Chapter x

Laparoscopic-assisted Swenson-like trans-anal pull-through for Hirschsprung Disease

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General information

Laparoscopic-assistance for Hirschsprung disease (HD) pull-through procedures has increased in popularity. This change has been associated in the UK for example, with a change from the Duhamel procedure being performed most frequently, to endo-rectal pull-through (ERPT) being practiced more widely (ref 1). The concept of the trans-anal only approach was put forth by Langer and de la Torre, but this was using a Soave-like dissection. The use of the Swenson-like technique for ERPT has been popularised by Levitt *et al*, who reported a series of 67 patients in 2013. The advantages of this approach are its simplicity, preservation of the pelvic nerves, and avoidance of the obstructing 'muscle cuff' which may occur after the Soave-Boley procedure (ref 2). The procedure can be undertaken as a purely trans-anal operation for cases

where recto-sigmoid aganglionosis is obvious from the contrast study, but initial laparoscopic colonic mobilisation and biopsy is preferred in most cases.

Working instruments

- 3mm ports and instruments – hook diathermy, graspers, needle holders.
- 30 degree camera (5mm or 3mm)
- Lone-star retractor and needle-point, hand-held monopolar diathermy is used for the trans-anal approach.

Positioning, port siting and ergonomic considerations

For laparoscopic mobilisation, the patient is positioned at the foot of the table, and turned 90 degrees. This allows the operating surgeon to stand at the patient's right shoulder, facing the pelvis, and the assistant can stand on the patient's left side. Full skin preparation of the lower limbs and abdomen is undertaken, and the legs/feet wrapped in crepe bandage and bio-occlusive dressing sheets to allow re-positioning intra-operatively. The laparoscopic stack is positioned at the feet end of the patient. Urethral catheterisation is required.

For the trans-anal approach, the prone position is preferable as this facilitates dissection between the rectum and urethra in males (rectum and vagina in females). If the trans-anal only approach is planned, prone position is used. For laparoscopic dissection/biopsy and trans-anal approach, the patient can be positioned supine with the legs elevated, however, prone position makes the trans-anal dissection easier.

Relevant anatomy

Dissection is made close to the rectal wall to avoid damage to pelvic nerves. If laparoscopic abdominal mobilisation is undertaken, both ureters (and vasa in males) should be identified and preserved.

Surgical technique

Laparoscopic Colonic Mobilisation and Biopsy

The patient is initially positioned supine as described above. Three or four ports are used, in small infants it is helpful to place these all above the umbilicus to allow more space for the instruments. The camera port is placed high in the epigastrium, to the right of the midline (and falciform ligament). Two lateral ports (3mm) are placed. A fourth port in the left upper quadrant can be helpful to grasp the sigmoid colon. Insufflation pressure of 8-10mmHg and flow of 2-3L/min are used. The patient is positioned in the head-down position so that the small bowel is displaced out of the pelvis. The recto-sigmoid colon is evaluated and the likely transition zone identified. There are two options for confirmatory colonic biopsy with frozen section histological evaluation. A seromuscular colonic biopsy can be taken from the *taenia coli* with a later full-thickness biopsy at the end of the pull-through. The alternative is to take an initial full-thickness colonic biopsy and suture the enterotomy closed (either laparoscopically or by exteriorising the colon through one of the port-sites). This avoids the pitfall of ganglion cells being noted in the muscular layer, whilst there are hypertrophic nerves in the submucosal layer.

Colonic mobilisation is started by elevating the sigmoid colon with grasping of the mesenteric edge of the bowel. Hook monopolar diathermy is used to fashion a window in the mesentery. Further mesenteric division is continued proximally and distally. Great care must be taken to

preserve the sigmoid mesenteric arcade, and to ligate the inferior mesenteric artery high near the aorta. This will allow mobility of the colonic pull-through segment without compromising its blood supply. The lateral colonic peritoneal attachments are displayed by drawing the colon medially, and are again divided using hook diathermy. The left ureter should be identified at this stage. If need be, the splenic flexure is taken down. Dissection is continued (medially and laterally) distally to the peritoneal reflection, together with identification of the right ureter. In males, the vasa should be identified at the level of the peritoneal reflection. As mobilisation of the rectum beneath the peritoneal reflection is easier from the trans-anal direction, laparoscopic dissection can be stopped at this point. For a transition zone proximal to the mid-transverse colon, an open approach is performed to carefully delineate the mesentery and to de-rotate the colon if necessary.

Trans-anal Approach:

The patient is positioned prone, with the buttocks elevated. The lone-star retractor pins are placed initially at the anal muco-cutaneous junction. The pins are then replaced deeper, so that the dentate line is now 'buried' and thus preserved (as is the distal 1.5cm of the anal canal). The intended line of stay sutures can be marked on the rectal mucosa if necessary. Interrupted stay sutures (e.g. silk) are placed in the rectal mucosa 1.0cm above the dentate line circumferentially. The sutures are placed on a single artery clip which is then used to provide uniform traction.

Full-thickness rectal incision is made, starting in the posterior midline, using needle-point monopolar diathermy. Once the circumferential full-thickness Swenson plane is established,

the rectum is drawn outwards using traction on the stay sutures. Dissection is continued close to the rectal wall with coagulation of extrinsic vessels, in the same fashion as employed in the posterior sagittal ano-rectoplasty. Dissection must be within the whitish fascia that envelops the rectum. The dissection is continued up to and through the peritoneal reflection. At this stage, the point of laparoscopic colonic mobilisation (if undertaken) will be reached, and the recto-sigmoid can be withdrawn easily. It is important to avoid twisting of the pull-through segment and the ante-mesenteric border (for example) can be marked with a suture. At this stage, if laparoscopy has been undertaken, the patient is turned supine again to allow visualisation of the pull-through.

The colo-anal anastomosis is fashioned in two layers using absorbable sutures. The first layer is placed between the seromuscular layer of the pull-through colon and the proximal (internal) incised rectal layer. The second layer sutures the distal incised rectal tissue to the colon (mucosa to mucosa). If the approach has been trans-anal only, a Hegar dilator or large-bore tube is passed well into the pull-through colon to ensure there has been no twist.

The port site wounds are closed with absorbable sutures under laparoscopic visualisation and skin glue applied.

Highlights and pitfalls

One of the key errors to avoid is inadvertent twisting of the pull-through segment. Some surgeons would advocate laparoscopy to avoid this, and passage of a Hegar dilator or large-bore tube at the end of the procedure.

As for all HD cases, irrespective of operative technique, accurate intra-operative histological confirmation of normal ganglion cells and absence of hypertrophic nerves (defined as >40 µm) is essential. Some surgeons pause once the initial laparoscopic biopsy is taken until confirmation of the level is established, others would continue, but only complete the colo-anal anastomosis once a full-thickness specimen has been evaluated. The pitfalls to avoid here are co-localised ganglion cells in the inter-muscular layer with hypertrophic nerves in the submucosal plexus, and spiral configuration of the transition zone.

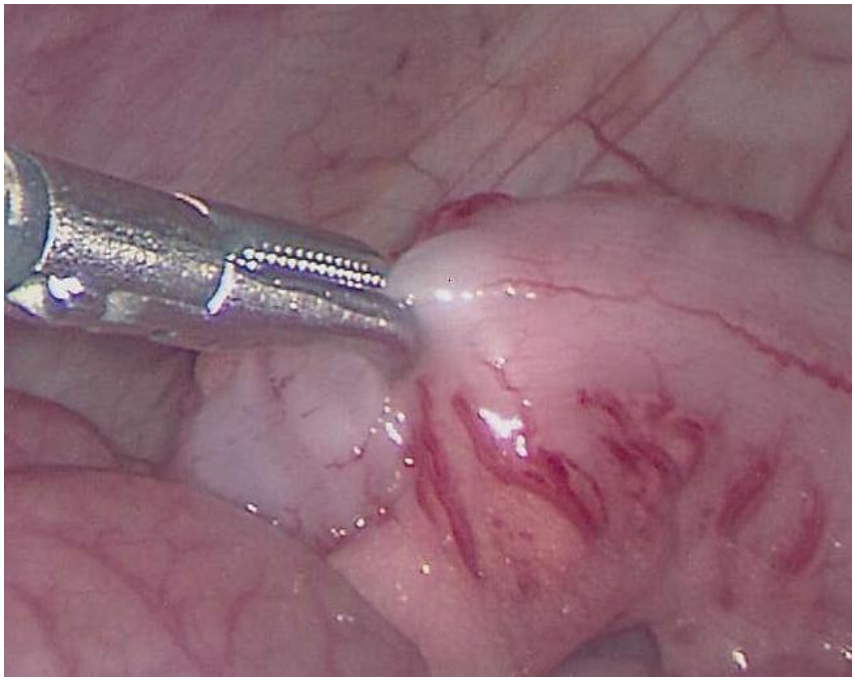
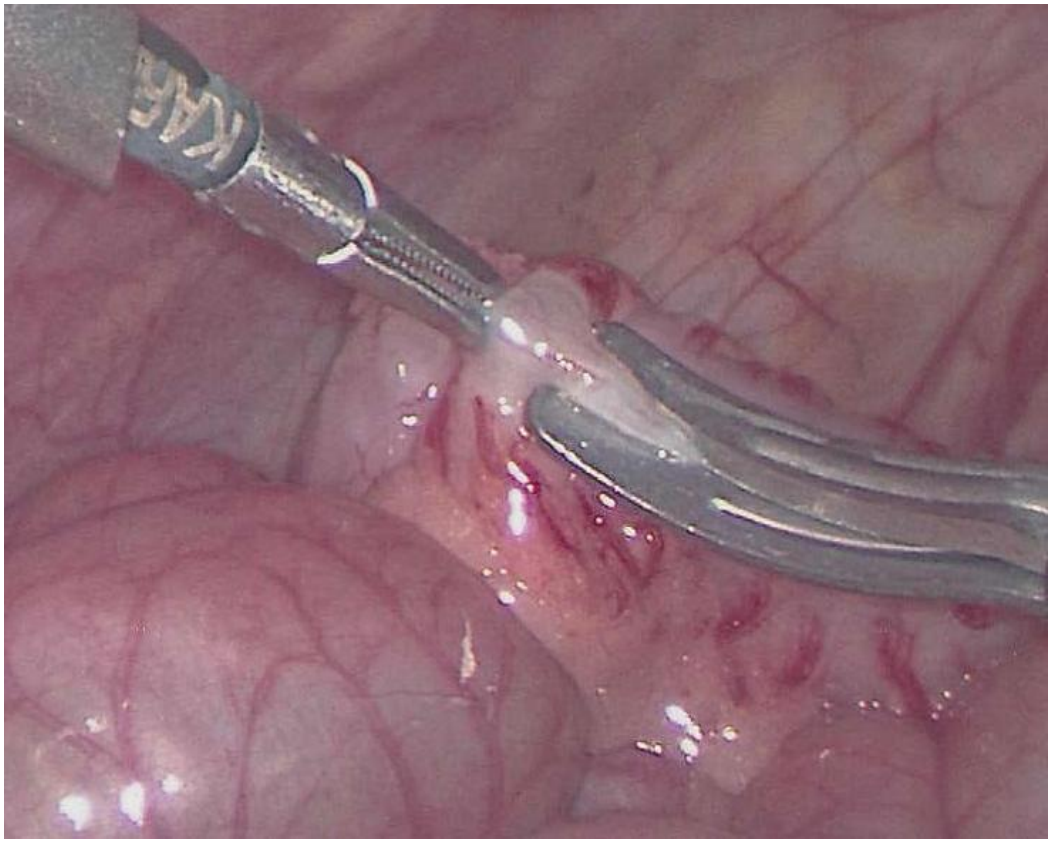
References:

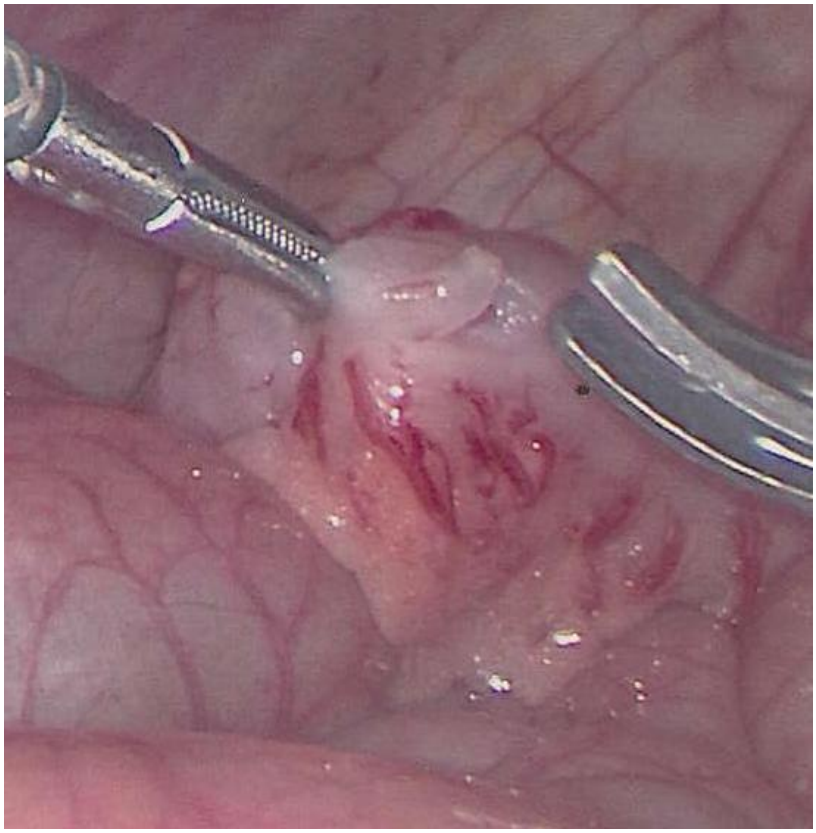
- 1. Evolution in the management of Hirschsprung's disease in the UK and Ireland: a national survey of practice revisited. Bradnock TJ, Walker GM. Ann R Coll Surg Engl. 2011 Jan;93(1):34-8.
- 2. The problematic Soave cuff in Hirschsprung Disease: Manifestations and treatment. Dickie BH, Webb KM, Eradi B, Levitt M. J Pediatr Surg 2014 Jan;49(1): 77-81.
- 3. Transanal, full-thickness, Swenson-like approach for Hirschsprung disease. Levitt MA, Hamrick MC, Eradi B, Bischoff A, Hall J, Peña A. J Pediatr Surg. 2013 Nov;48(11):2289-95.

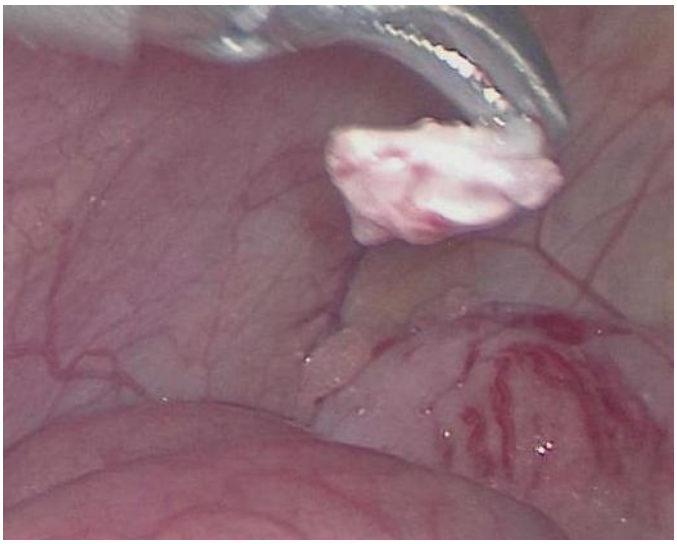
Figures:

- Figure 1-4: Laparoscopic seromuscular biopsies are taken for histological assessment.
- Figure 5-6: A window in the sigmoid mesentery is made and the mesentery divided proximally and distally staying closeto the bowel wall.
- Figure 7-8: Dissection continues to the peritoneal reflection, taking care to preserve the ureters and vasa.
- Figure 9: Lateral colonic peritoneal attachment are divided to further mobilise the pull-through segment. The left ureter is identified and preserved.

- Figure 10: Trans-anal approach – Lonestar retractor in place, with pins intitially at the dentate line.
- Figure 11: The Lonestar pins are replaced sequentially, so that the dentate line is now ‘hidden’.
- Figure 12: A marking line is made 1-1.5cm above the dentate line.
- Figure 13: A circumferential row of sutures (e.g. 5/0 silk) is placed.
- Figure 14: Full thickness dissection is started posteriorly, and continues close to rectal wall
- Figure 15: Dissection continues to the peritoneal reflection (clip applied).
- Figure 16: The pull-through segment is now easily drawn down.
- Figure 17: 2-layer colo-anal anastomosis is completed.
- Figure 18: Laparoscopic view confirming pull-through is not twisted (note intact left ureter).

- 
- 

- 



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