

Suspension Sutures Facilitate Single Incision Laparoscopic-Assisted Rectal Pull-Through for Hirschsprung Disease

Liem Thanh Nguyen (✉ liemnhp@hotmail.com)

National Hospital of Pediatrics

Anh Nguyen Tho

National Children's Hospital

Quang Nguyen Thanh

National Children's Hospital

Quynh Tran Anh

National Children's Hospital

Hau Bui Duc

National Children's Hospital

Hien Pham Duy

National Children's Hospital

Technical advance

Keywords: Hirschsprung disease, laparoscopic, single incision, suspension sutures, rectal pull-through

Posted Date: November 23rd, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-107785/v1>

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Abstract

Background

To present the surgical technique and long-term follow-up outcomes of single incision laparoscopic-assisted endorectal pull-through (SILEP) with suspension sutures using conventional instruments for Hirschsprung disease.

Methods

The procedure began with a 1cm transumbilical skin incision. Three separate punctures were made onto the fascia for a 5mm scope in the middle, a 5mm and 3mm ports for working instruments on the left and right, respectively. The first suspension suture was performed to secure the sigmoid colon to the abdominal wall. A window was created through the rectal mesentery, and dissection around the rectum was carried out. The second suspension suture was performed to suspend the rectovesical peritoneal fold or the rectovaginal peritoneal fold to the abdominal wall. Dissection around the rectum was continued downward to approximately 1cm below the peritoneal fold. The operation was completed by a transanal approach.

Results

40 patients underwent SILEP from March 2013 to April 2015. The median age was 2.7 months (ranged from 14 days to 17 months). The mean operative time was 94.7 ± 20 minutes. No conversion to open operation was required. Mean hospital stay was 4.1 ± 1.3 days. There were no intraoperative or perioperative complications. Long term follow-up results were obtained in 38 patients. The number of defecation from 1-2 times per day was noted in 36 patients (94.7%) and from 3-4 times per day in 2 patients (5.2%). Two patients had enterocolitis (5.2%).

Conclusion

Single site laparoscopic rectal pull-through with suspension sutures using conventional instruments is feasible and safe for Hirschsprung disease with good long-term outcomes.

Background

Hirschsprung disease (HD) was conventionally managed by an open, staged approach, which resulted in multiple unpleasant scars. In 1995, Georgeson first introduced a laparoscopic rectal pull-through for Hirschsprung¹. Since then, this approach has become a routine procedure in many centers and provided good outcomes. Conventional laparoscopic operation is usually performed using four incisions in the abdomen²⁻⁷. To achieve a better cosmetic result, in 2010, Muenstere *et al.*, described the single incision laparoscopic endorectal pull-through (SILEP) for Hirschsprung disease⁸. This approach has been applied

in some centers with moderate success⁹⁻¹². However, technical difficulty in performing the operation prevents its popularity with a small number of publications.

However, technical difficulty in performing the operation prevents its popularity leading to a small number of publications. Before 2013, we performed laparoscopic operation for HD using three or four incisions². To improve the feasibility of the operative maneuvers, we performed a modified SILEP for HD at The National Children's Hospital of Vietnam since March 2013.

This report aims to describe our modified procedure and its long-term outcomes.

Methods

Patients

All patients with rectal and sigmoid aganglionosis, initially diagnosed by colonography (typical image included a distally narrowed zone, a transition zone and a dilated colonic segment, and later on confirmed with an intra-operative frozen section biopsy) from March 2013 to April 2015.

Operative technique

The procedure began with a 1 cm transumbilical skin incision. Three separate punctures were made onto the fascia for a 5 mm conventional scope in the middle, 5 mm and 3 mm ports for working instruments on the left and right side, respectively. A 5 mm electrocautery hook, a 5 mm Metzenbaum scissors, and a 3 mm Kelly dissector were used (Fig. 1).

Extramucosal biopsies were performed at the narrow segment (suspected aganglionic segment) and dilated segment (presumed healthy colon).

The first suspension suture was performed to secure the sigmoid colon to the abdominal wall (Fig. 2). A window was created through the rectal mesentery, and dissection around the rectum was carried out. The second suspension suture was performed to suspend the rectovesical peritoneal fold or the rectovaginal peritoneal fold to the abdominal wall (Fig. 3). Dissection around the rectum was continued downward to approximately 1 cm below the peritoneal fold.

Dissection of the colonic mesentery was continued upward to provide more length to facilitate the tension-free mobilization of the colon through the anus. Laparoscopy was then stopped, and the remaining of the operative was performed trans-anally.

A Lone Star anorectal retractor was used to expose the anus for a transanal dissection. A circumferential incision was made to the mucosa at 1 to 1.5 cm proximal to the dentate line. The submucosal dissection was extended upward to approximately 3–4 cm. The seromuscular layer of the rectal wall was pulled down and divided longitudinally, then incised circumferentially to free the rectum completely. The seromuscular sleeve was resected after leaving a cuff of 1-1.5 cm in length from the dentate line. The

colon was subsequently pulled through the anus. Aganglionic and dilated segments were resected based on the results of the frozen biopsy. The coloanal anastomosis was fashioned manually with PDS 5/0.

15 days after the surgery, anal dilation was started once a day for one month, then twice per week for the next two months.

Results

Our study involved a total number of 40 patients, including 38 boys and 2 girls. Twenty-one patients (55.5%) is \leq three months old, and 19 patients (45.5%) is over three months old. Location of aganglionic segments: rectal in 29 patients (72.5%) and sigmoid in 11 patients (27.55%). Total operative time varied from 50–150 minutes (Mean: 96 ± 23 minutes). Length of the resected colon was from 15 cm-40 cm (Mean: 19.6 ± 6.23 cm). Insignificant blood loss was recorded. No conversion to open surgery was required. There was no perioperative complication. The mean postoperative hospital stay was 4.5 ± 2 days.

Intermediate follow-up results:

Intermediate follow-up with a mean duration of 23.2 ± 9.6 months (ranged from 15 months-42 months) was obtained in all 40 patients. Temporary perianal dermatitis occurred in 6 children (15%) in the early period after discharge. Thirty-nine children obtained spontaneous defecation, whereas constipation persisted in one patient (Table 1).

Table 1
Number of bowel movements

Number of bowel movements per day	N	%
1–2	28	70%
3–4	9	22.5%
≥ 5	3	7.5%
Constipation	1*	2.5

*This patient required a second operation due to inadequate resection of the aganglionic segment.

Enterocolitis (the presence of abdominal distension, explosive diarrhea with foul smelling or bloody stools that requiring antibiotics during last six months) was noted in 5 patients (12,5%), soiling in 8 patients (20%). Anastomotic stenosis or fistula was not observed in any patient.

Long term follow-up results:

Mean follow up was 65 ± 9.9 months (ranged 56 to 84 months) was achieved in 38 patients (95%). Frequency of bowels movements is presented in Table 2:

Table 2
Defecation function

Number of bowel movements per day	N	%
1-2	36	94,7
3-4	2	5,3
≥ 4	0	0
Constipation	0	0
Total	38	100

Enterocolitis occurred in 2 patients (5.2%). Soiling or constipation was not observed in any patient. All patients had urinary continence, and all male children had a normal penile erection according to their parents' observations.

Conclusion

Our result has demonstrated that SILEP with our modifications is feasible and safe for HD. The operation was accomplished in all patients. The operative was successfully performed in all patients without conversion to open surgery. Blood loss was non-significant. No perioperative complication was observed.

Aganglionic segments of the rectal or lower sigmoid colon are often dilated, which can reduce the operative field and lead to technical difficulties. Our suspension sutures can clearly expose the surgical site and greatly enhanced the feasibility of SILEP.

Sigmoid and rectal mesentery can be easily visualized by making a suspension suture which attaches the dilated sigmoid colon to the abdominal wall. Dissection of mesenteries can, therefore, be achieved with ease. Another technical challenge usually encountered is the separation of rectum from the bladder or the vagina. This can also be facilitated by making a second suspension suture from the peritoneal reflection onto the abdominal wall. Thus, a wider space between the bladder or the vagina and the anterior wall of the rectum is made available for precise dissection.

To the best of our knowledge, our mean operating time of 95 minutes is the shortest among the reported literature (Table 3) ^{8 10-12}. We think our suspension sutures have facilitated dissection and, in turn, reduced operating time.

Table 3
Operative time according to different publications

Publications	Mean Operative Time (minutes)
Muenster OJ <i>et al.</i> , [8]	145 ± 44
Tang ST <i>et al.</i> , [10]	122 ± 18
Xia X <i>et al.</i> , [11]	226 ± 69.4
Meng X <i>et al.</i> , [12]	211.91 ± 53.62
This study	96 ± 23

Our series has demonstrated that the longer the follow-up, the better the outcomes.

A bowel movement's frequency of one to two times a day only noted in 70% of patients in intermediate follow-up but has increased to 94% of patients in long-term follow-up.

In conclusion, SILEP with two suspension sutures is feasible, safe, and provides excellent early and long-term outcomes.

Abbreviations

SILEP

Single incision laparoscopic-assisted endorectal pull-through

HD

Hirschsprung disease

Declarations

Ethics approval and consent to participate:

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Ethics committee of Vietnam National Children's Hospital (Committee's reference number: **NHP-RICH-16-20**) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards

Informed consent was written by all individual participants included in the study.

Consent for publication: the authors have agreed to submit it in its current form for consideration for publication in the Journal.

Availability of data and material: the data is available from the corresponding author on request.

Competing interests: the authors declare that they have no competing interests

Funding: none

Authors' contributions:

Study conception and design: Liem Nguyen Thanh, Anh Nguyen Tho, Quang Nguyen Thanh, Quynh Tran Anh, Hau Bui Duc, Hien Pham Duy

Data acquisition: Anh Nguyen Tho

Analysis and data interpretation: Liem Nguyen Thanh, Anh Nguyen Tho, Quang Nguyen Thanh, Quynh Tran Anh, Hau Bui Duc, Hien Pham Duy

Drafting of the manuscript: Liem Nguyen Thanh, Anh Nguyen Tho, Quang Nguyen Thanh, Quynh Tran Anh, Hau Bui Duc, Hien Pham Duy

Critical revision: Liem Nguyen Thanh.

Acknowledgements

This study was supported by Research institute of child health of Vietnam national children's hospital.

We sincerely thank patients and their families for participating in the study.

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Figures



Figure 1

Trocar's placement

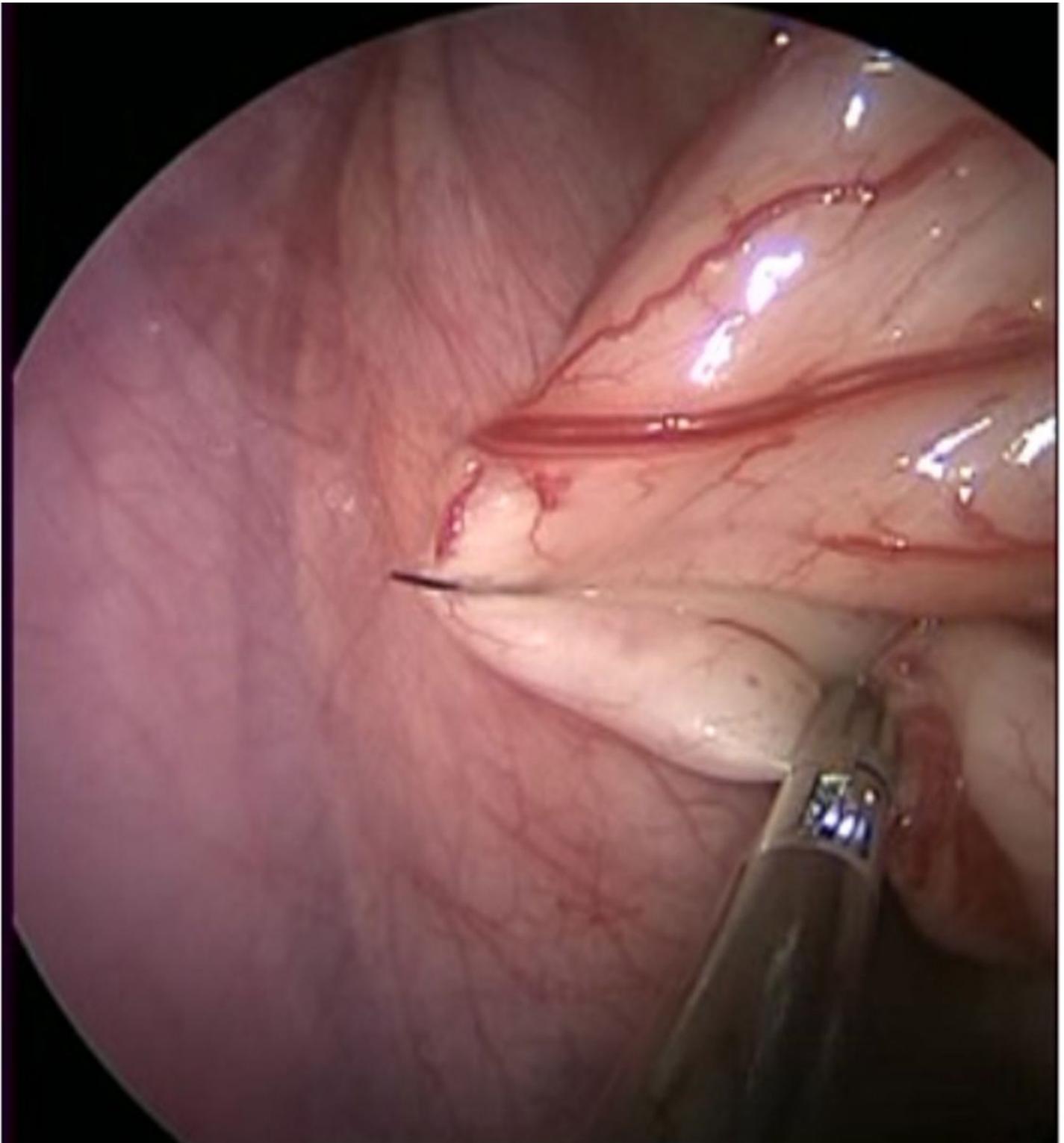


Figure 2

Secure the sigmoid to the abdominal wall

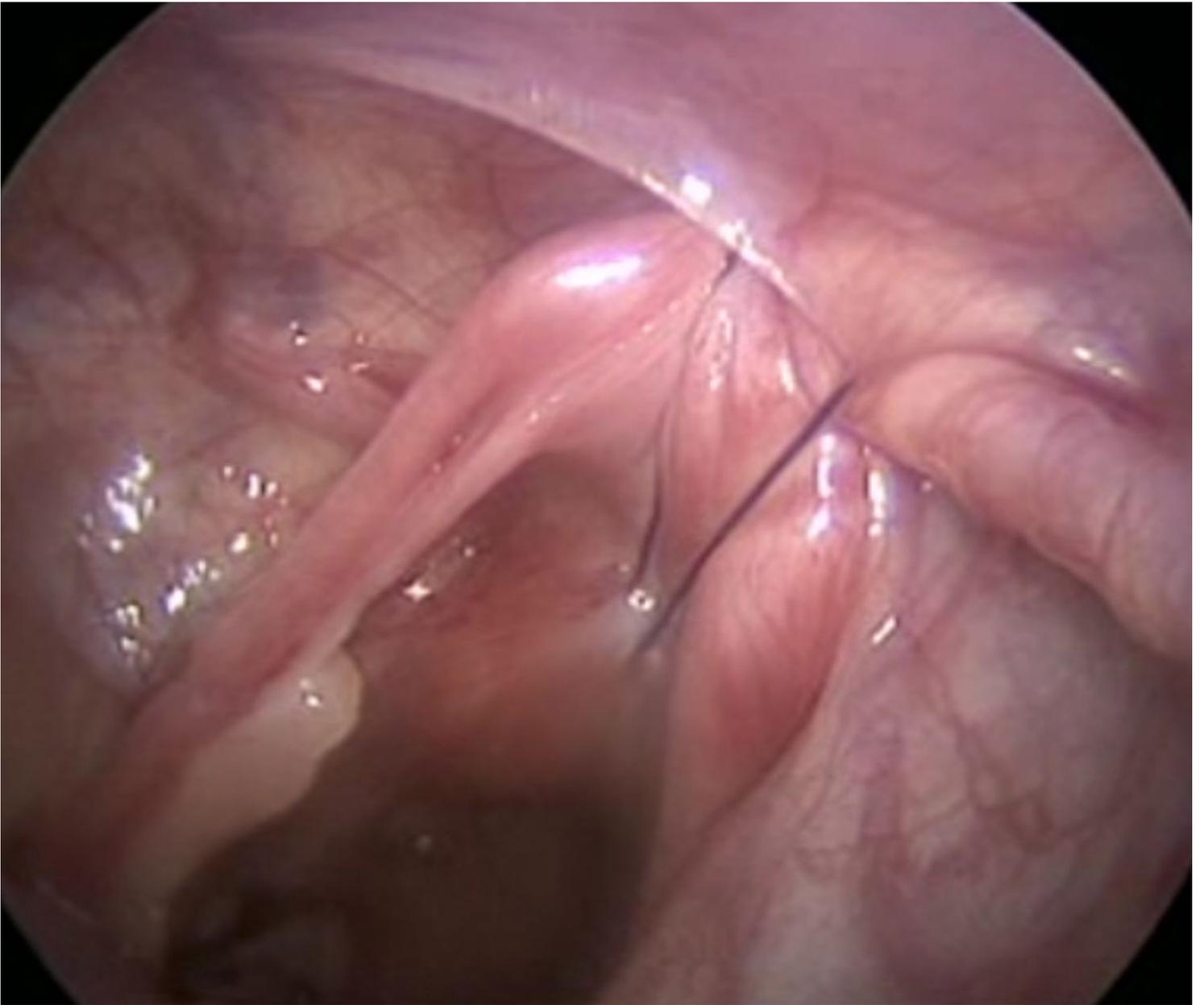


Figure 3

Suspend the peritoneal fold to the abdominal wall

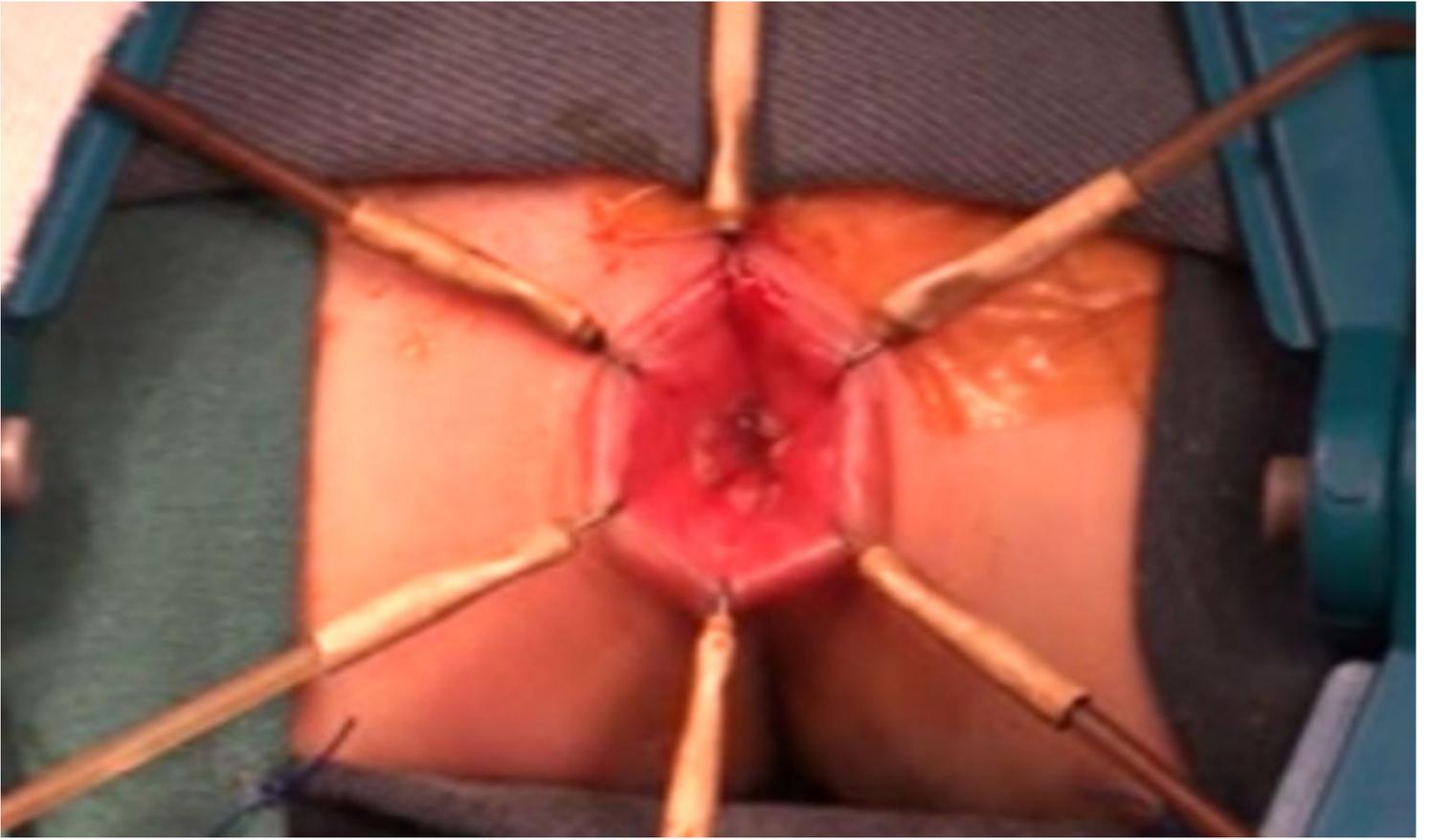


Figure 4

The anus was exposed using Lone Star retractor