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Should we perform a Hirschsprung redo pull-through on patients with retained transition zone?

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ABSTRACT

Background: In Patients with Hirschsprung Disease (HSCR) suffering from obstructive symptoms after their pull-through surgery, a transition zone pull-through (TZPT) was suggested as a causing factor. Current guidelines recommend a reoperation resecting the transition zone in these patients. This present study reports the clinical outcomes in patients with a confirmed TZPT.

Methods: A retrospective review of patients who underwent a primary transanal pull-through for recto-sigmoid HSCR at the Children's Hospital Colorado from January 2010 until June 2020 was performed. We included patients with a TZPT confirmed on the definitive histopathological report of the proximal margin's circumference obtained at the time of their pull-through surgery and follow-up at the Children's Hospital Colorado. Demographic data were collected. The primary outcome of interest was fecal control, episodes of Hirschsprung-associated enterocolitis (HAEC), the necessity of bowel management (with either laxatives or enemas), and a redo pull-through.

Results: Six patients had a TZPT. Two patients suffered episodes of HAEC. One patient is fecal incontinent. None of them underwent redo pull-through surgery. Medical treatment was successful in all with obstructive symptoms.

Conclusion: Patients who underwent a pull-through surgery for HSCR with retained transition zone may suffer from obstructive symptoms, which can be managed conservatively with medical treatment. A TZPT is not necessarily associated with persistent obstructive symptoms.

Level of evidence/type of study: Level III, retrospective.

Introduction

The histopathologic transition zone (TZ) in Hirschsprung disease (HSCR) is where distal aganglionic bowel transitions to normally ganglionated bowel. The TZ possesses distinct neuroanatomical features only found in this specific area [1–3]. The length of the TZ varies but is most frequently less than or equal to 5 cm in the recto-sigmoid HSCR [2,4].

The clinical relevance of residual TZ post-pull-through is unclear, but its distinct neuropathologic findings could correlate with motility problems [5,6]. Therefore, according to the Hirschsprung disease interest group, the current recommendation is that patients with post-operative obstructive symptoms with histopathological confirmed TZ pull-through should undergo reoperation [7]. However, a reoperation under this circumstance could result in poorer outcomes; contrary, conservative medical treatment has resulted in successful outcomes [8,9].

We present the clinical outcomes of six patients who underwent a primary transanal pull-through due to rectosigmoid HSCR, with features of a TZ at the proximal margin on the definitive histopathological report. We hypothesize that a TZ pull-through may not require reoperation in all cases with obstructive postoperative problems, such as constipation

Abbreviations: HSCR, Hirschsprung disease; TZ, transition zone; HAEC, Hirschsprung-associated enterocolitis; TZPT, transition zone pull-through.

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and Hirschsprung-associated enterocolitis (HAEC), and could be treated conservatively.

Material and methods

A retrospective chart review of patients with rectosigmoid HSCR who underwent a primary transanal pull-through at the Children's Hospital Colorado from January 2010 until June 2020 was performed. Patients were included if, at the time of the pull-through surgery, they had described features of the TZ at the proximal margin on their final histopathological report. All patients were followed at the Children's Hospital Colorado. The last patient contact was during the year 2022.

All specimens were re-reviewed independently by two senior pediatric pathologists in a standardized manner at the time of the study, confirming the diagnosis of a TZ at the proximal margin (donut) of the resected specimen. All the circumference of the proximal margin of the resected specimen obtained at the initial pull-through was sent for an intraoperative frozen study using hematoxylin and eosin (H&E) for the initial exam and report. Further processing of the entire specimen was then examined for definitive diagnosis (paraffin-embedded). This specimen was stained with H&E, calretinin, and Glut-1 immunohistochemistry. The histopathologic criteria for TZ were partial aganglionosis of the circumference, myenteric hypoganglionosis, or hypertrophic nerves (> 40 μm) of the submucosal plexus.

Data collected were demographic information, other comorbidities, surgical interventions under anesthesia, clinical follow-up, medications, and bowel management. The primary outcome of interest was fecal control, episodes of HAEC, and bowel management, with either laxatives or enemas, the necessity of a redo pull-through, and the surgical technique used during the pull-through.

A descriptive analysis was performed, and the patient's outcomes were reported in frequencies and percentages. The Colorado Multiple Institutional Review Board approved this study (IRB#:20–1891).

Results

Six patients with transition zone at the proximal margin were identified. Four were male, and two were female (Tables 1 and 2). Age at the time of surgery ranged from 8 days to 13 months, with a median of 9.5 months. Age at the time of data collection ranged from 7 to 13 years, with a median age of 9. The range of postoperative follow-up time was from 7 to 12 years, with a median of 8 years. All patients underwent a transanal Yancey-Soave PT.

Five patients at the time of evaluation had bowel control and voluntary bowel movements daily or every other day. In one patient with trisomy 21, an anorectal exam under anesthesia confirmed that the anastomosis was created too low over the anal canal. This patient suffers from fecal incontinence with a tendency to constipation. He is clean and socially continent with daily rectal enemas. Two patients had a history of episodes of HAEC and suffered from constipation. In both patients, the last HAEC event occurred at the age of five years (Table 1). They take daily stimulant laxatives, have bowel control, and have daily voluntary bowel movements. None of the patients underwent redo pull-through surgery.

Table 2
Histopathological features of the Circumference of the proximal margin in six patients submitted to a primary pull-through for rectosigmoid Hirschsprung disease.

Patient	Proximal margin of the resected specimen at the time of the pull-through
1	Submucosal nerves >40 microns
2	Submucosal nerves >40 microns
3	Areas of aganglionic submucosa and myenteric zone Submucosal nerves >40 microns
4	Submucosal nerves >40 microns
5	Submucosal nerves >40 microns
6	Partially aganglionic submucosa Submucosal nerves >40 microns

Discussion

Despite having a TZ pull-through operation, no patients in this series underwent a redo pull-through operation. Two patients had episodes of HAEC and constipation. Both patients were initially treated with irrigations and then with oral laxatives. They have daily bowel movements. Though our sample size is small, our data suggest conservative management should be considered for patients with TZ pull-through with persistent obstructive symptoms (e.g., constipation and HAEC). Similar results have been reported by Ghosh et al., none of their patients with TZ pull-through required a reoperation, and medical treatment was successful [8], and also by Shankar et al., one patient out of eleven with a TZ pull-through was submitted to a reoperation, the remaining received medical treatment [9].

A concern of TZ pull-through is an increased frequency of HAEC. In the two patients with episodes of enterocolitis, their last episode was at the age of five. In both patients, the frequency of episodes of enterocolitis has subsided over time. This is a well-known phenomenon in which events of HAEC postoperatively become less frequent over time, though the reason needs to be better understood [10]. This may indicate that this patient population should be followed conservatively over a more extended period before considering surgical treatments.

Although the diagnosis of a TZ pull-through in our patient population was confirmed, the length of the remaining TZ in the patient is unknown. Studies from Kapur suggest that in a rectosigmoid HSCR, the extent of the TZ is less than 5 cm [2]. However, other publications inform of a more extended TZ [11,12]. The significance of the length of the residual TZ for the patient's bowel function is unclear and remains unresolved [2].

The presence of submucosal hypertrophic nerves (>40 μm in diameter) is one of the histopathological criteria to confirm a transition zone in the circumference of the proximal margin [2,13] during a primary pull-through. In our patient cohort, submucosal hypertrophic nerves were established in the proximal margin in all patients during the definitive histopathologic evaluation. The criterion of submucosal hypertrophic nerves does not apply to diagnose TZ when evaluating biopsies of the neorectum in patients who have had a prior pull-through [13,14]. Therefore, we caution surgeons against relying on this finding when obtaining a biopsy of the neorectum and considering reoperation. Instead, as stated by Kapur, they should depend on the proximal margin of the initial specimen whenever possible since this is the optimal specimen to assess if a transition zone pull-through was performed [15].

Table 1
Clinical features of six rectosigmoid patients submitted to a primary repair resulting with a transition zone pull-through.

Patient	Age [years]	Age at Surgery	Gender	Bowel control	Episodes of Enterocolitis	Current Medication
1	7	8 days	Male	Continent	3	90 mg Senna
2	8	8 days	Male	Continent		no
3	9	9 months	Male	Incontinent		Rectal Enema
4	9	13 months	Female	Continent		no
5	11	10 months	Male	Continent	1	35 mg Senna
6	13	11 months	Female	Continent		no

Our data suggest that initial medical treatment can be undertaken to treat obstructive symptoms in patients with a transition zone pull-through. The decision to perform a reoperation is dependent on the surgeon. A redo pull-through increases the risk of creating a low/distal anastomosis occupying the anal canal. The partial or total absence of the anal canal after a Hirschsprung pull-through has been observed in patients with postoperative fecal incontinence [16–22]. The scientific explanation of this "association" has not been established.

The goal of making a redo pull-through justified by diagnosing a TZ is to resolve HAEC, constipation, or both. The anal canal must be protected during an operation or re-operation to preserve fecal continence. Several authors have published their experiences with re-operation in patients with TZPT. It is essential to notice that the diagnosis of TZ was made in biopsies of the neo-rectum, with only a few reporting functional outcomes. Those who say their post-redo results describe an “improvement” of HAEC or constipation, but these patients suffer from fecal incontinence [6,22–33]. Reoperation increases the chances of a low anastomosis within the anal canal, leading to fecal incontinence [16,17,34]. Furthermore, a reoperation does not guarantee to resolve obstructive symptoms [6,22–33]. The evidence suggests that medical treatment should be attempted in patients with a TZPT and postoperative HAEC or constipation before proposing a reoperation [8,9].

There are limitations of this study to note. First, it is limited by its sample size, which depends on the pathologist’s reliability of the intraoperative evaluation. After a primary pull-through, there should be no patients with TZ pull-throughs. That is, frozen intraoperative studies should be infallible. Our institution is a tertiary children’s hospital with a referral center for pediatric colorectal conditions, and our pediatric pathologists have extensive experience diagnosing Hirschsprung disease and transition zone on intraoperative frozen sections during primary pull-throughs examining the proximal margin’s circumference and in the definitive report using paraffin-embedded tissue. In the last ten years, the discrepancy between our institution’s intraoperative and final study of the complete proximal margin was 8.4% (6 out of 71 patients with primary pull-through). In the literature, the reported frequency of this discrepancy ranges from 3 to 11% [35,36].

Conclusion

Patients with a primary Hirschsprung pull-through with a histopathological transition zone in the circumference of the proximal margin who suffer from obstructive symptoms could be managed successfully with medical treatment. Although a small case series, our data illustrate that reoperation is not indicated in all the patients with a transition zone pull-through. These data suggest that transition zone pull-through is not necessarily the main or the only cause of persistent obstructive symptoms. Further studies are needed to understand better the clinical implications for patients with transition zone pull-through to determine the optimal treatment options for those who suffer obstructive symptoms postoperatively.

CRediT authorship contribution statement

Lea A. Wehrli: Conceptualization, Data curation, Formal analysis, Writing – review & editing. **Marina L. Reppucci:** Conceptualization, Data curation, Formal analysis, Writing – review & editing. **Jenny Stevens:** Conceptualization, Data curation, Formal analysis, Writing – review & editing. **Michael Arnold:** Conceptualization, Data curation, Formal analysis, Writing – review & editing. **Mark Lovell:** Conceptualization, Data curation, Formal analysis, Writing – review & editing. **María Zornoza:** Conceptualization, Data curation, Formal analysis, Writing – review & editing. **Andrea Bischoff:** Formal analysis, Writing – review & editing. **Luis De la Torre:** Conceptualization, Data curation, Formal analysis, Writing – review & editing, Writing – original draft.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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