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Laparoscopic rectopexy versus posterior sagittal presacral rectopexy for complete rectal prolapse in children: A review article

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Abstract

This review contrasts laparoscopic rectopexy with posterior sagittal presacral rectopexy for treating complete rectal prolapse in children. It delves into the multifactorial etiology of the condition, anatomical considerations, and the pathophysiology underlying rectal prolapse. The discussion extends to various surgical interventions, their advantages, drawbacks, and outcomes, highlighting the significance of choosing an appropriate treatment modality based on individual patient needs and anatomical peculiarities. The article underscores the importance of minimally invasive techniques in enhancing recovery while ensuring low recurrence rates, aiming to provide a comprehensive guide for clinicians in selecting optimal treatment strategies.

Keywords: Rectopexy, Laparoscopic, Rectal Prolapse, Pediatric Surgery.

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1. Introduction

Complete rectal prolapse in children is a rare but impactful condition causing discomfort and hindrance in daily life [1]. Its etiology is multifactorial, linked to constipation, chronic straining, and anatomical abnormalities [2]. Surgical interventions like laparoscopic rectopexy and posterior sagittal rectopexy aim to relieve symptoms with differing benefits [3]. Laparoscopic rectopexy offers minimally invasive advantages, while posterior sagittal rectopexy allows direct visualization and correction of associated anomalies [4].

2. Anatomical View

2.1. Anatomy of the rectum

Total laparoscopic rectal mobilization necessitates a comprehensive grasp of pelvic anatomy. Beginning with an anatomical overview, we detail operative steps relevant to the laparoscopic approach, noting potential complications may influence surgical strategy and anatomical identification [5]. The rectum, starting at the 3rd sacral vertebra, extends from the sigmoid colon, following a ventral concavity towards the levator hiatus [6]. At this hiatus, it merges with the anal canal, about four centimeters in front of the coccyx, entirely intrapelvic. The rectum exhibits three lateral curves, each marked by 'valves of Houston,' aiding in identification during sigmoidoscopy. The rectosigmoid junction, situated approximately six centimeters below the sacral protuberance, marks a distinct transition in anatomy, facilitating surgical localization [6] (Figure 1).

2.2.1. Anatomy of levator ani muscle

The levator ani, primarily striated muscle with some smooth muscle, supports the pelvic floor and facilitates passage of pelvic structures [7]. Comprising puborectalis, pubococcygeus, and iliococcygeus muscles, it receives innervation from somatic and autonomic nerves, aiding in functions like supporting pelvic organs and facilitating bodily functions [8, 9].

2.2.2. Origin, Course, and Insertion

The arcus tendinous fascia pelvis, covering the medial aspect of the obturator internus muscle, extends posteriorly to form the arcus tendinous levator ani, which serves as the origin of the iliococcygeus muscle fibers [10]. Puborectalis arises from the pubic symphysis and urogenital diaphragm, forming a sling around the rectum [9]. Pubococcygeus originates from the pubis and obturator fascia, inserting into the anococcygeal raphe, with gender-dependent variations in insertion site [9] (Figure 2).

2.3. Anatomy of pelvic plexus

The pelvic plexus, situated in the pelvis anterior to the sacrum and coccyx, is formed by the fusion of the superior and inferior hypogastric plexuses. Originating from lumbar and pelvic splanchnic nerves, it supplies pelvic organs with branches such as the prostatic, uterovaginal, vesical, and rectal plexuses. Controlling pelvic floor muscle contraction and sensory perception of bladder and bowel fullness, damage to the pelvic plexus can result in urinary and fecal incontinence, as well as sexual dysfunction [12] (Figure 3).

3. Pathophysiology of Rectal Prolapse

The pathophysiology of rectal prolapse presents two main theories. The first posits it as a sliding hernia through a defect in pelvic fascia, while the second suggests it begins as a circumferential internal intussusception of the rectum, potentially progressing to full-thickness prolapse [13]. Mucosal prolapse, distinct from full-thickness prolapse, occurs when rectal mucosa's connective tissue attachments loosen, often as a continuation of hemorrhoidal disease [14]. In pediatric populations, rectal prolapse incidence is higher due to anatomical differences like the rectum's vertical course, lower position, redundant mucosa, and underdeveloped structural elements [2]. Rectal prolapse can stem from increased bowel motility, abdominal pressure, or congenital conditions. Motility increases may result from infectious diarrhea or conditions like ulcerative colitis [15]. Chronic constipation, coughing, vomiting, and congenital disorders like Hirschsprung disease contribute to elevated abdominal pressure [15]. Rectal prolapse manifests as type 1 (mucosal) or type 2 (complete) prolapse, with distinct characteristics and degrees. Type 1 involves partial prolapse, while type 2 entails full-thickness extrusion of the rectal wall [16]. Type 2 further categorizes into first, second, and third-degree prolapse based on extent and protrusion from the anal verge [16].

3.1. Clinical picture

Rectal prolapse in adolescents presents with symptoms like tenesmus, anorectal pain, and passage of blood and mucus. In children, it's often discovered by parents, characterized by a dark red mass protruding from the rectum during straining, commonly resolving spontaneously before presentation [2]. Typically, prolapse is painless or associated with mild discomfort, with rectal tone potentially diminished during prolapse but typically normal afterward [2].

3.2. Evaluation

Diagnosing rectal prolapse primarily relies on history and physical examination due to the common resolution of prolapse before medical evaluation. For patients with constipation as a probable cause, contrast radiography of the colon and anorectal manometry are recommended. Third-degree or occult rectal prolapse may require colonoscopy or sigmoidoscopy, revealing characteristic erythematous granularity and polypoid lesions on the rectal wall. These procedures can also identify rectal polyps or ulcers, if present. Additional evaluation for associated pelvic floor anomalies and further characterization of prolapse may involve fluoroscopic dynamic defecography or magnetic resonance imaging [17].

4. Treatment / Management

Conservative management of rectal prolapse involves strategies such as stool softeners, laxatives, and avoiding prolonged straining, along with addressing any underlying conditions. Compliance with bowel regimen is crucial, especially for children under three years old, where these measures are effective in about 90% of cases. For children with cystic fibrosis, adjusting pancreatic enzymes is essential due to their increased risk of rectal prolapse [2, 18]. When symptoms persist or worsen, further management is warranted, especially if patients experience rectal pain, bleeding, ulceration, or difficulty reducing the prolapse manually. Initial interventions often include injection sclerotherapy, followed by Thiersch cerclage, and ultimately rectopexy if necessary [18].

4.1. Differential Diagnosis

Ileocecal intussusception, rectal polyp, duplication cyst, and haemorrhoids can cause rectal prolapse. Intussusception causes significant discomfort, although rectal prolapse is painless. Rectal haemorrhoids, rectal polyps, and rectal duplication cysts can be distinguished by circumferential prolapse [16].

4.2. Prognosis

Rectal prolapse has an excellent prognosis when discovered between 9 months and 3 years and without accompanying conditions. It commonly occurs in childhood and seldom returns beyond 6. After age 4, children with rectal prolapse are more likely to have neurologic or musculoskeletal issues that require surgery and persist into adulthood [19].

4.3. Treatment modalities for rectal prolapse

Rectal prolapse in children is self-limiting [20]. Stool softeners and rectal submucosal sclerosant injections have been used to treat recurring instances. Thiersch cerclage, posterior sagittal rectopexy (PSR), open or laparoscopic abdominal rectopexy, and Ekehorn's rectosacropexy were performed on recurrent and chronic cases [21]. Each method has pros and cons.

4.3.1. Laparoscopic rectopexy

Laparoscopy has become an effective rectal prolapse therapy. Laparoscopic surgery reduces discomfort, blood loss, hospital stays, and recovery time compared to open surgery [22]. Laparoscopic rectopexy and open repair had similar rates of recurrence, incontinence, and constipation in a meta-analysis [18]. This matched Milito et al. meta-analysis [23]. Laparoscopic rectopexy was shown to be safe and effective compared to open surgery in these meta-analyses.

4.3.2. Laparoscopic suture rectopexy (LSR)

This approach fully mobilises the rectum to the levator muscles. Suture or staples secure the rectum to the sacral promontory. Scarring and fibrosis from posterior dissection raise the rectum [24]. The literature studied showed no mortality and recurrence rates from 0% to 12%, with most studies reporting faecal incontinence improvement. Different investigations found that LSR improved, worsened, or had no effect on constipation. New-onset constipation occurred in 0%–17% of individuals.

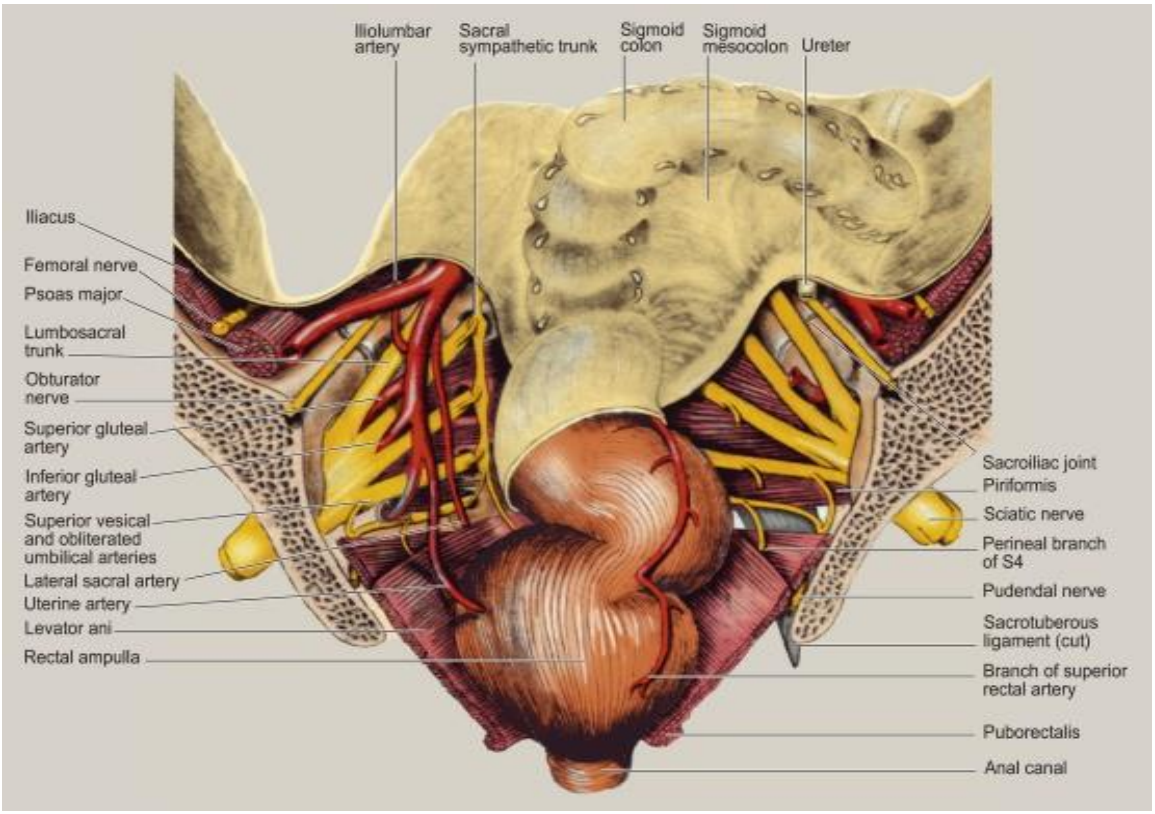

Figure 1: Anatomy of the rectum

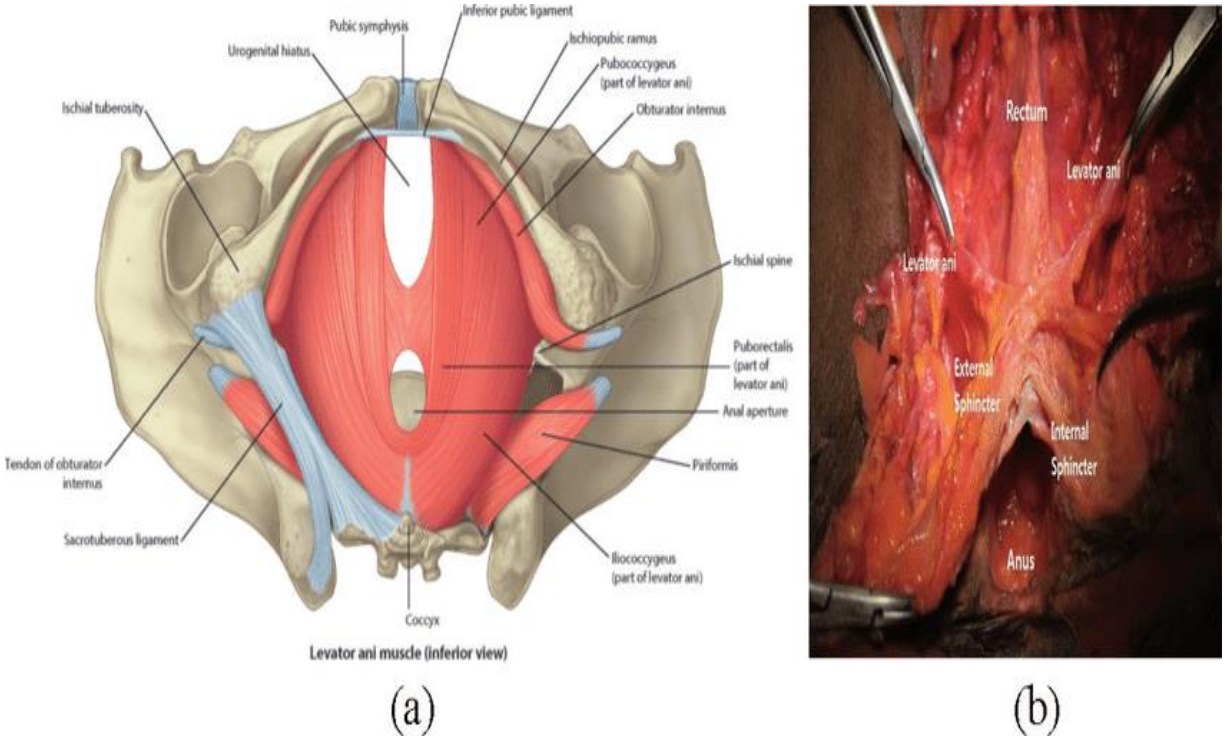

Figure 2: Anatomy of the pelvic floor. (a) Inferior view. The levator ani muscle consists of pubococcygeus, iliococcygeus, and puborectalis muscle. (b) Pelvic floor muscles and anal sphincter complex [11].

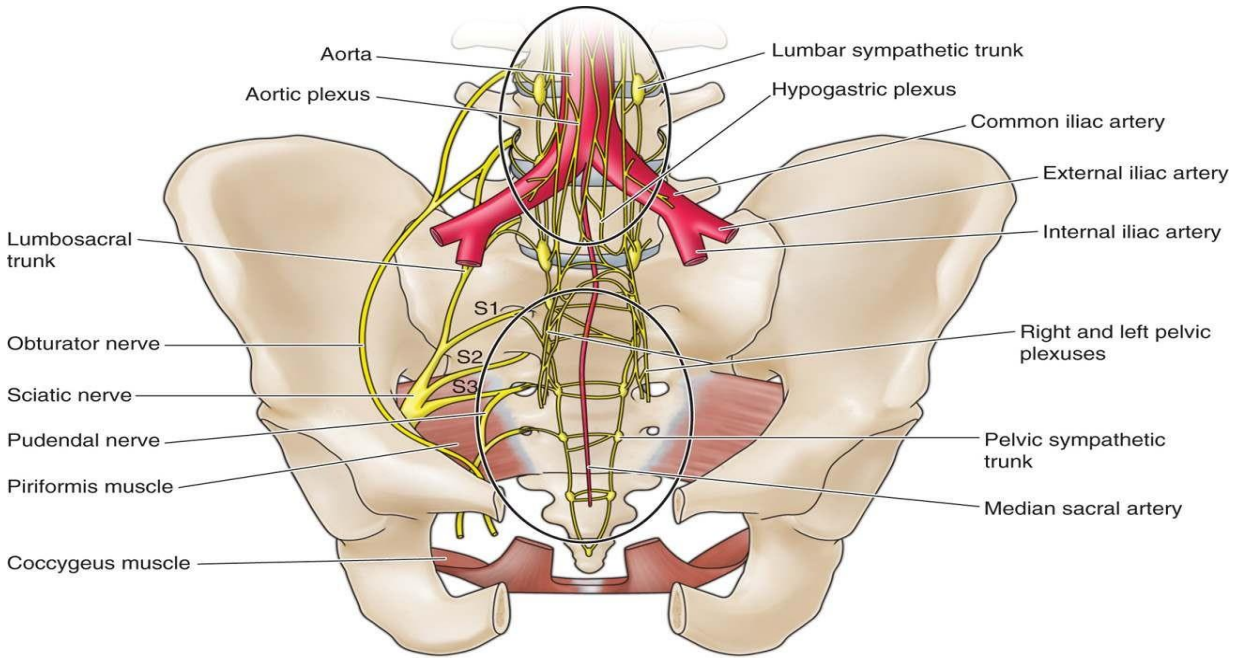

Figure 3: Superior and Inferior hypogastric plexus

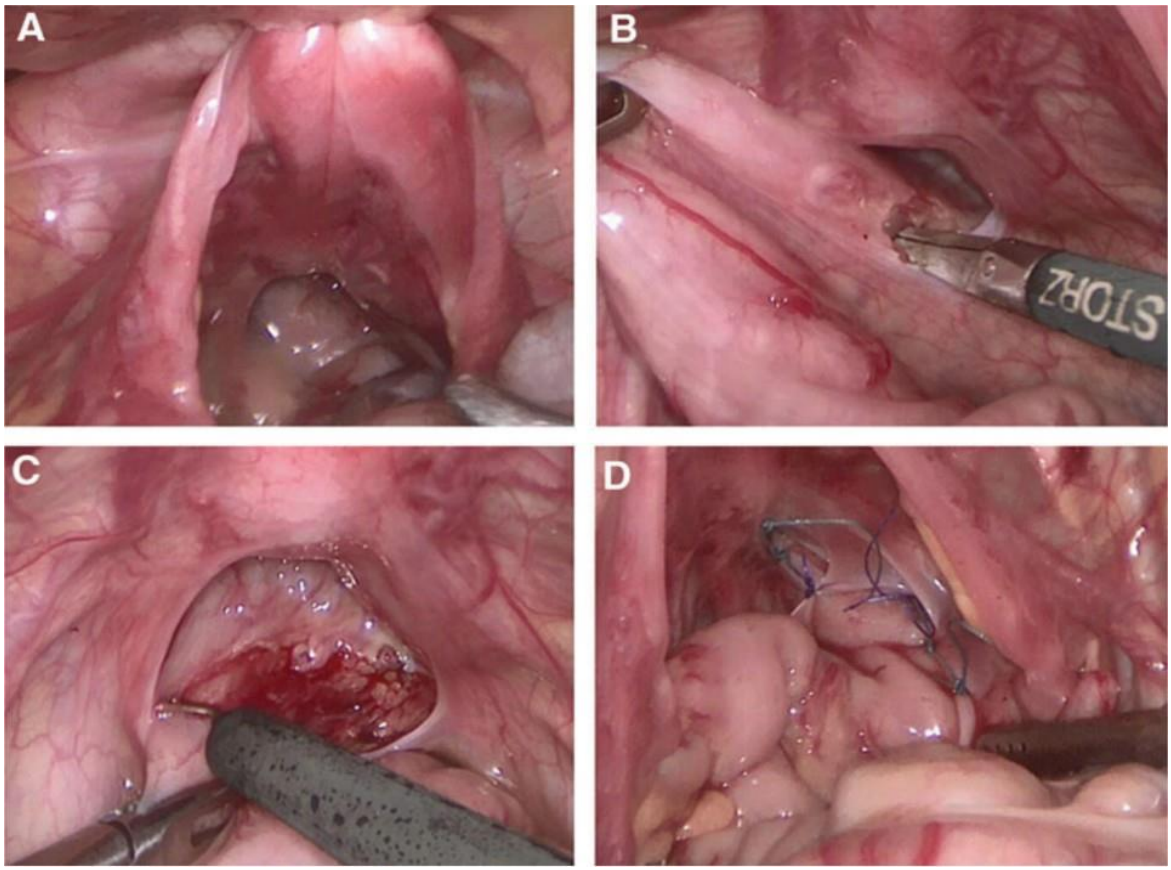

Figure 4: Laparoscopic suture rectopexy (LSR), (A) a laparoscopic view of suspension of uterus to abdominal wall in a 3.5- year-old girl with recurrent RP, (B) Plane of dissection anterior to the peritoneum of the rectum, (C) complete dissection of Douglass pouch and start lateral wall dissection, and (D) complete plication of Douglass pouch with Ethibond and lateral rectopexy with Prolene

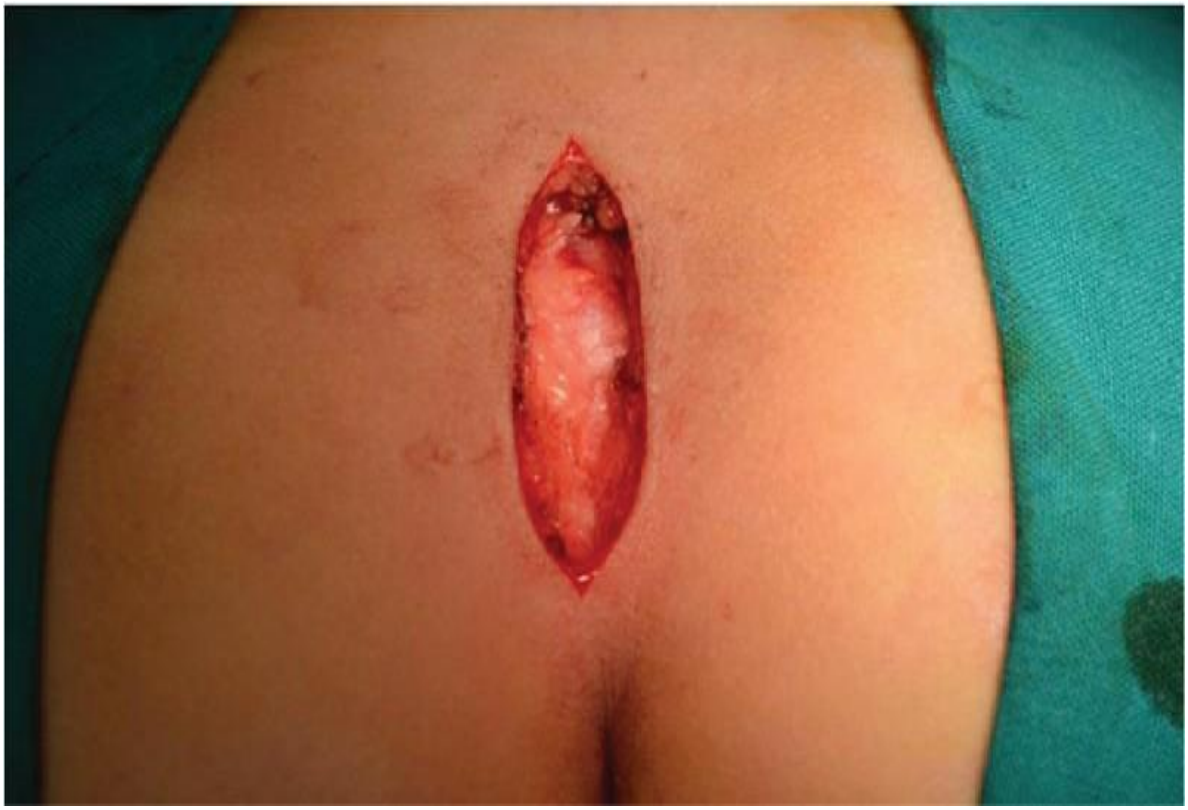

Figure 5: Incision starting above the coccyx at the natal cleft down to just above the external sphincter.

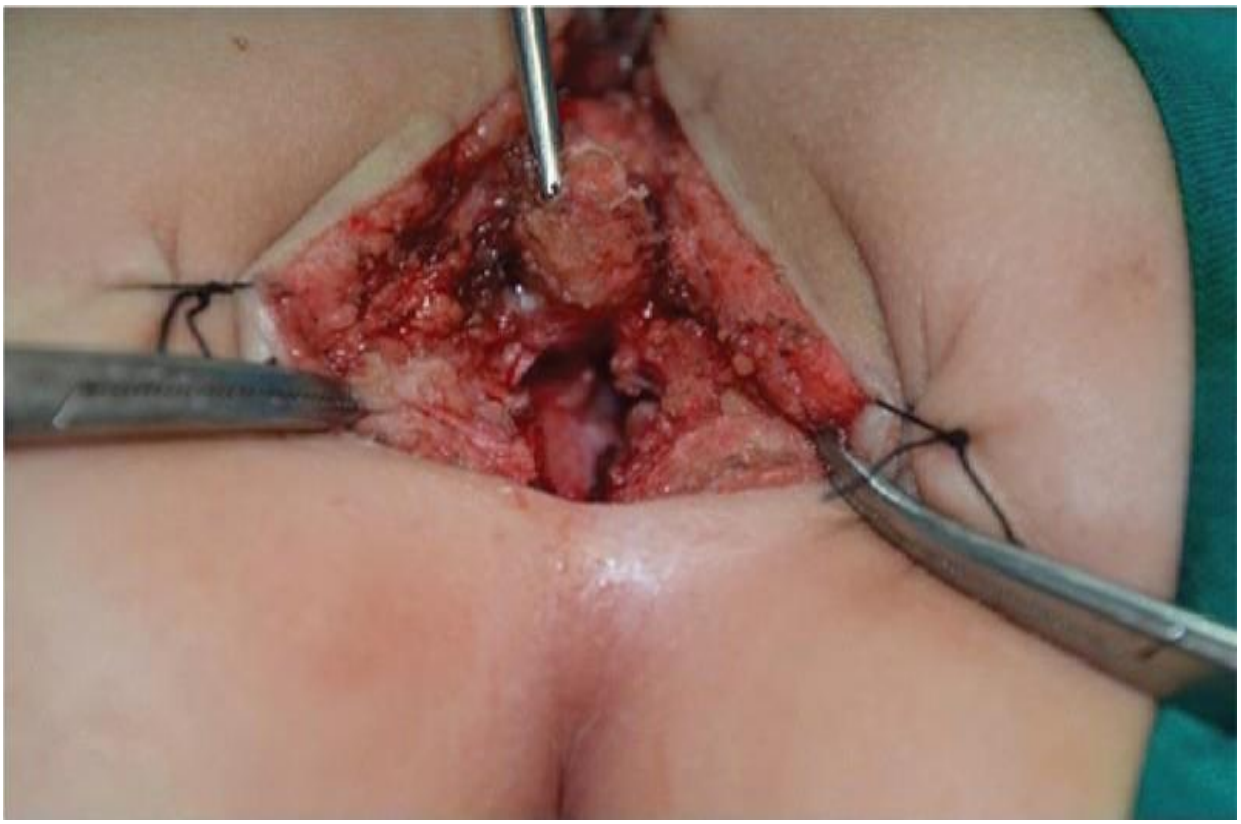

Figure 6: Levator ani muscles and the parasagittal fibers were divided in the midline, and the coccyx was excised.

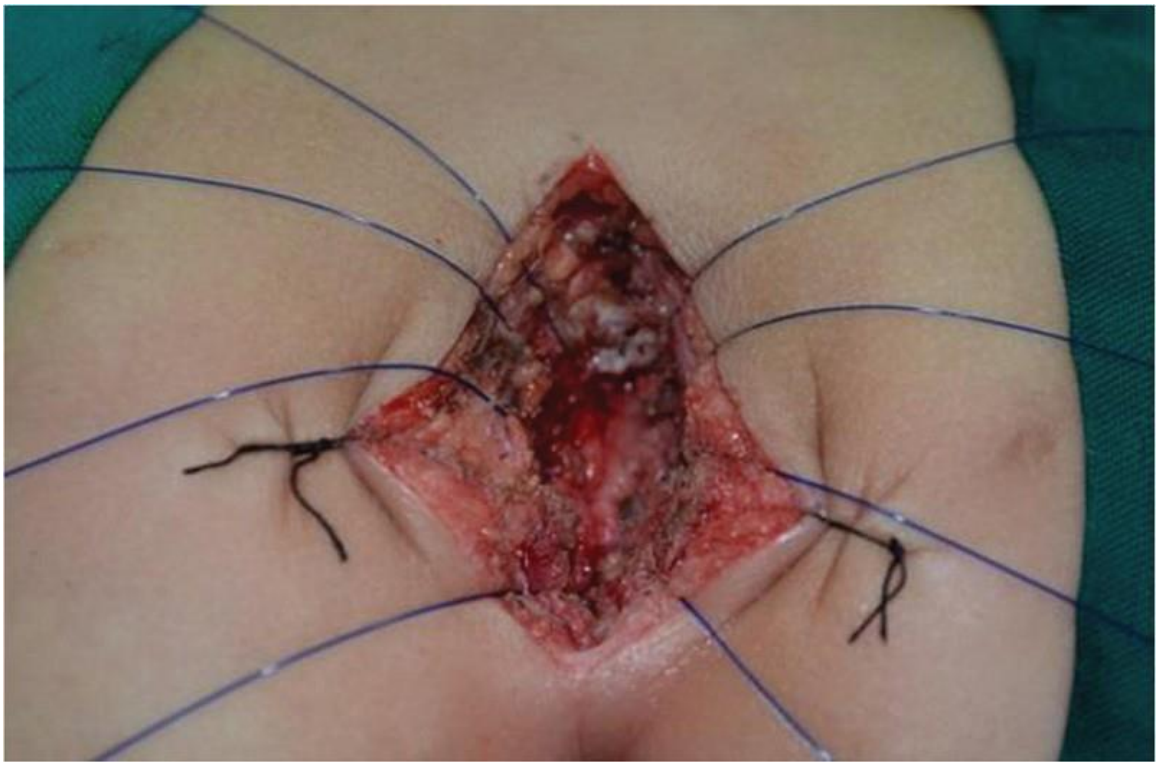

Figure 7: Rectum was plicated transversally and fixed to the posterior wall of the sacrum.

Efferent nerve division in the lateral ligaments and autonomic denervation might aggravate or cause constipation [25]. Liyanage et al. [26] found a 7% recurrence rate and no worsening of constipation after rectal mobilisation with limited lateral rectal ligament dissection (Figure 4).

4.3.3. Posterior sagittal rectopexy

An earlier study Hashish et al. conducted a study to assess the efficacy and safety of posterior sagittal rectopexy (PSR) in children with recurrent rectal prolapse, involving 22 patients aged 1 to 7 years who experienced recurrent prolapse after initial surgical treatment, with conservative management successful in four cases [27]. In the procedure, patients received preoperative bowel cleaning enemas and underwent PSR under general anesthesia, positioned in the prone Jack-knife position, with the natal cleft incised from above the coccyx to but not through the external anal sphincter complex [28]. Levator muscles and para sagittal fibers were divided in the midline using diathermy, with coccyx removal for exposure [28]. The posterior and lateral walls of the rectum were dissected approximately 10–15 cm, followed by horizontal plication of the rectum using 3/0 Proline sutures passing through the seromuscular coat in a specific pattern [28]. Proximal sutures were fixed to the sacrum, while levators and parasagittal muscles were approximated with interrupted vicryl 3/0 sutures [28]. Skin incisions were closed without drains [29]. Postoperatively, laxatives, a soft diet, or milk were administered to prevent constipation and straining during defecation, with patients discharged after 24 hours and receiving analgesics and antibiotics for three days [28]. Hashish et al. concluded that posterior sagittal rectopexy (PSR) is a feasible and effective option for managing recurrent rectal prolapse in children, yielding excellent functional outcomes [28]. Almetaher et al. conducted a study assessing the clinical and functional outcomes of PSR in children with persistent and recurrent rectal prolapse [21]. Preoperative preparation included bowel enemas, followed by PSR performed under general anesthesia in the prone Jackknife position. The procedure involved incision from above the coccyx to just above the external sphincter, followed by division of the levator ani muscles and parasagittal fibers. Blunt dissection of the rectum's lateral and posterior walls was performed, followed by transverse plication of the rectum using polypropylene sutures. The rectum was then fixed to the sacrum, and the incised muscles were repaired. Postoperatively, patients were discharged after one day and received antibiotics and analgesics for three to five days to prevent complications and ensure optimal recovery [21] (Figures 5-7). Various procedures have been utilized to manage rectal prolapse in children, including the Delorme operation, injections of sclerosant materials, Ekehorn’s rectosacropexy, resection rectopexy with or without mesh fixation, and levatorplasty procedure. However, the success rates of these procedures vary, with posterior sagittal rectopexy (PSR) demonstrating success rates as high as 90%. Despite the availability of multiple techniques, there is no clear superiority of one method over another, highlighting the absence of an ideal treatment approach [30]. Thiersch perianal cerclage and injection of sclerosant materials are simple procedures but are associated with significant risks, including infection, erosion of sutures in the rectal wall, anal stricture, and painful defecation, along with high recurrence rates. Studies have reported recurrence rates of 36% after a single injection and 16% after three injections with sclerosant materials [15].

Flum et al. have proposed combining Thiersch stitch with injection sclerotherapy as the primary treatment approach for rectal prolapse. While effective, abdominal rectopexy, another treatment option, poses risks such as impotence and vesical dysfunction, with recurrence rates as high as 25% [31]. Recent advancements in pediatric minimally invasive surgery have shown promising outcomes in the treatment of rectal prolapse, particularly with laparoscopic procedures such as laparoscopic mesh rectopexy and laparoscopic suture rectopexy. These techniques offer advantages such as rapid return of peristalsis, shorter hospital stays, lower recurrence rates, and improved cosmetic outcomes. However, their implementation requires specialized training programs and may incur higher costs, limiting their accessibility in some healthcare institutions. Alternatively, posterior sagittal repair combines anatomical rectal fixation to the sacrum with plication of dilated rectal walls, offering a comprehensive approach to rectal prolapse management [32, 33]. Recurrence rates for pediatric persistent rectal prolapse remain a concern, ranging up to 6.9% at 5 years and 10.8% at 10 years. Studies evaluating posterior sagittal repair (PSR) have reported varying recurrence rates. Almetaher et al. [21, 28, 29, 34] observed only one case of mucosal prolapse post-PSR, while Hashish reported three cases of partial recurrence. Saleh and Tsugawa found no recurrences in their studies, contrasting with Laituri et al. [21, 28, 29, 34] high recurrence rate of up to 70%, which they attributed to the anatomical origin of pediatric rectal prolapse. Notably, incontinence was absent in Almetaher et al.'s study, attributed to meticulous surgical technique preserving pelvic floor muscles and autonomic innervations [21, 28, 29, 34]. In conclusion, posterior sagittal repair emerges as a safe and effective option for persistent and recurrent rectal prolapse in children, yielding favorable clinical and functional outcomes. Emphasis should be placed on measures to minimize surgical wound infections to optimize postoperative recovery [21].

5. Conclusions

In conclusion, the comparative review of laparoscopic rectopexy and posterior sagittal presacral rectopexy for the management of complete rectal prolapse in children underscores the complexity and multifactorial nature of this condition. Both surgical approaches have shown efficacy and safety in treating pediatric rectal prolapse, each with its distinct advantages. Laparoscopic rectopexy stands out for its minimally invasive nature, reduced postoperative discomfort, and faster recovery times, making it a favorable option in suitable cases. Conversely, posterior sagittal rectopexy offers direct access for correcting associated anatomical anomalies and has demonstrated high success rates in managing recurrent and persistent prolapse. The choice between these modalities should be tailored to the patient's specific anatomical and clinical context, with considerations for the child's overall health, the presence of associated conditions, and the expertise of the surgical team. Future research and advances in minimally invasive techniques may further refine these approaches, enhancing outcomes and minimizing morbidity. The ongoing evaluation of long-term results and the development of guidelines for the management of rectal prolapse in pediatric patients will be crucial in optimizing care. This review highlights the importance of individualized patient care and the need for a multidisciplinary approach in the management of rectal prolapse, incorporating the latest evidence-based practices to ensure the best possible outcomes for this distressing and challenging pediatric condition.

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