ISSN: 1607-8322, e-ISSN: 2220-5799 **Anaesthesia, Pain & Intensive Care**
Vol 26(5); October 2022 DOI: 10.35975/apic.v26i4.2033

ORIGINAL RESEARCH **PAIN MANAGEMENT**

Comparative efficacy of kinesiotaping and stretching on sternocleidomastoid and upper trapezius muscles in patients suffering from myofascial pain due to temporomandibular joint disorder

Ozge BAYKAN[1], Selnur NARIN[2], Gülcan COSKUN AKAR[3]

Author affiliation:

1. Özge Baykan, Department of Physiotherapy, Arel University, İstanbul,Turkey; E-mail: ozgebaykancopuroglu@gmail.com
2. Selnur Narin. Physiotherapy and Rehabilitation, Dokuz Eylül University, İzmir,Turkey; E-mail: selnurnarin@gmail.com
3. Gülcan Coşkun Akar, Faculty of Dentistry, Department of Prosthetic Dental Treatment, Ege University, İzmir, Turkey; E-mail: gulcancoskunakar@gmail.com

Correspondence: Özge Baykan, Kemalpaşa Mahallesi, Halkalı Caddesi, No:101, 34295, Sefaköy - Küçükçekmece, İstanbul – Türkiye; E-mail: ozgebaykancopuroglu@gmail.com

Abstract

Aim: During the recent past, the big role of various techniques of physiotherapy in the management of various pain syndromes has been recognized. This study determined the effects of kinesiotaping and stretching on pain, cervical joint range of motion and functional status in patients with myofascial pain due to temporomandibular joint disorder.

Methodology: We enrolled 33 patients with myofascial pain due to temporomandibular joint disorder in the study. The patients were divided into three groups; Group K received kinesiotaping, while Group S received stretching exercises, of the sternocleidomastoid and upper trapezius muscles. Patients in the Groups K and S received application twice a week for two weeks. No application was made to the control group (Group C). Cervical joint range of motion, muscle strength, pain, algometry tests and functional evaluation were repeated three times.

Results: The groups were homogeneous in terms of demographics and the evaluated parameters at the beginning of the study ($P > 0.05$). In the Groups K and S, positive improvements were achieved in visual analog scale, algometry results, distance of mandibular depression, results of Patient Health Questionnaire and Jaw Functional Limitation Scale after treatment ($P < 0.05$).

Conclusion: Kinesiotaping and stretching on sternocleidomastoid and upper trapezius muscles were found to have equivalent effects in reducing pain, increasing mouth opening and functionality in patients suffering from myofascial pain due to temporomandibular joint disorder.

Clinical Trial Registration Number: NCT05481268

Abbreviations: JKLS: Jaw Functional Limitation Scale, PHQ: Patient Health Questionnaire, RDC/TMD: Research Diagnostic Criteria for Temporomandibular Disorders, SCM: Sternocleidomastoid, TMD: Temporomandibular disorder, TMJ: Temporomandibular joint, VAS: Visual Analog Scale

Key words: Humans; Kinesiotaping; Observer Variation; Patient Health Questionnaire; Reference Standards; Reproducibility of Results; Sensitivity and Specificity; Stretching Exercises; Temporomandibular Joint Disorders; Temporomandibular Joint Disorders / diagnosis; Temporomandibular Pain

Citation: Baykan O, Narin S, Akar GC. Comparative efficacy of kinesiotaping and stretching on sternocleidomastoid and upper trapezius muscles in patients suffering from myofascial pain due to temporomandibular joint disorder. Anaesth. pain intensive care 2022;26(5):695-701. **DOI:** 10.35975/apic.v26i4.2033

Received: March 30, 2022; **Reviewed:** July 27, 2022; **Accepted:** August 12, 2022

1. Introduction

Temporomandibular disorder (TMD) is a very frequently encountered problem in the pain clinics and affects masticatory muscles, temporomandibular joint (TMJ) and one or more of the hard and soft tissues adjacent to TMJ. It is characterized by pain in TMJ and/or masticatory muscles, irregular jaw movements and a click, popping sound and/or crepitation in the joint. Myofascial pain, which is one of the masticatory muscle dysfunction accounts for more than half of the clinical problems.[1,2]

Cacchiotti DA et al. İn their study detected cervical muscle spasm in 23%−68% of patients with TMD.[3] The purpose of using physical therapy methods for treating TMD is to relieve the pain, enable muscles to reach optimal length, reduce muscular irregularities and to reduce spasm and edema.[4]

With passive stretching, the soft tissue is mobilized, the limitation is eliminated, the range of motion is gradually increased and specifically the length of the shortened muscle is increased.[5] Kinesiotaping is a special technique used to improve the function in hard and soft tissue problems, reduce edema, relieve pain, support muscle function and accelerate healing.[6]

We compared the changes in cervical joint range of motion and pain symptoms and functionabilities by using kinesiotaping and stretching methods for treating upper trapezius and sternocleidomastoid (SCM) muscle, which may cause myofascial temporomandibular pain and investigated the effectiveness of these modalities in the treatment protocol.

2. Methodology

It was a double-blind, randomized clinical trial conducted from February 2018 to April 2018 at the Prosthetic Dental Treatment Outpatient Clinic of a university hospital in Turkey after approval by the Research Ethics Committee.

Inclusion criteria were; age 18−60 y, myofascial pain according to ‘Research Diagnostic Criteria for Temporomandibular Disorders’ (RDC/TMD), and natural posterior occlusion.[7] All patients were informed and a signed consent to participate in the research obtained. Exclusion criteria were; the presence of dentofacial anomalies, arthralgia, disk displacement, general inflammatory connective tissue diseases (e.g., rheumatoid arthritis), psychiatric disease, tumor, orofacial disease symptoms (e.g., neuralgia, migraine, etc.), local skin infection, regular analgesic use, fibromyalgia, history of TMJ-related surgery, and findings of allergy related to kinesiotape.

The sample size was calculated based on a previous study that gave an effect size of 0.8.[8] Taking an approximate value of the number of patients with myofascial pain who reported to our outpatient clinic, the level of significance was determined as 0.05 for the number of participants to be included in the study, and its power was 0.8. Sample size was calculated using G'Power version 3.1.9.2, which gave a sample size of 30 with 10 participants in each group. The patients were divided into groups using simple randomization method. We enrolled 11 patients in each group. Blinding was ensured by the patients and the dentists were unaware of the type of the physiotherapy treatment offered.

Patient evaluation was repeated 3 times; before the treatment, at the end of week 1; and after week 2 of the treatment. Demographic data of all patients were recorded. The subjective pain intensity of the patients was assessed with the Visual Analogue Scale (VAS). Additionally, pain during palpation of the muscles was assessed with algometry. The mouth opening of the patients was measured in millimeters for the distance between the upper and lower incisors. Therange of motion of the cervical joints was assessed using a goniometer and the cervical muscle strength was assessed manually. Functional status assessment was performed with the Turkish version of RDC/TMD. The Patient Health Questionnaire (PHQ) and the Jaw Functional Limitation Scale (JFLS) were used for comparison in the assessments; these are two of the subtests of the RDC/TMD questionnaire.[9,10] The purpose of these tests was to obtain numerical data and to compare the results objectively.

The selected patients were divided into three groups; Group K patients had muscle technique-inhibition method. An 'I' shaped tape was used for both SCM and upper trapezius. The tension of the tape was adjusted between 20 and 25% and the application was performed in the longest position of the muscle. The inhibition technique was applied from the insertion to the origin of the muscle. In the Group S, three cycles of stretches, for 20 sec each, were applied to upper trapezius and SCM muscle. Applications were performed every 3 days in 4 cycles in total. Group C (control group) patients received the treatment method approved by the dentist.

Statistical analysis

SPSS 24.0 (IBM Corporation, Armonk, New York, United States) and PAST 3 (Hammer, Ø., Harper, D.A.T., Ryan, P.D. 2001. Paleontological statistics) programs were used for the analysis of variables. Shapiro Wilk's test was used for normality of data. After fulfilling parametric assumptions, repeated measurement ANOVA was used for within the group analysis and independent sample T-test was used for between the group comparison. $P < 0.05$ was considered as significant.

Table 1: Comparison of the demographic characteristics of the groups

Variable	Kinesiotaping Group (n=11)	Stretching Group (n=11)	Control Group (n=11)	Total (N=33)	P Value
Involved site					
Right*	2 (18.2)	3 (27.3)	4 (36.4)	9 (27.3)	
Left*	2 (18.2)	4 (36.4)	5 (45.5)	11 (33.3)	0.335
Bilateral *	7 (63.6)	4 (36.4)	2 (18.2)	13 (39.4)	
Gender (M:F)	1:10	1:10	2:9	4:29	1
Age# (y)	25 (18−45)	32 (20−51)	20 (18−49)	27 (18−51)	0.149
Height # (cm)	165 (155−171)	166 (160−184)	167 (158−183)	165 (155−184)	0.481
Weight @ (kg)	65.00 ± 15.19	62.27 ± 10.59	64.64 ± 7.83	63.97 ± 11.30	0.837
BMI @ (kg/m²)	24.12 ± 5.12	22.47 ± 3.77	23.09 ± 3.12	23.22 ± 4.02	0.640

*Fisher Freeman Halton Test (Monte Carlo), Kruskall Walis H test (Monte Carlo), OneWay ANOVA (Robust test: Brown-Forsythe), * n (%); #Median (Minimum−Maximum); @ Mean ± Standard Deviation*

3. Results

The study was conducted on 33 patients, 18−60 y of age; out of these 4 (12.1%) were males and 29 (87.9%) were females. The mean age of the patients was 27 y. Demographics of the patients are presented in Table 1. There was no significant difference between the groups in regard to the affected site, age, height, weight and body mass index (P > 0.05) (Table 1).

There was a significant difference toward left lateral flexion between the Group K, Group S and the control group, in first and second tests (P < 0.05). A statistically significant increase was observed in right-rotation ROM (range of motion) after the treatment compared to the pretreatment in the Group K (P < 0.005) (Table 2).

No significant difference was found between the groups in pre- and post-treatment cervical muscle strength assessments (P > 0.05). No change was observed before and after treatment in any group (P > 0.005) (Table 3).

The mouth opening was observed to increase significantly after the treatment in the Group K and Group S (P < 0.005). Post-treatment results of the JFLS in the Group K and Group S were increased compared to the pre-treatment state (P < 0.005). In the Group K and Group S, the post-treatment increase in the PHQ results was statistically significant compared to the pretreatment state (P < 0.005). (Table 4).

to the pre-treatment state (P < 0.005). In the Group K and Group S, the post-treatment increase in the PHQ results

Table 2: Comparison of range of motion values between groups before and after treatment

Variable	Flexion ROM (°)	Extension ROM (°)	Right Lateral Flexion ROM (°)	Left Lateral Flexion ROM (°)	Right Rotation ROM (°)	Left Rotation ROM (°)
1st Intergroup Evaluation	0.976	0.326	0.106	0.042	0.327	0.587
2nd Intergroup Evaluation	0.885	0.493	0.074	0.035	0.417	0.607
3rd Intergroup Evaluation	0.846	0.372	0.193	0.064	0.389	0.822
K-S	0.78	0.438	0.554	0.230	0.217	0.537
K-C	0.870	0.722	0.447	0.098	0.036	0.224
S-C	0.73	1.000	0.459	0.182	0.096	0.327
Kinesiotape within-group	0.160	0.065	0.052	0.059	0.003	0.107
Stretching within-group	0.11	0.058	0.052	0.055	0.109	0.072
Control within-group	0.11	0.111	0.213	1.000	1.000	1.000

Friedman Test (Monte Carlo), Kruskal Wallis Test (Monte Carlo) Post Hoc Test: Dunn's Test, Data is given as median, K: Kinesiotaping, S: Stretching, C: Control, ROM: Range of motion. Data given as P-values

Table 3: Muscle strength measurement comparison between the groups before and after treatment

Variable	Flexion Muscle Strength	Extension Muscle Strength	Right Lateral Flexion Muscle Strength	Left Lateral Flexion Muscle Strength	Right Rotation Muscle Strength	Left Rotation Muscle Strength
Kinesiotape within group	1.000	1.000	1.000	1.000	1.000	1.000
Stretching within group	1.000	1.000	0.327	0.223	1.000	1.000
Control within group	1.000	1.000	1.000	1.000	1.000	1.000
K-S	1.000	1.000	0.775	1.000	1.000	1.000
K-C	0.792	1.000	0.775	0.314	1.000	0.672
S-C	0.817	1.000	1.000	1.000	1.000	1.000

Friedman Test (Monte Carlo), Kruskal Wallis Test (Monte Carlo), K: Kinesiotaping, S: Stretching, C: Control Data given as P-values

ble 4: Comparison of mandibular depression, Jaw function limitation scale and Patient Health Questionnaire values between groups before and after treatment

Variable	Mouth Opening Distance	Jaw Functional Limitation Scale-20	Patient Health Questionnaire
Kinesiotape within group	**0.001**	**0.001**	**0.001**
1-2	0.088	0.286	**0.025**
1-3	**0.014**	**0.033**	**0.025**
2-3	0.456	0.286	1.000
Stretching within group	**0.001**	**0.001**	**0.037**
1-2	0.286	0.337	**< 0.001**
1-3	**0.033**	**0.025**	0.113
2-3	0.286	0.201	0.113
Control within group	0.079	0.063	**0.037**
1-2	ad.	ad.	**< 0.001**
1-3	ad.	ad.	0.133
2-3	ad.	ad.	0.133
1st Intergroup Evaluation	0.057	0.461	0.081
2nd Intergroup Evaluation	**0.021**	0.398	0.081
K-S	0.109	ad.	ad.
K-C	**0.008**	ad.	ad.
S-C	0.299	ad.	ad.
3rd Intergroup Evaluation	**0.003**	0.184	**0.042**
K-S	0.250	ad.	0.088
K-C	**0.001**	ad.	0.400
S-C	**0.032**	ad.	**0.011**

Friedman Test (Monte Carlo), Kruskal Wallis Test (Monte Carlo) Post Hoc Test: Dunn's Test, K: Kinesiotaping, S: Stretching, C: Control. Data given as P-values

Table 5: Comparison of pain values between groups before and after treatment

Evaluation	Left Upper Trapezius Alg.	Right Upper Trapezius Alg.	Left SCM Alg.	Right SCM Alg.	Right Upper Trapezius VAS	Left Upper Trapezius VAS	Left SCM VAS	Right SCM VAS
1st Intergroup Evaluation	**0.018**	0.201	0.168	0.102	0.254	**0.007**	0.103	0.063
K-S	0.693	ad.	ad.	ad.	ad.	0.825	ad.	ad.
K-C	**0.008**	ad.	ad.	ad.	ad.	**0.007**	ad.	ad.
S-C	**0.022**	ad.	ad.	ad.	ad.	**0.004**	ad.	ad.
2nd Intergroup Evaluation	0.118	0.458	0.515	0.340	0.545	0.079	0.500	**0.033**
K-S	ad.	ad.	ad.	ad.	ad.	ad.	ad.	0.101
K-C	ad.	ad.	ad.	ad.	ad.	ad.	ad.	0.294
S-C	ad.	ad.	ad.	ad.	ad.	ad.	ad.	**0.010**
3rd Intergroup Evaluation	0.638	0.752	0.907	0.602	0.708	0.510	0.989	0.938
Intergroup difference (2-1)	0.335	0.456	0.424	0.532	0.415	0.146	0.747	0.735
Intergroup difference (3-1)	**0.002**	**0.011**	0.085	**0.014**	**0.011**	**0.006**	**0.008**	**0.008**
K-S	0.489	0.410	ad.	0.233	0.366	0.893	0.987	0.284
K-C	**0.006**	**0.004**	ad.	0.059	**0.004**	**0.021**	**0.017**	**0.028**
S-C	**0.006**	**0.027**	ad.	**0.003**	**0.033**	**< 0.001**	**0.030**	**0.002**
Intergroup difference (3-2)	**0.018**	0.052	0.564	**0.008**	0.072	**0.034**	0.374	**0.017**
K-S	0.518	ad.	ad.	0.920	ad.	0.791	ad.	0.230
K-C	**0.031**	ad.	ad.	**0.006**	ad.	0.055	ad.	0.240
S-C	**0.027**	ad.	ad.	**0.005**	ad.	**0.027**	ad.	**0.038**
Kinesiotape within group	**0.012**	**0.005**	**0.003**	**0.009**	**0.001**	**0.020**	**< 0.001**	**0.006**
1-2	0.138	0.076	0.088	0.384	0.046	0.096	0.038	0.176
1-3	**0.002**	**0.001**	**0.002**	**0.009**	**< 0.001**	**0.005**	**< 0.001**	**0.001**
2-3	**0.012**	**0.008**	**0.014**	**0.002**	**0.004**	**0.014**	**0.008**	**0.005**
Stretching within group	**0.009**	**0.026**	**0.003**	**0.044**	**0.020**	**0.001**	**0.002**	**0.012**
1-2	0.193	0.135	0.145	0.347	0.111	0.067	0.237	0.732
2-3	**0.002**	**0.005**	**0.001**	**0.015**	**0.005**	**< 0.001**	**< 0.001**	**0.005**
1-3	**0.010**	**0.039**	0.366	**0.038**	**0.031**	**0.005**	0.152	**0.006**
Control within group	0.341	0.461	0.364	0.299	0.325	0.167	0.333	0.992

General Linear Model Two-Way ANOVA (Univariate), One-Way ANOVA (Brown-Forsythe), Post Hoc Test: Fisher's Least Significant Difference (LSD) ve Games Howell, Alg.: Algometry, VAS: Visual Analog Scale, SKM: Sternocleidomastoid, K: Kinesiotaping, S: Stretching, C: Control. Data given as P-values

as statistically significant compared to the pretreatment state ($P < 0.005$). (Table 4). and Group S results increase in the second assessment and post-treatment algometry results were statistically significant compared to the pretreatment state ($P < 0.05$). A significant change was observed in the application groups after the treatment compared to the control group ($P < 0.05$). No significant change was observed in the application groups after treatment compared to the control group for algometry results except for the upper right trapezius result ($P > 0.05$) (Table 5).

In Group K and Group S, the change after the second and third assessments for pain according to VAS were statistically significant, compared to the pretreatment state ($P < 0.05$). No significant change was observed in Group K and Group S after treatment compared to the control group ($P < 0.05$) (Table 5).

4. Discussion

Temporomandibular disorders TMD refer to clinical problems involving muscles of mastication, TMJ and one or more of the hard and soft tissues surrounding TMJ. Myofascial pain accounts for more than half of the TMDs.[1,2] As it is a common problem, we selected our patients among patients diagnosed with TMD due to myofascial pain. Erikson et al. emphasized in light of biomechanical foundations that neck flexion and extension movements contribute to 'jaw joint movements', so any dysfunction in the 'neck muscles' causes a decrease in mouth opening distance.[11] TMD-related pain described in the literature was reported to localize in masticatory muscle most commonly which is followed by temporal muscle.[12] However, we thought that the SCM or upper trapezius could be affected due to their proximity to TMJ and would cause dysfunction, so we performed an application on these two muscles. The reflected pain patterns of the trigger points of the SCM and the upper trapezius are generally similar to the pain patterns felt by patients with problems in the jaw joint.

Conservative and minimally invasive treatment options are the first-line options for treating TMD.[13] Lim et al. performed a meta-analysis of 17 clinically controlled studies on kinesiotaping for chronic musculoskeletal disorders and pain.[14] They concluded that KT was a superior method for reducing pain compared with minimal intervention. In a study conducted by Hakgüder et al. on 62 patients, the patients were divided into two groups. The first group was treated with low-energy laser and stretching exercise, and the second group was treated with stretching exercise only. There was a significant change in the pretreatment algometric measurements in the Group S. Several researchers have proven the effectiveness of stretching in myofascial pain conditions.[15]

In our study, the effects of conservative treatment options used in treatment of TMD symptoms were examined compared with the control group.

5. Limitations

A 2-week follow-up was foreseen for the acute impact outcomes of the study. Further studies extending the follow-up period are recommended for the course of the disease. In such studies, we recommend the inclusion of higher numbers of individuals in the research.

7. Conclusion

In patients with myofascial pain due to temporomandibular joint disorder, Kinesiotaping and Stretching methods were found to have similar effects in reducing pain, increasing functionality and mouth opening. It is recommended KT and stretching applications be used when organizing the treatment of patients. It is also recommended to conduct studies on the long-term effects of both Stretching and Kinesiotaping in the pathology of TMD.

7. Data availability

The numerical data generated during this research is available with the authors.

8. Acknowledgement

We gratefully thank the staff of Departments of Physiotherapy and Rehabilitation of Arel University, İstanbul, Dokuz Eylül University, İzmir, and Faculty of Dentistry, Department of Prosthetic Dental Treatment, Ege University,İzmir,Turkey, for their patience and assistence during the conduct of this study.

9. Conflict of interest

The study did not utilize external or industry funding.

10. Authors' contribution

ÖB: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Writing, Visualization

SN, GCA: Conceptualization, Methodology, Supervision, Project administration

11. References

1. Auvenshine RC. Temporomandibular disorders: associated features. Dent Clin North Am. 2007 Jan;51(1):105-27, vi. [PubMed] DOI: 10.1016/j.cden.2006.10.005
2. Liu F, Steinkeler A. Epidemiology, diagnosis, and treatment of temporomandibular disorders. Dent Clin North Am. 2013 Jul;57(3):465-79. [PubMed] DOI: 10.1016/j.cden.2013.04.006
3. Cacchiotti DA, Plesh O, Bianchi P, McNeill C. Signs and symptoms in samples with and without temporomandibular disorders. J Craniomandib Disord. 1991 Summer;5(3):167-72. [PubMed]
4. Kato MT, Kogawa EM, Santos CN, Conti PC. TENS and low-

level laser therapy in the management of temporomandibular disorders. J Appl Oral Sci. 2006 Apr;14(2):130-5. [PubMed] DOI: 10.1590/s1678-77572006000200012

5. Lipetz JS, Lipetz DI. Disorders of Cervical Spine, Physical Medicine and Rehabilitation Principles and Practice. DeLisa, J. A. Lippincott Williams & Wilkins, Philadelphia; 2005. p.631-653.
6. González-Iglesias J, Fernández-de-Las-Peñas C, Cleland JA, Huijbregts P, Del Rosario Gutiérrez-Vega M. Short-term effects of cervical kinesio taping on pain and cervical range of motion in patients with acute whiplash injury: a randomized clinical trial. J Orthop Sports Phys Ther. 2009 Jul;39(7):515-21. [PubMed] DOI: 10.2519/jospt.2009.3072
7. Anderson GC, Gonzalez YM, Ohrbach R, Truelove EL, Sommers E, Look JO, et al. The Research Diagnostic Criteria for Temporomandibular Disorders. VI: future directions. J Orofac Pain. 2010 Winter;24(1):79-88. [PubMed]
8. Zuniga C, Miralles R, Mena B, Montt R, Moran D, Santander H, et al. Influence of variation in jaw posture on sternocleidomastoid and trapezius electromyographic activity. Cranio.1995 Jul;13(3):157-62. [PubMed] DOI: 10.1080/08869634.1995.11678061
9. Sebera F, Vissoci JRN, Umwiringirwa J, Teuwen DE, Boon PE, Dedeken P. Validity, reliability and cut-offs of the Patient Health Questionnaire-9 as a screening tool for depression among patients living with epilepsy in Rwanda. PLoS One. 2020 Jun 12;15(6):e0234095. [PubMed] DOI: 10.1371/journal.pone.0234095
10. Ohrbach R, Larsson P, List T. The jaw functional limitation scale: development, reliability, and validity of 8-item and 20-item versions. J Orofac Pain. 2008 Summer;22(3):219-30. [PubMed]
11. Eriksson PO, Zafar H, Nordh E. Concomitant mandibular and head-neck movements during jaw opening-closing in man. J Oral Rehabil. 1998 Nov;25(11):859-70. [PubMed] DOI: 10.1046/j.1365-2842.1998.00333.x
12. John MT, Dworkin SF, Mancl LA. Reliability of clinical temporomandibular disorder diagnoses. Pain. 2005 Nov;118(1-2):61-9. [PubMed] DOI: 10.1016/j.pain.2005.07.018
13. Marbach JJ. Orofacial phantom pain: theory and phenomenology. J Am Dent Assoc. 1996;127:221. [PubMed] DOI: 10.14219/jada.archive.1996.0172
14. Lim EC, Tay MG. Kinesio taping in musculoskeletal pain and disability that lasts for more than 4 weeks: is it time to peel off the tape and throw it out with the sweat? A systematic review with meta-analysis focused on pain and also methods of tape application. Br J Sports Med. 2015 Dec;49(24):1558-66. [PubMed] DOI: 10.1136/bjsports-2014-094151
15. Hakgüder A, Birtane M, Gürcan S, Kokino S, Turan FN. Efficacy of low level laser therapy in myofascial pain syndrome: an algometric and thermographic evaluation. Lasers Surg Med. 2003;33(5):339-43. [PubMed] DOI: 10.1002/lsm.10241

\

