Assessment of outcomes of combined minimally invasive perineal procedures for treatment of complete rectal prolapse in children: an approach to reduce recurrence rate

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Background
Rectal prolapse in children is common in developing countries with low health resources. Open and laparoscopic abdominal approaches are ideal for the treatment of rectal prolapse but they are not suitable for frail children and countries with poor medical resources. Perineal procedures are usually well tolerated and simple but have high recurrence rates.

Objective
Our objective is to assess the short-term outcomes of combined minimally invasive perineal procedures, including anal encirclement, submucosal alcohol injection, and Gant–Miwa procedure, in the management of full-thickness rectal prolapse in children. Through this combination, we looked forward toward magnifying the advantages of perineal procedures and allaying their complications, particularly recurrence rates.

Patients and methods
A total of 31 children with complete rectal prolapse were recruited during the period from May 2017 to June 2019. All the patients underwent three combined perineal procedures: mucosal plication (Gant’s technique), anal encirclement, and submucosal injection sclerotherapy.

Results
The study group included children with a median age of 6.55±2.14 years (range, 3.0–10.0 years). Mean operative time was 37.58±5.61 min (range, 30.0–45.0 min).

The end results of our study were renovating anorectal physiology by correcting the rectal prolapse and improving continence (93.5%) and constipation (93.5%), with no mortality (0%) and low recurrence rates (3.2%).

Conclusion
Our approach (combined minimally invasive perineal procedures) is simple, effective, and less invasive, with minimal morbidity and a negligible recurrence rate, particularly for children with complete rectal prolapse.

Keywords:
anal encirclement, Gant–Miwa, injection sclerotherapy, rectal prolapse

Introduction
Rectal prolapse is the extrusion of the rectal mucosa or the entire rectal wall through the anal mucocutaneous junction [1]. Rectal prolapse in children is not rare and usually presents in children younger than four years old without any sex predilection [2]. More than 100 surgical procedures with various modifications to optimize the repair of rectal prolapse have been proposed [3]. The currently accepted hypothesis states that complete rectal prolapse starts as a circumferential intussusception of the rectum, which gradually progresses to complete rectal prolapse [4]. The operative procedures for the management of rectal prolapse can be broadly categorized as either abdominal or perineal approach [5]. Perineal procedures can be classified into two groups. The first group principle is to initiate fibrosis such as submucosal sclerosant injection [6]. The second group aims to shorten the prolapsed rectum. They include Delorme’s operation, Altemeier’s operation, and stapled transanal rectal resection [6]. The benefits of the perineal operations are the patients experience minimal amounts of pain, often ambulating within hours after surgery and resuming a regular diet within the first 24 h, and so, short hospital stay [7]. Perineal approaches are associated with higher recurrence rates. It is, therefore, necessary to counsel patients regarding a high likelihood of recurrence in those undergoing a perineal procedure as a primary or repeat operation for the treatment of prolapse [8].

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Objective
Our objective is to assess the short-term outcomes of combined minimally invasive perineal procedures, including anal encirclement, submucosal alcohol injection, and Gant–Miwa procedure in the management of full-thickness rectal prolapse in children. Through this combination, we looked forward toward magnifying the advantages of perineal procedures and allaying their complications particularly recurrence rates.

Patients and methods
During the period from May 2017 to June 2019, 31 children presented to the Pediatric Surgery Unit, Benha University Hospital, with complete rectal prolapse. All patients’ complaints were mass protruding through the anus. Complete rectal prolapse was diagnosed by the clinical examination (Fig. 1). The complete blood counts, coagulation profiles, stool analysis liver, and renal function tests were performed. Written consent was taken from each parent. The variables assessed were age, sex, presenting complaints, associated conditions such as constipation, bleeding per rectum, fecal incontinence, investigations and conservative treatment undertaken, operative time, postoperative pain, hospital stay, return of bowel habits, regular diet, and complications of surgical management, especially recurrence of the prolapse. The children were kept fasting for 3 h preoperatively. The operations were undertaken under general anesthesia.

Operative procedures
The patient was put in the lithotomy position (Fig. 2). Mechanical traction of the rectal mucosa was applied through the anus, using Babcock’s forceps allowing the exteriorization of the prolapsed rectum (Fig. 3). Alcohol 70% was injected in rectal submucosa proximal to mucosal plication (Fig. 4). Successive application of artery forceps and grasping of the prolapsed mucosa were undertaken. A grip of rectal mucosa was transfixed by absorbable suture material, polyglycolic acid (Vicryl 2/0) in multiple transverse and longitudinal lines that were arranged 2–5 mm intervals without incising the transfixed mucosa until the rectal prolapse was shortened and reduced (Figs 5–10).

Thereafter, 3-mm-long vertical two incisions in the midline of the anal verge anteriorly and posteriorly at

Figure 1
Complete rectal prolapse.

Figure 2
The patient was put in the lithotomy position.

Figure 3
Exteriorization of the prolapsed rectum.
12 and 6 o’clock position respectively were made. Then a zero polyglycolic acid (Vicryl 0) suture attached to a curved needle (one-third circle, 50 mm) was introduced into the anterior incision subcutaneously backward, then emerged from the posterior incision, and then from the posterior incision to the anterior one encircling the anal verge. The suture was tied over a syringe 3 cm (Figs 11–13).

The children were maintained on laxatives postoperatively. Follow-up was scheduled one week and 1 month postoperatively, and then every 6 months (Fig. 14).

Statistical analyses
Statistical package for social sciences software (SPSS, version 20.0 for Windows, SPSS Inc., Chicago, Illinois, USA) was used for the univariate, bivariate, and stratified analyses of the data. Qualitative variables were analyzed by constructing contingency tables with Fisher exact test. Differences were considered significant at $P$ value less than or equal to 0.05.

Results
During the period from May 2017 to June 2019, 31 children with complete rectal prolapse, with a median age of 6.55±2.14 years (range, 3.0–10.0 years), presented to the Pediatric Surgery Unit, Benha University Hospital. The study group included 14
(45.2%) males and 17 (54.8%) females. All patients’ complaints were mass protruding through the anus. In 81% of patients, the mass sometimes protruded and in 19% of patients, the mass protruded all times necessitating manual reduction. The topography and the complaints of the patients are summarized in Table 1. To conduct this study, ethical permission was approved by the Ethics Committee at Benha Faculty of Medicine. Written informed consent was taken from each parent after a full discussion about these combined perineal procedures, method, and the possible consequences.

All the patients at the outset had conservative management for a median of 9 months (range, 6–15
months) before referral to our Pediatric Surgical Unit. The referral was categorical after the development of two or more recurrences of the rectal prolapse necessitating manual reduction while on conservative treatment. The associated manifestations in these children are shown in Table 2.

All the patients underwent three combined perineal procedures: mucosal plication (Gant's technique), anal encirclement, and submucosal injection sclerotherapy. Mean operative time was 37.58±5.61 min (range, 30.0–45.0 min). Tables 3 and 4 show a significant improvement of associated conditions after surgical management of rectal prolapse with combined minimally invasive perineal procedures, with a recurrence rate of 3.1%.

**Discussion**

In the literature, perineal approaches for the treatment of rectal prolapse have a bad prognosis because of higher recurrence rates [8–12]. So, perineal approaches are reserved for medically unfit patients [5]. Many studies claimed that the shortcoming of a higher recurrence rate is more than balanced by the decrease in perioperative morbidity in these risky patients [13–21]. The pathophysiology of rectal prolapse in children is different from that in adults. In adults, rectal prolapse is the result of laxity or
weakness of pelvic floor muscles associated with connective tissue injury including nerve injury and neuropathy of the pelvic floor owing to excessive straining for a long time [9,22]. In children, the pathophysiology is related to several anatomic concerns, such as loss of the normal sacral curvature, the great mobility of the sigmoid colon, and a loosely attached rectal mucosa to the underlying muscularis [23]. Therefore, selecting surgical approaches is difficult and should be tailored and individualized according to patient’s disease characteristics and the surgeon’s experience parallel to understanding exact causative factors and anatomical variation [5,12]. In this study, we tried to assess combined different minimally invasive perineal approaches, including mucosal plication (Gant’s technique), anal encirclement, and submucosal injection sclerotherapy in children with age group younger than 10 years (median age, 6.55±2.14 years) and their effect on recurrence rate in this age group. Mucosal plication (Gant–Miwa procedure) is not popular in the West, but in Japan, it plays a major role in the treatment of rectal prolapse [24]. The procedure consists of transfixation of mucosa to underlying muscle by multiple absorbable sutures 5 mm apart extending from the apex of the prolapse to 1 cm above the dentate line [8]. Clinical results show improved defecatory function with minimal complications. However, a higher recurrence rate of ∼30% has been reported [24]. Anal encirclement was first described by Thiersch in 1891 [25] using a silver wire, which was subsequently replaced by multiple alternative materials such as Mersilene, Dacron, Teflon, fascia lata, and others [8]. In principle, the Thiersch procedure consists of placement of foreign material subcutaneously around the anal canal initiating a foreign body reaction and a mechanical barrier to the passage of prolapse. This procedure is rarely performed because of its higher morbidity and recurrence rates [26]. Despite this, the Thiersch procedure is widely used in Japan as a step of the Gant–Miwa procedure [8]. Injection sclerotherapy is a simple well-tolerated and efficacious procedure and should be considered as a valuable initial procedure for the treatment of rectal prolapse after the failure of the conservative measures [1,27]. Injection sclerotherapy is considered an outstanding modality for treating partial rectal prolapse in children [28]. Various materials are available for such injection, but each has its advantages and complications [4]. Injection can be done with phenol in oil, hypertonic saline, 50% dextrose solution, ethyl alcohol, or cow milk [23]. Longitudinally injecting the sclerosing agent in each of the four quadrants of the rectal submucosal area

<table>
<thead>
<tr>
<th>Complication</th>
<th>Preoperative</th>
<th>Postoperative</th>
<th>Statistical test (FET)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constipation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ve</td>
<td>25 (80.6)</td>
<td>2 (6.5)</td>
<td>36.87</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>No</td>
<td>6 (19.4)</td>
<td>29 (93.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bleeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ve</td>
<td>11 (35.5)</td>
<td>0</td>
<td>13.37</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>–ve</td>
<td>20 (64.5)</td>
<td>31 (100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incontinence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ve</td>
<td>18 (58.1)</td>
<td>2 (6.5)</td>
<td>18.9</td>
<td>&lt;0.001**</td>
</tr>
<tr>
<td>–ve</td>
<td>13 (41.9)</td>
<td>29 (93.5)</td>
<td></td>
<td></td>
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</tbody>
</table>

**P-value is significant if it’s <0.001 meaning there is a significant improvement of results postoperatively in comparison to preoperative.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Morbidity (%)</th>
<th>Mortality (%)</th>
<th>Recurrence (%)</th>
</tr>
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<tbody>
<tr>
<td>Perineal procedures</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Delorme operation</td>
<td>4–33</td>
<td>0–7</td>
<td>6–26</td>
</tr>
<tr>
<td>Altemeier’s operation</td>
<td>5–24</td>
<td>0–6</td>
<td>0–18</td>
</tr>
<tr>
<td>Open abdominal approaches</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suture rectopexy</td>
<td>9–20</td>
<td>0–4</td>
<td>0–20</td>
</tr>
<tr>
<td>Rectopexy and resection</td>
<td>7–23</td>
<td>0–7</td>
<td>0–9</td>
</tr>
<tr>
<td>Laparoscopic approaches</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suture rectopexy</td>
<td>9–19</td>
<td>0</td>
<td>0–7</td>
</tr>
<tr>
<td>Rectopexy and sigmoidectomy</td>
<td>8–21</td>
<td>0–1</td>
<td>0–11</td>
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<tr>
<td>Ventral mesh rectopexy</td>
<td>10–36</td>
<td>0</td>
<td>0–15</td>
</tr>
</tbody>
</table>
Combined minimally invasive perineal procedures

Abdelhalim

promotes inflammatory response and scar, which prevent rectal prolapse [29]. The success rates and complications of the treatment reported in the literature differ for each sclerosing agent, with overall success rates ranging from 80 to 100% and recurrence rates of 11% [1,30]. In adults, rectal prolapse is six times more common in females than in males, but in children, it usually presents without any sex predilection [2,11]. The study group included 14 (45.2%) males and 17 (54.8%) females. Children with rectal prolapse frequently have associated fecal dysfunctions, such as fecal incontinence (50%) and constipation (65%) [12]. Sarmast et al. [31] reported prolapse of a rectal mass (96%), bleeding after defecation (36.6%), diarrhea (23.9%), and constipation (6%) as the most common manifestations in their cohort. The most common associated symptom in our study was constipation (80%), followed by fecal incontinence (58%). Other symptoms were soiling (51%) and bleeding with defecation (35%). According to the mechanism of action, the perineal approaches for the treatment of rectal prolapse can be classified into two categories. The first category acts by inducing fibrosis such as submucosal injection of sclerosant materials [6]. The second category acts by shortening the prolapsed rectum. This category can be subdivided into two groups: the first one is more invasive such as Delorme’s operation and Altemeier operation. The second group is less invasive, such as mucosal plication for rectal prolapse, known as the Gant–Miwa procedure [6]. We can avail both mechanisms (inducing fibrosis and shortening of the prolapsed rectum) by combining minimally invasive perineal procedures, that is, Gant–Miwa procedure, anal encirclement, and submucosal alcohol injection, specifically in children, as one of the pathophysiology of rectal prolapse in them is a loosely attached rectal mucosa to the underlying muscularis [23]. Our results build up this supposition, where there were significant improvements in associated conditions with rectal prolapse, as summarized in Table 4. The end results of our study were renovating anorectal physiology by correcting the rectal prolapse and improving continence (93.5%) and constipation (93.5%) with no mortality (0%) and low recurrence rates (3.2%). These results are comparable to other perineal and abdominal procedures for the treatment of rectal prolapse, with the advantages of less invasive and low morbidity and mortality, as shown in Table 5 [32–38].

The recurrence rate was low (3.2%) in our combined perineal procedures in comparison with the every single procedure. Yamana and Iwadare [24] reported that recurrence rates in Gant–Miwa procedure were up to 30%. Anal encirclement has a high recurrence rate (33–44%) [39,40]. Recurrence rates after sclerosant injection were up to 11% [23,28,30]. In our study, recurrence occurred in one child (3.2%). The prolapse was mild and less than the presenting prolapse. We found that the precipitating factors were excessive straining, malnutrition, and heavy parasitic infestation. Hence, the parents of the patient were advised to prevent excessive straining of child, and treatment was directed at dietary correction of constipation and malnutrition, proper toilet training, and the elimination of parasitic infestation. High-fiber diet and stool softeners were also prescribed. The follow-up visits of the patient showed the cure of the recurred rectal prolapse without any surgical intervention.

Conclusion

Our approach (combined minimally invasive perineal procedures) is simple, effective, and less invasive, with minimal morbidity and a negligible recurrence rate, particularly for children.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References
