Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i2.4585

ADOPTING TRANSANAL SWENSON PULL-THROUGH FOR HIRSCHSPRUNG DISEASE IN PESHAWAR, PAKISTAN

Majid Sagheer Mufti[1], Waqar Ullah[2*]

[1,2] Paediatric Surgery, Lady Reading Hospital, Peshawar, Pakistan

***Corresponding author:** Waqar Ullah,
Email: waqarkhattak18@gmail.com

ABSTRACT
Hirschsprung's disease (HD) has been recognized as one of the leading causes of intestinal blockage in children. Children who are affected typically present with intestinal blockage in the days following delivery. Even with surgical advancements, long-term results are still unpredictable. This study highlights the significance of long-term patient follow-up to rapidly detect and treat these problems. The purpose of the research was to provide light on the use of Transanal Swenson Pull-Through (TSPT) in the treatment of patients with Hirschsprung's disease, concentrating on characteristics such as operating time, postoperative problems, length of hospital stay, and overall patient results. Post-surgical problems with pathologically proven Hirschsprung's disease were examined in children in age between 0 to 15 years. 72 patients were assessed across four unique periods: one month, one month to one year, one year to five years, and more than five years. Participants were restricted to those having a biopsy-confirmed diagnosis of classical or short-segment Hirschsprung's disease. Utilizing the Defaecation and Faecal Continence questionnaire, functional results were evaluated in accordance with the Rome IV criteria. It focuses primarily on seven major problems: Anastomotic Leak, Stricture, Frequent stooling/faecal incontinence, Persistence of symptoms, Transition zone pull through, Post-Operative Enterocolitis, and Reoperation. The most prevalent consequence was Stricture, while Anastomotic Leak was quite uncommon. Frequent bowel movements and faecal incontinence were most common in the initial postoperative period. Persistent symptoms were the least prevalent, but their long-term influence on patient quality of life was a considerable issue. Post-Operative Enterocolitis was more prevalent in the intermediate to long-term durations.

Keywords: full-thickness rectal biopsy, Swenson type, transanal pull through procedure, complication of treatment, Hirschsprung’s disease

1 Introduction

Hirschsprung's disease (HD) has been recognized as one of the leading causes of intestinal blockage in children[1,2]. The absence of neuronal ganglion cells in the myenteric and submucosal plexus leads the build-up of faces in the proximal section[3]. The congenital abnormality reveals itself in the distal region of the gastrointestinal tract. These anomalies lead to the major patient symptom of persistent constipation, with some instances progressing to acute intestinal blockage[4]. Notably, short-segment HD accounts for over 80% of the incidence of the illness[5,6]. The primary goal of surgical intervention in HD is to remove the aganglionic colon and reconnect the properly innervated gut to the anus. This treatment is performed methodically to prevent further functional blockage and preserve faecal continence[2,7]. Historically, the problem was treated with a two-stage surgical

procedure, beginning with a proximal diverting colostomy followed by a transabdominal pull-through many months later[8]. In 1998, the introduction of single-stage transanal pull-through surgery marked a significant shift in the treatment strategy[9,10]. The Swenson treatment, the Duhamel method, and the Soave procedure have been developed throughout time as the three basic procedures for treating HD. Each of these has shown diverse functional results[11,12]. Innovative operative techniques, such as the heart-shaped anastomosis, the Z-shaped anastomosis, the short-cuff Soave surgery, and the Swenson-like approach utilizing trans anal and laparoscopic approaches are still being researched by surgeons today[2,8,13].

Numerous surgeons have abandoned the conventional colostomy in favour of the single-stage technique[14]. Subsequent investigations have shown its safety, even in neonates, encouraging other medical institutes to adopt it as the standard of care[15,16]. This technique is popular because of its simplicity, cost-saving possibilities, minimum invasiveness, and speedier recovery with fewer problems[17,18]. These benefits have proven important, particularly in low-income nations where paediatric surgical institutions with restricted means are few[14,15,19]. Swenson and Soave's techniques have both been modified for transanal approaches. Before this change, transanal endorectal pull-through (TEPT) with the Yancey/Soave technique without a specified cuff length was routinely done in various low-income countries[20]. Nguyen *et al* [15] reported good outcomes with the regular Swenson treatment in Vietnamese HD patients, however, there have been no following investigations in our nation on the classic Swenson technique or its transanal variant.

In response to these obstacles, our facility in Pakistan implemented single-stage surgery in January 2019 to reduce postoperative problems. This research intends to compare the results and complications of the transanal Swenson and Soave procedures as part of our research. The identification and management of postoperative obstructive consequences remain substantial issues, especially in low- and middle-income countries with limited resources. Despite this, the therapy of HD has dramatically improved owing to a clearer knowledge of its pathophysiology and genetic basis. Providers in these settings frequently lack access to comprehensive diagnostic tools such as anorectal manometry, may have limited pathology experience, may not have a bowel management program, and may be unable to use therapeutics such as Botulinum toxin in paediatric patients due to its unavailability or lack of approval.

The purpose of the research was to provide light on the use of Transanal Swenson Pull-Through (TSPT) in the treatment of patients with Hirschsprung's disease, concentrating on characteristics such as operating time, postoperative problems, length of hospital stay, and overall patient results.

2 Materials & Methods

The study was conducted using a descriptive cross-sectional approach between April 2021 and April 2022 and examined the effects of a specific surgical technique performed on 72 patients. The gender details of the patients are given in Table 1. This study's inclusion criteria were deliberately crafted to target a specific subgroup of the population. Participants were restricted to those having a biopsy-confirmed diagnosis of classical or short-segment Hirschsprung's disease. In addition, only patients between the ages of 0 and 15 were included.

Table 1 : Patients gender and their percentage

Gender	Percentage
Male	55 (76.3%)
Female	17 (23.6%)
With prior stoma	9 (12.5%)
Without prior stoma	63 (87.5%)

The percentage of patients from the age group of 0 to 15 years are provided in Table 2. This criterion was chosen since Hirschsprung's illness is largely a juvenile ailment, and adult patients may require alternative therapy strategies. Participants were excluded from the research if their parents or legal guardians did not consent to Transanal surgery for their kid.

Table 2 Demographic data of Patients

Age	Percentage
<1 month	9 (12.5%)
1 month to 1 year	27 (37.5%)
1 year to 5 years	13 (18.05%)
>5 years	23 (31.95)
Total	72

This was done to guarantee that all participants provided the necessary consent and support for this intrusive operation. As this element of preoperative treatment is crucial for decreasing the risk of infection and maximizing surgical results in TSPT, patients who did not comply with rectal wash procedures were also excluded. The primary outcome of this study was the efficacy and safety of TSPT as determined by operative time, the incidence of anastomotic leak and post-operative stricture, length of hospital stay, time until return to normal feeding, and potential complications such as faecal incontinence or frequent bowel movements. In addition, postoperative symptom persistence and transition zone pull-through were thoroughly observed[16].

Patients were recruited in the trial if they satisfied the inclusion criteria and none of the exclusion criteria. Detailed information was obtained preoperatively, intraoperatively, and postoperatively. Each procedure's operating time was documented, beginning with the initial incision and ending with the completion of suturing. It was watched and recorded whether any anastomotic leaks or post-operative strictures occurred. From the date of operation to the day of release, hospital stays were measured in days. The number of days between the day of surgery and the day the patient was able to tolerate regular oral eating after surgery was measured in days. During the follow-up period, faecal incontinence and frequent bowel movements were observed and characterized according to clinical standards. Also observed was the persistence of Hirschsprung's disease symptoms following surgery and the prevalence of transition zone pull-through. In performing this study, we adhered to ethical standards and prioritized the well-being of the participants. Consent was received from the patient's guardians, and the appropriate institutional ethical review board authorized the study. All information was handled with extreme secrecy and anonymised to safeguard the identities of patients. The research was undertaken to minimize any potential danger or discomfort to the participants.

2.1 Procedure

The Transanal Swenson Pull-Through (TSPT) procedure began with the patient's admission to the hospital one day before surgery. This allowed for a lengthy time of preparation and monitoring in a controlled setting to enhance surgical results and patient safety. Once hospitalized, all patients were instructed to do frequent rectal washing at home using liquid paraffin and saline. The purpose of this procedure was to assure intestinal cleanliness, limit the danger of infection, and improve the view of the surgical field. After being admitted to the ward, three further rectal washes were administered to further address these symptoms. Immediately before surgery, an extra wash was performed on the operating table to ensure the optimal operating environment. Overnight, patients were ordered to consume nothing by mouth, or Nil Per Os (NPO). This is a frequent preoperative advice designed to reduce the possibility of aspiration during anaesthesia. Preoperative prophylactic antibiotics were supplied as part of the surgical preparations. Ceftriaxone and Flagyl were utilized to avoid potential perioperative infections. In addition, a Foley catheter was inserted to guarantee appropriate bladder decompression throughout the procedure, hence assisting in the prevention of urinary problems. The patient was positioned in a prone posture for the TSPT procedure. This posture was chosen because it allows mobility and pull-through of the aganglionic segment and provides ideal access to the rectal and colonic regions.

The aganglionic segment, or the portion of the colon afflicted by Hirschsprung's disease, was discovered and removed during surgery. The average length of the resected colon ranged from 18 to 12 cm, depending on the severity of the illness in each patient. The proximal (healthy) and distal (diseased) ends of the resected colon were correctly marked for orientation purposes and then sent for

histological analysis. This phase is essential for confirming the final diagnosis and reviewing the surgical margins to ensure full removal of the diseased section. In contrast to many abdominal procedures, a nasogastric (NG) tube was not utilized after this procedure. This choice was based on the fact that the TSPT method does not entail significant manipulation of the upper gastrointestinal system, hence decreasing the need for postoperative stomach decompression. Possible advantages include greater patient comfort and a speedier return to oral eating. After surgery, patients were closely followed for problems such as bleeding, infection, and anastomotic leakage. In addition, the care team closely monitored symptoms of restored bowel function, such as the passage of gas or stool and tolerance for oral eating. The technique, including preoperative preparation and aftercare, was created with patient safety, comfort, and speedy recuperation in mind. As a result, every step was methodically executed by the highest standards of surgical care. Importantly, the outcomes of this experiment would give essential information on the efficacy and safety of TSPT as a therapy for Hirschsprung's illness.

3 Results

Notably, only 9 individuals (12.5 per cent) had a previous stoma, whereas 63 patients (87.5 per cent) had not had this condition. A detailed examination of the surgical timeframes based on the patient's age found that the length increased with age. The procedure took around 8724 minutes for patients less than one month, 11716 minutes for those aged one month to one year, 12722 minutes for children aged one to five years, and 13619 minutes for patients older than five years. The post-operative details of the patients are given in Table *3* below. All patients began consuming oral fluids on the first post-operative day, indicating that post-operative recoveries were reasonably similar across age groups. Normal feeding was resumed on the second day for patients younger than one year and on the third day for older patients. Similarly, hospital stays increased with age, from 387 hours for the smallest group to 3411 hours for the one-month-to-one-year group to 576 hours for the one-to-five-year group to 635 hours for the oldest group.

Table 3 Operative and Post Operative Details of Patients

	1 month	**1 month to 1 year**	**1 yr to 5 years**	**More than 5 years**
Operative time	87±24 mins	117±16 mins	127±22 mins	136±19 mins
Oral fluid	1st post op day	1st post op day	1st post op day	1st post op day
Normal Feeding	Day 2	Day 2	Day 3	Day 3
Hospital stay	38±7 hours	34±11 hours	57±6 hours	63±5 hours

The research also evaluated postoperative complications thoroughly. Two out of seventy-two (2.7%) patients with an ileostomy were found to have anastomotic leakage. Ten out of seventy-two patients (13.8%) had strictures, needing a one-month dilatation/stoma reversal. In eight out of seventy-two (11.1%) individuals, frequent bowel movements and/or faecal incontinence were identified and managed with stool bulking agents and bowel management. The least prevalent consequence was the persistence of symptoms, which occurred in 2.7% of patients and was treated with redo-biopsy and bowel management. The medical treatment of postoperative enterocolitis was found in 6 of 72 patients (8.3%). Lastly, four out of seventy-two patients (5.5 per cent) required reoperation, including ileostomy and repeat biopsies. Complications in medical treatments are undesirable but often inevitable outcomes that may emerge owing to variables such as the intricacy of the process, the patient's physiological reaction, or even unanticipated events. In this investigation, post-procedure problems were identified in patients and grouped according to the periods in which they occurred: 1 month, 1 month to 1 year, 1 year to 5 years, and more than 5 years as given in Table 3. Anastomotic Leak is a serious complication that has happened twice, representing 2.7% of all occurrences as shown in Figure 1. Observations were conducted once between 1 month and 1 year and again between 1 year and 5 years. These leaks can have potentially catastrophic consequences, and in our trial, an ileostomy was used to treat this condition[21]. An intraoperative pic showing the rectum, transition zone and dilated colon is shown in Figure 1 (a) and Figure 1 (b) shows transanal dissection around the rectum.

Stricture, the constriction of a region, was the most prevalent complication, accounting for 13.8% of all cases. The largest incidence occurred within the first month after surgery (44 per cent of patients), but continued to occur at decreased rates over the subsequent five years. The treatment for stricture comprised one month of dilatation and, in certain circumstances, stoma reversal. Frequent stooling or faecal incontinence, a problem related to lack of bowel control, was observed in 11.1% of all patients, primarily during the first month. After the first year, there were no reported cases of this problem. The majority of treatment strategies include stool bulking agents and bowel control measures. The persistence of symptoms was seen in a negligible number of instances, just 1.3% of the total number of cases. This after-one-year consequence was problematic since it indicated an unsuccessful operation or other underlying, undiagnosed concerns. The treatment strategy included a rebiopsy, which was normal, as well as bowel control[22].

Notably, no instances of "transition zone pull-through," a surgical operation in which the normal bowel is "pulled through" the aberrant segment and linked to the anus, were documented as complications during any of the investigated periods[23]. This may suggest the effectiveness of the surgery, or it may be the result of other events. Post-operative enterocolitis, an inflammatory disorder, was detected in 8.3% of patients, beginning in the first month and continuing for 5 years. To address this illness, medical intervention was necessary. In 5.5% of the instances, a second procedure was necessary. Reoperation may be necessary for several reasons, including the persistence of symptoms, the development of a new complication, or the inefficacy of the initial procedure. In such cases, ileostomy and rebiopsy were frequently employed as treatment. The data offer a detailed description of the outcomes and problems associated with the surgical technique evaluated across all age groups. The data shed light on age-related changes in operating times, recovery measures, and complications following surgery. In addition to describing the measures utilized to address each complication, the study provides essential insights into the possible hazards and recovery patterns following surgical intervention.

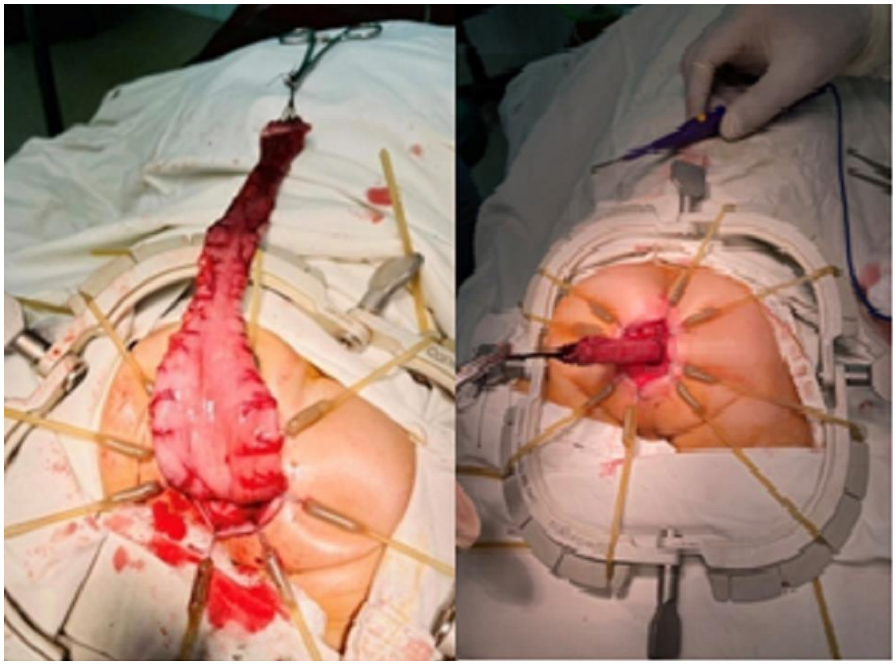

Figure 1 Intraoperative picture demonstrating rectum, dilated sigmoid and transition zone

4 Discussion

The total incidence of anastomotic leak, a significant complication, was found to be 2.7%. Even though these leaks can result in considerable morbidity and mortality, the comparatively low percentage implies that the danger can be mitigated with careful surgical technique and postoperative care. Leaks were efficiently addressed by ileostomy, highlighting the significance of early diagnosis and action[19]. With a prevalence rate of 13.8%, stricture was the second most prevalent condition seen. This problem, which occurs most commonly within the first month after surgery, underscores

the critical period of recuperation. The findings of the study highlight the importance of close patient monitoring during this period and the necessity for urgent intervention, such as dilatation, to prevent long-term effects[24].

Frequent bowel movements/faecal incontinence: This complication occurred in 11.1% of all patients, especially in the first month. Although non-lethal, it has a substantial impact on the patient's quality of life. In these instances, a combination of stool bulking agents and bowel control was helpful, suggesting that postoperative treatment must incorporate steps to manage and avoid this problem[25]. This complication was found to be quite uncommon, accounting for 1.3% of all cases. Its persistence for a longer period (1 to 5 years and beyond) may signal the need for greater long-term monitoring and maybe further intervention, such as a repeat biopsy and individualized bowel care[4]. Transition zone pull-through: The absence of problems in this category over the analyzed periods shows a good outcome, indicating that the technique may be useful and safe in the long run[26].

With an overall incidence of 8.3 per cent, the study shows that postoperative enterocolitis is not an unusual complication. The study also highlights the need for long-term surveillance by showing that the majority of cases occur between 1 and 5 years after surgery, necessitating medical attention. Reoperation was necessary in 5.5 per cent of cases, demonstrating the complexity of the procedure and the range of patient responses.

Regarding surprising results, the significant prevalence of post-operative enterocolitis between 1 and 5 years defies the widely held idea that most surgical issues show up in the first few days following surgery. It may be necessary to observe the patient for a longer time if this finding suggests a chronic or delayed response to surgery[11]. The need for careful monitoring for postoperative complications is highlighted by the study's findings, which, in comparison to earlier surgical research, are consistent[2]. The longitudinal nature of this study offers a fresh perspective and emphasizes how crucial it is to continue long-term treatment and monitoring. This approach is a crucial contribution to the existing surgical literature and has the potential to greatly enhance patient outcomes[27].

The results of this study have applications for healthcare professionals, particularly those engaged in surgical operations and post-operative care. These findings emphasize the need for meticulous oversight and customized treatments in the efficient management of issues. The large prevalence of strictures, particularly in the first month following surgery, highlights the need for surgeons to pay close attention. The increased prevalence of frequent bowel movements and faecal incontinence during this period also highlights the necessity for early use of treatments such as stool bulking agents and bowel control. This could reduce pain experienced by the patient, speed up their rehabilitation, and improve their quality of life while they are recovering. Additionally, the study demonstrates the importance of long-term surveillance by showing that some issues, such as post-operative enterocolitis, may develop much later[28]. This data should prompt doctors to prolong their awareness beyond the immediate postoperative period and to modify patient monitoring regimens accordingly. In terms of expanding knowledge in the area, the longitudinal design of this study provides a comprehensive viewpoint on the timing of difficulties. It gives evidence that the risk of problems continues long beyond the early postoperative period[29].

In addition, the incidence of chronic symptoms and the necessity for reoperation highlight the complexity of postoperative recovery. They emphasize the need for continued study to optimize surgical procedures, postoperative care, and long-term treatment to reduce the incidence of these bad events. Significantly, the absence of problems in the transition zone pull-through shows that, with careful surgical skill and long-term monitoring, this surgery can be safe and successful[30]. This discovery offers important information to the area of surgery, which might improve surgical decisions and expectations in similar circumstances. The potential influence on future patient treatment is significant. As the study gives a complete and longitudinal perspective on post-operative problems, it may lead to modifications in existing methods or recommendations. Improve patient outcomes by emphasizing longer-term follow-up and creating ways for early diagnosis and treatment of problems such as stricture and post-operative enterocolitis[7].

The variety in occurrence and kind of problems highlights the necessity for specialized patient care and tailored treatment options. Given that some problems, such as Post Op Enterocolitis, might

develop years after surgery, this further emphasizes the significance of long-term patient follow-up. The value of this study to the field is that it provides a full picture of post-surgical problems, not only in terms of their frequency and therapy but also in terms of their occurrence chronology. This study gives healthcare clinicians vital information to improve patient care by identifying the most common problems, their onset, and treatment methods. In addition, the report suggests many areas for further investigation. There are various potential areas for inquiry and discovery, ranging from a deeper examination of the early postoperative period to the investigation of why certain patients continue to endure chronic symptoms.

5 Conclusions

Post-operative complications as well as their treatment, including Anastomotic Leak, Stricture, Frequent stooling/Faecal incontinence, Symptom Persistence, Post-Operative Enterocolitis, and the need for Reoperation were investigated in sample of 72 patients. Anastomotic leaks were shown to occur in both the early and the mid-term time periods, despite the fact that the frequency of these leaks was determined to be rather low. The immediate post-operative period had the greatest incidence of strangulations, which gradually decreased over time. The incidence of frequent bowel movements or faecal incontinence was highest immediately after surgery and dropped considerably afterwards. Despite their rarity, persistent symptoms were a serious worry. Post-Operative Enterocolitis was mostly a mid-to-long-term consequence, but re-operations occurred at varying times. These issues and their timings help drive healthcare personnel follow-up regimens for patients, ensuring that complications are detected and treated promptly. Additionally, the study assists in establishing realistic patient expectations regarding probable problems and their likelihood over time.

In addition to documenting the occurrence and management of post-surgical problems, it also offers a chronology of their occurrence. This useful information might serve as the basis for future research and has the potential to influence modifications to present procedures or recommendations, ultimately enhancing the quality of patient treatment. The study found a rather high prevalence of strictures during the first postoperative month, it would be highly advantageous to do more targeted research to determine the underlying causes. Investigating the role of surgical technique, patient characteristics, and post-operative care in the occurrence of stricture might aid in its prevention.

Conflict of Interest

Authors have no conflict of interest.

References

1. F. Soave, Hirschsprung Disease, Arch. Dis. Child. 39 (1964) 116 LP – 124. https://doi.org/10.1136/adc.39.204.116.
2. K.E. Georgeson, M.M. Fuenfer, W.D. Hardin, Primary laparoscopic pull-through for Hirschsprung's disease in infants and children., J. Pediatr. Surg. 30 (1995) 1012–1017. https://doi.org/10.1016/0022-3468(95)90333-x.
3. J.C. Langer, Surgical approach to Hirschsprung disease, Semin. Pediatr. Surg. 31 (2022) 151156. https://doi.org/https://doi.org/10.1016/j.sempedsurg.2022.151156.
4. J. Feng, T. Li, N. Li, Laparoscopically Assisted Pull-Through Operation for Hirschsprung's Disease, Hirschsprung's Dis. Allied Disord. (2019) 357–371.
5. M.B. Madonna, S.R. Luck, M. Reynolds, D.K. Schwarz, R.M. Arensman, Swenson Procedure for the Treatment of Hirschsprung's Disease, Semin. Pediatr. Surg. 7 (1998) 85–88. https://doi.org/https://doi.org/10.1016/S1055-8586(98)70018-6.
6. S.O. Ekenze, C. Ngaikedi, A.A. Obasi, Problems and outcome of Hirschsprung's disease presenting after 1 year of age in a developing country., World J. Surg. 35 (2011) 22–26. https://doi.org/10.1007/s00268-010-0828-2.
7. M.A. Levitt, B. Dickie, A. Peña, The Hirschsprungs patient who is soiling after what was considered a "successful" pull-through, in: Semin. Pediatr. Surg., Elsevier, 2012: pp. 344–353.
8. A. Vilanova-Sánchez, R.J. Wood, C.A. Reck-Burneo, D.R. Halleran, M.A. Levitt, Laparoscopic

Approach to Hirschsprung Disease, Video Atlas Pediatr. Endosurgery A Step-By-Step Approach to Common Oper. (2021) 89–93.
9. Z. Xu, Z. Zhao, L. Wang, Q. An, W. Tao, A new modification of transanal Swenson pull-through procedure for Hirschsprung's disease, Chin. Med. J. (Engl). 121 (2008) 2420–2423.
10. Y. Zhang, Z. Liu, S. Li, S. Yang, J. Zhao, T. Yang, S. Li, Y. Chen, W. Guo, D. Hou, One-stage transanal endorectal pull-through for Hirschsprung disease: experience with 229 neonates, Pediatr. Surg. Int. 38 (2022) 1533–1540.
11. A. Nasr, J.C. Langer, Evolution of the technique in the transanal pull-through for Hirschsprung's disease: effect on outcome, J. Pediatr. Surg. 42 (2007) 36–40.
12. L. De La Torre, J.C. Langer, Transanal endorectal pull-through for Hirschsprung disease: technique, controversies, pearls, pitfalls, and an organized approach to the management of postoperative obstructive symptoms, in: Semin. Pediatr. Surg., Elsevier, 2010: pp. 96–106.
13. A. Yamataka, M. Takeda, G. Miyano, Laparoscopic Operation, Hirschsprung's Dis. Allied Disord. Status Quo Futur. Prospect. Treat. (2019) 155–162.
14. M. Rouzrokh, A.T. Khaleghnejad, L. Mohejerzadeh, A. Heydari, H. Molaei, What is the most common complication after one-stage transanal pull-through in infants with Hirschsprung's disease?, Pediatr. Surg. Int. 26 (2010) 967–970.
15. B.-U. Nguyen, M.T. Vu, Q.-T. Pham, V.-H.N. Phung, Q.-N.N. Dang, T. Thai, D.-T. Le Vo, T.T. Tran, M.M. Huynh, Q.K. Huynh, T.K. Ngo, H.T. Dao, Adopting the Swenson-like technique for patients with Hirschsprung disease in Vietnam, Pediatr. Surg. Int. 39 (2023) 124. https://doi.org/10.1007/s00383-023-05415-z.
16. C. Byström, S. Östlund, N. Hoff, T. Wester, A.L. Granström, Evaluation of bowel function, urinary tract function, and quality of life after transanal endorectal pull-through surgery for Hirschsprung's disease, Eur. J. Pediatr. Surg. 31 (2020) 40–48.
17. P.A. Vũ, H.H. Thiện, P.N. Hiệp, Transanal one-stage endorectal pull-through for Hirschsprung disease: experiences with 51 newborn patients, Pediatr. Surg. Int. 26 (2010) 589–592. https://doi.org/10.1007/s00383-010-2599-0.
18. X. Bing, C. Sun, Z. Wang, Y. Su, H. Sun, L. Wang, X. Yu, Transanal pullthrough Soave and Swenson techniques for pediatric patients with Hirschsprung disease, Medicine (Baltimore). 96 (2017). https://journals.lww.com/md-journal/Fulltext/2017/03100/Transanal_pullthrough_Soave_and_Swenson_techniques.21.aspx.
19. L. De la Torre, K. Cogley, K. Santos, O. Morales, J. Calisto, The anal canal is the fine line between "fecal incontinence and colitis" after a pull-through for Hirschsprung disease, J. Pediatr. Surg. 52 (2017) 2011–2017.
20. A. Pratap, D.K. Gupta, V.C. Shakya, S. Adhikary, A. Tiwari, P. Shrestha, S.R. Pandey, R.K. Yadav, Analysis of problems, complications, avoidance and management with transanal pull-through for Hirschsprung disease, J. Pediatr. Surg. 42 (2007) 1869–1876. https://doi.org/10.1016/j.jpedsurg.2007.07.017.
21. A. Hadidi, F. Bartoli, K.-L. Waag, Role of transanal endorectal pull-through in complicated Hirschsprung's disease: experience in 18 patients, J. Pediatr. Surg. 42 (2007) 544–548.
22. J.P. Sulkowski, J.N. Cooper, A. Congeni, E.G. Pearson, B.C. Nwomeh, E.J. Doolin, M.L. Blakely, P.C. Minneci, K.J. Deans, Single-stage versus multi-stage pull-through for Hirschsprung's disease: practice trends and outcomes in infants, J. Pediatr. Surg. 49 (2014) 1619–1625.
23. K.J. Stensrud, R. Emblem, K. Bjørnland, Anal endosonography and bowel function in patients undergoing different types of endorectal pull-through procedures for Hirschsprung disease, J. Pediatr. Surg. 50 (2015) 1341–1346.
24. M. V Fosby, K.J. Stensrud, K. Bjørnland, Bowel function after transanal endorectal pull-through for Hirschsprung disease–does outcome improve over time?, J. Pediatr. Surg. 55 (2020) 2375–2378.
25. J. Hagens, K. Reinshagen, C. Tomuschat, Prevalence of Hirschsprung-associated enterocolitis in patients with Hirschsprung disease, Pediatr. Surg. Int. (2022) 1–22.

26. H.A. Almetaher, S.N. Ragab, H. Hassan, A.A. Eisa, E.A. Elhalaby, Laparoscopic-assisted Swenson pull-through for Hirschsprung's disease, Egypt. J. Surg. 41 (2022). https://journals.lww.com/ejos/Fulltext/2022/04000/Laparoscopic_assisted_Swenson_pull_through_for.39.aspx.
27. M.A. Levitt, M.C. Hamrick, B. Eradi, A. Bischoff, J. Hall, A. Peña, Transanal, full-thickness, Swenson-like approach for Hirschsprung disease, J. Pediatr. Surg. 48 (2013) 2289–2295. https://doi.org/https://doi.org/10.1016/j.jpedsurg.2013.03.002.
28. H. Ahmad, M.A. Levitt, D. Yacob, D.R. Halleran, A.C. Gasior, C. Di Lorenzo, R.J. Wood, J.C. Langer, Evaluation and management of persistent problems after surgery for hirschsprung disease in a child, Curr. Gastroenterol. Rep. 23 (2021) 1–9.
29. M.A. Levitt, B. Dickie, A. Peña, Evaluation and treatment of the patient with Hirschsprung disease who is not doing well after a pull-through procedure, in: Semin. Pediatr. Surg., Elsevier, 2010: pp. 146–153.
30. A.J.M. Dingemans, H.J.J. van der Steeg, R. Rassouli-Kirchmeier, M.W. Linssen, I. van Rooij, I. de Blaauw, Redo pull-through surgery in Hirschsprung disease: short-term clinical outcome, J. Pediatr. Surg. 52 (2017) 1446–1450.