



Colonic Slow Transit in Patients with Dyssynergic Defecation and Effectiveness of Biofeedback Therapy

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ABSTRACT

Background: Colonic transit is delayed in two-thirds of patients with dyssynergic defecation. As a result, dyssynergic defecation and slow transit constipation may be linked. There is a scarcity of research on the coexistence of dyssynergic defecation and slow transit constipation, as well as the efficacy of biofeedback therapy in this group of patients.

Methods: The results of anorectal manometry and MR defecography were used to diagnose dyssynergic defecation. The colon transit time was measured with the help of 24 specially marked markers. All of the patients were given biofeedback therapy.

Results: The study's average age of 17 patients with dyssynergic defecation was 45.6 years. The colon transit time was prolonged in seven patients (41.2%). In anorectal manometry, seven patients (41.2%) had improved dyssynergic defecation after dyssynergic defecation. When the relationship between colon transit time and biofeedback therapy was investigated, it was discovered that normal colon transit time was found in 85.7 percent of those who benefited from biofeedback therapy. In contrast, slow transit constipation was found in 60% of those who did not.

Conclusion: In patients with pre-biofeedback therapy and dyssynergic defecation, colon transit time should be evaluated, and it should be kept in mind that these patients may be resistant to treatment in the case of accompanying slow transit constipation.

Keywords: Anorectal manometry, Biofeedback therapy, Colonic Slow Transit, Constipation, Dyssynergic Defecation

Dissinerjik Defekasyonlu Hastalarda Kolonik Yavaş Geçiş ve Biofeedback Tedavisinin Etkinliği

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Öz

Amaç: Dissinerjik dışkılama olan hastaların üçte ikisinde kolonik geçiş gecikir. Sonuç olarak, dissinerjik dışkılama ve yavaş geçişli kabızlığın bağlantılı olması mümkündür. Dissinerjik dışkılama ile yavaş geçişli kabızlığın bir arada bulunmasının yanı sıra bu hasta grubunda biofeedback tedavisinin etkinliğine ilişkin araştırma sayısı azdır.

Yöntemler: Dissinerjik dışkılama tanısı için anorektal manometri ve MR defekografi sonuçları kullanıldı. Kolon geçiş süresi, özel olarak işaretlenmiş 24 işaret yardımıyla ölçüldü. Tüm hastalara biofeedback tedavisi verildi.

Bulgular: Çalışmada dissinerjik dışkılama şikayeti olan 17 hastanın yaş ortalaması 45,6 idi. Yedi hastada (%41.2) kolon geçiş süresi uzamıştı. Anorektal manometride, 7 hastada (%41.2) dissinerjik defekasyondan sonra dissinerjik defekasyon düzeldi. Kolon geçiş süresi ile biofeedback tedavisi arasındaki ilişki incelendiğinde biofeedback tedavisinden fayda görenlerin yüzde 85,7'sinde kolon geçiş süresinin normal olduğu, fayda görmeyenlerin ise yüzde 60'ında yavaş geçişli kabızlık bulunduğu keşfedildi.

Sonuç: Prebiofeedback tedavisi ve dissinerjik dışkılama olan hastalarda kolon geçiş süresi değerlendirilmeli ve bu hastaların eşlik eden yavaş geçişli kabızlık durumunda tedaviye dirençli olabileceği akılda tutulmalıdır.

Anahtar sözcükler: Anorektal manometri, Biofeedback tedavisi, Kolonik Yavaş Geçiş, Kabızlık, Dissinerjik Defekasyon

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Introduction

Constipation is a common ailment in the community, with a prevalence of 14–18%, and it significantly impacts the quality of life. Furthermore, constipation increases the use of healthcare services as well as direct and indirect economic costs. The three types of functional constipation are normal transit constipation (NTC), slow transit constipation (STC), and rectal evacuation disorders or dyssynergic defecation (DD) ^{1,2}. Accurate categorization is critical for treating and managing constipation (1). One-third of all chronic constipation patients have DD, which is one of the most common causes of chronic constipation. This acquired behavioral problem is caused by the coordination disorder of the abdominal and pelvic floor muscles during stool evacuation (1-3). Meanwhile, STC is one of the other causes of chronic constipation. It is characterized by changes in the number of myenteric plexus neurons or Cajal interstitial cells, as well as causing myopathy or neuropathy, which prolongs colonic transit time ⁴.

Because two-thirds of patients with difficult defecation also have delayed colonic transit, DD and STC may be linked ^{1,5}. It has been discovered in some studies using radio opaque or scintigraphy that there is a delay in DD not only in the rectosigmoid region but also throughout the colonic transit ^{5,6}. Treatments (lifestyle changes, medical treatments, diet, and so on) are frequently insufficient in patients with DD and STC, and many patients continue to suffer from symptoms ^{1,2}. Biofeedback therapy (BFT) is a low-cost, non-invasive, and easy-to-use treatment for DD that has been shown to be one of the most effective. Both clinical symptoms and the DD pattern can be improved with BFT ^{2,3}. Hence, BFT is recommended as first-line therapy for DD by both the American Neurogastroenterology and Motility Society and the European Society of Neurogastroenterology and Motility (ANMS - ESNM) ⁷. For patients with STC who do not respond to diet and lifestyle changes, pharmacological stimulating agents (bisacodyl, neostigmine, etc.) are recommended as first-line therapy. However, in STC patients who have failed to respond to first-line treatments, treatment options are limited. A total colectomy may be necessary in severe cases, but this is rare ⁸. BFT has been shown in studies to normalize colon transit time (CTT) in patients with STC, in addition to being the most effective treatment for DD ⁹. As a result, BFT is also recommended for STC patients who are not responding to medical treatment.

The literature on the coexistence of DD and STC, as well as the effectiveness of BFT in this group of patients, is limited.

MATERIALS AND METHODS

Patients

Patients who received BFT treatment for DD and whose CTT was studied were included in the study after our study protocol was scrutinized and approved by the Local Ethics Committee (protocol number: 72300690-799). From January 2010 to February 2019, patient data were collected retrospectively. The information was gathered from the motility laboratory's medical records as well as our hospital's digital database.

Patients between the ages of 18 and 75 who presented to our clinic with constipation symptoms that did not respond to conservative treatments (diet, laxatives, enemas, stool volume-enhancing treatment, or laxatives), those who had symptoms for more than 12 months, those whose organic and metabolic causes of chronic constipation were excluded by colonoscopy and laboratory tests, and those who fully met the DD criteria for Rome IV (10) were included. The results of anorectal manometry (ARM) and MR (magnetic resonance) defecography were used to make the diagnosis of DD.

All of the patients were given BFT. BFT was completed for those who benefited from the treatment for 10-15 sessions, but for those who did not benefit, the treatment was stopped after the 6th session. Patients whose DD pattern disappeared in ARM after BFT were considered successful, as were patients who achieved adequate anal relaxation (> 20% sphincter relaxation) and had clinically complete improvement in their symptoms. Even if bowel and defecation symptoms improved, BFT was considered unsuccessful in those whose DD pattern persisted in ARM.

Demographic and characteristic features of the patients, their history, as well as ARM results at baseline and after BFT were evaluated.

Colon transit time

The patient swallowed 24 specially marked capsules of 5 mm in diameter, which can be seen on x-ray (radiopaque), after breakfast in the morning. X-rays were taken on the 3rd and 5th days. The test was discontinued if more than 80% of the rings were not seen on the X-ray on the 3rd day. A colon transit time of 3 days is considered normal. If 80% of the rings were still visible on the 3rd-day x-ray, the control x-ray was taken on the 5th day. If less than 20% of the rings were visible on the 5th day, the colonic transit time was considered five days or normal. If more than 20% of the rings are seen on the 5th day, the colonic transit time is considered > 5 days or abnormal. In this situation, the distribution of the remaining rings in the column was evaluated. A diagnosis of STC was made if there was a homogeneous distribution of the rings in the colon or if they accumulated on the right side of the vertebra. As the diagnosis of DD was definite by ARM and MR defecography in all patients in the study, if the rings were collected in the last part of the rectosigmoid colon and were absent in the right colon, it was considered secondary to DD and colonic motility was accepted as

normal. Yet, these patients were considered to have anorectal dysfunction.

Anorectal physiological tests

A seven-channel water perfusion system (Dent-sleeve International) was used for ARM ¹¹. The anal resting pressure, anal maximum squeezing pressure, anal pressure during coughing, anal relaxation or paradoxical contraction during defecation and rectoanal inhibitory reflex were recorded. The rectal sensation was assessed by measuring the first sensation, the desire to defecate, and the maximum tolerated volume.

Biofeedback Therapy

Bowel habits, exercise, laxatives, dietary fiber, fluid intake, and timed toilet training were all discussed with patients. Patients were taught how to improve defecation efforts using postural and diaphragmatic breathing techniques by an experienced team of motility specialists (gastroenterologist, nurse, and physiotherapist), with education on the anatomy of normal defecation, advice on correct toilet positioning, and postural and diaphragmatic breathing techniques, and they were asked to perform these maneuvers at home at least 2 to 3 times a day for 15 minutes. The physiotherapist showed the patients visual and verbal exercises to relax the pelvic floor muscles, strengthen the abdominal and pelvic muscles, and allow abdominopelvic coordination. Patients were also given visual and written documents that they could use to exercise at home.

For BFT, the EMG-BFT technique was used ¹². Surface EMG probes were stitched to the skin in the bilateral anal canal while the patient was lying in the left lateral ducubit position. On a computer monitor, patients watched manometric tracings from surface EMG probes around the bilateral anal canal. With visual

and verbal feedback, patients were taught to follow the nurse's commands to control the sphincter and pelvic floor muscles and improve abdominopelvic coordination. BFT had been applied to patients for at least six sessions under the supervision of a motility nurse. The BFT sessions lasted anywhere from 30 to 45 minutes.

Statistical analysis

In the computer environment, the data were analyzed using IBM SPSS Statistics 20.0 Windows 10 software. Patients' continuous numerical variables with normal distribution were expressed as mean SD values, whereas those with non-normal distribution were expressed as median, minimum-maximum values. Ratios were used to express nominal data (percentages). Because of the small number of patients, no comparisons were made.

Results

Of the 17 patients with DD included in the study, 14 (82.4%) were female, three were male, and the mean age was 45.6 17.9 years. The patients had symptoms for a median of 84 months ¹²⁻³⁰. The most common complaints among the patients were constipation (82.4%) and an inability to completely defecate the stool (17.6%). CTT was normal in 10 (58.8%) patients and prolonged in 7 (41.2%) patients. When the rectal sensations were evaluated with a rectal balloon, 9 (52.9%) of the patients had normal rectal sensations, 7 had rectal hyposensitivity, and 1 had rectal hypersensitivity. The rectal resting pressures of the patients decreased after BFT, whereas an increase was observed in the anal squeezing pressures. Following BFT, DD improved in 7 patients (41.2%) in ARM and the patients' clinical complaints disappeared. However, the DD pattern in ARM continued in 10 patients (58.8%). The demographic and clinical characteristics of the patients are presented in Table 1.

Table 1: Characteristic and demographic features of patients

Age, years, mean, (range), min-max.	45.6±17.9 (19-80)
Male, n (%)	3 (%17.6)
Female, n (%)	14 (%82.4)
Primary symptom	
• Constipation, n (%)	14 (82.4)
• Inability to fecal evacuation, n (%)	3 (17.6)
Primary symptom duration, median (min-max)	84 (12-300)
Biofeedback number of sessions, median (min-max)	10 (7-15)
Primary symptom	
• Constipation, n (%)	14 (82.4)
• Inability to fecal evacuation, n (%)	3 (17.6)
Resting Pressure	
• Before BFT (mmHg, mean)	73.6 ± 24.4
• After BFT (mmHg, mean)	66.1±16.1
Squeeze Pressure	
• Before BFT (mmHg, mean)	133.4 ± 36.5
• After BFT (mmHg, mean)	154.7 ± 23.6
Rectal sensitivity	
• Normal, n (%)	9 (52.9)
• Decreased, n (%)	7 (41.2)
• Increased, n (%)	1 (5.9)
Colon transit time	
• Normal colon transit time, n (%)	10 (58.8)
• Slow colon transit time, n (%)	7 (41.2)
Response to biofeedback therapy	
• Responders, n (%)	7 (41.2)
• Non-responders, n (%)	10 (58.8)

BFT; Biofeedback therapy

Table 2: Comparison by colon transit time of patients

	Normal colon transit time, (%)	Slow colon transit time, (%)
Male, (n:3)	66.7	33.3
Female, (n:14)	57.1	42.9
Primary symptom		
• Constipation, (n:14)	57.1	42.9
• Inability to fecal evacuation, (n:3)	66.7	33.3
Resting Pressure		
• Before BFT (mmHg, mean)	80.5±25.8	63.8±19.9
• After BFT (mmHg, mean)	72.9±13.9	56.4±14.6
Squeeze Pressure		
• Before BFT (mmHg, mean)	155±11.5	154.2±35.9
• After BFT (mmHg, mean)	158±11.2	156.2±35.8
Rectal sensitivity		
• Normal, (n:9)	77.8	22.2
• Decreased, (n:7)	28.6	71.4
• Increased, (n:1)	100	
Response to biofeedback therapy		
• Responders, n (%)	85.7	14.3
• Non-responders, n (%)	40	60

BFT; Biofeedback therapy

When the CTTs of the patients were evaluated (Table 2), it was found that SCT accompanied DD in 33.3% of males and 42.9% of females. SCT was detected in 6 (42.9%) patients who presented with constipation and in 1 (33.3%) patient who presented with the inability to fecal evacuation. A decrease in rectal resting pressures and an increase in anal squeezing pressures

The DD pattern improved in 41.2% of the patients in our study after BFT, and only one of the patients with STC improved the DD pattern after BFT, whereas 85.7% (6/7) did not benefit from BFT.

Only 2 patients had a history of surgery due to an anal fissure. One of these two patients had prolonged

were observed after BFT in all patients with normal or slowed CTT. In 71.4% of patients, SCT was accompanied by decreased rectal sensation. When the relationship between CTT and BFT was analyzed, it was found that NCTT was detected in 85.7% of those who benefited from BFT, while SCT was observed in 60% of patients who did not respond to BFT.

CTT and normal rectal sensitivity. This patient did not benefit from BFT. In the other patient, transit time was normal, rectal hyposensitivity was observed, and the DD pattern improved following BFT.

Discussion

A significant proportion of patients with DD also have a delay in the delivery of colon contents, according to our research. Patients with a long CTT are more likely to have abnormal rectal sensitivity. Patients who have both DD and STC benefit less from BFT.

In 55-64 percent of adults with DD and 12 percent of adolescents with DD, delayed CTT with scintigraphy or radiopaque markers has been reported^{6,11}. Tanner et al. (13) found DD in 9% of patients with constipation who did not respond to first-line treatment, STC in 42%, DD and STC overlap in 13%, and NTC in 36% of patients in a study of 230 patients with constipation who did not respond to first-line treatment. A total of 50 patients were diagnosed with DD, with 30 of them (60 percent) also having STC. 30 (24%) of the 127 patients with STC also had DD. Grotz et al.¹⁴ found that patients with STC had longer left colon and rectosigmoid transit times than patients with DD when using radiopaque markers.

Furthermore, Nullens et al.⁵ used the scintigraphy method to measure CTT in patients with DD, patients with STC with normal ARM, and healthy control groups. They discovered that in patients with DD and STC coexistence, the overall CTT time was longer than in the control group, and that overall colon transit was slower in patients with STC than in patients with DD. In contrast to Grotz et al.¹⁴, Nullens et al.⁵ found that patients with STC had slower right colon emptying than patients with DD. This disparity, however, could be due to the different methods they used to measure CTT. In CTT measurements made with a radiopaque marker, radiopaque materials may accumulate in the rectosigmoid region due to anorectal dysfunction in patients with DD¹⁵. Furthermore, Nullens et al.⁵ used the scintigraphy method to measure CTT in patients with DD, patients with STC with normal ARM, and healthy control groups. They discovered that in patients with DD and STC coexistence, the overall CTT time was longer than in the control group, and that overall colon transit was slower in patients with STC than in patients with DD. In contrast to Grotz et al.¹⁴, Nullens et al.⁵ found that patients with STC had slower right colon emptying than patients with DD. This disparity, however, could be due to the different methods they used to measure CTT.

Although the etiology of DD is unknown, inadequate relaxation of the anal sphincter, paradoxical contraction of the anal sphincter, or a disorder in the forward evacuation of stool in the rectum are blamed as the mechanisms causing its pathophysiology. With BFT, it is aimed to restore the abdominopelvic coordination ability (1-3) and in numerous randomized studies demonstrating the effectiveness of BFT, response rates have been reported as 70-80%¹⁶⁻¹⁸. Meanwhile, in our study, 41.2% of patients benefited from BFT. This variability in treatment success may be due to the differences in BFT methods (manometry-based biofeedback, EMG biofeedback, balloon

defecation training, and home-based training biofeedback) applied to patients as well as to the differences between patient groups¹⁶⁻¹⁹.

The exact reason for DD and STC coexistence is unknown. The improvement of STC after BFT has been attributed to the theory that DD causes reflex inhibition in the proximal colon and colonic transit^{20,21}. Patients with STC who do not respond to diet or stimulant treatments have limited treatment options, and the role of BFT in these patients is uncertain^{20,22}. According to another study, BFT helps with both normal and slow transit constipation²³⁻²⁵. However, it was suggested in a later controlled study that while BFT was beneficial only for patients with DD and NTC, it was not beneficial for patients with STC²⁶. Improvements in anal sphincter tone at rest, functions of the anal sphincter and puborectalis muscles, abdominopelvic coordination during defecation, and rectal sensation functions may occur as a result of the BFT^{18,27}. A decrease in resting pressures, improvement in patients' first sensations, and a slight increase in squeezing pressures were all observed after BFT in one study, but their predictive effect on BFT success was not found³. In our research, however, we found that after BFT, anal squeezing pressure increased while anal resting pressure decreased. Furthermore, DD may be accompanied by 50-60% impaired rectal sensation. While some studies found changes in rectal sensation after BFT, others found no difference in rectal sensation after BFT^{2, 28-30}. The rectal sensations of the patients after BFT were not assessed in our study, but we did find that 47.1 percent of the patients had impaired rectal sensation, with the majority (62.5 percent) of those with impaired rectal sensation having a prolonged colon transit time.

It was revealed that the symptom profiles of patients with chronic constipation did not differ depending on the subgroups of constipation, and the symptom profiles of patients with STC and DD overlap were largely similar to those of patients with NTC, STC, or DD alone¹³. In our study, although all patients had DD, constipation was the primary symptom in 82.4% of them, rather than the inability to fecal evacuation. ARM and colon transit time should be studied for the treatment plan of patients who do not respond to diet and laxatives, considering the fact that their symptom profile cannot distinguish subgroups of constipation.

The limitations of the study are that the study was retrospective, relatively small number of patients, colon transit time and rectal sensation were not checked after BFT, and the effectiveness of BFT was not compared in patients with only STC.

Conclusion

Patients with DD might also have a prolonged total colon transit time. In the coexistence of DD and STC, response rates to BFT might decrease. Hence, colon transit time should be evaluated in patients with pre-BFT and DD, and it should be kept in mind that these

patients may be resistant to treatment in the case of accompanying STC. A more multidisciplinary approach and combining treatments with BFT could increase the chance of success in these patients. However, more randomized studies with large patient groups are needed for the treatment of DD and STC coexistence.

Ethics Committee Approval: The Ankara City Hospital of Medical Sciences Ethics Committee granted approval for this study (protocol number: 72300690-799)

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