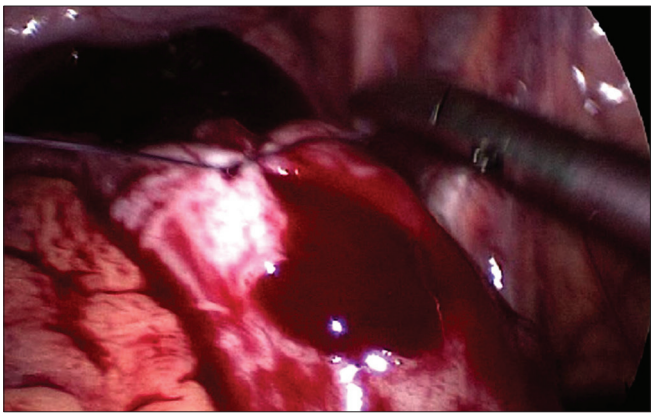


Figure 3: The site of the biopsies was closed by vicryl violet 3/0

In rectosigmoid aganglionic groups (Group I and III), a window was made in the sigmoid mesentery Figure 4 and a stitch was taken through the window into the abdominal wall to elevate it and facilitate proximal and distal mobilisation of the colon, the sigmoid was mobilised [Figure 5]. Proximal ganglionic bowel was mobilised, preserving the marginal arcade.

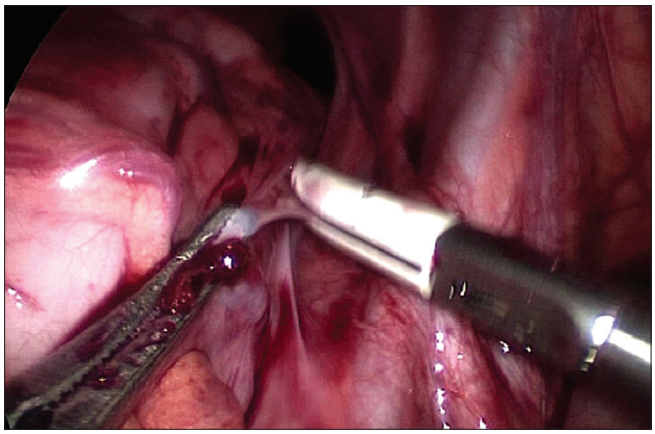


Figure 4: A window was made in the sigmoid mesentery

In the long aganglionic segment encountered in Groups II and IV, we did the same thing with a division of lateral peritoneal reflection and freeing the splenic flexure until the colon above the funnelling (transition zone) was long enough to reach deep into the pelvis without tension in those three cases which transitional zone was at the descending colon but in another two cases where transitional zone was at transverse colon, we completed dissection of the transverse colon from the gastrocolic ligament and ligation of upper left colic vessels using energy sealing device (LigaSure) preserving marginal arcade.

In all cases, we incised sharply peritoneal reflection to facilitate mobilisation of the aganglionic rectum, the rectum below the peritoneal reflection was mobilised as much as possible within 2–3 cm of peritoneal reflection. After completion of laparoscopic dissection and assurance of hemostasis, the ports were left *in situ* and the patient's position was changed for transanal dissection of the remaining rectum.

Transanal part

As most of the rectal dissection was conducted laparoscopically, only the lower 2–3 cm of the rectum was mobilised transanally. The anastomosis was performed about 1 cm above the dentate line. The level of pull-through was at the biopsy-proven ganglionic segment. Once the anastomosis was completed, laparoscopy was performed again to check for the orientation of the pull-through bowel. A drain was placed and the port sites were closed.

Postoperatively, all patients received their immediate post-operative care in the intermediate care unit. Patients were maintained on intravenous (I. V) fluid therapy with continuous nasogastric decompression and I. V. antibiotics for 48 h. Oral feeding was initiated when bowel sounds returned. A patient was discharged when a full oral diet was reached. Parents were taught to perform rectal irrigation daily to decrease the incidence of enterocolitis and after 2 weeks from discharge, we taught parents to perform home dilatation with Hegar dilators. The patient's outcome was evaluated for faecal consistency, the frequency of soiling and presence of perianal skin excoriation at 3 and 6 months after the procedure.

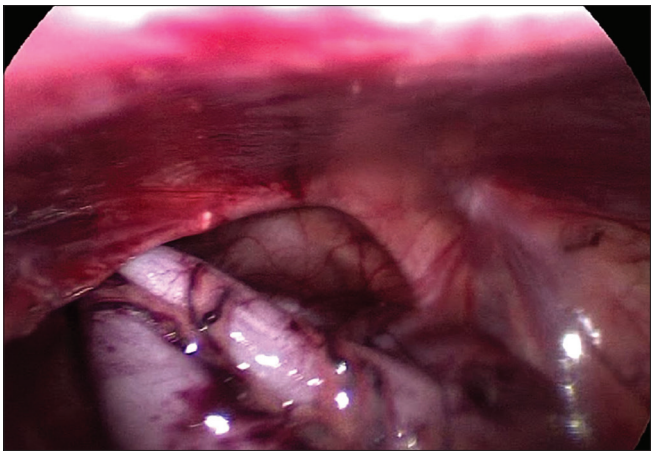


Figure 5: A stitch was taken through the window into the abdominal wall to elevate it and facilitate proximal and distal mobilisation of the colon

Statistical analysis

Statistical data analysis was done using Microsoft® Excel® 2013 (15.0.4420.1017) 32-bit software. Descriptive data analysis as well as analytical analysis was done using ANOVA: single-factor test, *t*-test: two sample assuming unequal variances and *F*-test two sample for variances.

Results

Fifteen patients who met the criteria comprising 10 males and 5 females were recruited. The age of patients ranged from 3 years to 7 years. Group I included 7 cases (46.6%). Group II included 3 cases (20%), while Group III included 3 cases (20%) and Group IV included 2 cases (13.3). Operating time varied according to the length of the aganglionic segment, the average time for classic rectosigmoid aganglionosis (Groups I and III) was 2 h; in cases where the funnel was extending higher (Group II, IV), the average time was 3.5 h.

In 9 cases, oral intake was started 48 h after operation, and in 6 cases, it was delayed to 72 h. The mean hospital stay was 5 days (range: 4–7 days). Early complications (within 3 months postoperatively) occurred in six cases: enterocolitis in two cases that responded to conservative measures and perianal excoriation occurred in four cases that responded to zinc oxide ointment applications and constipating agents. There were no cases of anastomotic leak.

Late complications (after 3 months) occurred in seven patients: four cases developed anastomotic stricture that responded to regular dilatations and four cases had attacks of enterocolitis at 6 and 9 months postoperatively that needed hospital admission and the attacks had subsided under conservative measures in the form of parenteral antibiotics, rectal irrigation, I. V fluids and nil-per-os.

Discussion

Georgeson *et al*. in 2008 had experience in laparoscopic-assisted colon pull-through in 12 children converted creation the pneumoperitoneum by Veress needle to open transumbilical

technique.[9-11] In all our cases, the open technique showed safer introduction and reliability.

Some paediatric surgeons documented that the role of laparoscopy in the interventional surgery for HD is limited to those with long aganglionic segment based on contrast enema study.[12,13] The reported advantages of laparoscopy for the management of HD cases were in agreement with those reported by Ksia *et al*.,[14] who retrospectively studied 20 patients older than 2 years who underwent a transanal Soave one-stage endorectal pull-through procedure for HD and concluded that laparoscopy may be necessary whenever there are difficulties in the pull-through. In our study, we used laparoscopy in short and long aganglionic segments.

Georgeson *et al*. in their multicenteric study reported a mean of 4.8 days. The incidence of enterocolitis in the Georgeson *et al*.[11] multicenteric study was 7.5%, while in Wang *et al*.'s study, 8 of 61 (21%) patients had enterocolitis, but fortunately, all cases responded to conservative measures. Anastomotic stricture occurred in 13% which responded to regular dilatations. Perforations occurred in one case (1.6%) in Wang *et al*.'s study and no perforations in Georgeson *et al*.'s study. Leak occurred in two cases in Georgeson's study (2.5%) and two patients (3.3%) in Wang *et al*.'s study who were managed by diverting colostomy.[15] No mortality was reported in the follow-up period. Continence to stools needs a longer period of follow-up, especially in the younger age group. On those children above 3 years, continence results were satisfactory in the follow-up period and reported to be good by some authors.[16] The procedure is cost-effective and accepted by the parents.[17]

While in this study, we have enterocolitis in five cases who responded to conservative measures, perianal excoriation occurred in four cases who responded to zinc oxide ointment applications and constipating agents, anastomotic stricture in four cases and there were no cases of anastomotic leak.

Takawira *et al*.[18] compared contrast enema, anorectal manometry and biopsy with histology for the diagnosis of HD and found that haematoxylin and eosin-stained fresh frozen sections remain the criterion standard for its highest sensitivity and specificity. Intraoperative fresh frozen section histological examination allowed proper identification of the normal ganglionic level so that no remnant aganglionosis was missed; in support of such a policy, throughout the follow-up period, no patient developed recurrent constipation. Moreover, Takahashi *et al*.[19] and Bonnard *et al*.[20] found that laparoscopic biopsy taking can aid diagnosis and decision-making in HD cases. In this study, we depended on contrast enema, and biopsy with histology for the diagnosis of HD also, laparoscopic biopsy taking can aid diagnosis with intraoperative fresh frozen section histological examination that allowed proper identification of the normal ganglionic level and decision-making, especially in cases with ill-defined funnel with contrast enema.

In addition, Thomson *et al*.[21] conducted a meta-analysis for the outcomes following totally transanal endorectal pull-through (TERPT) versus TERPT with any form of laparoscopic assistance for infants with uncomplicated HD and found no statistically significant differences concerning PO enterocolitis, faecal incontinence or constipation.

Conclusion

Laparoscopic-aided transanal pull-through procedure is a safe, feasible modality for the management of HD in children more than 3 years.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Mabula JB, Kayange NM, Manyama M, Chandika AB, Rambau PF, Chalya PL. Hirschsprung's disease in children: A five year experience at a university teaching hospital in northwestern Tanzania. BMC Res Notes 2014;7:410.
2. Soret R, Mennetrey M, Bergeron KF, Dariel A, Neunlist M, Grunder F, *et al*. A collagen VI-dependent pathogenic mechanism for hirschsprung's disease. J Clin Invest 2015;125:4483-96.
3. Fukuzawa M. Progress in the treatment of and research on hirschsprung's disease. Nihon Geka Gakkai Zasshi 2014;115:312-6.
4. Aubdoollah TH, Tang ST, Yang L, Li S, Lei HY, Zhang X. Hybrid single-incision laparoscopic approaches for endorectal pull-through in hirschsprung's disease. J Laparoendosc Adv Surg Tech A 2015;25:595-8.
5. Antao B, Roberts J. Laparoscopic-assisted transanal endorectal coloanal anastomosis for Hirschsprung's disease. J Laparoendosc Adv Surg Tech A 2005;15:75-9.
6. Bradnock TJ, Walker GM. Evolution in the management of Hirschsprung's disease in the UK and Ireland: A national survey of practice revisited. Ann R Coll Surg Engl 2011;93:34-8.
7. Nah SA, de Coppi P, Kiely EM, Curry JI, Drake DP, Cross K, *et al*. Duhamel pull-through for Hirschsprung disease: A comparison of open and laparoscopic techniques. J Pediatr Surg 2012;47:308-12.
8. Zhu T, Feng J, Zhang W, Wei M, Yu D, Zhang X, *et al*. Subtotal colectomy with a single-incision laparoscopic surgery technique in children with long-segment Hirschsprung disease and allied disorders. Pediatr Surg Int 2013;29:197-201.
9. Georgeson KE, Fuenfer MM, Hardin WD. Primary laparoscopic pull-through for Hirschsprung's disease in infants and children. J Pediatr Surg 1995;30:1017-21.
10. Georgeson KE, Cohen RD, Hebra A, Jona JZ, Powell DM, Rothenberg SS, *et al*. Primary laparoscopic-assisted endorectal colon pull-through for Hirschsprung's disease: A new gold standard. Ann Surg 1999;229:678-82.
11. Gerogeson KE, Muensterer OJ. Laparoscpic assisted transanal pull-through for hirschsprung's disease. Holschnider AM, Puri P, editors. Hirschsprung's Disease and Allied Disorders. 3rd ed. Berlin: Springer; 2008. p. 323-33.
12. Hadidi A. Transanal endorectal pull-through for Hirschsprung's disease: Experience with 68 patients. J Pediatr Surg 2003;38:1337-40.
13. Langer JC, Minkes RK, Mazziotti MV, Skinner MA, Winthrop AL. Transanal one-stage Soave procedure for infants with Hirschsprung's disease. J Pediatr Surg 1999;34:148-51.
14. Ksia A, Yengui H, Saad MB, Sahnoun L, Maazoun K, Rachida L, *et al*. Soave transanal one-stage endorectal pull-through in the treatment of Hirschsprung's disease of the child above two-year-old: A report of 20 cases. Afr J Paediatr Surg 2013;10:362-6.
15. Wang NL, Lee HC, Yeh ML, Chang PY, Sheu JC. Experience with primary laparoscopy-assisted endorectal pull-through for Hirschsprung's disease. Pediatr Surg Int 2004;20:118-22.

16. Fujiwara N, Kaneyama K, Okazaki T, Lane GJ, Kato Y, Kobayashi H, *et al*. A comparative study of laparoscopy-assisted pull-through and open pull-through for Hirschsprung's disease with special reference to post-operative faecal continence. J Pediatr Surg 2007;42:2071-4.
17. Bufo AJ, Chen MK, Shah R, Gross E, Cyr N, Lobe TE. Analysis of the costs of surgery for Hirschsprung's disease: One-stage laparoscopic pull-through versus two-stage Duhamel procedure. Clin Pediatr (Phila) 1999;38:593-6.
18. Takawira C, D'Agostini S, Shenouda S, Persad R, Sergi C. Laboratory procedures update on Hirschsprung disease. J Pediatr Gastroenterol Nutr 2015;60:598-605.
19. Takahashi T, Kato Y, Okazaki T, Koga H, Lane GJ. Patchy innervation confirmed in pull-through bowel with normal conventional biopsy results in Hirschsprung's disease - The benefit of circumferential biopsying. Hepatogastroenterology 2013;60:1014-7.
20. Bonnard A, Terrasa JB, Viala J, Aizenfisz S, Berrebi D, Ghoneimi AE. Abdominal cellulitis following a laparoscopic procedure: A rare and severe complication. Eur J Pediatr Surg Rep 2014;2:67-70.
21. Thomson D, Allin B, Long AM, Bradnock T, Walker G, Knight M. Laparoscopic assistance for primary transanal pull-through in Hirschsprung's disease: A systematic review and meta-analysis. BMJ Open 2015;5:e006063.