

Survey of Pain to Palpation of the Occipitofrontalis Muscle in Patients with Temporomandibular Disorders

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Aim: The aims of this study were to survey the frequency of pain to palpation of the occipitofrontalis muscle in a TMD patient group, and to identify patients showing pain to palpation of the occipitofrontalis muscle that is also consistent with patients' headache symptom.

Methods: A total of 218 TMD patients (32.0 ± 13.1 years) participated in this study. Patients' symptoms, including headache, were surveyed by questionnaire. Temporomandibular joints, jaw muscles, and pericranial muscles including the occipitofrontalis muscle were examined with digital palpation. Pain to palpation (i.e. tenderness) was scored from 0 to 3 according to the patients' response, and frequencies were calculated of pain to palpation scores for each site of the pericranial muscles.

Results: Twelve patients among 218 TMD patients (5.5%) showed pain to palpation (scores of 1, 2) on the occipitalis or frontalis sites, and seven patients (3.2%) had moderate pain (a score of 2) to palpation. Among 218 TMD patients, there was only one patient whose primary symptomatic site of headache corresponded with the result of pain to palpation of the occipitofrontalis muscle.

Conclusion: It can be concluded that examination with palpation of the occipitofrontalis muscle could be considered in the evaluation of TMD patients' headache symptom when other factors have been ruled out.

Key words : Occipitofrontalis, Palpation, Temporomandibular disorders, Headache

I. INTRODUCTION

Headache is very common in temporomandibular disorder (TMD) patients. Previous reports on the prevalence of headache in TMD populations

suggested the headache symptom occurred in a range of 48 to 77 percent of cases.¹⁻⁴⁾ Among the several categories of headache disorders, tension-type headache is the most frequently encountered type. The headache is described as a feeling of wearing a tight headband that causes dull, non-pulsating pain. The typical location of tension-type headache is in the temporal, parietal, frontal and occipital regions.⁵⁾

Numerous etiologic factors are thought to be associated with tension-type headache. Myofascial trigger points commonly produce heterotopic pain expressed as headache.⁶⁾ Myofascial trigger points that usually refer pain to the head region include those of the trapezius muscle, sternocleidomastoid

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muscle, and splenius capitis muscle.⁷⁾ The occipitofrontalis muscle is another source of tension-type headache. The frontalis portion of the occipitofrontalis muscle is associated with frontal headache, and the occipital portion refers pain to lateral cranial and postocular region.⁷⁾

The occipitofrontalis muscle is the major cutaneous muscle of the scalp, and has the frontalis belly anteriorly and the occipitalis belly posteriorly. The galea aponeurotica which covers the vertex as a large, flat, tendinous sheet connects these two bellies.⁸⁾ The frontalis muscle belly raises the eyebrow and wrinkles the forehead, and bilateral action produces an expression of surprise or attention. The occipitofrontalis muscle is supplied by the facial nerve.⁸⁾

Because the occipitalis muscle is not a part of the masticatory system, unlike the temporalis muscle, has gained little attention by clinicians that treat patients with TMD. Therefore, its relationship to TMD patients' headache disorder has not been fully understood. The aims of this study were: (i) first, to survey the frequency of 'pain to palpation' (i.e. tenderness) of the occipitofrontalis muscle in a TMD patient group; and (ii) to identify patients showing pain to palpation of the occipitofrontalis muscle that is consistent with their headache symptom.

II. MATERIAL AND METHODS

1. Subjects

Study subjects were patients aged 18 years or older with TMD signs and symptoms seeking care at Chonnam National University Dental Hospital, Department of Oral Medicine. Subjects were excluded if they presented with one or more of the following conditions: a history of systemic arthritic diseases, fibromyalgia, and acute infectious diseases. Among 268 TMD patients who came to the clinic as their primary visit during the period from July 2008 to July 2009, 218 patients with complete examination data satisfied the selection

criteria of the study group. It consisted of 72 males and 146 females with a mean (\pm SD) age of 32.0 (\pm 13.1) years (range = 18.1 - 71.4 years).

2. Clinical examination

Patients completed a self-administered TMD questionnaire. The questionnaire asked whether they had often experienced headache during the past six months, and overall pain intensity at the time of examination expressed as a numerical rating scale from 0 to 10. Temporomandibular joints (TMJ), jaw muscles, and pericranial muscles including the occipitofrontalis muscle were examined with digital palpation. Examination sites for pericranial muscles were: frontalis, occipitalis, anterior temporalis, middle temporalis and posterior temporalis for the right and left sides. Pain to palpation was scored as 0 for no pain/pressure, 1 for mild pain, 2 for moderate pain, and 3 for severe pain. After clinical and routine radiographic examination, TMD diagnosis was made for each patient.

3. Analysis of the data

The patients that showed pain to palpation (score 1, 2 or 3) on the occipitalis or frontalis sites were selected, and then the frequencies of pain to palpation scores for each site of the pericranial muscles were calculated. The symptomatic sites of headache, TMD diagnosis, and the pain to palpation scores of the pericranial muscles were compared with each other to find any association.

III. RESULTS

Among 218 patients, twelve (5.5%) revealed a pain to palpation score of 1 or more than 1 in one or more sites of the occipitofrontalis muscle (1 male and 11 females). Seven patients (3.2%) showed a score of 2 in the occipitofrontalis muscle (all female), and none of the patients presented a score of 3. To be specific, six patients presented a

Table 1. Pain to palpation (i.e. tenderness) scores of the pericranial muscles, and their frequencies in the twelve TMD patients presenting with tenderness of the occipitofrontalis muscle

No	Gender	Age	Right					Left					Frequency		
			Front	Occipt	TempA	TempM	TempP	Front	Occipt	TempA	TempM	TempP	Score1	Score2	Score3
1	F	19.2	0	1	1	0	0	0	0	1	2	0	3	1	0
2	F	34.7	0	2	2	0	1	0	2	0	1	0	2	3	0
3	F	40.5	1	0	1	0	0	0	0	2	1	1	4	1	0
4	F	48.5	0	0	0	0	0	0	2	2	2	0	0	3	0
5	F	19.9	0	0	0	2	2	0	2	0	0	0	0	3	0
6	F	21.4	0	0	0	0	0	0	2	0	0	0	0	1	0
7	F	22.8	0	1	0	1	0	0	2	1	1	0	4	2	0
8	F	22.8	2	0	0	0	0	2	0	0	0	0	0	2	0
9	F	23.8	1	0	2	2	0	0	0	1	0	0	2	2	0
10	F	36.7	1	0	0	0	0	1	0	0	0	0	2	0	0
11	F	53.9	0	2	1	0	0	0	2	2	0	0	1	5	0
12	M	25.8	0	0	0	0	0	0	1	0	0	0	1	0	0

Frequency	Score 1	3	2	3	1	1	1	1	3	3	1
	Score 2	1	2	2	2	1	1	6	3	2	0
	Score 3	0	0	0	0	0	0	0	0	0	0

Front: frontalis; Occipt: occipitalis; TempA: anterior temporalis; TempM: middle temporalis; TempP: posterior temporalis

Table 2. TMD diagnosis of the twelve patients showing pain to palpation of the occipitofrontalis muscle

No	Gender	Age	Headache symptom	Pain (NRS)	TMD Diagnosis
1	F	19.2	No	5	Acute disc displacement without reduction of the right TMJ
2	F	34.7	No	5	Arthralgia of right TMJ, local myalgia of right and left masseter and temporalis
3	F	40.5	No	8	Arthralgia of right TMJ
4	F	48.5	Yes	8	Acute disc displacement without reduction of the left TMJ, myofascial pain of the left masticatory muscles
5	F	19.9	Yes	6	Local muscle soreness of right temporalis and masseter
6	F	21.4	Yes	1	Chronic disc displacement without reduction of the left TMJ
7	F	22.8	Yes	2	Osteoarthritis of the right TMJ, myofascial pain of right and left masseter
8	F	22.8	Yes	2	Bruxism, disc displacement with reduction of the right TMJ
9	F	23.8	Yes	8	Local muscle soreness of right temporalis and masseter
10	F	36.7	Yes	1	Disc displacement with reduction of right and left TMJs
11	F	53.9	Yes	9	Local muscle soreness of temporalis and masseter on both sides
12	M	25.8	Yes	1	Bruxism

score of 2 on the occipitalis site, whereas only one patient presented a score of 2 on the frontalis site. (Table 1).

Among the twelve patients who showed pain to palpation of the occipitofrontalis muscle, nine patients responded that they often experienced headache. TMD diagnosis of the twelve patients showing pain to palpation of the occipitofrontalis was diverse: myalgia only for three patients, disc displacement for five patients, TMJ arthralgia for two patients, and TMJ arthritis with myalgia for one patient. Overall pain intensity varied from 1 to 9 for the twelve patients (Table 2).

Among the twelve TMD patients, the symptomatic site of head pain was coincided with the site of pain to palpation of the pericranial muscles in one patient (No. 5). Patient No. 5 had a history of trauma on the left occipitalis region and craniotomy surgery on the right temporal region. Both regions showed a pain to palpation score of 2 upon examination.

IV. DISCUSSION

The occipitofrontalis muscle is composed of a pair of thin, broad muscles covering the top of the skull. It consists of an occipital belly and a frontal belly connected by an extensive aponeurosis.⁸⁾ However, one recent study⁹⁾ reported that this muscle is composed of two anatomically different muscles. The superficial fascia overlies the occipital belly and ends at the frontal belly. The occipital belly becomes the galea aponeurotica and inserts into the underside of the frontal belly. The occipital and frontal bellies have physiologically independent actions. The frontal belly initially raises the eyebrow, draws the scalp forward, and is active in the wrinkling of the forehead. The occipital belly alone is responsible for drawing back the galea aponeurotica, and eventually can be active during raising of the eyebrows.¹⁰⁾

The frontalis muscle has been found to respond to various types of stimulation, including auditory¹¹⁾, taste¹²⁾, and mental fatigue¹³⁾. Patients with

myofascial pain showed higher electromyographic (EMG) response of the frontalis muscle to stress.¹⁴⁾ Resting EMG activity of the frontalis muscle was higher in TMD patients with myofascial pain.¹⁵⁾ Clenching increased frontalis EMG activity from rest however, the use of an interocclusal appliance reduced frontalis EMG activity.¹⁶⁾ In tension-type headache patients, algometric and EMG recordings at the frontalis muscle were more impaired during mental arithmetic.¹⁷⁾ Prolonged experimental frontalis muscle contraction, failed to produce headache in a group with relatively frequent tension-type headache.¹⁸⁾ The occipitalis muscle had high tension levels in tension-type headache and migraine patients under a condition of stress.¹⁹⁾

The present study employed pain response to manual palpation of the pericranial muscles in TMD patients for the assessment of the muscle condition. The diagnostic value of palpation techniques has been based on the inference that pain or tenderness results from physiological alterations in structures such as muscle or bone.²⁰⁾ Palpation by an experienced clinician may be a sufficiently reliable method for screening painful areas, and therefore can reveal the site of the pain.²¹⁾ Fair to excellent agreement between trained examiners for tenderness assessment methods has been demonstrated.²²⁾ On a 4-point scale, a patient's reaction to tenderness on the palpation is graded with ordinal data of 0 to 3. Clinical changes in muscle and joint tenderness are more easily detected with a 4-point scale than a 2-point scale.²³⁾ For myofascial trigger point examination, spot tenderness of both the frontalis and occipitalis muscles is identified by flat palpation.⁷⁾ The present study revealed that about 5% of the TMD patients showed pain to palpation in the occipitalis or frontalis regions, and 3% had moderate pain to palpation in these regions. Reports about the prevalence of tenderness of the occipitofrontalis muscle are very few. One study reported that headaches are predominantly temporal, but 24% occur in the frontal region.²⁴⁾

Hatch et al²⁵⁾ reported that muscle tenderness

was positively associated with the diagnosis of tension-type headache. However, caution is needed when interpreting the association between tenderness of the pericranial muscles and headache. Currently, it is unclear whether the presence of pericranial muscle tenderness is the cause or the result of the headache.²⁶⁾ Moreover, many patients with tension-type headache present without pericranial muscle tenderness.²⁶⁾ In this study, there was only one patient whose primary symptom of head pain coincided with pain to palpation of the occipitofrontalis muscle among 218 TMD patients. In other patients, a direct association between the patients' symptomatic site and the tenderness site of the occipitofrontalis muscle could not be demonstrated. This finding suggests that the correlation of the occipitalis muscle tenderness to TMD patients' headache is rather weak. Therefore, clinical examination of the occipitofrontalis muscle could be considered as another measure if other significant factors are not evident when determining the source of headache.

There are some limitations that need to be addressed regarding the present study. First, the patients' headache symptom was not evaluated in detail or specifically defined. Second, the entire process of data acquisition including patient interview and clinical examination was performed by one examiner. Intra- and inter-rater reliability could not be evaluated. Third, the sample size of the patients with occipitofrontalis muscle tenderness was not large enough to determine the clear association between tenderness of the occipitofrontalis muscle and TMD. Future research should examine a healthy control group limit the TMD subgroup with muscular pain only, for example; and employ a specific headache definition.

V. CONCLUSION

This study examined 218 TMD patients to survey the frequency of pain to palpation of the occipitofrontalis muscle, and revealed that about 5% of the TMD patients showed pain to palpation in

the occipitalis or frontalis regions and 3% had moderate pain to palpation in these regions. Within the limits of this study, it can be concluded that examination with palpation of the occipitofrontalis muscle could be considered in the evaluation of TMD patients' headache symptom when other factors have been ruled out.

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국문초록

측두하악장애 환자에서의 뒤통수이마근의 촉진 통증 양태

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본 연구의 목적은 측두하악장애 환자 그룹에서 뒤통수이마근의 촉진 통증의 빈도를 조사하고, 환자의 두통 증상과 일치하는 뒤통수이마근의 촉진 통증을 보이는 환자를 확인하는 것이었다. 218명의 환자(32.0 ± 13.1세)를 대상으로 두통을 포함한 증상에 대한 문진을 하였으며, 턱관절, 씹기근육 및 뒤통수이마근을 포함한 머리둘레근육을 촉진으로 검사하였다. 촉진에 대한 통증은 환자의 반응에 따라 0에서 3까지 점수를 부여하였고 머리둘레근육의 각 부위에 대해 촉진 통증 점수의 빈도를 산출하였다. 218명의 측두하악장애 환자 중 12명(5.5%)에서 뒤통수힘살 또는 이마힘살 부위에서 촉진 통증(점수 1, 2)을 보였고, 그 중 7명의 환자(3.2%)에서는 중등도의 촉진 통증(점수 2)을 보였다. 두통의 주 증상 부위와 뒤통수이마근의 촉진 통증 결과가 일치하는 환자는 218명의 측두하악장애 환자 중 1명이었다. 결론적으로 측두하악장애 환자의 두통 증상을 평가하는데 다른 요인들이 관련되지 않는다면 뒤통수이마근에 대한 촉진 검사를 고려해 볼 수 있다.

주제어 : 뒤통수이마근, 촉진, 측두하악장애, 두통
