Brief Communications

Referred Pain From the Trochlear Region in Tension-Type Headache: A Myofascial Trigger Point From the Superior Oblique Muscle

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Background.—Tension-type headache (TTH) is a prototypical headache in which myofascial trigger points (MTrPs) can play an important role. To our knowledge, MTrPs in the muscle tissues of the trochlear region, ie, the superior oblique muscle (SOM), have not been previously mentioned, and a referred pain pattern from this region has never been reported.

Objective.—To describe the referred pain from the trochlear area based on the examination of MTrPs in the SOM in patients with episodic and chronic TTH (CTTH).

Design.—A blinded, controlled study.

Methods.—The trochlear region was examined in 15 patients with CTTH, 15 patients with episodic TTH (ETTH), and 15 control subjects. Referred pain elicited by different maneuvers performed during manual palpation, ie, maintained pressure, active muscle contraction, and stretching of the muscle, was assessed with a visual analogue scale. Patients with ETTH were examined on days when they were headache-free, whereas CTTH patients were examined on days in which headache intensity was less than 4 points on a 10-cm horizontal visual analogue scale.

Results.—Eighty-six percent of patients with CTTH and 60% with ETTH had referred pain that originated from MTrPs in the SOM, while only 27% of the controls reported referred pain. This pain was perceived as a deep ache located at the retro-orbital region, sometimes extending to the supra-orbital region or the homo-lateral forehead. Pain intensity was greater in CTTH patients than in ETTH patients or control subjects ($P < .001$).

Conclusions.—MTrPs in the SOM may evoke a typical referred pain pattern in patients with TTH. The presence of a myofascial disorder in the trochlear region might contribute to the pathogenesis of TTH.

Key words: referred pain, trochlear region, tension-type headache, superior oblique muscle, myofascial trigger points

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INTRODUCTION

Tension-type headache (TTH) is a prototypical headache in which pericranial myofascial tissues can play an important role.[1,2] Some authors have claimed that pain from pericranial head, neck, and/or shoulder muscles are referred to the head, and are experienced as headache.[3-5] Simons et al described the referred pain patterns from different myofascial trigger points (MTrPs) in these muscles, which produce pain features that are usually found in patients suffering from TTH.[6] A MTrP is a hyperirritable spot associated with a taut band of a skeletal muscle that is painful on compression, palpation, and/or stretch, and that can give rise to a typical referred pain pattern.[6] Some of the characteristics of TTH, such as the pressure and/or tightness pain quality[7] or the increased tenderness to palpation of pericranial myofascial tissues,[1,2] resemble MTrPs

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referred pain descriptions.[6] Therefore, MTrPs might contribute to the pathogenesis of TTH.

Recently, primary trochlear headache (PTRH), a new cephalgia, has been described by Yangüela et al[8] Among the clinical features of PTRH, they found tenderness on palpation of the trochlear area, exacerbation of pain by physical or emotional stress, a positive trochlear maneuver, and pain relief by lidocaine injection into the trochlear region. These authors suggested possible pathogenic mechanisms of PTRH that included friction, traction or microvascular, compressive, neural trauma to the supraorbital (SO) and/or supratrochlear (ST) nerves provoked by continuous movements of the trochlear apparatus, or the muscle pulley.[8]. However, taking into account PTRH symptoms, the existence of MTrPs in the superior oblique muscle (SOM) could also be considered. Furthermore, MTrPs in the SOM might be involved in other primary headaches such as TTH and migraine headache.

Despite their comprehensive research, Simons et al have not described the referred pain pattern from MTrPs in the SOM.[6] Moreover, to our knowledge MTrPs in the SOM have not been previously mentioned, and a referred pain pattern from the trochlear region has never been reported in the medical literature. Our aim was to describe the referred pain from the trochlear area based on the examination of MTrPs in the SOM in patients with episodic and chronic TTH. In addition, we described the differences in the presence of MTrPs in the SOM among patients with chronic TTH (CTTH), patients with episodic TTH (ETTH), and control subjects.

MATERIALS AND METHODS

Subjects.—Fifteen subjects suffering from chronic TTH, 15 subjects with episodic TTH, and 15 healthy age- and sex-matched subjects without headache during the prior year participated in this study from February to July of 2004. Subjects with CTTH and ETTH were diagnosed according to the criteria of the International Headache Society (IHS) by an experienced neurologist.[7] CTTH subjects had to have headache on at least 15 days per month, and ETTH subjects had to have headache on less than 15 days per month. A headache diary[9] was kept for 4 weeks prior to the trochlear area examination, in order to confirm the headache type in each subject. Subjects with ETTH were headache-free on the day of evaluation, whereas subjects with CTTH were examined on days in which the headache intensity was less than 4 points on a 10-cm horizontal visual analogue scale. The health status of all the patients was clinically stable, without current symptoms of any other concomitant chronic disease.

Procedure.—The right and left trochlear regions of all the participants were explored. The examination of the trochlear area was focused on the search for myofascial trigger points in the superior oblique muscle. It was performed by an assessor who had more than four years' experience in MTrPs diagnosis, and who was blinded to the subjects' condition. Diagnostic criteria as described by Simons et al[6] and by Gerwin et al[10] were adapted for the SOM and used to diagnose MTrPs. Specifically, the diagnosis of MTrP in the SOM was made when there was tenderness in the trochlear region, referred pain evoked by maintained pressure, and increased referred pain on at least one of the provocative manoeuvres of contraction and/or stretching of the SOM. A MTrP was considered active if the subject recognized the referred pain from this region as familiar, while a MTrP was considered latent if the subject did not recognize the referred pain as familiar.[6,10]

The examination was divided into four stages. First, the trochlear region was palpated looking for a tender spot in the superior-internal corner of the orbit (upper medial canthus) (Figure 1A). Second, moderate pressure on this region was applied by the thumb of the assessor for 30 seconds (Figure 1B), if the muscle was found to be tender on initial palpation. Third, the subject was told to look in an inferior and medial direction (infra-adduction) (Figure 1C), if referred pain resulted from the previous maneuver. If a MTrP was present in the SOM, active contraction of the muscle on downward-medial gaze concomitant with pressure on the affected tissues had to be more painful than pressure alone. Fourth, the patient moved the eye in a superior and lateral direction (supra-abduction) (Figure 1D). If this stretching of the SOM also evoked increased referred pain, the diagnosis was definite MTrP; if not, the diagnosis was probable MTrP. This sequence is detailed in Figure 1.

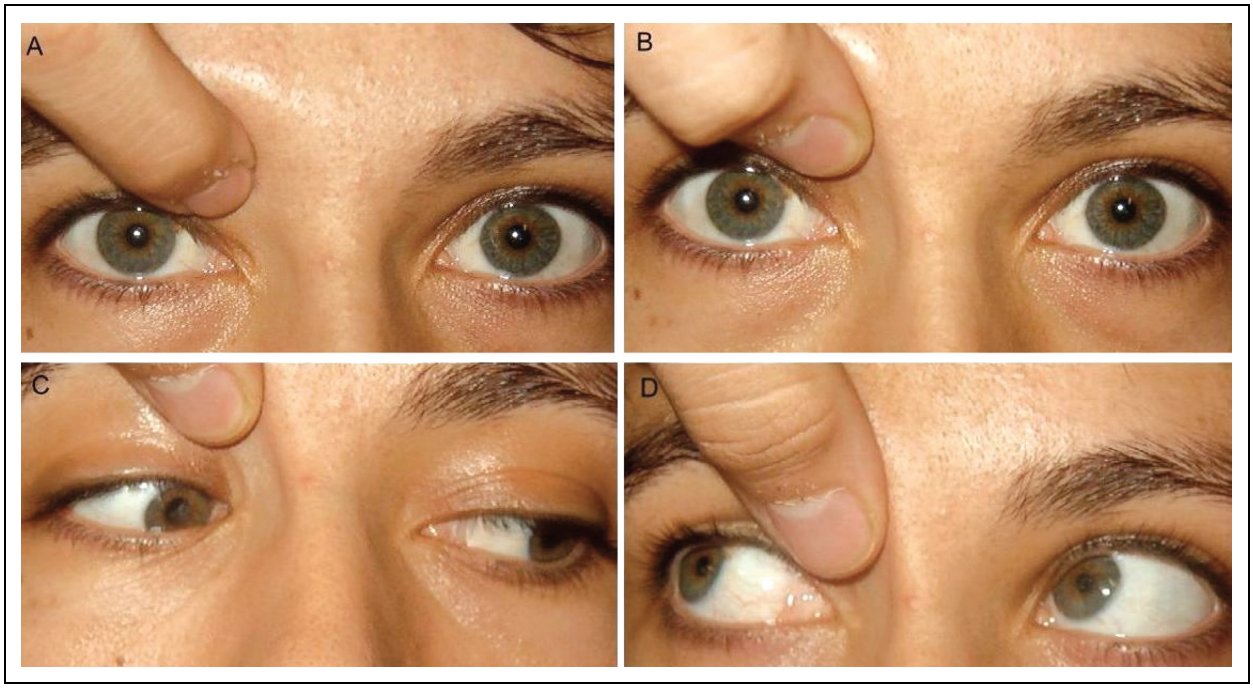

Fig 1.—Trochlear examination focusing on the assessment of myofascial trigger points in the superior oblique muscle.

A 10-cm horizontal visual analogue scale (VAS; range: 0 = no pain, to 10 = maximum pain) was used to assess the level of pain at each stage of the examination: (1) local pain on compression of the trochlear region; (2) referred pain when pressure was maintained for 30 seconds; (3) referred pain on downward-medial gaze (active contraction of the SOM); and (4) referred pain on upward-lateral gaze (stretch of the SOM). The reliability and validity of the VAS as a measure of pain has been previously established.[11] For each subject, the mean of the VAS scores on both sides (right and left) was used in the subsequent statistical analysis.

Statistical Analysis.—Data were analyzed with the SPSS package (version 11.5). Mean values of the VAS scores and the number of active and latent MTrPs were calculated. A normal distribution was assessed by means of the Kolmogorov–Smirnov test ($P > .05$). A one-way analysis of variance (ANOVA) for repeated measures was used to compare the intragroup scores of the VAS during the last three stages of the examination (the Bonferroni correction was used as post-hoc analysis). The intergroup comparison of the scores in the VAS at each stage of the trochlear examination was also achieved with the one-way ANOVA test (again, the Bonferroni correction was used as post-hoc analysis). The χ^2-test was used to assess the differences in the presence of latent and/or active MTrPs among groups. The statistical analysis was conducted at a 95% confidence level. A *P*-value less than .05 was considered as statistically significant.

RESULTS

Forty-five subjects participated in this study: 15 patients with CTTH (5 men and 10 women; mean age: 37 ± 16 years); 15 patients with ETTH (4 men and 11 women; mean age: 40 ± 15 years), and 15 healthy control subjects (5 men and 10 women; mean age: 38 ± 14 years). Headache history ranged from 5 months to 8 years (mean 2.2; SD 2.1 years) in CTTH patients, and from 4 months to 4 years (mean 1.5; SD 1.3 years) in ETTH patients.

Patients suffering from CTTH were examined on days in which headache intensity was less than 4 on the VAS (mean ± SD = 2.2 ± 0.8). All of them had local pain with palpation on the trochlear region. The VAS score on palpation was 6.1 ± 0.9. Of these subjects, 13 (86%) reported pain located outside the trochlear area, ie, referred pain, when moderate pressure on the superior-internal corner of the orbit was maintained

for 30 seconds (VAS = 5.9 ± 1.0). Both, the active contraction and the stretching of the SOM increased the referred pain (contraction: VAS = 6.8 ± 1.5; stretching: VAS = 6.5 ± 0.8), consistent with a diagnosis of definite MTrPs. There were significant differences between the compression stage and both the contraction and the stretching stages (compression versus contraction, $P = .005$; compression versus stretching, $P < .001$), but not between these two latter stages. All the CTTH patients with referred pain recognized it as familiar, especially when their headaches were aggravated by stress. Therefore, all the MTrPs in this group were considered active.

Patients suffering from ETTH were examined at a time without headache. All of them also reported local pain with palpation on the trochlear region (VAS = 4.1 ± 1.1). Of these subjects, 9 (60%) reported referred pain when moderate pressure on the superior-internal corner of the orbit was applied for 30 seconds (VAS = 4 ± 0.8). The intensity of the referred pain was increased by active muscle contraction (VAS = 4.8 ± 0.5) and by stretching of the SOM (VAS = 4.4 ± 1.1). The increase was only significant with contraction ($P = .005$), but not with stretching. Only two ETTH patients with referred pain recognized it as familiar, ie, had active MTrPs. The remaining seven ETTH patients who reported referred pain from the trochlear area were diagnosed with latent MTrPs. The location and quality of the referred pain in CTTH and ETTH patients are summarized in Table 1.

Ten of the 15 control subjects (67%) had pain in the trochlear region with manual palpation (VAS = 2.1 ± 1.0). Of these subjects, only 4 (27%) reported referred pain when moderate pressure on the superior-internal corner of the orbit was maintained for 30 seconds (VAS = 2.6 ± 0.5). The intensity of this referred pain was slightly increased with the active contraction of the SOM (VAS = 2.8 ± 0.5), but not with the stretching maneuver (VAS = 2.5 ± 0.7). Then, control subjects were diagnosed as having probable MTrPs. There were no significant differences among any of these stages. The location and quality of the referred pain were similar to those of the subjects with CTTH and ETTH, but pain was less intense ($P < .001$).

Table 1.—Location and Quality of the Referred Pain Evoked From the Superior Oblique Muscle Examination in Subjects With Tension-Type Headache

Patient	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sex	M	F	F	F	M	M	F	F	M	F	F	F	F	F	M
Tension-type headache (TTH) characteristics															
Subtype	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Length	8 year	1 year	2 year	3 year	2 year	8 month	5 month	9 month	3 year	11 month	2 year	8 month	6 year	1 year	2 year
Referred pain with superior oblique muscle examination															
Location	RO, SO	RO, HoF	RO, SO	RO	RO, SO	RO, SO	RO, HoF	RO	–	RO, SO	RO, HoF	RO, HoF	RO, SO, HoF	RO, SO, HoF	–
Quality	Bur, Pres	Pres	Bur, Pres	Pres, Tigh	Bur, Pres	Pres	Pres, Tigh	Pres	–	Bur, Pres	Pres	Pres, Tigh	Tigh, Bur, Pres	Bur, Pres	–
Tension-type headache (TTH) characteristics															
Subtype	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Length	1 year	4 month	5 month	4 year	1 year	6 month	1.5 year	7 month	9 month	2 year	3 year	6 month	4 year	2.5 year	5 month
Referred pain with superior oblique muscle examination															
Location	RO	RO, SO	–	RO, SO, HoF	–	–	RO, SO	–	RO, HoF	RO	–	RO	–	RO, SO	RO, SO
Quality	Tigh, Pres	Pres	–	Bur, Pres	–	–	Pres	–	Pres	Pres, Tigh	–	Pres	–	Tigh, Pres	Bur, Pres

M, Male; F, Female; C, Chronic TTH; RO, Retro-orbital; SO, Supra-orbital; HoF, Homo-lateral forehead; Bur, Burning quality; Pres, Pressing quality; Tigh, Tightening quality.
Note: Subjects 3, 5, 6, 8, 9, 11, 13, and 15 did not report pain outside the trochlear area (referred pain).

Table 2.—Presence of Myofascial Trigger Points in Patients With Tension-Type Headache and Healthy Controls

	CTTH* (n = 15)	ETTH† (n = 15)	Controls (n = 15)
Active MTrPs	13	2	0
Latent MTrPs	0	7	4‡

*$P < .001$ with respect to ETTH and control subjects.
†non significant with respect to control subjects.
‡These control subjects showed referred pain from the trochlear area, although the existence of MTrPs is controversial.
MTrP, Myofascial trigger point; CTTH, Chronic tension-type headache; and ETTH, Episodic tension-type headache.

The differences in the presence of either active or latent MTrPs among groups are summarized in Table 2. Patients suffering from CTTH showed a greater prevalence of active MTrPs than patients with ETTH and control subjects ($P = .001$). Although patients suffering from ETTH also showed a greater number of active and latent MTrPs than control subjects, this difference was not significant ($P = .3$).

COMMENTS

We have described a referred pain pattern from the trochlear area that we think comes from myofascial trigger points in the superior oblique muscle. This may be an important cause of frontal and eye-related headache pain as indicated by the nearly universal presence of referred pain from the trochlear region in our sample of chronic tension-type headache, and symptoms consistent with active or latent MTrPs in episodic tension-type headache subjects. To our knowledge, referred pain from the SOM has not been previously described. Headache originating in the trochlear region has been reported,[8] but without reference to the contribution of referred pain from muscle tissues (SOM).

The SOM referred pain pattern is perceived as internal and deep pain located at the retro-orbital region. Referred pain can extend to the supra-orbital region, and sometimes to the homo-lateral forehead. The pain is also described as being deep within the eye (Figure 2). The cause of referred pain from the trochlear region could arise from MTrPs within the SOM, or it could originate in the supraorbital and/or supratrochlear nerves. Pain from muscle[6,12] and pain from nerve entrapment[8] can both be increased by

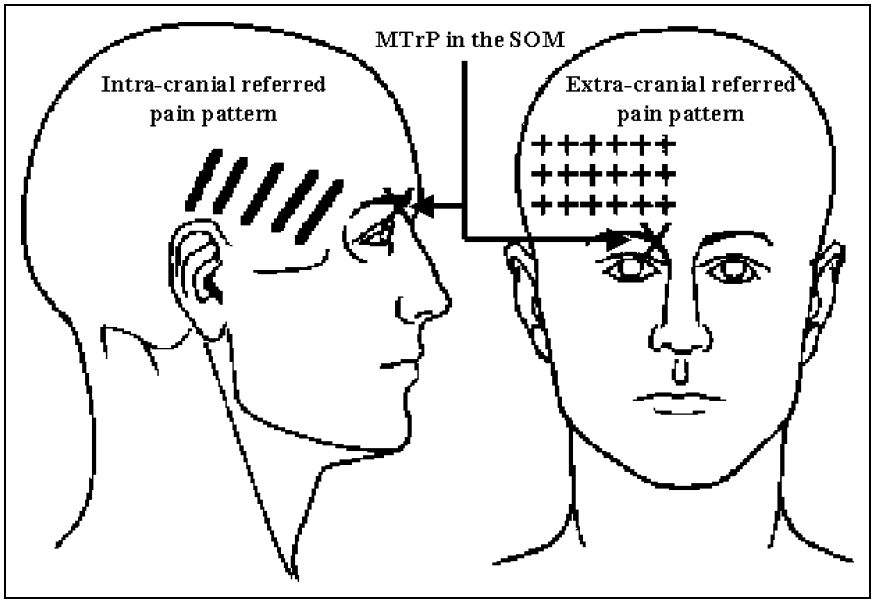

Fig 2.—Referred pain pattern from myofascial trigger points in the superior oblique muscle.

emotional stress and local palpation. MTrP pain will be increased by muscle stretching, but if there is nerve entrapment, stretching can also increase nerve pain. Injection of either lidocaine or corticosteroids will result in a decrease in pain from both, MTrPs[13] and nerve entrapment.[8] Contraction of muscle containing active MTrPs will usually increase the intensity of the local and referred pain. Data indicating that this occurred supports the concept that trochlear and regional pain did come from MTrPs. However, an entrapped nerve can act the same way if compression is increased by contracting the entrapping muscle. Despite a possible association between MTrPs in the SOM and neural entrapment of SO and ST nerves, a cause and effect relationship should not be assumed. In some patients the neural entrapment could provoke MTrPs in the SOM, whereas in other subjects the presence of MTrPs in the SOM could generate an overload of the trochlear pulley so that any contraction of the SOM would provoke a friction or traction of the nerves. Therefore, it is not clear whether referred pain from the trochlear region is caused by MTrPs in the SOM, by entrapment of the SO and/or ST nerves or by the combination of both disorders. Probably, both disorders play an interconnected role in the genesis of referred pain from the trochlear region.

There are some limitations to our study. First, only patients with TTH were included. Hence, our results cannot be extrapolated to other disorders. It would be useful to repeat the same procedure with patients suffering from migraine, cluster headache, and other headache disorders to assess the differences among them, and to elucidate the role of the trochlear region in different types of headache. The second limitation was the sample size. This is the first study in the literature describing the typical referred pain pattern from the trochlear region focusing the examination on myofascial tissues (MTrPs in the SOM), but it is imperative to repeat the same procedure with a greater number of subjects to clearly define the role of the SOM and the terminal trigeminal nerve branches (SO and ST) in patients suffering from TTH.

CONCLUSION

The referred pain pattern from the trochlear region based on the examination of the myofascial tissues is perceived as internal and deep pain located at the retro-orbital region. The pain can extend to the supra-orbital region, and sometimes to the homolateral forehead.

From a clinical stand-point, the existence of myofascial disorders in the trochlear area (MTrPs in the SOM) might play an important role in the pathogenesis of TTH. Further studies are required to confirm the existence of MTrPs in the trochlear region in TTH patients. Moreover, the treatment of myofascial disorders in the trochlear region might be crucial in the management of TTH.

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