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The Effectiveness of Matrix Rhythm Therapy in Patients with Ankylosing Spondylitis

Ankilozan Spondilit'li Hastalarda Matrix Ritm Terapinin Etkinliği

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ABSTRACT

Aim: The aim of this study was to investigate the effects of matrix rhythm therapy in addition to exercise treatment on mobility, functionality, disease activity, presence of enthesitis, quality of life, biopsychosocial level, fatigue, sleep quality and exercise beliefs in patients with Ankylosing Spondylitis (AS).
Method: Total of 7 AS patients, 3 women and 4 men, were included in the study. In addition to exercise treatment, matrix rhythm therapy was applied to patients with AS, 2 days a week for 6 weeks. Exercise treatment consisted of a total of 20 exercises aimed at increasing flexibility and muscle strength. Matrix rhythm therapy started from the thoracic region and progressed to the lumbar region and lower extremities. Mobility was evaluated with Bath Ankylosing Spondylitis Metrology Index (BASMI), functional limitations with Bath Ankylosing Spondylitis Functional Index (BASFI), disease activity with Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), the presence of enthesitis with Maastrich Ankylosing Spondylitis Enthesitis Score (MASES), quality of life with Ankylosing Spondylitis Quality of Life Questionnaire (ASQol), disease-related biopsychosocial level with Biopsychosocial Questionnaire (BETY-BQ), fatigue with Multidimensional Assessment of Fatigue Scale (MAF), sleep quality with Pittsburgh Sleep Quality Index (PSQI), exercise beliefs with Exercise Beliefs Questionnaire. All evaluations were performed in approximately 60 minutes pre and post intervention.
Results: When the data were analyzed, there was a significant difference in BASMI-intermalleolar distance (p:0.041), MAF (p:0.028) PSQI (p:0.046) Exercise Beliefs Questionnaire/ Benefit (p: 0.027) and Disadvantage (p:0.042) scores after the intervention compared to before the intervention.
Conclusions: Matrix rhythm therapy applied in addition to exercise treatment increased hip abduction and sleep quality, reduced fatigue, and positively affected exercise-related beliefs in patients with AS.

Keywords: Ankylosing spondylitis, therapy, exercise

ÖZ

Amaç: Bu çalışmanın amacı, Ankilozan Spondilit (AS)'li hastalarda egzersiz tedavisine ek olarak uygulanan matriks ritm terapinin mobilite, fonksiyonellik, hastalık aktivitesi, entezit varlığı, yaşam kalitesi, biyopsikososyal düzey, yorgunluk, uyku kalitesi ve egzersiz inanışları üzerine etkisini incelemekti.
Yöntem: Çalışmaya 3 kadın ve 4 erkek olmak üzere toplam 7 AS hastası dahil edildi. AS'li hastalara haftada 2 gün 6 hafta boyunca egzersiz tedavisine ek olarak matriks ritm terapi uygulaması yapıldı. Egzersiz tedavisi, esneklik ve kas kuvvetini arttırmaya yönelik toplam 20 egzersizden oluşmakta idi. Matriks ritm terapiye, torakal bölgeden başlanıldı ve lumbal bölge ve alt ekstremitelere doğru ilerlendi. Mobilite Bath Ankilozan Spondilit Mobilite İndeksi (BASMİ) ile, fonksiyonel limitasyonlar Bath Ankilozan Spondilit Fonksiyonel İndeks (BASFİ) ile, hastalık aktivitesi Bath Ankilozan Spondilit Hastalık Aktivitesi İndeksi (BASHAİ) ile, entezit varlığı Maastricht Ankilozan Spondilit Entezit Skoru (MASES) ile, yaşam kalitesi Ankilozan Spondilit Yaşam Kalitesi Anketi (ASYKA) ile, hastalıkla ilişkili biyopsikososyal düzey Bilişsel Egzersiz Terapi Yaklaşımı Ölçeği (BETY-BQ) ile, yorgunluk Yorgunluğu Çok Boyutlu Değerlendirme Ölçeği (YÇBDÖ) ile, uyku kalitesi Pittsburgh Uyku Kalitesi İndeksi (PUKİ) ile, egzersiz inançları Egzersiz İnançları Anketi ile değerlendirildi. Tüm değerlendirmeler, müdahale öncesi ve sonrasında yaklaşık 60 dakika da gerçekleştirildi.
Bulgular: Veriler analiz edildiğinde, müdahale sonrasında müdahale öncesine göre BASMI- intermalleolar mesafe (p:0.041); YÇBDÖ (p:0.028); PUKİ (p:0.046), Egzersiz İnançları Anketi/ Avantaj (p: 0.027) ve Dezavantaj (p:0.042) puanlarında anlamlı düzeyde fark vardı.
Sonuç: Egzersiz tedavisine ek olarak uygulanan matriks ritm terapi uygulaması, AS'li hastalarda kalça abduksiyonunu ve uyku kalitesini arttırmış, yorgunluğu azaltmış ve egzersizle ilgili inanışları olumlu yönde etkilemiştir.

Anahtar Kelimeler: Ankilozan spondilit, terapi, egzersiz

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Introduction

Ankylosing Spondylitis (AS) is a chronic, progressive, systemic inflammatory disease that mainly affects the sacroiliac joints and axial skeleton. Less commonly, it may involve peripheral joints and can also cause extra-articular manifestations such as enthesitis and uveitis [1].

Inflammation in the axial skeleton in the early stages of the disease causes new bone formation and restriction of spinal mobility and function in later stages. Restriction of movement in the spinal region generally occurs due to ossification of the facet joints and syndesmophytes developing from the edges of the vertebral bodies. Inflammation of the axial skeleton is often accompanied by tenderness and stiffness of the paraspinal muscles. As the disease progresses, lumbar lordosis and spinal mobility gradually decreases [2]. Inflammatory low back pain is the leading and most typical symptom of AS and usually begins insidiously with sacroiliitis and is felt in the lower thoracic, lumbar and sacroiliac joint areas. Initially, the pain may be intermittent, but over time it become more constant, with morning stiffness lasting longer than 30 minutes. Pain that decreases with movement is typical.

According to the evidence-based recommendations of Assessment of SpondyloArthritis International Society (ASAS) and the European Alliance of Associations for Rheumatology (EULAR), the integration of pharmacological and non-pharmacological treatment approaches in the management of AS enhances treatment effectiveness by creating a synergistic effect [3]. Exercise should be initiated as soon as the patient is diagnosed and continued throughout their lifetime as a treatment method. The main purpose of exercise, which is the primary non-pharmacological treatment approach for spondyloarthropathy patients, is to maintain mobility and strength, reduce symptoms, prevent or limit spinal deformities, reduce disease activity, contribute to cardiopulmonary health in the long term, and generally improve physical function and quality of life. Personalized, pain-controlled exercises can be safely prescribed at all stages of the disease [4].

Matrix rhythm therapy aims to restore the mobility of tissues with external oscillators given to the cells. With this therapy, various chemical, physiological and mechanical effects are created in the tissue. As a result of these effects, various benefits are provided, such as shortening the renewal time of cells and cell matrix in muscles, nerves and bones, reducing muscle spasm and muscle pain, increasing cell regeneration, accelerating lymphatic passage, accelerating the metabolism and removing toxic substances, and strengthening the immune system [5]. Various studies on matrix rhythm therapy have proven its effect on pain and increased functionality in different musculoskeletal conditions [6,7]. To our knowledge, there were no studies investigating the effectiveness of matrix rhythm therapy in AS or other rheumatic diseases.

The symptoms and findings in patients with AS lead to a decline in physical function, which impacts their quality of life. The effectiveness of treatment methods is very important in terms of reducing symptoms and improving quality of life. Considering the effects of exercise and the chemical, physiological and mechanical mechanisms of matrix rhythm therapy in the treatment of patients with AS, these treatments can provide positive effects on various parameters of the disease, and the results obtained from this study may contribute to the literature on the treatment of patients with AS.

The aim of this study was to examine the effectiveness of matrix rhythm therapy in addition to exercise treatment in patients with AS.

Method

Total of 7 AS patients, 3 women and 4 men, were included in this study, which was planned as a cross-sectional study. Patients were diagnosed with AS by the same rheumatologist according to the modified New York criteria. Inclusion criteria were - diagnosed with AS by a rheumatologist, -18 years or older, -stable pharmacological treatments for the last month. Exclusion criteria were:- done regular physical activity in the last 3 months, -any orthopedic or neurological disorder that will affect exercise, -uncontrolled cardiopulmonary disease, - pregnancy, -malignancy and a history of surgery in the last 6 months, - situations in which physical therapy modalities are contraindicated (sensory

impairment, pacemaker users),

The results of patients who did not participate in 75% of the intervention and had changes in pharmacological treatments during the study were not included in the analyses.

Ethical approval of the study was obtained from the local ethics committee (E-60116787-020-601289). This study was ethically carried out with Helsinki Declaration Principles. Verbal information was given to all patients and an informed consent form was signed.

Intervention

In addition to exercise treatment, matrix rhythm therapy was applied to patients with AS by the same physiotherapist, 2 days a week for 6 weeks.

Exercise Treatment: Twenty exercises were performed in approximately 30-minute sessions, 2 days a week for 6 weeks. This treatment consisted of spinal mobility exercise, flexibility exercises for the cervical, thoracic and lumbar spine, stretching for the shoulder complex, hamstring, quadriceps and erector spinal muscles, and strengthening exercises for the abdominal region, back extensors and proximal muscle groups.

Matrix Rhythm Therapy: Matrix rhythm therapy was applied for approximately 40 minutes to the thoracic, lumbar, and gluteal regions of the patients twice a week for 6 weeks. Therapy was performed in supine and prone positions. In prone position, abdominal parts of the patients were supported with a thin pillow to ensure relaxation. To ensure effective use of the device head, powder was applied to the application surface. To increase parasympathetic activity, therapy started from thoracic region and progressed to lumbar region and lower extremities. The application was performed parallel to the muscle fibers, starting from the midpoint and moving towards the origin and insertion. It began on the less painful side, with the compression technique applied by keeping the device head fixed on the paravertebral muscles, targeting areas with intense muscle spasm, pain, and sensitivity. The head rhythm of the device was increased according to the patient's tolerance.

Outcome Measures

Mobility was evaluated with Bath Ankylosing Spondylitis Metrology Index (BASMI), functional limitations with Bath Ankylosing Spondylitis Functional Index (BASFI), disease activity with Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), the presence of enthesitis with Maastrich Ankylosing Spondylitis Enthesitis Score (MASES), fatigue with Multidimensional Assessment of Fatigue Scale (MAF), sleep quality with Pittsburgh Sleep Quality Index (PSQI), quality of life with Ankylosing Spondylitis Quality of Life Questionnaire (ASQol), disease-related biopsychosocial level with Biopsychosocial Questionnaire (BETY-BQ), exercise beliefs with Exercise Beliefs Questionnaire,. All evaluations were performed in approximately 60 minutes pre and post intervention. The physiotherapist who conducted the evaluation was different from the one who administered the intervention.

Bath Ankylosing Spondylitis Metrology Index (BASMI): BASMI consists of clinical measurement of cervical rotation, tragus to wall distance, modified Schober's, lumbar lateral flexion and intermalleolar distance. It is scored between 0 and 10. As the score increases, mobility decreases [8].

Bath Ankylosing Spondylitis Functional Index (BASFI): This index consists of 10 questions. The total score is between 0-10. A high score indicates that the patient's functional limitations in daily life increase [9].

Bath Ankylosing Spondylitis Disease Activity Index (BASDAI): BASDAI consists of 6 questions that examine the patient's level of weakness/ fatigue, spinal pain, joint pain/swelling and sensitivity to touch, and the level and duration of morning stiffness in the last week. The total score is from 0 to 10. As the score increases, disease activity increases [10].

Maastricht Ankylosing Spondylitis Enthesitis Score (MASES) : With this scale, evaluate whether the 1st and 7th costochondral joints, anterior superior and posterior superior iliac spines, iliac crest, Achilles attachment site at the heel are bilaterally and whether the 5th lumbar spinous process is sensitive to pressure. The total score is calculated by giving 0 points for non-sensitive areas and 1 point for sensitive areas. A higher score means there are more enthesitis areas [11].

Multidimensional Assessment of Fatigue scale (MAF): This scale consists of 16 items and measures four dimensions of fatigue: a higher score indicates greater fatigue [12].

Pittsburgh Sleep Quality Index (PSQI): PSQI consists of seven-component scores that sleep latency, sleep duration, subjective sleep quality, sleep disturbances, use of sleeping medication, habitual sleep efficiency, and daytime dysfunction. Total score has a range of. 0-21. Higher score indicates worse sleep quality [13].

Ankylosing Spondylitis Quality of Life Questionnaire (ASQol): ASQoL consists of 18 questions regarding symptoms, function, and illness-related anxiety. Each question is answered yes or no and the number of "yes" is taken into account. High score is interpreted as decreased quality of life [14].

Biopsychosocial Questionnaire (BETY-BQ): BETY-BQ is a measurement tool developed in accordance with the biopsychosocial model and evaluates the biopsychosocial status of patients with rheumatic disease. It consists of 30 items. Each item is scored between 0 and 4 and high score is associated with poor biopsychosocial status [15].

Exercise Beliefs Questionnaire: Each question is answered on a 6-point Likert scale. Two scores are obtained: Benefit and Disadvantage. While the total score for “Benefit” is between 13-78; Total score for “Disadvantage” is between 12-72 [16].

Statistical analysis

The data were analyzed with the SPSS package program. Continuous variables were given as mean ± standard deviation and categorical variables as numbers and percentages.

For dependent group comparisons, Wilcoxon Signed Ranks Test was used. In the statistical analysis, the significance level was accepted as $p<0.05$.

Results

Total of seven AS patients, three women and four men, participated in the study. The mean age of the seven AS patients was 55.57±12.23 years and disease activity was 9.50±8.06 years. There were 2 (28.6%) patients who smoked and had chronic respiratory disease. Demographic and disease-related data of AS patients were shown in Table 1. There were no side effects or adverse events associated with matrix rhythm therapy.

Table 1. Demographic and disease-related data of patients with Ankylosing Spondylitis

Variables	Ankylosing Spondylitis Patients (n:7)	
	Mean±SD	Median (min/max)
Age (years)	55.57±12.23	56(38/72)
Height (m)	1.66±0.07	1.70(1.49/1.72)
Weight (kg)	76.71±8.57	74(66/90)
BMI (kg/m2)	27.82±3.31	27.18(22.84/32.43)
Disease duration (years)	9.50±8.06	6(0.5/20)
Education year	7±3.41	5(5/12)
	n (%)	
Gender		
-woman	3 (42.9)	
-man	4 (57.1)	
Employed		
-Yes	2 (28.6)	
-No	5 (71.4)	
Smoking		
-Yes	2 (28.6)	
-No	5 (71.4)	
History of chronic respiratory disease		
-Yes	2 (28.6)	
-No	5 (71.4)	

After intervention, there was a significant difference in BASMI- intermalleolar distance (p:0.041), MAF (p:0.028) PSQI (p:0.046) and Exercise Beliefs Questionnaire/ Benefit (p: 0.027) and Disadvantage (p:0.042) scores, but no significant difference in BASMI-cervical rotation (p:0.317), BASMI-tragus to wall distance (p:0.705), BASMI-lumbar side flexion (p:0.279), BASMI-modified Schober’s (p:0.595), BASMI-Total (p:0.141), BASDAI (p:0.753), BASFI (p:0.176), MASES (p:0.581), ASQoL (p:0.225), BETY-BQ (p:0.173) (Table 2).

Discussion

In this study, matrix rhythm therapy applied in addition to exercise treatment increased hip abduction and sleep quality, reduced fatigue, and positively affected exercise-related beliefs in

patients with AS.

Table 2. Analysis of pre and post intervention results

Variables	Ankylosing Spondylitis Patients (n:7)		
	Pre Median (min/max)	Post Median (min/max)	p*
BASMI-cervical rotation	4(3/9)	4(3/9)	0.317
BASMI-tragus to wall distance	2(0/6)	3(1/7)	0.705
BASMI-lumbar side flexion	7(2/10)	5(2/8)	0.279
BASMI-modified Schober's	6(1/10)	3(0/9)	0.595
BASMI-intermalleolar distance	4(3/8)	3(0/6)	0.041
BASMI-Total	3.6 (2.6/8.4)	3.6 (1.2/7.8)	0.141
BASDAI	5.41 (1.83/7.58)	5.46 (1.33/7.83)	0.753
BASFI	6.5 (2.11/9.4)	2.7 (0/8.81)	0.176
MASES	5 (1/13)	7.5 (5/11)	0.581
MAF	41.6 (25.63/45.40)	26.9 (15.04 /33.13)	0.028
PSQI	9 (5/16)	5 (4/9)	0.046
ASQoL	15 (7/18)	8 (3/18)	0.225
BETY-BQ	80 (51/120)	60 (18/112)	0.173
Exercise Beliefs Questionnaire/Benefit	62 (48/78)	67 (64/78)	0.027
Exercise Beliefs Questionnaire/ Disadvantage	43 (28/62)	36 (28/41)	0.042

*Wilcoxon Signed Ranks Test, Bold values mean p<0.05, BASMI: Bath Ankylosing Spondylitis Metrology Index, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index, BASFI: Bath Ankylosing Spondylitis Functional Index, MASES: Maastrich Ankylosing Spondylitis Enthesitis Score, MAF: Multidimensional Assessment of Fatigue Scale, PSQI: Pittsburgh Sleep Quality Index, ASQoL: Ankylosing Spondylitis Quality of Life Questionnaire, BETY-BQ: Biopsychosocial Questionnaire.

Matrix rhythm therapy is a technique that targets abnormalities at the cellular level while maintaining various physiological functions of the body [17]. Matrix rhythm therapy provides oscillations between 8-11 Hz physiological frequencies. These frequencies synchronize with the body to re-establish the disrupted rhythm at the cellular level. Matrix rhythm therapy improves microcirculation, provides oxygen supply and thus increases energy production. The immediate effect of matrix rhythm therapy can be seen as relaxation of tissue, muscle and fascia. As the metabolic process is regulated at the cellular level and the flow of oxygen to the cells increases, this relaxation continues and is maintained for a longer time. Once the pain subsides and the soft tissues relax, the condition is brought under control and this can be maintained with routine exercises. Matrix rhythm therapy can be applied for many conditions related to non-healing wounds, arthritis, osteoporosis, vascular insufficiencies, spasticity, migraine, bone degeneration, neuropathy, pain and swelling [18]. The compression effect created by matrix rhythm therapy may cause greater soft tissue mobilization and more afferent stimulation. However, the vibration frequency created by matrix rhythm therapy is thought to be compatible with the natural vibration frequency of the muscle, and this is thought to contribute to the therapeutic effectiveness in the body [19].

The studies on matrix rhythm therapy have proven its effect on pain and increased functionality in different musculoskeletal conditions [6,7]. Jager et al evaluated the effect of matrix rhythm therapy on pain level, sleep patterns and flexibility of the spine in 80 patients with low back pain. As a result of this study, matrix rhythm therapy application was shown to be effective in reducing pain and increasing flexibility compared to conservative treatment [20]. Gohil et al compared the effects of matrix rhythm therapy and pilates exercises on lumbar flexibility, functional disorders and pelvic tilt in 50 patients with chronic low back pain (pilates group (n = 25) and matrix rhythm therapy group (n = 25)). After two weeks, a more significant improvement was reported in the matrix rhythm therapy group compared to the pilates group [21].

Taspınar et al. examined the effects of massage and matrix rhythm therapy on peripheral blood circulation in 15 healthy young female individuals. They reported that matrix rhythm therapy application showed a more significant increase in circulation compared to massage application [22]. Rawtani et al compared the acute effects of passive stretching therapy and matrix rhythm therapy on hamstring flexibility in 30 healthy women. Significant improvement in hamstring flexibility was found after the intervention compared to before the intervention in both groups. Greater improvement in flexibility was achieved in the matrix rhythm therapy group compared to the passive stretching group. According to the results of the study, matrix rhythm therapy was found

to be superior to passive stretching in improving hamstring flexibility [23]. Palekar et al divided 30 patients diagnosed with supraspinatus tendinitis into two groups. While therapeutic exercise and ice application were applied to the control group; matrix rhythm therapy, therapeutic exercise and ice application were applied to the study group. As a result, the study group showed greater improvement in pain, disability, and shoulder range of motion compared to the control group [24].

In the present study, matrix rhythm therapy applied in addition to exercise treatment increased hip abduction and sleep quality, reduced fatigue, and positively affected exercise-related beliefs in patients with AS. We believe that the muscle, fascia and tissue relaxation achieved in hip abductors with matrix rhythm therapy may be strengthened with exercises, allowing patients with AS to have a better quality of sleep. Thanks to this positive change in the hip abductors, which have important roles in mobility, and a more rested body at night, patients' perceptions of fatigue may have decreased and their perspectives may have changed in a positive direction.

Matrix rhythm therapy is a relatively new technique. When the literature was examined, no study was found regarding the effectiveness of matrix rhythm therapy on AS or other rheumatological diseases. To our knowledge, the present study was unique as it was the first study to apply this approach to patients with AS.

The limitation of our study was the small number of patients and the lack of a control group. If there was a control group, clearer comments could be made about the effectiveness of matric rhythm therapy based on the results of the comparative analyses.

Since the sample size of this study is small, generalization may be insufficient, therefore, results from larger sample groups may contribute to future studies. Also, we recommend that in future studies, more detailed physiological or laboratory evaluations should be made regarding the effects of matrix rhythm therapy at the cellular level in patients with AS. It may also be interesting to know whether matrix rhythm therapy has different effects on gender.

Conclusion

We recommend the application of matrix rhythm therapy in addition to exercise treatment, especially in patients with AS who have problems with hip abduction, high fatigue levels and affected sleep quality.

Ethic: Ethical approval of the study was obtained from the local ethics committee (E-60116787-020-601289). This study was ethically carried out with Helsinki Declaration Principles. Verbal information was given to all patients and an informed consent form was signed.

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