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CASE REPORT

Static ultrasound and manual therapy in refractory migraine. Case report *

Ultrassom estático e terapia manual para tratamento da enxaqueca refratária. Relato de caso

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SUMMARY

BACKGROUND AND OBJECTIVES: Reduced pressure pain thresholds (PPT) and presence of muscular trigger points are often observed in patients with migraine. Physical therapy is frequently helpful in these patients. The objective of this study was to demonstrate the benefits of static ultrasound in the treatment of patients with migraine.
CASE REPORT: Female patient, 25 years-old with migraine since the age of 15 years. She was referred by a headache specialist due to refractoriness to pharmacological treatment. She had around 8 disabling attacks per months, lasting from 2 to 3 days. We examined the craniocervical muscles, measured the PPT and cervical range of motion. She participated in 20 sessions twice a week, lasting from 40 to 50 minutes, of global stretching, stretching and cervical traction, as well as myofascial release and deactivation of muscular trigger points. From the 6th section after, static ultrasound was added to the protocol.
CONCLUSION: There has been significant reduction in the frequency and duration of migraine attacks, as well as increased PPT. Physical therapy using Static Ultrasound may be of value for patients with refractory migraine.
Keywords: Physical Therapy Modalities, Migraine without Aura, Myofascial Pain Syndromes, Ultrasound therapy.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Limiares reduzidos de dor a pressão (LDP) e presença de pontos de gatilho musculares costumam ser observadas em pacientes com enxaqueca. A fisioterapia costuma ser útil para esses pacientes. O objetivo deste estudo foi demonstrar os benefícios do ultrassom estático no tratamento de pacientes com enxaqueca.
RELATO DE CASO: Paciente do sexo feminino, 25 anos, com enxaqueca desde os 15 anos de idade. Foi enviada por especialista em cefaleia devido à refratariedade ao tratamento farmacológico. Tinha aproximadamente 8 ataques incapacitantes por mês que duravam 2 a 3 dias. Foram examinados os músculos craniocervicais, medido o LDP e a amplitude de movimento cervical. Participou de 20 sessões, duas vezes por semana com duração de 40 a 50 minutos, de alongamento global e tração cervical, além de vibração miofascial e desativação dos pontos de gatilho musculares. Após a 6ª sessão introduziu-se o ultrassom estático ao protocolo.
CONCLUSÃO: Houve redução significativa na frequência e duração dos ataques de enxaqueca, além de aumento do LDP. A fisioterapia com ultrassom estático pode ser útil para pacientes com enxaqueca refratária.
Descritores: Enxaqueca sem aura, Modalidades de Fisioterapia, Síndromes da dor miofascial, Terapia por ultrassom.

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INTRODUCTION

Migraine is a prevalent and debilitating condition in the general population[1]. Its central mechanisms are well described. Activation of the trigeminal vascular system plays a central role in the pathophysiology of migraine[2]. Pericranial tenderness, allodynia, and referred pain are frequently seen during and between attacks of migraine headache[3]. Accordingly, peripheral nociceptive input, including input from the muscles, may be of importance in the pathophysiology of migraine[4,5]. Of interest is that palpation of trigger points often initiates or worsens headaches[6]. Patients with migraine often present lower craniocervical muscles pressure pain thresholds (PPT) as well as forward head position[6]. Additionally, they often have several active myofascial trigger points in the craniocervical region[4].

Static Ultrasound is a non-invasive method, sometimes used to deactivate trigger points, since it yields increased muscular temperature which, in turn, accelerates muscular metabolic rates, reducing spasms, pain and chronic inflammation, while increasing local blood flow[7,8]. Static Ultrasound may also increase PPT, therefore reducing local peripheral tenderness[9,10]. To the best of our knowledge, this technique has never been used before to deactivate myofascial trigger points.

Similarly, manual therapy techniques, such as massage, stretching, and progressive compression may yield benefits for individuals with migraine[11-12]. These techniques change blood flow by mobilizing superficial tissues relative to deeper structures relieving muscular tension[13].

In this study, we report the case of a patient with refractory migraine with incomplete relieve after manual therapy techniques, but with important improvement in the frequency and duration of migraine after Static Ultrasound was associated.

CASE REPORT

Female patient, 25 years old, nurse had migraine without aura since the age of 15 years. Pain was unilateral, mainly on the left side. Frequency of attacks was around 8 per month, lasting from 2 to 3 days. Pain was severe (from 8 to 10 in a numerical 10 point scale). Analgesics provided only modest relief. Migraine caused disability was important and clinical antecedents were unremarkable.

Before being referred to our physical therapy service, she had been followed by a headache specialist and treated with several standard medication protocols, as well as with nerve blocks (greater and lesser occipital nerves), the patient related transient improvement.

Posture was assessed and it was verified forward head position, rectification of the chest and lumbar hypolordosis. Muscular palpation by digital pressure (up to 4 kg) was conducted bilaterally in the following craniocervical muscles: suboccipitalis, upper portion of trapezius (insertion and body), temporalis (anterior, medium and posterior portions), masseter (origin, body, insertion), and sternocleidomastoid. A total of 16 trigger points were identified and reproduced the headache when pressed.

PPTs were assessed using a pressure algometer (Instrutherm DD-200) with 1 cm^2 surface, and a speed of 1 kg/s[14]. Measurements were taken 3 times with the exception of assessments on the thenar region of the right hand (assessed only once and used as a control). Measurements were taken at 3 different times: before treatment, at the 11th week of treatment (interim) and at the 22nd and last session (Table 1).

Table 1 – Pressure pain threshold before treatment, at the 11th week of treatment (interim) and at the 22th session (last session).

Muscles	Pre-Treatment		Interim		Post-Treatment	
	Right	Left	Right	Left	Right	Left
Suboccipitalis	1.22	0.99	1.52	1.49	2.01*	1.98*
Trapezius	1.40	1.20	1.44	1.47	2.10*α	2.04*α
Anterior temporalis	1.18	0.85	1.47	1.19	2.18*α	2.28*α
Medial temporalis	1.36	0.90	1.93	1.61*	2.87*α	2.33*α
Posterior temporalis	1.72	1.10**	1.90	1.59*	2.38*	2.31*α
Sternocleidomastoid	1.25	0.98	1.22	1.08	1.90*α	1.51*
Origin of Masseter	1.27	0.91	1.57	1.30	2.41*α	2.14*α
Masseter body	1.07	0.84	1.33	1.05	1.79*α	1.86*α
Masseter insertion	1.02	0.76**	1.16	1.07*	1.40*α	1.61*α

& Difference between both sides; * Difference in relation to pre-treatment; α Difference in relation to the interring assessments; ANOVA test ($p < 0.05$)

Cervical range of motion (CROM) was evaluataed with a specific CROM device[15], measuring flexion, extension, lateral inclination, and rotation of the head. All assessments were conducted by the same professional.

Treatment sessions happened twice a week, lasting from 40 to 50 minutes each, over 18 weeks, corresponding to 20 sessions plus baseline and final assessments. Sessions consisted of manual therapy techniques as well as orientation for daily stretching of the cervical region and of the chest. The patient was also instructed to walk at least 3 times per week for at least 30 minutes, and received recommendations about proper posture.

The following procedures were conducted in all sessions: global stretching, practicing for diaphragmatic breathing, cervical stretching, cervical traction, myofascial liberation, and deactivation of trigger points.

Global stretching in the positions frog on the ground or frog in the air was alternated at different sessions, with duration of 20 to 30 minutes. During the exercises, the patient was instructed to use diaphragmatic breathing (Figure 1).

Stretching, traction, and myofascial release: cervical stretching was maintained for 30 seconds for each position (flexion, extensions, rotations and inclination)[16]; tractions were maintained for 2 minutes. After that, myofascial release was conducted during 20 minutes (Figure 2).

Deactivation of trigger points**:** progressive compression of trigger points was used. When the patient reported pain, compression was suspended until total pain relief. After that, digital pressure was again increased until new onset of pain. Procedures were repeated until total relief of pain, or maximum duration of 60 seconds per trigger point.

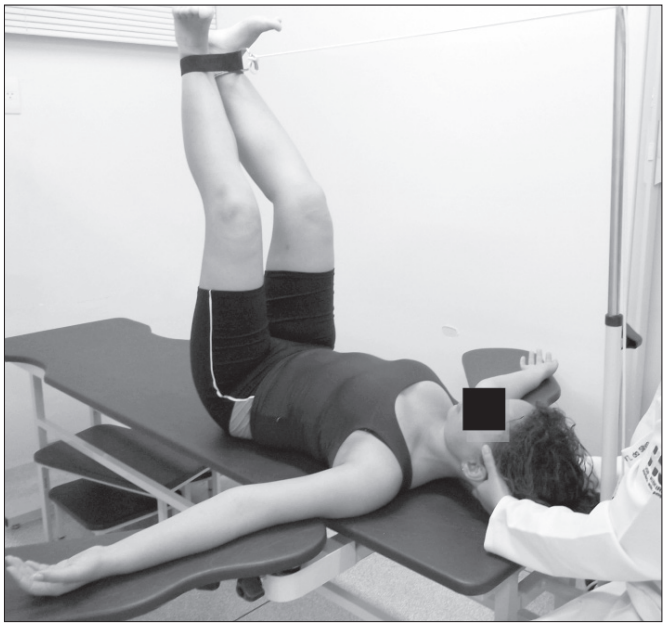

Figure 1 – Global stretching

Figure 2 – Positioning the patient during myofascial release

After 6 sessions, considerable changes were not observed. She had important muscular tenderness, and had lost motivation to continue on therapy. From the 6ª session on we added static Static Ultrasound (IBRAMED´s Sonopulse compact 1MHz) at the dose of 1.5 W/cm^2, per 1.5 minutes on the TPs that could trigger the headache. This resource was always used toward the end of the sessions and on no more than 2 trigger points.

PPT at the three assessment times was compared with two-way ANOVA with post test (Bonferroni) ($p < 0.05$). CROM values were compared with the chi-square test .

After 20 sessions the frequency of headaches was significantly reduced, from 8 to 2 attacks per month. Pain intensity ranged from 5 to 10 at baseline and from 5 to 8 at treatment end. Duration decreased from over 1 day to a mean of 7 hours.

In the pre-treatment assessment, the left side had significantly lower PPT as contrasted to the right side. In the interim assessment, PPT increased overall bilaterally and reached significant values for the medium and posterior temporal muscles on the left side and for the insertion of the masseter on the left side. At treatment end, PPT values were significantly increased relative to pre-treatment and interim assessments. For the occipital muscles (both sides), right posterior temporal muscle, and left sternocleidomastoid, differences happened only relative to baseline. For all others, differences were also significant as contrasted to the interim assessments (Table 1).

In the initial assessment she had 16 trigger points that

could trigger the headache, which decreased to 14 in the interim assessment, and to just 5 at the end of the program.

As for the cervical range of motion, pre-treatment assessment demonstrated small reduction in movement amplitude for flexion, lateral and left inclination and cervical extension. Cervical range of motion increased for all parameters, although without significant difference.

DISCUSSION

The patient responded poorly to manual therapy techniques and traditional physical therapy. This may have reflected a possible baseline state of central sensitization. Because her pain was reproduced during myofascial release, as well as following deactivation of trigger points, peripheral manipulation may have contributed to the central sensitization. In the initial assessment she had 16 trigger points that could trigger the headache; they were 14 in the interim assessment, and only 5 at the end of the program. After onset of Static Ultrasound therapy, pain improved considerably, and was no longer triggered by manual therapy techniques.

Although Static Ultrasound did not cause relevant temperature increase, since parameters involved low heating rate and short application time, trigger points were probably stimulated by Static Ultrasound non-thermal effects which knowingly yield physiological effects and segmental analgesia[8]. Reduction in muscular hyperalgia was probably followed by decreased nociceptive input to the central nervous system and, as a consequence, central and peripheral sensitization were decreased.

We found important reduction in the PPT as a function of therapy. Furthermore, there was a reduction in the PPT between both sides of the head, suggesting once more that peripheral and central sensitization were reduced.

Headache severity may be result of nociceptive mechanisms from the periphery, as well as from intra and extracranial tissues. The input converges into the second order neurons, located in the trigeminal nucleus caudalis. Because brain hypersensitivity is a dynamic condition influenced by nociceptive inputs[17], nociceptive lateralization may facilitate unilateral hypoalgesia in patients with headache[18]. This may have explained the increased severity of pain on the head, as well as the lower PPT values pre-treatment.

Although the cervical range of motion did not significantly vary as a function of treatment, it may be that minor changes were enough to yield better muscular balance and cervical mobility. Finally, the outcome may have also reflected the effects of adjuvant therapy, such as Global stretching, diaphragmatic breathing and others, since they improve corporal image, increasing self-perception and muscular tonus rebalance and tend to decrease muscular tension, therefore helping to relieve the trigger points. Altogether, the intervention improved migraine headaches that had been previously resistant to pharmacological therapies.

The association of the two types of therapies, Static Ultrasound and manual therapy techniques, has decreased duration and frequency of migraine attacks and the number of active trigger points, as well as significantly increasing PPT. Physical therapy provides several non-invasive methods that focus on triggering and perpetuating headache factors[20].

Limited studies demonstrated the benefits of Static Ultrasound treatment for the release of trigger points in migraine patients. This case report demonstrated that the combination of manual therapy techniques and Static Ultrasound offers an interesting non-pharmacological alternative for migraine patients with myofascial involvement. Future studies, as randomized clinical studies, must be conducted to confirm our results in a large scale.

REFERENCES

1. Stovner Lj, Hagen K, Jensen R, et al. The global burden of headache: a documentation of headache prevalence and disability worldwide. Cephalalgia 2007;27(3):193-210.

2. Goadsby PJ, Lipton RB, Ferrari MD. Migraine--current understanding and treatment. N Engl J Med 2002;346(4):257-70.

3. Bevilaqua-Grossi D, Chaves TC, Gonçalves MC; Moreira VC, Canonica AC, Florencio LL, Bordini CA, Speciali JG, Bigal ME. Pressure Pain Thereshold in the Craniocervical muscles of women with episodic and chronic migraine: A Controlled Study. Arquivos de neuropsiquiatria 2011.

4. Fernández-de-Las-Peñas C, Cuadrado ML, Pareja JA. Myofascial trigger points, neck mobility and forward head posture in unilateral migraine. Cephalalgia. 2006 Sep; 26(9):1061-70.

5. Giamberardino MA, Tafuri E, Savini A, et al. Contribution of myofascial trigger points to migraine symptoms. J Pain. 2007 Nov;8(11):869-78.

6. Bevilaqua-Grossi D, Pegoretti KS, Goncalves MC et al. Cervical Mobility in Women With Migraine. Headache 2009;49:726-731.

7. Rose S, Draper DO, Schulthies SS, et al. The stretch-

ing window, part two: rate of thermal decay in deep muscle following 1-MHz ultrasound. J Athl Train 1996;31(2):139-43.
8. Draper DO, Castel JC, Castel D. Rate of temperature increase in human muscle during 1 MHz and 3 MHz continuous ultrasound. J Orthop Sports Phys Ther 1995;22(4):142-50.
9. Baker RJ, Bell GW. The effect of therapeutic modalities on blood flow in the human calf. J Orthop Sports Phys Ther 1991;13(1):23-7.
10. Srbely JZ, Dickey JP, Lowerison M, et al. Stimulation of myofascial trigger points with ultrasound induces segmental antinociceptive effects: a randomized controlled study. Pain 2008;139(2):260-6.
11. Majlesi J, Unalan H. High-power pain threshold ultrasound technique in the treatment of active myofascial trigger points: a randomized, double-blind, case-control study. Arch Phys Med Rehabil 2004;85(5):833-6.
12. Fryer G, Hodgson L. The effect of manual pressure release on myofascial trigger points in the upper trapezius muscle. J Bodywork Mov Ther 2005;9(4):248-55.
13. Fernandez de las Penas C, Alonso-Blanco C, Fernandez-Carnero J, et al. The immediate effect of ischemic compression technique and transverse friction massage on tenderness of active and latentmyofascial trigger points: a pilot study. J Bodywork Mov Ther 2006;10(1):3-9.
14. Gerwin RD. A review of myofascial pain and fibromyalgia factors that promote their persistence. Acupunct Med 2005;23(3):121-34.
15. Hou CR, Tsai LC, Cheng KF, et al. Immediate effects of various physical therapeutic modalities on cervical myofascial pain and trigger-point sensitivity. Arch Phys Med Rehabil 2002;83(10):1406-14.
16. Chaves TC, Nagamine HM, de Sousa LM, et al. Intra and Inter agreement of pressure pain threshold for masticatory structures in children reporting orofacial pain related to temporomandibular disorders and symptom-free children. J Orofac Pain 2007;21(2):133-42.
17. Youdas JW, Carey JR, Garrett TR. Reliability of measurements of cervical spine range of motion--comparison of three methods. Phys Ther. 1991 Feb;71(2):98-104
18. Cunha AC, Burke TN, França FJ, et al. Effect of global posture reeducation and of static stretching on pain, range of motion, and quality of life in women with chronic neck pain: a randomized clinical trial. Clinic 2008;63(6):763-70.
19. Herren-Gerber R, Weiss S, Arendt-Nielsen L, et al. Modulation of central hyper-sensitivity by nociceptive input in chronic pain after whiplash injury. Pain Med 2004;5(4):366-76.
20. Lawler SP, Cameron LD. A randomized, controlled trial of massage therapy as a treatment for migraine. Ann Behav Med. 2006;32(1):50-9.

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We declare no conflict of interest in our case report.