FACULDADE DE MEDICINA
UNIVERSIDADE DO PORTO

MESTRADO INTEGRADO EM MEDICINA

2013/2014

Carlos Augusto da Silva Faria

Dry needling in the management of myofascial trigger points in the orofacial area

março, 2014

FMUP

FACULDADE DE MEDICINA
UNIVERSIDADE DO PORTO

Carlos Augusto da Silva Faria

Dry needling in the management of myofascial trigger points in the orofacial area

Mestrado Integrado em Medicina

Área: Estomatologia/Farmacologia e Terapêutica

Trabalho efetuado sob a Orientação de:
Dr. João Geraldo Reis Correia Pinto
E sob a Coorientação de:
Doutor António Albino Coelho Marques Abrantes Teixeira

Trabalho organizado de acordo com as normas da revista:
Journal of Oral & Facial Pain and Headache

março, 2014

FMUP

U.PORTO
FMUP FACULDADE DE MEDICINA UNIVERSIDADE DO PORTO
UNIDADE CURRICULAR PROJETO DE OPÇÃO DISSERTAÇÃO / MONOGRAFIA

Projeto de Opção do 6º ano - DECLARAÇÃO DE INTEGRIDADE

Eu, Carlos Augusto Silva Faria, abaixo assinado, nº mecanográfico 200500936, estudante do 6º ano do Mestrado Integrado em Medicina, na Faculdade de Medicina da Universidade do Porto, declaro ter atuado com absoluta integridade na elaboração deste projeto de opção.

Neste sentido, confirmo que **NÃO** incorri em plágio (ato pelo qual um indivíduo, mesmo por omissão, assume a autoria de um determinado trabalho intelectual, ou partes dele). Mais declaro que todas as frases que retirei de trabalhos anteriores pertencentes a outros autores, foram referenciadas, ou redigidas com novas palavras, tendo colocado, neste caso, a citação da fonte bibliográfica.

Faculdade de Medicina da Universidade do Porto, 20/03/2014

Assinatura: Carlos Augusto Silva Faria

U.PORTO
FMUP FACULDADE DE MEDICINA UNIVERSIDADE DO PORTO
UNIDADE CURRICULAR PROJETO DE OPÇÃO DISSERTAÇÃO / MONOGRAFIA

Projecto de Opção do 6º ano – DECLARAÇÃO DE REPRODUÇÃO

NOME
Carlos Augusto da Silva Faria

CARTÃO DE CIDADÃO OU PASSAPORTE (se estrangeiro)	E-MAIL	TELEFONE OU TELEMÓVEL
11763053	carlosafaria@gmail.com	00351965267783

NÚMERO DE ESTUDANTE	DATA DE CONCLUSÃO
200500936	2014

DESIGNAÇÃO DA ÁREA DO PROJECTO
Estomatologia/Farmacologia e Terapêutica

TÍTULO DISSERTAÇÃO
Dry needling in the management of myofascial trigger points in the orofacial area

ORIENTADOR
João Geraldo Reis Correia Pinto

COORIENTADOR
António Albino Coelho Marques Abrantes Teixeira

É autorizada a reprodução integral desta Dissertação para efeitos de investigação e de divulgação pedagógica, em programas e projectos coordenados pela FMUP.

Faculdade de Medicina da Universidade do Porto, 20/03/2014

Assinatura conforme cartão de identificação: Carlos Augusto Silva Faria

Aos meus pais Augusto e Glória. Os vossos exemplos regem a minha vida.

À minha irmã Marisa, por compartilhar as minhas aspirações.

À minha esposa Maria João, pela companhia, compreensão e pelo mais belo dos sentimentos: o amor.

Ao meu filho João, razão do meu ser.

A toda a minha família.

De todo o coração, dedico este trabalho.

In memoriam,

João Teixeira Cardoso, um amigo e um pai que permanece sempre presente.

Title: Dry needling in the management of myofascial trigger points in the orofacial area

Abstract

Aims: Myofascial pain in the orofacial area is a common cause of head and neck pain characterized by the presence of myofascial trigger points (MTrPs). According to recent literature, there is a need for well-designed studies concerning dry needling (DN) in the management of MTrPs. The objective of our work is to evaluate the effectiveness of DN compared to sham DN and counselling in the treatment of active MTrPs in the orofacial area. **Methods**: We conducted a prospective, double-blinded, randomized, controlled study in which 30 patients with established MTrPs in the orofacial area were randomized into 3 groups. The study group (DN, n=10), the placebo group (sham DN, n=10) and the gold standard group (counselling, n=10). Each patient received 3 sessions with 7 days intervals. Pain intensity was rated using a visual analogic scale (VAS) and unassisted jaw opening without pain (PFJO) was assessed with a millimeter rule after each consultation and one month after the last consultation. **Results**: Patients receiving real DN experienced a statistically significant decrease in jaw pain when compared to the other groups. PFJO scores increased significantly when compared to sham DN but not when compared to counselling which also determined an increase in PFJO. **Conclusion**: A single session of MTrPs DN decreases myofascial pain intensity in patients with orofacial MTrPs and also increases PFJO after 3 sessions. These effects are sustained during one month. Changes in pain and mandibular range of motion support clinically relevant treatment effects.

Key words: Myofascial pain, referred pain, taut band, placebo responses, TMD.

Introduction

Myofascial pain (MP) is characterized by the presence of myofascial trigger points (MTrPs), defined as hyperirritable nodules located within a taut band of skeletal muscle.[1] MP in the orofacial area is a common cause of head and neck pain.[2, 3]

Despite insufficient knowledge on pathophysiologic mechanisms of MTrPs[4-6] there are several therapies for MTrPs that include conservative treatment, such as systemic nonsteroidal anti-inflammatory drug (NSAID), local NSAID gel or patch, thermotherapy, manual therapy, ultrasound and other physical modalities.[6-8] Additionally, it is important to provide adequate education and home programs to patients to avoid recurrent or chronic pain.[7] Other techniques like acupuncture, MTrPs injections and dry needling (DN) also have been used.[6, 7] DN is a commonly used procedure and has been object of several studies concerning its efficacy and mechanism of action since Lewit's publication.[9-13]

Various studies demonstrated superior effects of DN for treatment of MTrPs in the orofacial area when compared to sham DN.[14, 15] On the other hand, the placebo effect has been consistently reported in the literature and these findings highlight the need for sham procedures in studies involving DN.[16] Other studies did not report superior effects of DN compared to other techniques.[17] According to a recent meta-analysis, there is a need for well-designed studies concerning DN in the management of MTrPs.[18]

The objective of our work is to evaluate the effectiveness of DN (study group) compared to sham DN (placebo) and counselling (gold standard) in the treatment of active MTrPs in a sample of patients referred to a temporomandibular disorders (TMD) specialized hospital center.

The strength of this double-blind RCT is related to the strict technique for determination of MTrPs in the orofacial area, the precise place of needle insertion in the MTrPs and the way that needle is inserted to eliminate the MTrPs.

Material and methods

We conducted a prospective, double-blinded, randomized, controlled study in which DN, sham DN (placebo) and counselling (gold standard) were compared.

The study protocol was approved by the Hospital São João Health Ethics Committee.

Before the study oral and written informed consents were obtained from each subject.

Patients referred to the Stomatology Temporomandibular Disorders (TMD) department at the Hospital São João, Oporto Medical School, were consecutively recruited over a period of 7 months and evaluated according to our standard protocol with RDC/TMD (axis I and axis II) by a calibrated investigator (CAF).[19] Additionally, all patients were screened for MTrPs according to Simons and Travell orientations.[1, 20]

Patients were included if they had a RDC/TMD axis I diagnostic of myofascial pain and active MTrPs in the masseter and/or temporalis muscles. This included (1) localized spontaneous pain, (2) presence of a taut, palpable band, (3) localized tenderness in a precise point along taut band (4) referred pain area for a given MTrP and (5) replication of the patient's pain symptoms with the referred pain elicited by pressure on MTrP.

Patients were excluded if they had other TMD diagnostic besides myofascial pain (RDC/TMD axis I or axis II), if they had previously received acupuncture, DN or other TMD treatment in the last 6 months, if they were under eighteen years old, had a bleeding disorder, had needle phobia and if they had rheumatologic, metabolic, neurologic or psychiatric disorders.

Patients who met these criteria entered the trial. The TMD appointment was scheduled according to referral date by Portuguese National Health System. The first ten patients were assigned for DN group, the following ten patients were assigned for counselling group and the last ten patients were assigned for sham DN. The groups were randomized by *Random.org*.

In the study group, DN therapy was applied in the MTrPs using standard single use sterile acupuncture needles 0,20mm x 13mm. Each patient received 3 sessions with 7 days intervals. The patient was placed in the supine position, the skin was disinfected with alcohol, the trigger points were determined and the needle was inserted. When the needle penetrated the MTrP a movement "up and down" was repeated 3 to 5 times (without being completely removed). The procedure was repeated for several MTrPs (active and latent).

In the placebo group, sham DN was applied pricking the skin with a blunted needle after the skin was disinfected with alcohol and the trigger points determined using the same protocol as in the DN group. The sham DN looked very similar to real DN except it didn't penetrate the skin. The procedure is described elsewhere by Streitberger.[21]

In the counselling group patients received an educational and counseling program about MP and MTrPs including its benign condition and were asked to relax their masticatory muscles, not to clench their teeth, not to chew gum, not to bite their nails, not to bite pens and to avoid other similar oral habits.

All groups had 3 sessions for 3 consecutive weeks. The same treatment protocol was used in both groups (DN and sham DN). All needlings were performed by the same physician experienced in DN (CAF) using the same needles within a constant time period. No exercise program and physical therapy modalities were given during the

treatment process. All subjects were asked not to take any kind of analgesic, nonsteroidal anti-inflammatory or muscle relaxant drugs.

Pain intensity was rated using a visual analogic scale (VAS).[22] Unassisted opening without pain (pain-free maximal jaw opening - PFJO) was assessed with a millimeter rule.[19, 23] Evaluation of patients was carried out before and immediately after the treatment (DN, sham DN or counseling) and also one month after the last consultation. This evaluation was carried out by a physician who was blinded to the patient´s groups (JCP). Patients were not informed about which group they belong to.

Data was analyzed using IBM SPSS Statistics 21.0. Since the sample had less than 30 subjects in each group non parametric tests were used. We used the Kruskal-Wallis test for comparison between groups ($p<0,05$). Then we used a Mann-Whitney U test corrected for Bonferroni ($p<0,05/3$) to compare the groups two by two.

Results

One hundred eighty-one consecutive patients with orofacial pain were screened for eligibility criteria between July and December 2013. Finally a total of 30 patients satisfied all the criteria and agreed to participate. Figure 1 shows the diagram of recruitment of the participants.

Most of the subjects were female (96,7%, n=29) and the characterization of the sample in terms of age is described in table 1.

Characterization of all groups for VAS and PFJO prior and after the treatment is described in table 2 and table 3.

There were no statistically significant differences between groups with respect to VAS (table 4) and PFJO (table 5) scores prior to the treatment. After 3 consultations there was a statistically significant difference between the groups with respect to VAS

(table 4) and PFJO (table 5) scores and one month after the last consultation we could observe a statistically significant difference between the groups with respect to VAS (table 4) and PFJO scores (table 5).

Patients receiving real DN experienced a statistically significant reduction in jaw pain when compared to the other groups. Prior to treatment the mean VAS score was 5,95 and one month after the last DN session VAS score was 0 (table 3). In fact, VAS scores decreased in each treatment session and it was statistically significant in every observations when compared to sham DN and counselling groups (table 6). Counselling and sham DN groups also experienced a decrease in VAS scores. One month after the last consultation mean VAS score had decreased from 6,35 to 3,05 for counselling and from 6,05 to 4,5 in the sham DN (table 3). This difference was not statistically significant between these two groups (table 6).

Patients receiving real DN experienced an increase in PFJO scores. Mean PFJO prior to treatment was 38,4mm and one month after the last DN session the mean PFJO was 48,2mm (table 2). After the 3rd consultation and one month later mean PFJO scores increase was statistically significant when compared to sham DN but not when compared to counselling (table 7) which determined an increase in PFJO from mean 34,8mm to 45,2mm (table 2). No significant increase in PFJO was observed in sham DN group. The mean PFJO score prior to treatment was 40,6mm and one month after last consultation was 42mm (table 2). There were no statistically significant differences in mean PFJO between sham DN and counselling groups in all periods of observation (table 7).

Discussion

In our study, we tried to investigate whether DN was superior to sham DN or to a conservative modality (counselling) for the treatment of MTrPs in the orofacial area. Our results indicates that DN of active and latent MTrPs induced a significant decrease in reported pain compared to both sham DN and counselling. These results are consistent with other studies showing that DN is effective for treatment of MTrPs.[14] There are also studies which did not report superior effects of DN in comparison to other techniques.[17] The authors of this study suggested that the improvement in pain symptoms was the result of placebo-related factors rather than a true treatment effect. Also, in the study of Diracoglu[15] both the MTrPs and the control group were needled. In our study, to avoid any other noxious stimuli, we used a blunt needle.

Diracoglu[15] found evidence in mean algometric values favoring DN but no difference to the controls in terms of VAS and PFJO. In our study, we could observe an increase in PFJO in the DN group that was statistically significant when compared with sham DN but not when compared to counselling group which also registered an increase in PFJO. Our results are in accordance to other studies that conclude that behavioral changes are effective in the management of pain in MP patients.[24] Our findings were significantly better than in the placebo group and although the pain scores have improved in the counselling group, the results were significantly better in the DN group. Other authors also emphasize the importance of adequate education and home programs in the treatment of MTrPs.[7] We performed DN and counselling in separate groups to more precisely report on the effects of DN.

In a recent meta-analysis, it was concluded that the effectiveness of DN in the management of MTrPs is limited.[18] We believe that these contradictory results might be due to difficulty in applying the diagnostic criteria of Simons and Travell to identify

MTrPs and also to the user technique for DN. We tried to overcome this challenge by using an experienced professional calibrated according to RDC/TMD[19] with ten years' experience in identifying MTrPs according to Simons and Travell criteria and DN. Despite promising novel applications of ultrasound and magnetic ressonance elastography to visualize and characterize MTrPs,[25, 26] the Simons and Travell criteria have good interexaminer reliability when applied by experienced clinicians.[20] Another important aspect of our study is that we needled not only active MTrPs but also latent MTrPs. Shah developed a technique for measuring the biochemical milieu of human skeletal muscle.[27] He found higher levels of bioactive substances (inflammatory mediators, neuropeptides, catecholamines, and cytokines) not only in the active MTrPs but also in the vicinity of active MTrPs.[28] Furthermore, these biochemical substances were elevated in remote, unaffected muscles of individuals with active MTrPs.[29]

In conclusion, this study showed that application of DN into active and latent MTrPs in the masseter and temporalis muscles induced significant improvement in pain intensity levels and PFJO when compared to sham DN and to counselling in patients with MTrPs in the orofacial area. In fact, the results of our RCT indicate that a single session of MTrPs DN decreases myofascial pain intensity in patients with orofacial MTrPs. After 3 sessions also increases mandibular range of motion in patients with orofacial MTrPs. These effects were sustained during one month after the last session of DN. The improvement in pain symptoms and mandibular range of motion supports clinically relevant treatment effects.

Nevertheless, the effects of our study were documented in the short term, so future studies should include larger samples and explore long-term effect of DN.

References

1. Simons DG, Travell JG, Simons LS. Travell and Simons' Myofascial Pain and Dysfunction: The Trigger Point Manual. 2nd ed. Baltimore; 1999.
2. Manolopoulos L, Vlastarakos PV, Georgiou L, et al. Myofascial pain syndromes in the maxillofacial area: a common but underdiagnosed cause of head and neck pain. Int J Oral Maxillofac Surg 2008;37:975-84.
3. Fernandez-de-Las-Penas C, Simons D, Cuadrado ML, Pareja J. The role of myofascial trigger points in musculoskeletal pain syndromes of the head and neck. Curr Pain Headache Rep 2007;11:365-72.
4. Fernandez-de-las-Penas C, Dommerholt J. Myofascial trigger points: peripheral or central phenomenon? Curr Rheumatol Rep 2014;16:395.
5. Bron C, Dommerholt JD. Etiology of myofascial trigger points. Curr Pain Headache Rep 2012;16:439-44.
6. Srbely JZ. New trends in the treatment and management of myofascial pain syndrome. Curr Pain Headache Rep 2010;14:346-52.
7. Hong CZ. Treatment of myofascial pain syndrome. Curr Pain Headache Rep 2006;10:345-9.
8. 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;139:260-6.
9. Srbely JZ, Dickey JP, Lee D, Lowerison M. Dry needle stimulation of myofascial trigger points evokes segmental anti-nociceptive effects. J Rehabil Med 2010;42:463-8.
10. Cummings TM, White AR. Needling therapies in the management of myofascial trigger point pain: a systematic review. Arch Phys Med Rehabil 2001;82:986-92.
11. Kalichman L, Vulfsons S. Dry needling in the management of musculoskeletal pain. J Am Board Fam Med 2010;23:640-6.
12. Vulfsons S, Ratmansky M, Kalichman L. Trigger point needling: techniques and outcome. Curr Pain Headache Rep 2012;16:407-12.
13. Lewit K. The needle effect in the relief of myofascial pain. Pain 1979;6:83-90.
14. Fernandez-Carnero J, La Touche R, Ortega-Santiago R, et al. Short-term effects of dry needling of active myofascial trigger points in the masseter muscle in patients with temporomandibular disorders. J Orofac Pain 2010;24:106-12.
15. Diracoglu D, Vural M, Karan A, Aksoy C. Effectiveness of dry needling for the treatment of temporomandibular myofascial pain: a double-blind, randomized, placebo controlled study. J Back Musculoskelet Rehabil 2012;25:285-90.
16. Zubieta JK, Stohler CS. Neurobiological mechanisms of placebo responses. Ann N Y Acad Sci 2009;1156:198-210.
17. McMillan AS, Nolan A, Kelly PJ. The efficacy of dry needling and procaine in the treatment of myofascial pain in the jaw muscles. J Orofac Pain 1997;11:307-14.
18. Tough EA, White AR, Cummings TM, Richards SH, Campbell JL. Acupuncture and dry needling in the management of myofascial trigger point pain: a systematic review and meta-analysis of randomised controlled trials. Eur J Pain 2009;13:3-10.

19. Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord 1992;6:301-55.
20. Gerwin RD, Shannon S, Hong CZ, Hubbard D, Gevirtz R. Interrater reliability in myofascial trigger point examination. Pain 1997;69:65-73.
21. Streitberger K, Kleinhenz J. Introducing a placebo needle into acupuncture research. Lancet 1998;352:364-5.
22. Jensen MP, Turner JA, Romano JM, Fisher LD. Comparative reliability and validity of chronic pain intensity measures. PAIN 1999;83:157-62.
23. Walker N, Bohannon RW, Cameron D. Discriminant validity of temporomandibular joint range of motion measurements obtained with a ruler. J Orthop Sports Phys Ther 2000;30:484-92.
24. Conti PC, de Alencar EN, da Mota Correa AS, et al. Behavioural changes and occlusal splints are effective in the management of masticatory myofascial pain: a short-term evaluation. J Oral Rehabil 2012;39:754-60.
25. Sikdar S, Shah JP, Gebreab T, et al. Novel applications of ultrasound technology to visualize and characterize myofascial trigger points and surrounding soft tissue. Arch Phys Med Rehabil 2009;90:1829-38.
26. Chen Q, Bensamoun S, Basford JR, Thompson JM, An KN. Identification and quantification of myofascial taut bands with magnetic resonance elastography. Arch Phys Med Rehabil 2007;88:1658-61.
27. Shah JP, Phillips TM, Danoff JV, Gerber LH. An in vivo microanalytical technique for measuring the local biochemical milieu of human skeletal muscle. J Appl Physiol (1985) 2005;99:1977-84.
28. Shah JP, Gilliams EA. Uncovering the biochemical milieu of myofascial trigger points using in vivo microdialysis: an application of muscle pain concepts to myofascial pain syndrome. J Bodyw Mov Ther 2008;12:371-84.
29. Shah JP, Danoff JV, Desai MJ, et al. Biochemicals Associated With Pain and Inflammation are Elevated in Sites Near to and Remote From Active Myofascial Trigger Points. Archives of Physical Medicine and Rehabilitation 2008;89:16-23.

Figure 1 - Flow diagram of subjects.

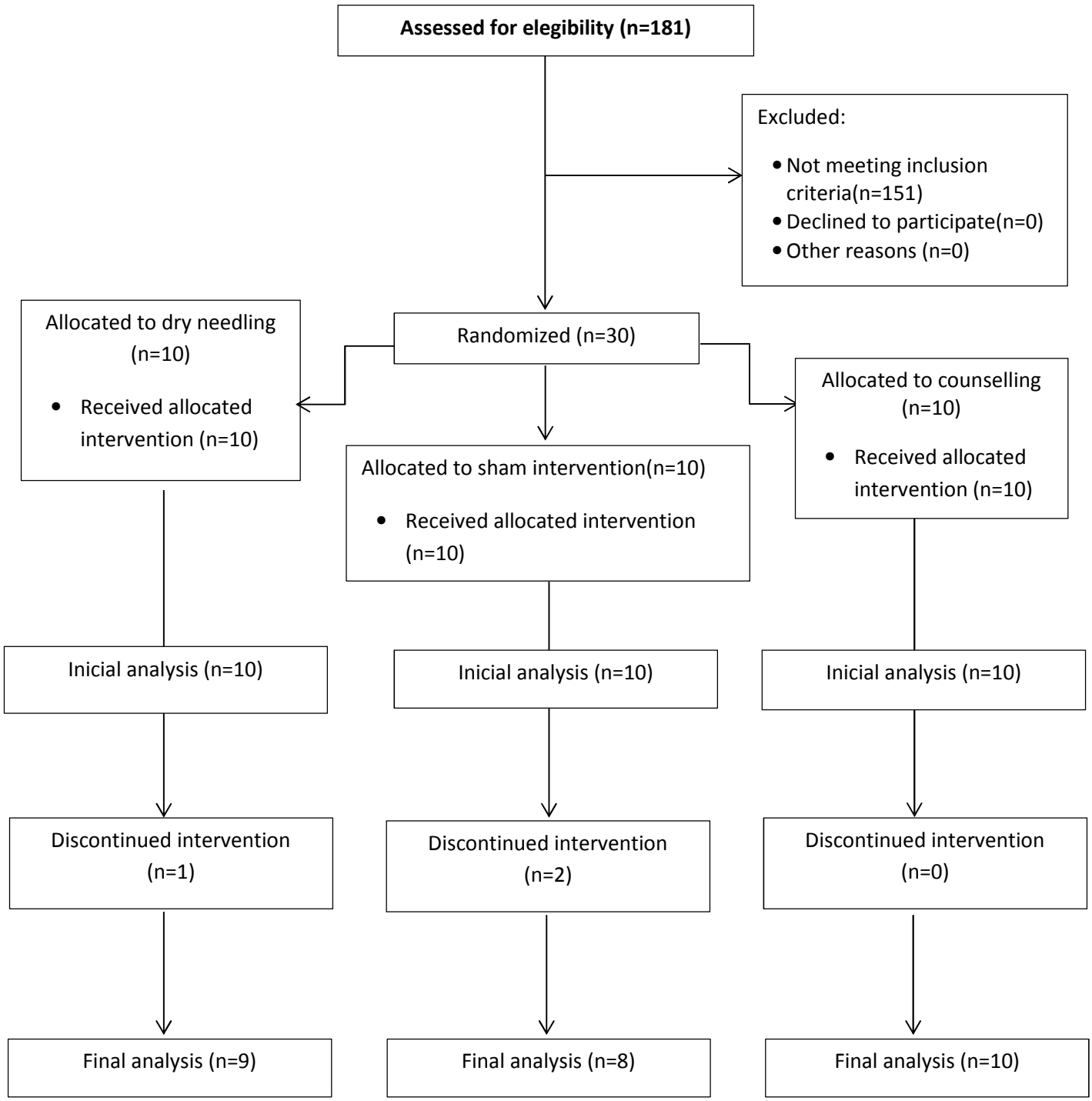


Table 1 – Sample description in terms of age

Group	Minimum	Maximum	Mean	Std. Deviation
Dry needling	21	59	33.40	15.25
Counselling	30	70	41.60	14.26
Sham dry needling	23	28	24.70	1.70

Table 2 - Sample description of PFJO (mm)

Group	PFJO - prior to treatment		PFJO - after 1st consultation		PFJO - after 2nd consultation		PFJO - after 3rd consultation		PFJO - one month after last consultation	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
DN	38.40	9.97	43.80	6.65	44.70	7.07	48.11	5.01	48.22	4.58
C	34.80	11.97	34.80	11.97	39.40	6.80	43.20	4.89	45.20	6.10
SDN	40.60	7.40	44.10	5.49	42.56	6.25	42.25	3.15	42.00	3.59

PFJO – pain free maximal jaw opening; DN – dry needling; C – counselling; SDN – sham dry needling

Table 3 – Sample description relative to VAS

Group	VAS - prior to treatment		VAS - after 1st consultation		VAS - after 2nd consultation		VAS - after 3rd consultation		VAS - one month after last consultation	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
DN	5.95	1.38	2.50	2.10	0.30	0.67	0.22	0.67	0.00	0.00
C	6.35	1.25	6.35	1.25	4.90	1.73	4.30	2.26	3.05	2.79
SDN	6.05	1.80	5.50	2.12	4.78	1.94	4.50	2.52	4.50	2.52

VAS – visual analogue scale; DN – dry needling; C – counselling; SDN – sham dry needling

Table 4 - Kruskal-Wallis test for comparison between groups for the VAS scores in the different moments of evaluation

Group	VAS - prior to treatment				VAS - after 1st consultation				VAS - after 2nd consultation				VAS - after 3rd consultation				VAS - one month after last consultation			
	N	Mean Rank	χ^2	Sig	N	Mean Rank	χ^2	Sig	N	Mean Rank	χ^2	Sig	N	Mean Rank	χ^2	Sig	N	Mean Rank	χ^2	Sig
DN	10	14.50			10	7.40			10	5.65			9	5.44			9	6.50		
SDN	10	14.90	0.52	ns	10	17.55	13.96	0.001	9	19.78	18.96	<0.001	8	18.44	16.21	<0.001	8	20.19	14.76	0.001
C	10	17,10			10	21.55			10	20.05			10	18.15			10	15.80		

*ns p>0.05; VAS – visual analogue scale; DN – dry needling; SDN – sham dry needling; C – counselling

Table 5 - Kruskal-Wallis test for comparison between groups for the PFJO scores in the different moments of evaluation

Group	PFJO - prior to treatment				PFJO - after 1st consultation				PFJO - after 2nd consultation				PFJO - after 3rd consultation				PFJO - one month after last consultation			
	N	Mean Rank	χ^2	Sig	N	Mean Rank	χ^2	Sig	N	Mean Rank	χ^2	Sig	N	Mean Rank	χ^2	Sig	N	Mean Rank	χ^2	Sig
DN	10	18.25			10	15.90			10	18.75			9	19.50			9	18.17		
SDN	10	16.90	3.49	ns	10	17.20	0.97	ns	9	14.28	3.35	ns	8	10.75	6.58	<0.037	8	8.19	6.96	0.031
C	10	11.35			10	13.40			10	11.90			10	11.65			10	14.90		

*ns p>0.05; PFJO – pain free maximal jaw opening; DN – dry needling; C – counselling; SDN – sham dry needling

Table 6 - Mann-Whitney U test corrected for Bonferroni to compare the groups two by two for VAS scores in the different moments of evaluation

Group	VAS - prior to treatment				VAS - after 1st consultation				VAS - after 2nd consultation				VAS - after 3rd consultation				VAS - one month after last consultation			
	N	Mean Rank	U	Sig	N	Mean Rank	U	Sig	N	Mean Rank	U	Sig	N	Mean Rank	U	Sig	N	Mean Rank	U	Sig
DN	10	9.50			10	5.95			10	5.55			9	5.17			9	6.50		
Vs			40.00	ns			4.50	<0.001			0.50	<0.001			1.50	<0.001			13.50	0.008
C	10	11.50			10	15.05			10	15.45			10	14.35			10	13.15		
DN	10	10.50			10	6.95			10	5.60			9	5.28			9	5.00		
Vs			50.00	ns			14.50	0.005			1.00	<0.001			2.50	<0.001			0.00	<0.001
SDN	10	10.50			10	14.05			9	14.89			8	13.19			8	13.50		
C	10	11,10			10	12.00			10	10.10			10	9.30			10	8.15		
Vs			.00	ns			35.00	ns			44.00	ns			38.00	ns			26.50	ns
SDN	10	9.90			10	9.00			9	9.89			8	9.75			8	11.19		

*ns p>0.017; VAS – visual analogue scale; DN – dry needling; C – counselling; SDN – sham dry needling

Table 7 - Mann-Whitney U test corrected for Bonferroni to compare the groups two by two for PFJO scores in the different moments of evaluation

Group	PFJO - prior to treatment				PFJO - after 1st consultation				PFJO - after 2nd consultation				PFJO - after 3rd consultation				PFJO - one month after last consultation			
	N	Mean Rank	U	Sig	N	Mean Rank	U	Sig	N	Mean Rank	U	Sig	N	Mean Rank	U	Sig	N	Mean Rank	U	Sig
DN	10	11.60			10	12.65			10	12.60			9	12.72			9	11.22	34.00	
Vs			39.00	ns			28.50	ns			29.00	ns			20.50	ns				ns
C	10	9.40			10	8.35			10	8.40			10	7.55			10	8.90		
DN	10	9.80			10	11.10			10	11.65			9	11.78			9	11.94		
Vs			43.00	ns			44.00	ns			28.50	ns			11.00	0.015			9.50	0.008
SDN	10	11.20			10	9.90			9	8.17			8	5.88			8	5,69		
C	10	9.50			10	8.50			10	9.00			10	9.60			10	11.50		
Vs			40.00	ns			30.00	ns			35.00	ns			39.00	ns			20.00	ns
SDN	10	11.50			10	12.50			9	11.11			8	9.38			8	7.00		

*ns p>0.017; PFJO - pain free maximal jaw opening; DN - dry needling; C - counselling; SDN - sham dry needling

Ao meu orientador, Dr. João Geraldo Reis Correia Pinto, que despertou em mim o gosto pela disfunção temporomandibular, o meu respeito e amizade pela confiança depositada em mim.

Ao meu co-orientador, Doutor António Albino Coelho Marques Abrantes Teixeira, o meu agradecimento pela orientação sábia durante a elaboração deste trabalho.

À Doutora Maria dos Prazeres Gonçalves, a minha gratidão pela ajuda paciente na análise estatística.

Ao Doutor Antônio Sérgio Guimarães, a minha admiração pelos conhecimentos que me transmitiu pois muito contribuíram para o meu conhecimento da disfunção temporomandibular.

Ao Doutor Luís Belo, pelas considerações importantes durante a realização deste trabalho.

Aos colegas e amigos do curso de mestrado integrado em medicina, pelo convívio e pela troca de conhecimentos.

A todos os professores da FMUP, por tudo o que me ensinaram.

A todos os meus amigos.

NORMAS REVISTA

Journal of Orofacial Pain
GUIDELINES FOR AUTHORS

Journal of Orofacial Pain is a quarterly journal that publishes scientifically sound articles of interest to practitioners and researchers in the field of pain, in particular orofacial pain and related conditions such as headache, temporomandibular disorders, and occlusally related disorders. The Journal publishes several types of peer-reviewed original articles:

1. *Clinical and basic science research reports*—based on original research in pain, especially orofacial pain and related conditions. Case reports will also be considered provided they outline a background, well-documented clinical features (history, diagnostic and management approaches) and discussion of uncommon cases relevant to orofacial pain and related conditions.
2. *Topical reviews*—dealing with a subject of relevance to pain, in particular orofacial pain and related conditions.
3a. *Invited focus articles*—presenting a position or hypothesis on a basic science or clinical subject of relevance to orofacial pain and related conditions. These articles are not intended for the presentation of original results. Authors are selected by the Editorial Board.
3b. *Invited commentaries*—critiquing a focus article by addressing the strong and weak points of the focus article. Authors of the commentaries are selected by the Editorial Board in consultation with the focus article author, and the focus article and the commentaries on it are published together in the Journal.
4. *Proceedings of symposia, workshops, or conferences*—covering topics of relevance to orofacial pain and related conditions.

In addition, the Journal publishes:
5. *Abstracts*—selected by the Editorial Board from those accepted by the AAOP or other affiliated academies. Criteria include originality and significance of findings, statistical basis of the data, conclusions appropriately drawn from the data, and appropriate grammatical expression.
6. *Invited guest editorials*—may periodically be solicited by the Editorial Board.
7. Letters to the Editor—may be submitted to the editor-in-chief; these should normally be no more than 500 words in length.
8. Literature abstracts—abstracts of selected journal articles.
9. Meeting reviews—highlights of selected scientific meetings.
10. Book reviews—may periodically be solicited by the editorial board.

Submit manuscripts via online submission service: www.manuscriptmanager.com/jop

Review/editing of manuscripts. Manuscripts will normally be reviewed by the editor-in-chief, one associate editor, and at least two reviewers with expertise within the scope of the article. The publisher reserves the right to edit accepted manuscripts to ensure conciseness, clarity, and stylistic consistency, subject to the author's final approval.

Adherence to guidelines. Manuscripts not prepared in accordance with these guidelines or written in improper English will be returned with instructions to correct these problems prior to review.

MANUSCRIPT PREPARATION

The Journal will follow as much as possible the recommendations of the International Committee of Medical Journal Editors (Vancouver Group) in regard to preparation of manuscripts and authorship (Uniform requirements for manuscripts submitted to biomedical journals. Ann Intern Med 1997;126:36–47).

Manuscripts should be typed double-spaced with a 1-inch margin all around. Number all pages.

- **Title page.** This should include the title of the article (descriptive but as concise as possible) and the name, degrees, title, professional affiliation, and full address of all authors. Phone, fax, and e-mail address must also be provided for the corresponding author, who will be assumed to be the first-listed author unless otherwise noted. If the paper was presented before an organized group, the name of the organization, location, and date should be included.
- **Abstract/key words.** Include a maximum 250-word structured abstract (with headings *Aims, Methods, Results, Conclusion)* and five key words.
- **Introduction.** Summarize the rationale and purpose of the study, giving only pertinent references. Clearly state the working hypothesis.
- **Materials and Methods.** Present materials and methods in sufficient detail to allow confirmation of the observations. Published methods should be referenced and discussed only briefly, unless modifications have been made. Indicate the statistical methods used, if applicable.
- **Results.** Present results in a logical sequence in the text, tables, and illustrations. Do not repeat in the text all the data in the tables or illustrations; emphasize only important observations.
- **Discussion.** Emphasize new and important aspects of the study and the conclusions that follow from them. Do not repeat in detail data or other material given in the Introduction or Results section. Relate observations to other relevant studies; point out the implications of the findings and their limitations.
- **Acknowledgments.** Acknowledge persons who have made substantive contributions to the study. Specify grant or other financial support, citing the name of the supporting organization and grant number.
- **Figure Legends.** Figure legends should be grouped at the end of the text and typed double-spaced.
- **Abbreviations.** The full term for which an abbreviation stands should precede its first use in the text unless it is a standard unit of measurement.
- **Trade names.** Generic terms are to be used whenever possible, but trade names and manufacturer should be included parenthetically at first mention.

REFERENCES

- **All references must be cited** in the text, numbered in order of appearance.
- **The reference list** should appear at the end of the article in numeric sequence.
- **Do not include unpublished data** or personal communications in the reference list. Cite such references parenthetically in the text and include a date.
- **Avoid using abstracts** as references.
- **Provide complete information** for each reference, including names of all authors (up to six). If the reference is to part of a book, also include the title of the chapter and names of the book's editor(s).

Journal reference style:
1. Turp JC, Kowalski CJ, Stohler CS. Treatment-seeking patterns of facial pain patients: Many possibilities, limited satisfaction. J Orofac Pain 1998;12:61–66.

Book reference style:
1. Hannam AG, Langenbach GEJ, Peck CC. Computer simulations of jaw biomechanics. In: McNeill C (ed). Science and Practice of Occlusion. Chicago: Quintessence, 1997:187–194.

ILLUSTRATIONS AND TABLES

- All illustrations and tables should be numbered and cited in the text in order of appearance.
- Illustrations and tables should be embedded in a PC Word or PDF document.
- All illustrations and tables should be grouped at the end of the text.
- *Original artwork or slides may still be required of the author after acceptance of the article.*

MANDATORY SUBMISSION FORM

The Mandatory Submission Form, signed by all authors, must accompany all submitted manuscripts before they can be reviewed for publication. This form can be found elsewhere in this issue or can be downloaded from the Journal's website (www.manuscriptmanager.com/jop) under "Publisher's Home-Page." Please fax the completed form to +1 416 979 4936 (mark it for Dr Barry Sessle's attention), or e-mail it to admin.jop@dentistry.utoronto.ca.

PERMISSIONS AND WAIVERS

- Permission of author and publisher must be obtained for the direct use of material (text, photos, drawings) under copyright that does not belong to the author.
- Waivers must be obtained for photographs showing persons. When such waivers are not supplied, faces will be masked to prevent identification.
- Permissions and waivers should be faxed along with the Mandatory Submission Form to Dr Sessle's office (+ 1 416 979 4936).

REPRINTS

Reprints can be ordered from the publisher. The publisher does not stock reprints; however, back issues can be purchased.