Laparoscopic Rectopexy: First Option for Rectal Prolapse?

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Rezumat

Rectopexia laparoscopică: prima opțiune terapeutică pentru prolapsul rectal?

Introducere: Prolapsul rectal (PR) este una dintre afecțiunile ano-rectale benigne; datorită asocierii cu constipația și incontinența PR poate afecta semnificativ calitatea vieții bolnavilor. Nu există un consens privind metoda chirurgicală optimă pentru tratamentul acestuia.

Scop: Obiectivul studiului a fost de a evalua rezultatele pe termen scurt și lung obținute la pacienții cu PR operați în clinica noastră.

Material și metodă: Am efectuat o analiză retrospectivă pe un lot de 83 de pacienti cu PR tratați chirurgical în clinica noastră între 1997 și 2013; au fost urmărite datele demografice, tehnica chirurgicală utilizată, complicațiile, precum și rezultatele pe termen scurt și lung.

Rezultate: Vârsta medie a fost de 45 de ani (± 18 ani) și 60% (n = 50) dintre pacienți au fost de sex feminin. Valoarea medie a indicelui de masă corporală (body mass index, BMI) a fost de 24,3 (± 4,1) kg/m². Vârsta medie a fost semnificativ mai mare la pacienții la care s-a utilizat abordarea transperineală (grupul PA) decât la cei cu abordare transabdominală (grupul TA) (p <0,05). Durata de spitalizare nu a fost influențată de tehnica chirurgicală (deschisă, laparoscopică sau perineală), dar în analiza subgrupului a fost semnificativ mai scurtă pentru rec-topexia laparoscopică (p <0,05). Durata medie de urmărire a fost de 80 ± 38,6 luni. Zece (12%) pacienți au avut recidivă în timpul perioadei de urmărire; totuși, recidiva nu a fost asociată cu un anumit tip de tehnică chirurgicală (p = 0,824).

Concluzie: Luarea în considerare a simptomatologiei asociate și a stării generale a pacienților înainte de efectuarea intervenției chirurgicale pentru PR poate îmbunătăți rata de succes. Datorită rezultatelor favorabile pe termen scurt și ratei acceptabile de recidivă pe termen lung rectopexia laparoscopică ar trebui să fie considerată drept prima opțiune în tratamentul PR.

Cuvinte cheie: prolaps rectal, laparoscopie, rectopexie, proceduri transabdominale, proceduri perineale

Abstract

Background: Rectal prolapse (RP) is one of the benign ano-rectal diseases and impairs the quality of life due to co-existing constipation and incontinence problems. There is no consensus for the most accurate surgical method for its treatment.

Aim: The objective was to evaluate the short- and long-term results of patients with rectal prolapse who underwent surgery in our clinic.

Material and Method: A retrospective analysis was performed of 83 patients with RP who underwent surgery between 1997-2013 in terms of demographic data, surgical technique, complications, and early and late outcomes.

Results: The mean age was 45 years (± 18 years) and 60% (n = 50) of the patients were female. The mean body mass index (BMI) was 24.3 (± 4.1) kg/m². The mean age was significantly

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higher in the transperineal approach (PA group) than trans-abdominal approach (TA group) (p <0.05). The length of hospital stay was not affected by surgical technique (open or laparoscopic or perineal surgery), but in the subgroup analysis it was significantly shorter for laparoscopic rectopexy (p <0.05). The median follow-up was 80 ± 38.6 months. Ten (12%) patients had recurrence during the follow-up period; however, recurrence was not associated with the type of surgical technique (p = 0.824).

Conclusion: Giving consideration to patients' additional symptoms and general condition before committing to a surgical method for RP may improve the success rate. Laparoscopic rectopexy should be considered as the first option in the treatment RP owing to its favorable early-term outcomes and acceptable rate of long-term recurrence.

Key words: rectal prolapsus, laparoscopy, rectopexy, trans-abdominal procedures, perineal procedures

Introduction

Rectal prolapse most commonly occurs in individuals aged between 50-70 years and is 6 times more common in women than in men. Other pelvic floor disorders can also accompany this pathology and 20-35% of the patients have urinary incontinence at the time of the diagnosis; some 15-20% have vaginal prolapse (1,2,3). Furthermore, symptoms such as rectal bleeding, pain during defecation, constipation and incontinence can be seen, all of which impair patients' quality of life. RP can easily be diagnosed during the physical examination through observation of the prolapsed rectum (± colon segment), which comes out through the anal canal with or without straining. Moskhowitz defined its etiopathogenesis in 1912 as "a sliding hernia that depends on pelvic floor weakness" and described a method for its treatment. Depending on video-defecography findings, Broden and Shellman (1968) described RP as an intestinal intussusception. Pathologies associated with pelvic anatomy (deep pouch of Douglas, loose lateral rectal ties and weak fixation to the sacrum, low perineum, long rectosigmoid), long-standing increase of intra-abdominal pressure (chronic constipation, straining), brain and spinal cord diseases, and difficult birth processes are precipitating factors that play a role in its etio-pathogenesis. However, multi-parity is not an effective cause as expected; 40-50% of women who are diagnosed as having RP have never given birth (1,3). From the last century to the present time, over a hundred surgical techniques, either trans-abdominal (TA) or trans-perineal (PA) have been described for the treatment of this disease, but there is still no consensus on the ideal technique (2,4). In the current study, the short- and long term results of patients who underwent corrective surgery both trans-perineally and trans-abdominally (open surgery or laparoscopic) for RP were evaluated.

Material and Method

Eighty-three patients who underwent surgery for RP in Istanbul Faculty of Medicine between 1997 and 2013, were enrolled in this study. Demographic data, surgical techniques, early and late surgical outcomes were analyzed retrospectively. Short-term outcomes were obtained from the clinical and operation reports. To evaluate long-term outcomes, patients were called to the clinic, patients who could not attend were evaluated through phone interview.

Rome II Criteria was used to appraise patients' constipation, and Boutsis-Ellis scoring was used for fecal incontinence. The obtained data was entered into Microsoft Excel 2010 and analyzed statistically using SPSS 20. Student's t-test was used for mean values and parametric variables; Mann-Whitney U test was used for non-parametric variables. P <0.05 was considered statistically significant.

Results

The mean age was 45 years (± 18 years); 50 (60%) of the patients were women and 33 (40%) were male. The mean body mass index was 24.3 (± 4.1) kg/m². Analysis of the demographic data showed that age and the BMI of patients who underwent PA were significantly higher than the patients who underwent TA (p = 0.001 and p = 0.008; *Table 1*). Constipation (n = 57, 69%), urinary incontinence (n = 34, 41%) and rectal bleeding (n = 14, 17%) were the most common accompanying symptoms at the time of admission. No differences were found between two groups in the mean duration of symptoms and the length of the prolapsed segment (*Table 1*). All patients underwent preoperative colonoscopy. Defecography only was performed in 20 patients, and anal electromyography was performed in 4 patients. Only one patient underwent a pre-operative anal manometer test. Patients who had had constipation for a long period of time, were evaluated using the colon transit time test. Nineteen (22%) of the patients had previously undergone surgery in another center and were referred to our clinic after recurrence. Fourteen of these 19 patients underwent TA, the remainder had PA.

Seventy-nine percent of the patients (n = 66) were underwent TA, whereas 21% (n = 17) had PA. The surgical procedures are broadly summarized in *Table 2*. The preferred surgical method was not different in recurrent and first-time surgery patients. There was no postoperative mortality. Short-term morbidity was seen in 7 (8%) patients. This included wound infection in 5 patients, myocardial infarction in 1 patient and anastomotic leak in 1 patient. Temporary urinary dysfunction occurred in 6 (7%) patients and worsening sexual dysfunction was seen postoperatively in two patients (4%). Sexual dysfunction was present in these patients before surgery due to previous vertebral fractures secondary to spinal trauma. There was no significant difference between the two groups according to the short-term morbidity (p >0.05, *Table 3*). The mean length of hospital stay was 4.7 days (range, 1-33 days) with no significant difference between the PA and TA groups

Table 1. *Demographic and clinical details of the patients*

	Trans abdominal n=65 (% 79)	Trans perineal n=17 (% 21)	TOTAL	p Value
Male	26 (%79)	7 (% 21)	33 (% 40)	
Female	40 (%80)	10 (% 20)	50 (% 60)	0.961
Median Age	41	56	45	0.001
BMI (kg/m²)	23.5	26.2	24.3	0.008
The mean duration of the complaint (month)	79.9	68.5	78.5	0.71
The length of the prolapsed segment (cm)	6,4	8,4	7	0.13

Table 2. *The distribution of surgical procedure*

	Trans abdominal n= 66 (79%)		Trans-perineal n=17 (21%)
	Open Surgery n=27 (41%)	Laparoscopic n=39 (59%)	
Resection-rectopexy (Frykman Goldberg)	2	8	
Resection (anterior resection)	3		
Rectopexy With mesh (Wells, Notaras, Frykman Goldberg)	22	6	
Suture rectopexy			25
Altemeiyer			14
Delorme			3
Length of stay*	5.2±5.29	3.7±2.46	5.04±2.35
		1.6±0.7 (Lap. Rectopexy)**	

* p> 0.05 , ** p< 0.05

Table 3. *The details of the complications*

	Open (n=27)	Laparoscopic (n=39)	Perineal (n=17)	Total (n=83)
Wound infection	3 (11%)	2 (5%)	0 (%)	5 (6%)
Myocardial infarction	0 (%)	0 (%)	1 (6%)	1 (1%)
Anastomotic leak	0 (%)	1 (3%)	0 (%)	1 (1%)
Total	3 (11%)	3 (8%)	1 (6%)	7(8%)

p>0.05

(laparoscopy or open surgery). However, in the subgroup analysis, the length of stay was significantly shorter in patients who underwent laparoscopic suture rectopexy (1.6 ± 0.7 days, p <0.05) (*Table 2*).

The mean follow-up was 80 ± 38.6 months. According to the Boutsis-Ellis pre- and postoperative evaluation, even though no change was found in the ratio of patients who had incontinence, the degree of incontinence decreased (*Graphic 1*). Surgical technique had no effect on incontinence outcomes (p=0.12).

Constipation was assessed in accordance with the Rome II Criteria. Before surgical treatment, 57 (69%) patients reported constipation and 30 (56%) recovered postoperatively. During the follow-up, 10 (12%) patients had recurrence of prolapsus. These patients underwent PA (Altemeier procedure), mesh rectopexy (Wells procedure, the meshing of Frykman-Goldberg), suture rectopexy and resection rectopexy [3(27%), 3(27%), 3(27%) and 1(9%); respectively]. The evaluation of the recurrence rate relative to surgical techniques showed no difference (p = 0.82).
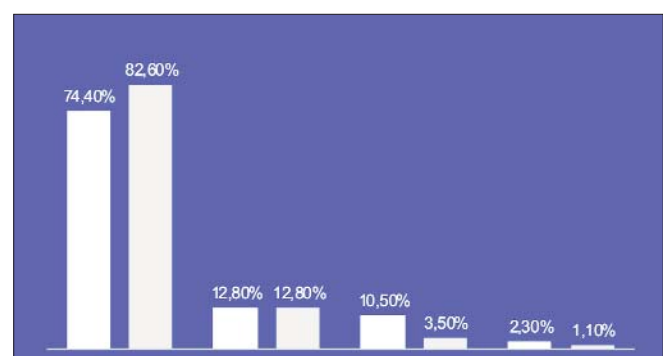
Graphic 1. *The evaluation of fecal incontinence before and after surgery according to Boutsis-Ellis Criteria*

Discussion

Medical history and physical examination are often sufficient to diagnose RP. Anorectal physiologic tests such as a defecography, anal manometry, and anal electromyography may be used to evaluate occult pathologies such as prolapse ani or

rectal intussusception (1, 3, 5, 6). The colon transit time may be a guide in the decision of surgery technique (resection-rectopexy) in patients who have severe long-term constipation (1, 3, 7). Only patients with RP were selected for our study, physiologic studies were used to exclude patients with other pelvic floor disorders. Visual inspection was enough to diagnose RP, and with the exception of colonoscopy, no other additional diagnostic tests were required in the majority of patients. However, patients who reported long-term constipation were evaluated using the colon transit time test. Anal electromyography provides information about the preoperative sphincter function but it cannot predict postoperative continence (8, 9). Accordingly, anal electromyography, which is not a standard preoperative diagnosis test, was only performed in 4 patients. Defecography can assist in detecting additional pathologies associated with obstructive defecation or pelvic floor weaknesses (1, 7, 10) and it was conducted in 20 patients. Although these pelvic floor physiology tests have no effect on the decision process of surgical technique they may be helpful in the postoperative period because some patients with incontinence may be considered for further treatments (1).

Numerous surgical techniques have been described in RP treatment; most of them have only historic value. There is no consensus on the surgical technique because it is not a common homogeneous disease. The commonly-used techniques are separated under trans-abdominal and trans-perineal approaches (1,3,10). A surgeon's familiarity with certain techniques, the patient's age, condition and comorbid diseases all play important roles during the decision making process prior to the operation. PA is preferred in elderly patients and can be done under spinal anesthesia. The postoperative period is more comfortable and less painful when PA is performed. This method is associated with a shorter length of hospital stay and a lower risk of sexual dysfunction, especially for young male patients. However, this approach has a high risk of recurrence and its functional outcomes are worse than TA (4, 11). Although some authors have reported that reinforcement of the levator muscle diastasis with levatoroplasty reduces the recurrence rate, published data of recurrence ratio for PA ranges between 10-30% (12-16).

In the current study, the mean age and BMI of the patients who underwent PA were found higher (p = 0.001, p = 0.008). In addition, these patients had a longer prolapsed segment than TA patients, but this difference was not significant. Perineal recto-sigmoidectomy (Altemeier) procedure was the most preferred PA in our clinic (n = 15). In our experience, it was observed that the Delorme procedure, which is accepted as the treatment of choice for short segment prolapse (1), was opted for the treatment of patients who were younger (n = 3, mean age 35 years) and had long segment prolapse (mean 9 cm). Advantages of the Delorme procedure include not requiring full layer anastomosis and the ability to be performed under regional anesthesia (2). Although no recurrence was seen with this technique, its recurrence rate (5-22%) is higher than TA methods like other PA procedures (1,10).

During TA, the rectum is dissected to the pelvic floor in the posterior compartment (see *Fig. 1 - 7A,B*). It is dissected
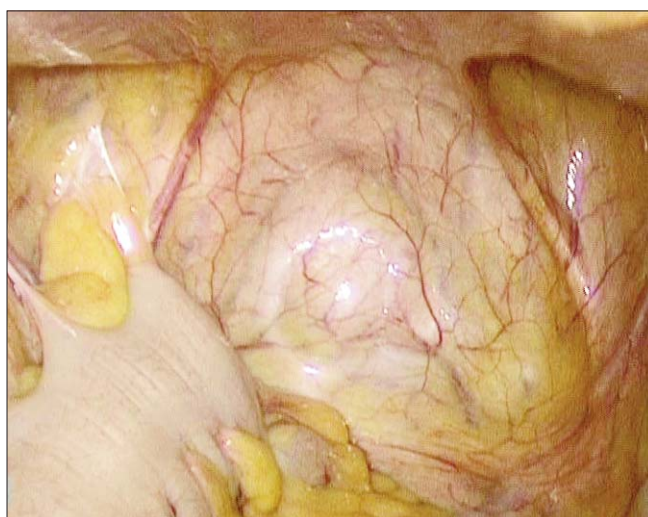

Figure 1. *A case of rectal prolapse*

Figure 2. *Laparoscopic view of the rectum and douglas sac at the beginning of the operation*
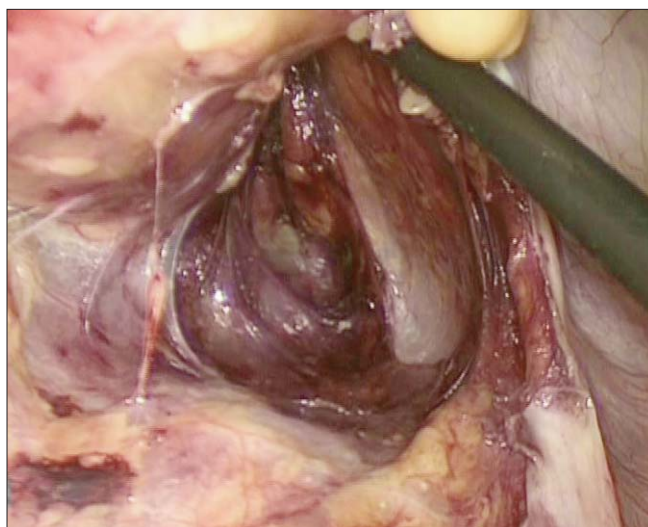

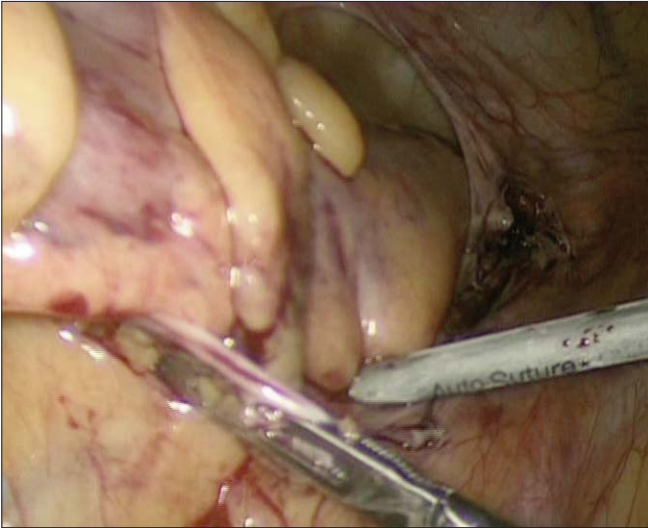**Figure 3.** *The posterior dissection of the rectum performed from promontorium to coccys*

Figure 4. *The fixation of the mobilized and pulled rectum to the promontorium*

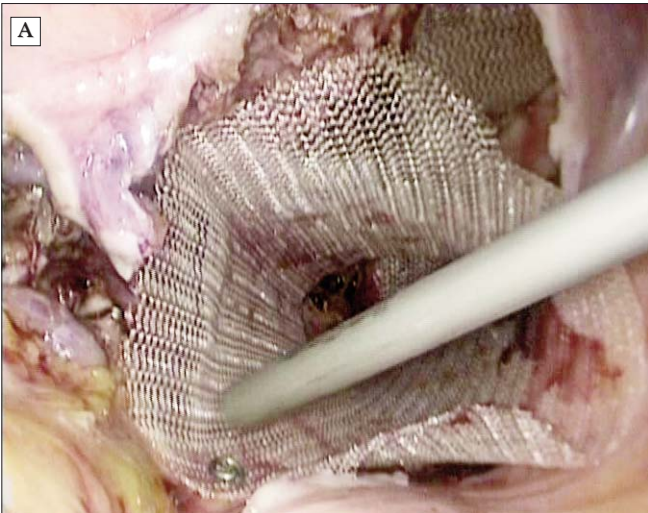*Figure 5.* *Rectum after posterior and lateral mobilization)*

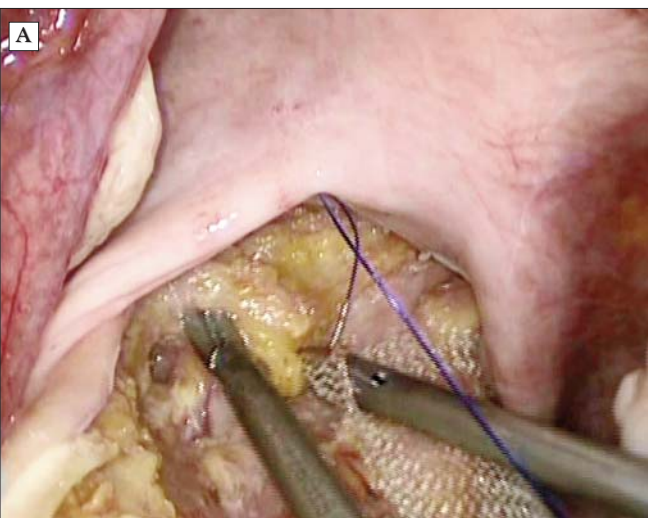*Figure 6.* *(A, B): Mesh fixation to the sacrum*

Figure 7. *(A, B): Mesh fixation to the rectum*

up to the level of the prostate in male patients and up to the upper part of the vagina in female patients in the anteriorly. Even though removal of the lateral ligaments reduces the recurrence rate, it is not recommended due to its consequences on function such as rectal emptying (1,6,10,17). After mobilization of the rectum, sacral fixation with or without a mesh is currently the most commonly-used method. The rectum can become fixed to the sacrum secondary to the fibrotic reaction created by mobilization or mesh. The original method described by Wells was used for a long time for its low recurrence rates, but then lost its popularity, probably due to its high constipation rate (1). Mesh is wrapped all around the rectum in the Ripstein procedure, whereas in the Wells procedure, mesh is placed only on the posterior part of the rectum (10). However, obstructive defecation, fecal impaction, ureter obstruction, recto-vaginal fistula and impotence have all been reported as adverse effects associated with the mesh (2,18,19). It has been reported that most of the mesh-related complications occurred when mesh was coiled up 360° on the rectum (1,6,19). The biggest disadvantage of the wrap-rectopexy is that it leads to 15% new constipation cases and increases constipation symptoms in 50% patients who had preoperatively (1). In the current study, the Ripstein procedure was never performed in any patients, whereas a total of 28 patients were treated using mesh (Wells, n=19; Frykman-Goldberg, n=8; Notaras, n=1). Eight patients out of 18 were underwent Frykman-Goldberg procedures with mesh, which is disputed about because of colorectal anastomosis, and the remaining 10 patients were underwent Frykman-Goldberg procedures with sutured pexy. After the Frykman-Goldberg operations, anastomotic leakage developed in one patient without mesh; no other complications were observed in patients who received a mesh. Athanasiadis et al. (18) reported a 2% infection rate after using mesh in their large series. Similarly, Calışkan et al. (20) reported no mesh-related complications in their series of 68 patients, despite the fact that they used various grafts such as Ivalon sponge, prolene, and Gore-tex.

After Frykman and Goldberg described the resection-rectopexy procedure without mesh, this technique has been a popular approach for the last 40 years with 2-5% recurrence and 0-20% complication rates. Although it has been claimed that, "It is convenient to perform this operation in long-term constipated patients and / or patients with redundant sigmoid colon "(21), some surgeons find its performance in constipated patients to be controversial. In addition, they argue the sigmoid resection alone may not be enough; subtotal colectomy may be required for some of these patients (22). However, the Frykman-Goldberg operation is not recommended for patients who have fecal incontinence (1,3).

In the last two decades laparoscopic rectopexy operations have become popular. Its recurrence (4-8%) and morbidity (10-33%) rates are not very different from other abdominal procedures, but it is recommended for early postoperative comfort (1,4,21,23,24). In the first half of our 17-year period, the most preferred TAs were the mesh operations (Wells, Frykman-Goldberg with mesh). However, after minimally invasive surgery became popular, laparoscopic rectopexy and Frykman-Goldberg operations have begun to be preferred. During the last ten years, 58.4% of the cases (n = 39) underwent suture rectopexy and the majority of them were performed laparoscopically (n = 25).

There are a few randomized controlled trials that compare PA and AP (1, 25). Retrospective studies have shown that TA had a lower overall recurrence rate than PA (0-27% vs 4-38%) (10). Most recurrences develop within the first 3 years. However, the success of the RP surgery should not be gauged only by recurrence rates, but also with improvements in incontinence, constipation, and defecation problems. The occurrence of incontinence is also associated with the delay in treatment commencement, and although the anatomy is corrected through surgery, the results are frequently not satisfactory (1, 10). Regardless of the RP repair technique, incontinence that develops in the first year can be improved in 20-80% of patients (5, 6, 10, 23), but symptoms may increase in 12.8-22% of patients after PA (5, 10). In the current study, although no reduction in the amount of patients with incontinence was observed, clinical improvement was observed in stage 3a and 3b patients (the ratio decreased from 10.5% to 3.5% in stage 3a and from 2.5 to 1.1% in stage 3b). When incontinence was evaluated based on the delay of performing surgery, stage 1 patients underwent surgery 10.4 months after they became symptomatic, and stage 2, 3 and 4 patients had surgery after approximately 100 months. In many series, constipation improves in 14-83% of patients, but patients with new constipation have been reported to range between 14-50%, especially after TA procedures (1, 10, 23). In the current study, we observed that 53% of the patients with constipation had improvement in their symptoms and we identified no patients with new constipation after surgical treatment.

Conclusion

RP, whose etiology is not identified clearly, is a complex anorectal disorder and the best treatment methods are still considered unknown. Failure to select the most appropriate surgical technique according to patients' general condition and additional symptoms impacts on the overall surgical success rate. Early intervention is important in the treatment of RP because the stage of fecal incontinence deteriorates as the duration between the commencement of the patient's symptoms and surgery is extended. We believe that laparoscopic rectopexy should be considered as the first option in the treatment of RP owing to its acceptable recurrence rate and favorable early-term results, which include those in patients with co-morbidities and the elderly.

Constribution of author/coauthor

Metin Keskin and Dogan Gönüllü designed the study, analyzed and interpreted data and wrote the manuscript. Bora Karip analyzed and interpreted data. Emre Balık drafted the article or revised it critically for important intellectual content. Türker Bulut revised the article and gave the final approval of the version to be published.

References

1. Madhulika V, Janice R, Buie WD. Practice Parameters for the Management of Rectal Prolapse. Dis Colon Rectum. 2011;54: 1339-1346.

2. Nagle D. Rectal prolapse and fecal incontinence. Primary Care. 1999:26:101-111

3. Yıldırım S, Baykan A. Rektal prolapsus. " Anorektal bölgenin selim hastalıkları". Ed:Menteş B, Bulut T, Alabaz Ö, Leventoğlu S, Türk Kolon ve Rektum Cerrahi Derneği 2014.

4. Auguste T, Dubreuil A, Bost R, Bonaz B,Faucheron JL. Technical and functional results after laparoscopic rectopexy to the promontory for complete rectal prolapse. Prospective study in 54 consecutive patients. Gastroenterol Clin Biol. 2006; 30(5); 659-63.

5. Lechaux JP, Atienza P, Goasguen N, Lechaux D, Bars I. Prosthetic rectopexy to the pelvic floor and sigmoidectomy for rectal prolapse. Am J Surg 2001;182(5) ; 465-9.

6. Safar B, Vernava AM. Abdominal approaches for rectal prolapse. Clinics in colon and rectal surgery. 2008:21(2); 94-9.

7. Wexner SD, Zbar AP, Pescatori M editors. Complex anorectal disorders. Investigations and managemet. Springer Verlag, London, 2005.

8. Birnbaum EH, Stamm L, Rafferty JF, Fry RD, Kodner IJ, Fleshman JW. Pudendal nerve terminal motor latency influences surgical outcome in treatment of rectal prolapse. Dis Colon Rectum 1996:39 ; 1215-21.

9. Schultz I, Mellgren A, Nilsson BY, Dolk A, Homstrom B. Preoperative electrophysiologic assessment cannot predict continence after rectopexy. Dis Colon Rectum 1998: 41; 1392-98.

10. Varma GM, Steele SR. Overview of rectal procidentia (rectal prolapse). Sect Editor: Weiser M. www.uptodate.com

11. Tou S, Brown SR, Malik AI, Nelson RL. Surgery for complete rectal prolapse in adults. Cochrane Database Syst Rev.2008: 4; CD0011758.

12. Fengler SA, Pearl RK, Prasad ML, Orsay CP, Cintron JR, Hambrick et al. Management of reccurent rectal prolapse. Dis Colon Rectum.1997:40; 832-4.

13. Riansuwan W, Hull TL, Bast J, Hammel JP, Church JM. Comparison of perineal operations with abdominal operations for full-thickness rectal prolapse. World J Surg. 2010:34; 1116–22.

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

15. Chun SW, Pikarsky AJ, You SY, Gervaz P, Efron J, Weiss E et al. Perineal rectosigmoidectomy for rectal prolapse: role of levatorplasty. Tech Coloproctol. 2004:8; 3–9.

16. Habr-Gama A, Jacob CE, Jorge JM, Seid V, Marquez CF, Mantese JC et al. Rectal procidentia treatment by perineal rectosigmoidectomy combined with levator ani repair. Hepatogastroenterology. 2006:53; 213–17.

17. Speakman CT, Madden MV, Nichols RJ, Kamm MA.Lateral ligament division during rectopexy causes constipation but prevents recurrence: results of a prospective randomized study. Br J Surg. 1991:78(2); 1431-3.

18. Athanasiadis S, Weyand J, Heiligers J, Heumuller L, Barthelmes L. The risk of infection of three synthetic materials used in rectopexy with or without colonic resection for rectal prolapse. Int J Colorectal Dis. 1996:11(1); 42-4.

19. Gordon PH, Hoexter B. Complications of Ripstein procedure. Dis Colon Rectum. 1974;17: 89-90.

20. Çalışkan C, Korkut AM, Fırat Ö, Akgün E, Osmanoğlu H. Rektal prolapsus deneyimimiz: 27 yılda 68 vaka. Ege Tıp Dergisi/Ege Journal of Medicine. 2008:47; 29-34.

21. Solomon MJ, Young CJ, Eyers AA, Roberst A. Randomized clinical trial of laparoscopic versus open abdominal rectopexy for rectal prolapse. Br J Surg. 2002:89; 35-39.

22. Hsu A, Brand MI, Saclarides TJ. Laparoscopic rectopexy without resection:a worthwhile treatment for rectal prolapse in patients without prior constipation. Am Surg. 2007:73; 858-861.

23. Benoist S,Taffinder N, Gould S, Chang A, Darzi A. Functional results two years after laparoscopic rectopexy. The American Journal of Surgery. 2001:182: 168–173.

24. Harmston C, Jones O. The evolution of laparoscopic surgery for rectal prolapse. International J of Surgery.2011: 9; 170-173.

25. Deen KI, Grant E, Billingham C, Keighley MR. Abdominal resection rectopexy with pelvic floor repair versus perineal rectosigmoidectomy and pelvic floor repair for full thickness rectal prolapse. Br J Surg. 1994:81: 302–304,