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 propose

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].

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
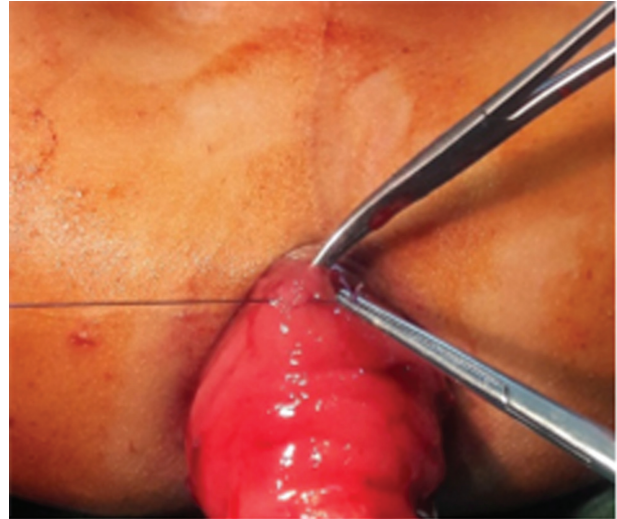
Figure 1

Complete rectal prolapse.

Figure 2

The patient was put in the lithotomy position.

Figure 3

Exteriorization of the prolapsed rectum.

Figure 4

Submucosal alcohol injection.

Figure 5

Grasping prolapsed mucosa using artery forceps.

Figure 6

Transfixation of a grip of mucosa.

Figure 7

Longitudinal line of transfixed mucosa.

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

Figure 8

Successive longitudinal and transverse lines of transfixed mucosa.

Figure 9

Transfixation of the whole prolapsed mucosa.

Figure 10

Complete reduction of the prolapse into the rectum.

Figure 11

Anal encirclement over a 3-ml syringe.

Figure 12

Complete anal encirclement.

(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.
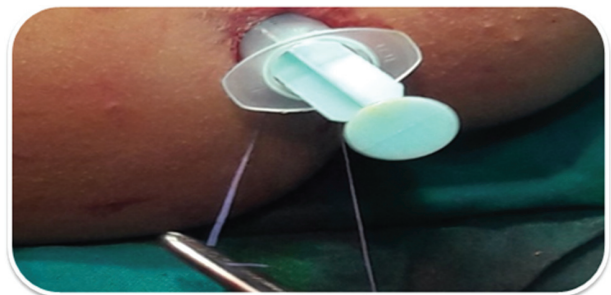
All the patients at the outset had conservative management for a median of 9 months (range, 6–15
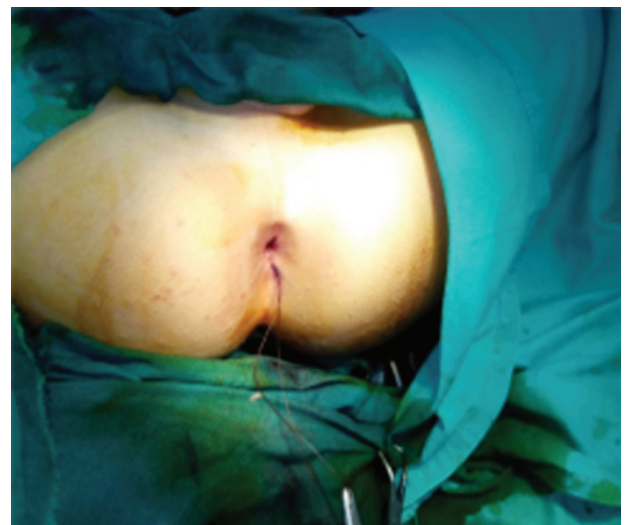
Figure 13

End of the operation.

Figure 14

Result of the approach 1 month postoperatively.

Table 1 Distribution of the studied group according to personal data and complaint

	Value=31
Age [mean±SD (range)]	6.55±2.14 (3.0–10.0)
Sex [n (%)]	
Male	14 (45.2)
Female	17 (54.8)
Complaint: mass protruding	
Sometimes	25 (80.6)
All times	6 (19.4)

Table 2 Distribution of the studied group according to associated conditions

Associated conditions	Value=31
Constipation	
++ve	25 (80.6)
−ve	6 (19.4)
Bleeding	
++ve	11 (35.5)
−ve	20 (64.5)
Soiling	
++ve	16 (51.6)
−ve	15 (48.4)
Incontinence	
++ve	18 (58.1)
−ve	13 (41.9)
Conservative treatment before operation	
+ve	31 (100)
−ve	0

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

Table 3 Distribution of the studied group according to postoperative complications

Postoperative complications	Value=31
Recurrence	
+ve	1 (3.2)
−ve	30 (96.8)
Constipation	
++ve	2 (6.5)
No	29 (93.5)
Bleeding	
+ve	0
−ve	31 (100)
Fever	
+++ve	3 (9.7)
−ve	28 (90.3)
Incontinence	
++ve	2 (6.5)
−ve	29 (93.5)
Mortality	
+ve	0
−ve	31 (100)

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

Table 4 Complication differences in preoperative and post operative result

	Complication		Statistical test (FET)	P value
	Preoperative	Postoperative		
Constipation				
++ve	25 (80.6)	2 (6.5)	36.87	<0.001**
No	6 (19.4)	29 (93.5)		
Bleeding				
++ve	11 (35.5)	0	13.37	<0.001**
−ve	20 (64.5)	31 (100)		
Incontinence				
++ve	18 (58.1)	2 (6.5)	18.9	<0.001**
−ve	13 (41.9)	29 (93.5)		

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

Table 5 Postoperative rates of morbidity, mortality, and recurrence rates of rectal prolapse treatment approaches

Approach	Morbidity (%)	Mortality (%)	Recurrence (%)
Perineal procedures			
Delorme operation	4–33	0–7	6–26
Altemeier's operation	5–24	0–6	0–18
Open abdominal approaches			
Suture rectopexy	9–20	0–4	0–20
Rectopexy and resection	7–23	0–7	0–9
Laparoscopic approaches			
Suture rectopexy	9–19	0	0–7
Rectopexy and sigmoidectomy	8–21	0–1	0–11
Ventral mesh rectopexy	10–36	0	0–15

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

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.

Conflicts of interest
There are no conflicts of interest.

References
1 Rentea R, Peter S. Pediatric rectal prolapse. Clin Colon Rectal Surg. 2018; 31:108–116.
2 El-Chammas K, Rumman N, Goh V, Quintero D, Goday P. Rectal prolapse & cystic fibrosis. J Pediatr Gastroenterol Nutr 2015; 60:110–112.
3 O'Brien D. Rectal prolapse. Clin Colon Rectal Surg 2007; 20:125–132.
4 Shah A, Parikh D, Jawaheer G, Gornall P. Persistent rectal prolapse in children: sclerotherapy and surgery management. Pediatr Surg Int 2005; 21:270–273.
5 Hori T, Yasukwa D, Machimoto T, Kadokawa Y, Hata T, Ito T, et al. Surgical options for full-thickness rectal prolapse; current status & institutional choice. Ann Gastroenterol 2018; 31:188–197.
6 Wu JS. Rectal prolapse: historical perspective. Curr Probl Surg 2009; 46:602–716.
7 Takesue Y, Yokoyama T, Murakami Y, Akagi S, Ohge H, Yokoyama Y, et al. Effectiveness of perineal rectosigmoidectomy for treat. of rectal prolapse in elderly & high risk patients. Surg Today 1999; 29:290–293.
8 Madsen MA. perineal approaches to rect. prolapse. Clin Colon Rectal Surg. 2008; 21:100–105.
9 Bordeianou L, Hicks CW, Kaiser AM, Alavi K, Sudan R, Wise P. Rectal prolapse; overview of clinical features, diagnosis, & patient specific management strategies. J Gastrointest Surg 2014; 18:1059–1069.
10 Varma M, Rafferty J, Buie WD. Standards practice task force of American Society of Colon & Rectal Surgeons. Practice parameters for management of rectal prolapse. Dis Colon Rectum 2011; 54:1339–1346.
11 Mostafa RM. Rectal prolapse: diagnosis & clinical management. World J Gastroenterol 2010; 16:2193–2194.
12 Yoon SG. Rectal prolapse: review according to the personal experience. J Korean Soc Coloproctol 2011; 27:107–113.

13 Yakut M, Kaymakciioglu N, Simsek A, Simşek A, Tan A, Sen D. Surgical treatment of rectal prolapse: retrospective analysis of 94 cases. Int Surg 1998; 83:53–55.

14 Altomare DF, Binda G, Ganio E, De Nardi P, Giamundo P, Pescatori M. Long-term outcomes of Altemeier's procedure for rectal prolapse. Dis Colon Rectum 2009; 52:698–703.

15 Madoff RD, Mellgren A. 100 years of rectal prolapse surgery. Dis Colon Rectum 1999; 42:441–450.

16 Tsunoda A, Yasuda N, Yokoyama N, Kamiyama G, Kusano M. Delorme's procedure for rect. prolapse: clinical & physiological analysis. Dis Colon Rectum 2003; 46:1260–1265.

17 Deen KI, Grant E, Billingham C, Keighley MRB. Abdominal resection rectopexy with pelvic floor repair vs. perineal rectosigmoidectomy & pelvic floor repair for full-thickness rectal prolapse. Br J Surg 1994; 81:302–304.

18 Tiengtianthum R, Jensen CC, Goldberg SM, Mellgren A. Clinical outcome of perineal proctectomy among patients of advanced age. Dis Colon Rectum 2014; 57:1298–1303.

19 Madiba TE, Baig MK, Wexner SD. Surgical management of rectal prolapse. Arch Surg 2005; 140:63–73.

20 Pescatori M, Interisano A, Stolfi VM, Zoffoli M. Delorme's operation & sphincteroplasty for rectal prolapse & fecal incontinence. Int J Colorectal Dis 1998; 13:223–227.

21 Watts AMI, Thompson MR. Evaluation of Delorme's procedure as treatment for full-thickness rectal prolapse. Br J Surg 2000; 87:218–222.

22 Kraemer M, Paulus W, Kara D, Mankewitz S, Rozsnoki S. Rectal prolapse traumatizes rectal neuromuscul. microstructure explaining persistent rectal dysfunction. Int J Colorectal Dis 2016; 31:1855–1861.

23 Zganjer M, Cizmic A, Cigit I, et al. The treatment of rectal prolapse in children with cow milk inj. sclerotherapy: 30-years experience. World J Gastroenterol 2008; 14:737–740.

24 Yamana T, Iwadare J. Mucosal plication (the Gant-Miwa procedure) with anal encircling for rectal prolapse review of the Japanese experience. Dis Colon Rectum 2003; 46(10 Suppl): S94–S99.

25 Carl Thiersch 1822-1895. Concerning prolapse of rectum with special emphasis on the operation by Thiersch. Dis Colon Rectum 1988; 31:154–155.

26 Barfield LR. Perineal approaches to rectal prolapse. Clin Colon Rectal Surg 2017; 30:12–15.

27 Chan WK, Kay SM, Laberge JM, et al. Injection sclerotherapy in the treatment of rectal prolapse in infants & children. J Pediatr Surg 1998; 33(2):255–258.

28 Fahmy MA, Ezzelarab S. Outcomes of submucosal injection of different sclerosing materials for rectal prolapse in children. Pediatr Surg Int 2004; 20:353–356.

29 Ezer SS, Kayaselçuk F, Oguzkurt P, et al. Comparative effects of different sclerosing agents used to treat rect. prolapse: experimental study in rats. J Pediatr Surg 2013; 48:1738–1743.

30 Abeş M, Sarihan H. Injection sclerotherapy of rectal prolapse in children with 15% saline solution. Eur J Pediatr Surg 2004; 14:100–102.

31 Sarmast MH, Askarpour S, Peyvasteh M, Javaherizadeh H, Mooghehi-Nezhad M. Rectal prolapse in children: study of 71 cases. Prz Gastroenterol 2015. 10:105–107.

32 Garely AD, Krieger BR, Ky AJ. Rectal prolapse. In Cameron JL, Cameron AM, eds. Current surgical therapy. Philadelphia: Elsevier Saunders 2014. 190–194

33 Rickert A, Kienle P. Laparoscopic surg. for rectal prolapse & pelvic floor disorders. World J Gastrointest Endosc 2015; 7:1045–1054.

34 Theuerkauf FJ Jr, Beahrs OH, Hill JR. Rectal prolapse. Causation & surgical treatment. Ann Surg 1970; 171:819–835.

35 Lieberth M, Kondylis LA, Reilly JC, Kondylis PD. Delorme's repair for full-thickness rectal prolapse: retrospective review. Am J Surg 2009; 197:418–423.

36 Foppa C, Martinek L, Arnaud JP, Bergamaschi R. 10 years follow up after laparoscopic suture rectopexy for full-thickness rectal prolapse. Colorectal Dis 2014; 16:809–814.

37 Lechaux D, Trebuchet G, Siproudhis L, Campion JP. Laparoscopic rectopexy for full-thickness rectal prolapse: single-institution retrospective study evaluating surgical outcomes. Surg Endosc 2005; 19:514–518.

38 Naeem M, Anwer M, Qureshi MS. Short-term outcomes of laparoscopic ventral rectopexy for rectal prolapse. Pak J Med Sci 2016; 32:875–879.

39 Corman ML. Colon and rectal surgery. 5th ed. Philadelphia: Lippincott Williams & Wilkins 2005. 515.

40 Kuijpers HC. The treatment of complete rect. prolapse: to narrow, to wrap, to suspend, to fix, to plicate, to encircle, or resect ? World J Surg 1992; 16:826–830.