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OPEN ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

Effects of Biofeedback Treatment on Anal Incontinence Before Closing The Protective Ileostomy in Patients Undergoing Low Anterior Resection

Low Anterior Rezeksiyon Yapılan Hastalarda Koruyucu İleostominin Kapatılması Öncesinde Biofeedback Tedavinin Anal İnkontinans Üzerine Etkileri

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ÖZET

Amaç: Bu çalışma, anal sfinkterin pasif durumda olduğu dönemde (koruyucu ileostomi kapatılmadan önce) uygulanan biofeedback terapi yönteminin, rektum kanseri nedeniyle düşük anterior rezeksiyon ve koruyucu ileostomi yapılan hastalarda postoperatif inkontinans gelişimini önleme veya azaltma üzerindeki etkisini incelemeyi amaçlamaktadır. Bu bağlamda, biofeedback tedavisinin hem klinik semptomlar hem de anorektal manometri ölçüm parametreleri üzerindeki etkileri değerlendirilmiştir.
Gereçler ve Yöntem: Çalışmaya, Necmettin Erbakan Üniversitesi Meram Tıp Fakültesi Genel Cerrahi Kliniği'nde düşük anterior rezeksiyon ve koruyucu ileostomi operasyonu geçiren hastalar dahil edilmiştir. Rastgele seçilen 40 hasta, her biri 20 kişiden oluşan iki gruba ayrılmıştır. Çalışma grubundaki hastalara, ileostomi kapatılmadan önce toplam dört hafta süresince, haftada iki seans olmak üzere biofeedback egzersiz tedavisi uygulanmıştır. Kontrol grubundaki hastalar ise bu tür bir terapi almamıştır. Koruyucu ileostomi kapatıldıktan iki hafta sonra her iki grup üzerinde anorektal manometri ölçümleri yapılmıştır. Ayrıca, Cleveland Clinic/Wexner İnkontinans Skoru , düşük anterior rezeksiyon sendromu skoru ve Cleveland Clinic tarafından geliştirilen Yaşam Kalitesi Anketi uygulanarak hastaların klinik durumları değerlendirilmiştir.
Bulgular: Biofeedback egzersiz tedavisi uygulanan hastalarda, koruyucu ileostomi kapatıldıktan sonra yapılan manometri ölçümlerinde "ortalama dinlenme basıncı" değerlerinin anlamlı derecede daha yüksek olduğu bulunmuştur. Düşük anterior rezeksiyon sendromu skorlamasına göre, çalışma grubunda inkontinans düzeyinin daha düşük olduğu, ayrıca gündüz dışkılama sıklığının daha az olduğu tespit edilmiştir. Bu bulgular, biofeedback terapisinin anal sfinkter üzerinde güçlendirici bir etkisi olabileceğini düşündürmektedir.
Sonuç: Çalışma sonucunda elde edilen veriler, koruyucu ileostomi kapatılmadan önce uygulanan biofeedback tedavisinin, postoperatif dönemde hastaların düşük anterior rezeksiyon sendromu semptomlarını iyileştirebildiğini ve bazı manometrik ölçüm parametrelerinde olumlu etkiler sağladığını ortaya koymaktadır. Bu sonuçlar, biofeedback terapisinin bu hasta grubu için umut verici bir tedavi yöntemi olabileceğini göstermektedir.

Anahtar Kelimeler: Fekal inkontinans, rektum kanseri, biofeedback tedavi

ABSTRACT

Objective: This study aimed to investigate whether biofeedback therapy performed while the anal sphincter was passive (before the closure of protective ileostomy) had any preventive or reducing effect on postoperative incontinence development in patients undergoing low anterior resection and protective ileostomy for rectal carcinoma. Additionally, the study sought to evaluate the impact of biofeedback therapy on anorectal manometry measurements, quality of life, and overall functional outcomes.
Materials and Methods: This study included patients who underwent low anterior resection and protective ileostomy at the General Surgery Clinic of Necmettin Erbakan University, Meram Medical Faculty. A total of 40 patients were randomly divided into two groups of 20 individuals each. The study group received biofeedback exercise therapy, which was administered twice a week for four consecutive weeks prior to the ileostomy closure. The control group did not receive any exercise therapy. Two weeks after the ileostomy closure, anorectal manometry measurements were performed for both groups. Clinical outcomes were assessed using the Cleveland Clinic/Wexner Incontinence Score , the low anterior resection syndrome score, and the Cleveland Clinic-developed Quality of Life Questionnaire.
Results: Patients who received biofeedback exercise therapy demonstrated higher "average resting pressure" in anorectal manometry measurements performed after ileostomy closure. According to the LARS scoring, the study group experienced less incontinence and a lower frequency of daytime defecation compared to the control group. These findings suggest a significant improvement in anal sphincter functionality.
Conclusion: The results of this study indicate that biofeedback therapy performed before ileostomy closure improves postoperative low anterior resection syndrome symptoms and enhances specific anorectal manometric parameters. These findings are promising and highlight the potential of biofeedback therapy as an effective intervention in this patient population.

Keywords: Fecal incontinence, rectal cancer, biofeedback therapy

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INTRODUCTION

Fecal incontinence can be defined as the decrease or loss of the anal sphincter's ability to control the discharge of solid, liquid and gaseous contents (1). It significantly impairs the quality of life of the patients. Guillaume et al. (2) reported the prevalence of fecal incontinence of varying degrees of severity as 18% in all age groups. However, fecal incontinence is mostly not reported as a complaint by patients since it is a private matter, patients may be embarrassed, or they may consider incontinence normal due to advanced age or previous surgery. Therefore, the actual prevalence rates are thought to be higher. Complaints such as changes in defecation frequency and anal incontinence may develop in patients who underwent low anterior resection (LAR) for rectal carcinoma (3). Multi-center studies have shown that low anterior resection syndrome (LARS), which is associated with symptoms such as incontinence, need for frequent defecation, and urge to defecate, develops in 80% of patients after undergoing LAR (4). Fecal incontinence has significant effects on the social and cultural life of individuals and has been reported to cause the development of fear of leaving home and avoidance of several outdoor social activities in several patients (5). Therefore, its diagnosis and treatment are of great importance for patients to be able to return to their social lives after the surgery and the medical treatments that they undergo and receive due to rectal carcinoma.

In the past, most of the studies on rectal carcinoma focused on local recurrence and mortality. In recent years, the development of surgical techniques, the widespread use of multidisciplinary treatment approaches and the decrease in mortality rates have led studies to focus on the functional results of treatment and quality of life. It has been shown that cancer-related depression adversely affects the general health and social relations of the person, and it is recommended to provide psychological support to cancer patients (6). Biofeedback therapy is an effective approach in the treatment of fecal incontinence after LAR (7). The combination of pelvic floor muscle physiotherapy and biofeedback therapy has been shown to be more effective than pelvic floor muscle physiotherapy alone (8). This study aimed to investigate the effects of biofeedback therapy performed when the anal sphincter was passive (before the closure of protective ileostomy) on postoperative incontinence development in patients who underwent LAR and protective ileostomy for rectal carcinoma.

MATERIALS AND METHODS

While planning our study, we found that there should be 21 cases in the study and control groups in the sample calculation we made using G Power version 3.1.9.3 with the parameters effect size: 0.8, a error: 0.05, b error: 0.20. Due to the fact that 2 of our cases exited during the study and the study budget was limited, we completed our study with 20 cases in the study and control groups. This study included patients undergoing LAR and protective ileostomy in the General Surgery Clinic of Necmettin Erbakan University, Meram Medical Faculty, between 01.02.2018 and 01.12.2018. This study was approved by Necmettin Erbakan University Meram Medical Faculty ethics committee with 05/01/2018 dated and 2017/1145 numbered decision and all procedures were conducted in accordance with the Declaration of Helsinki and local laws and regulations. All participants gave their written informed consent after the researchers explained the aim and course of the study. Oral assent was also obtained from all participants. As can be seen in the flow diagram, Patients were selected from locally advanced stage middle and lower rectal cancer cases with T3/T4 or lymph node involvement (Stage 2 or 3) in preoperative pelvic MRI imaging (Figure 1). Inclusion criteria for the study were: (1) age between 18 and 80 years, (2) histologically confirmed rectal adenocarcinoma requiring LAR and protective ileostomy, (3) clinical staging of T3/T4 or node-positive disease, (4) completion of neoadjuvant chemoradiotherapy, (5) ability to provide informed consent and participate in scheduled sessions. Patients with incomplete clinical data, refusal to participate, or noncompliance with scheduled interventions were excluded. All patients underwent low anterior resection and total mesorectal excision (LAR-TME) 4-6 weeks after receiving neoadjuvant chemoradiotherapy. History of previous pelvic surgery, history of urinary and/or fecal incontinence were accepted as exclusion criteria.

The patients were divided into two groups, each consisting of 20 people, using the 4-block randomization system. Patients who have undergone LAR operation and have a protective

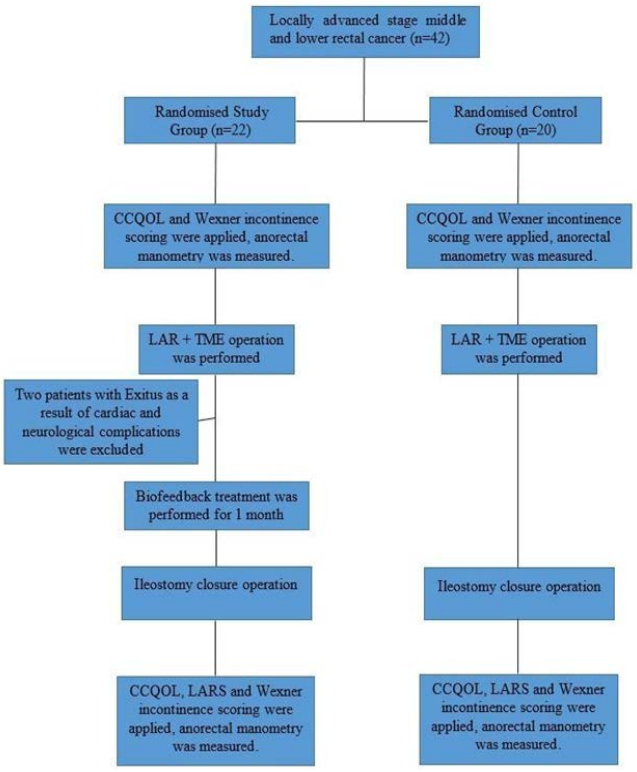

Figure 1. Flow Diagram

ileostomy do not defecate through the anus as long as their ileostomy is open. Therefore, they do not need fecal continence provided by the anal sphincter in their daily lives. For this reason, the anal sphincter will remain passive as long as the ileostomy remains open unless the patient is particularly exercising. 20 patients in the study group were called for exercises one month after LAR and were included in a four-week biofeedback therapy program. Exercises were done in two sessions a week, each lasting 30 minutes. The exercises were performed in the hospital accompanied by a nurse. The patients in the control group did not receive biofeedback therapy before ileostomy closure. Detailed information was provided to all patients included in the study, and their written consents were obtained.

Anorectal manometry, the Cleveland Clinic/Wexner Incontinence Score (CCIS) and Cleveland Clinic-developed Quality of Life Questionnaire (QOL) were preoperatively administered to both groups. Anorectal manometry measurement was performed using an eight-channel capillary perfusion system manometry device two weeks after protective ileostomy closure. In addition to the scales applied in the preoperative period, the Low Anterior Resection Syndrome scoring (LARS) was applied. Following the completion of the necessary documentation, independently of the present study, routine treatments of our clinic (biofeedback treatment and other necessary treatments) were provided to the patients in the control group with anal incontinence complaints.

Statistical Analysis

Statistical analysis was carried out using SPSS version 20.0 software. Descriptive data were expressed as number, percentage, and mean ± standard deviation. Categorical data was analyzed using the chi-square test. The Shapiro-Wilk test was used to determine whether the data followed a normal distribution. The independent t-test was for the analysis of normally distributed data, while the Mann-Whitney U test was used for the analysis of non-normally distributed data. A p-value of <0.05 was considered statistically significant. However, exact p-values were reported when possible to reflect the strength of association.

RESULTS

This study included a total of 42 patients undergoing LAR and protective ileostomy for rectal carcinoma in the General Surgery Clinic of Necmettin Erbakan University, Meram Medical Faculty, between February 2018 and December 2018. The patients were divided into two groups as: the study group and the control group. There were 22 and 20 individuals in the study and control groups, respectively. Two patients in the study group died during the study and were excluded. One patient with a history of heart valve replacement and receiving treatment for heart failure died due to the development of decompensated heart failure. One patient who developed Gulian Barre syndrome died while under treatment in the neurology intensive care unit.

Of the patients, 24 patients (60%) were male and 16 (40%) were female. There were 12 (60%) male and 8 (40%) female patients in the study group, whereas the control group included 11 (55%) male and 9 (45%) female patients. There was no statistically significant difference between the groups in terms of gender distribution (p: 0.757). The groups were similar in terms of age, anastomosis level, circular stapler diameter, and comorbidities. No difference was observed between the groups in terms of surgical procedure. 13 (65%) patients in the study group and 12 (60%) patients in the control group underwent laparoscopic surgery. For other patients, classical open surgery was performed with an anterior approach and none of the patients underwent robotic surgery (Table 1).

Scales and Scoring

The mean preoperative CCQOL score was 24.15 (19-30) in the study group and 25.40 (16-30) in the control group. The

Table 1. Comparison of the groups in terms of "age", "anastomosis level", "staple head""gender", "comorbidity" and "surgical procedure"

		Study group	Control group	Average ± Standard deviation		P value
Age	Study group	39	74	59,60 ± 10,99		0,708
	Control group	28	79	60,95 ± 11,60		
Anastomosis level	Study group	3	10	6,90 ± 1,83		0,384
	Control group	3	11	6,30 ± 2,43		
Stapler diameter	Study group	28	33	30,75 ± 2,38		0,574
	Control group	28	33	30,45 ± 2,19		
				Total Count	Total Percent	
Gender	Male	12	11	24	60,0	0,757
	Female	8	9	16	40,0	
Comorbiditiy	None	11	12	23	57,5	0,758
	Hypertension	5	3	8	20,0	
	Diabetes	1	3	4	10,0	
	COPD	1	1	2	5,0	
	Other	2	1	3	7,5	
Surgical procedure	Laparoscopic	13	12	25	62,5	0,752
	Laparotomy	7	8	15	37,5	

COPD: chronic obstructive pulmonary disease

mean preoperative Wexner incontinence score was 1.00 (0-4) in the study group and 2.15 (0-12) in the control group. There was no statistically significant difference between the study and control groups in terms of preoperative CCQOL scores and Wexner İncontinence scores (CCQOL: p=0.245, Wexner: p=0.232). The mean postoperative LARS score was 14.75 (4-19) in the study group and 25.75 (12-44) in the control group. The mean postoperative Wexner incontinence score was 3.45 (0-8) in the study group and 10.3 (4-18) in the control group. The postoperative LARS scores and Wexner incontinence scores of the control group were found to be significantly higher than those of the study group (LARS: p=0.001, Wexner: p=<0.001) (Table 2).

It was found that minor and major LARS symptoms were more common in the control group in the postoperative period (p = 0.022). In the postoperative period, minor LARS was observed in 2/20 (10%) cases and major LARS in 1/20 (5%) cases in the study group; In the control group, 4/20 (20%) cases had minor LARS and 7/20 (35%) cases had major LARS.

Manometric Measurements

All participants underwent anorectal manometry study both in the preoperative and postoperative periods and their mean resting pressure, maximum resting pressure (MRP), mean squeezing pressure, maximum squeezing

Table 2. Scales and Measures

		Minimum	Maximum	Average ± Standard deviation	P value
Preoperative CCQOL	Study group	19	30	24,15 ± 4,11	0,245
	Control group	16	30	25,40 ± 3,76	
Postoperative CCQOL	Study group	9	30	22,15 ± 5,98	0,957
	Control group	10	30	22,90 ± 4,78	
Postoperative LARS	Study group	4	39	14,75 ± 8,33	0,001
	Control group	12	44	25,75 ± 10,03	
Preoperative CCIS	Study group	0	4	1,00 ± 1,12	0,232
	Control group	0	12	2,15 ± 2,94	
Postoperative CCIS	Study group	0	8	3,45 ± 2,48	<0,001
	Control group	4	18	10,30 ± 4,18	

CCQOL: Cleveland clinical quality of life score, LARS: Low anterior resection syndrome score, CCIS: Wexner incontinence score

Table 3. Manometric Measurements

		Min.	Max.	Average Standard deviation	P value.	T value
ARP	Study group	37	75	57,65±11,35	0,308	1.034
	Control group	35	75	53,60±13,36		
Postoperative ARP	Study group	28	72	46,85±13,96	0,044	2.082
	Control group	13	67	37,65±13,98		
ASP	Study group	57	184	93,55±29,28	0,117	-1.602
	Control group	59	174	108,20±28,54		
Postoperaive ASP	Study group	44	129	78,25±24,01	0,106	1.672
	Control group	47	85	68,40±10,84		
MRP						
	Study group	49	102	76,80±16,44	0,305	-1,041
	Control group	42	126	83,45±23,35		
Postoperative MRP	Study group	38	107	66,10±17,84	0,521	0,647
	Control group	26	129	61,80±23,75		
MSP	Study group	87	298	179,45±59,34	0,776	0,512
	Control group	84	256	170,55±50,24		
Postoperative MSP	Study group	42	295	156,85±70,63	0,199	1,278
	Control group	61	282	131,00±56,51		
FACL	Study group	2,70	5,10	3,90±0,64	0,939	-0,077
	Control group	3,10	5,20	3,91±0,58		
Postoperative FACL	Study group	2,50	7,30	3,57±1,06	0,776	0,446
	Control group	2,00	4,50	3,44±0,75		
RAİR	Study group	12	33	19,45±5,59	0,080	-1,799
	Control group	11	34	23,00±6,83		
Postoperative RAİR	Study group	8	29	16,45±5,34	0,616	-1,430
	Control group	8	61	21,70±15,53		

ARP: Average resting pressure, ASP: Average squeezing pressure, MRP: Maximum resting pressure,
MSP: Maximum squeezing pressure, FACL: Functional anal canal length, RAIR: Rectoanal inhibitory reflex

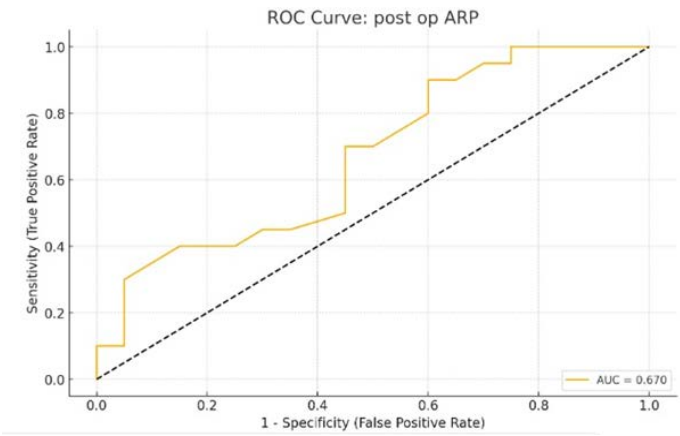

Figure 2. ROC Curve

pressure (MSP), functional anal canal length (FACL), and rectoanal inhibitory reflex (RAIR) were recorded. Preoperative manometric measurement values were similar between the groups. There was no statistically significant difference between postoperative average squeezing pressure values. The parameter of postoperative average resting pressure was found to be significantly lower in the control group (p=0.044, t=2.082) (Table 3). Receiver Operating Characteristic (ROC) analysis was performed to evaluate the discriminative performance of selected clinical parameters in distinguishing study and control groups. Postoperative average resting pressure showed a moderate predictive power with an AUC of 0.670. The optimal cut-off value was 33 mmHg, providing 90% sensitivity and 40% specificity. On the other hand, postoperative LARS score and QOL score yielded AUC values of 0.181 and 0.505, respectively, indicating low discriminative utility in this context. (Figure 2)

Univariate analysis for independent predictors

Postoperative mean Wexner incontinence scores showed a negative correlation with anastomosis level ($r = -0.476$, $p = 0.006$) and a positive correlation with age ($r = 0.392$, $p = 0.031$). These findings suggest that lower anastomosis level and older age may act as risk factors for higher incontinence scores. Since randomization was used, multivariate analysis was not applied.

DISCUSSION

Besides the complaints, such as the need for sudden defecation and various levels of incontinence, changes may occur in defecation habits and frequency of patients undergoing LAR for rectal carcinoma (3,4). The symptoms of incontinence, need for frequent defecation and urgent need for defecation are collectively referred to as anterior resection syndrome or LARS. Multicenter studies have shown that postoperative LARS develops in 80% of the patients (4,9). In a study by Wells et al. involving 277 patients, chemoradiotherapy, opening diverting diversion, surgeon's experience and low anastomosis level were reported to be effective in the development of LARS (10). Various anastomosis techniques have been studied in the literature to prevent LARS. In a study by Brown et al. including 2609 cases, the authors compared end-to-end coloanal anastomosis, colonic J-pouch, end-to-side anastomosis, and transverse coloplasty, and reported similar functional results in the long term(11). End-to-end coloanal anastomosis was preferred in all cases included in our study. There are studies in the literature investigating the usefulness of Kegel exercises for the treatment of incontinence and other functional disorders developing after pelvic surgery(12). However, the fact that these exercises are not performed under the supervision of a healthcare professional and, therefore, it cannot be determined if the patient does them correctly and effectively causes problems (13). At this point, biofeedback therapy comes to the fore as it is performed under the supervision of healthcare professionals; both visual and auditory feedback can be provided to the patient, and thus, the effectiveness of the exercise can be followed up.

There are different results in the literature regarding the duration of the biofeedback unit and the number of sessions. 6 sessions of treatment are recommended in ANMS-ESNM position paper and consensus guidelines on biofeedback therapy for anorectal disorders (14). In another article, a total of 10 sessions of treatment were applied, but the results were found to be insufficient (15). In our study, we preferred to apply a treatment protocol lasting 8 sessions. It was possible to extend the treatment period further, but we did not want the patients in the study to worry that their ileostomy closure operations were delayed because they were participating in this study. For this reason, we could not extend the treatment period any longer. Although our current results are clinically satisfactory, perhaps better results could have been obtained with longer treatment.

In the present study, anorectal manometric measurements were also performed in addition to LARS scoring and CCIS for clinical evaluation. Since the normal ranges of anorectal manometric measurement methods and results have not yet been fully standardized, their consistency is controversial. In a study by Pehl et al. involving a total of 703 cases consisting of individuals with fecal incontinence and healthy individuals, the authors reported the sensitivity of anorectal manometry as 91.4% and specificity as 62.5% (16). Yeap et al.(17) conducted a meta-analysis on a total of 1499 cases and reported the sensitivity and specificity of anorectal manometry as 80%. Bright et al. (18) reported that more realistic results could be obtained when manometric measurements were performed by mimicking physiological mechanisms. In their study, patients were asked to squeeze the anal sphincter, and a balloon that was inflated in the rectum was pulled out slowly, and patients were asked to prevent the balloon from coming out. The results of the measurement made with the help of balloons were found to be statistically significantly higher (16). The literature review has shown that anorectal manometry has acceptable accuracy, sensitivity and specificity in demonstrating defecation functions. However, the accuracy of the results is affected by the experience of the practitioner,

adequately informing the patient before the procedure, the environment conditions in which the test was carried out, the cooperation of the patient, and the mode of application of the test.

In a study by Laforest et al. involving 48 cases, patients undergoing LAR were divided into two groups and biofeedback therapy was administered to one group following ileostomy closure, whereas the other group did not receive the therapy (19). The authors found that both groups had similar Wexner scores. In the present study, the Wexner incontinence score was significantly higher in the control group compared to the study group. In a meta-analysis by Visser et al. biofeedback therapy was found to significantly reduce the symptoms and to improve the quality of life in patients with LARS symptoms (12). In the present study, the LARS score was found to be lower in the group receiving biofeedback therapy, in line with the literature. Performing exercises to strengthen continence with the application of biofeedback therapy may have increased the ability of the pelvic floor muscles to contract in a coordinated manner, although the maximum tightening pressure did not increase significantly. In addition, as a result of the manometric measurements made in the study group, it was determined that the mean resting pressure was higher than the control group. ARP and resting continence are largely formed by the internal sphincter (14). With the increase in internal sphincter function, resting continence may have increased in the study group, and as a result, symptoms such as frequent defecation and the need for urgent defecation may have decreased. We think that biofeedback treatment reduced the LARS score in the study group as a result of these mentioned effects.

In a study involving 169 patients, Pucciani (20) reported that LARS symptoms were more significant and the mean resting pressure was lower in patients who undergo pelvic surgery compared to those who did not underwent pelvic surgery. In the present study, the postoperative MRP, squeezing pressure, FACL and RAIR percentages of the study group and the control group were found to be similar, whereas the postoperative mean resting pressure was found to be significantly lower in the control group. Some of the results of this study are consistent with several studies in the literature, whereas some of them are inconsistent with the literature data. Different results are obtained in different studies. We attribute this to the fact that anorectal manometry measurement results could not have been fully standardized due to various factors such as the experience of the person performing the measurement, patient cooperation, and the features of the measurement device used. Internal sphincter is responsible for 80% of incontinence during the resting period. The mean resting pressure is known to give an idea about the resting continence, in which the internal sphincter is predominantly involved. The fact that the circular stapler shaft, which is advanced through the transanal route, traumatizes the internal sphincter due to excessive dilatation while passing through the anal sphincters may be another reason why the resting pressure is measured significantly lower.

There are studies reporting different results regarding the effects of anastomosis level and age on incontinence. In a study by Rasmussen et al., including 43 patients, the complaints of incontinence were found to increase as the anastomosis level decreased, but the patient age was found to have no effect on incontinence complaints (21). In another study of 27 patients undergoing rectal cancer surgery, continence was reported to be better after medium and high colorectal anastomoses compared to low coloanal anastomosis (22). The anastomosis level and patient age were found to be similar between the study and control groups in the present study. Anastomosis level was found to be positively correlated with the postoperative mean resting pressure, whereas it was negatively correlated with the postoperative Wexner score. This was an expected result and consistent with many similar studies in the literature. Unlike the Rasmussen study, there was a negative correlation between the patient's age and postoperative mean resting pressures in the present study. This may be due to the fact that the incidence of incontinence in the normal population increases with age in Türkiye.

ROC analysis suggested that among the studied variables, only postoperative average resting pressure had a moderate capacity to differentiate between the study and control groups. The optimal cut-off of 33 mmHg provided high sensitivity (90%) but relatively low specificity (40%). This finding supports the potential value of resting pressure as an objective manometric marker for treatment response, while LARS and QOL scores demonstrated limited diagnostic performance in this small sample.

Limitations

In addition to the small sample size and the absence of postoperative endoanal ultrasonography, other limitations of our study include its single-center design and the relatively short follow-up duration. Furthermore, although manometric measurements were used as objective parameters, the lack of long-term postoperative follow-up for recurrence of incontinence or symptom progression may have affected the generalizability of our findings.

CONCLUSION

In conclusion, the incidence of LARS following the LAR procedure is high and significantly impairs the patient's quality of life. This study investigated the effects of biofeedback therapy performed after LAR and before protective ileostomy closure when the anal sphincter was passive on postoperative incontinence, in other words, on LARS symptoms. There is still no standard treatment procedure regarding incontinence after LAR. Various treatment methods and schedules have been studied in the literature. As a result of our study, it was concluded that biofeedback therapy administered before ileostomy closure reduced the development of postoperative LARS and significantly improved the mean resting pressure. The results are promising, but the number of studies on the subject is limited. Therefore, there is a need for multi-center studies with a larger population group presenting long-term results for the development and standardization of the treatment modality recommended herein.

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