

## Evaluating secondary otalgia pain related to the TMJ and cervical region

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**Abstract. Objectives:** Understanding the etiologies of secondary otalgia can help in the assessment and treatment of the disease. The two most common causes of secondary otalgia are temporomandibular joint (TMJ) disorders (TMD) and cervical region disorders (CRD). The aim of this study was to determine the pain characteristics of secondary otalgia related to TMD and CRD, and to evaluate how these features affect diagnostics.

**Methodology:** Two hundred patients admitted to the outpatient clinic with secondary otalgia complaints and suspected TMD and/or CRD were included. Based on standardized examinations and interviews, patients were classified into 3 groups; CRD group (47.5%), TMD group (46%), and the mixed group (6.5%). All patients were questioned regarding their pain and general characteristics. Data obtained were compared between groups.

**Results:** There were no significant differences between any groups in terms of mean age, average duration of the complaint, or gender distribution ( $p > 0.05$ ). Pain in the TMD group was felt in the inner ear (51.3%) and front of the ear (40.8%,  $p < 0.05$ ), while pain in the CRD group was mostly localized behind the ear (47.6%,  $p < 0.05$ ). There were no significant differences between the CRD and TMD groups in terms of pain characteristics (duration, daily course, and severity;  $p > 0.05$ ).

**Conclusions:** It may not be possible to find etiologic factors in patients with secondary otalgia. Most patients reporting secondary otalgia also had CRD, TMD, or both. Therefore, a detailed examination and questioning of these patients will be helpful in the diagnosis.

### Introduction

Otalgia can be defined as a sensation of pain in the ear. A large number of the consultations to otorhinolaryngology clinics are for otalgia. Pain caused by the ear itself is defined as primary otalgia, whereas pain felt in the ear but due to pathologies in neighboring or distant regions is referred to as secondary otalgia.<sup>1</sup> For this reason, it is important to understand the innervation of the ear and its relationship with anatomical structures in order to identify possible causes of secondary otalgia pain.

Various diseases can cause ear pain since the ear has rich sensory innervation through both the cranial (V, VII, IX, and X) and cervical (2 and 3) nerves.<sup>2</sup> Consistent with the dispersion region of these nerves, the most common causes of secondary otalgia are dental, cervical, temporomandibular joint (TMJ), or pharyngeal pathologies.<sup>2,3,4</sup> A detailed otorhinolaryngology examination should be conducted on patients with otalgia so that important pathologies are not missed such as oncologic lesions. However, detecting TMJ and cervical pathologies may not always be possible

by clinical examination alone. For this reason, a detailed examination of the cervical region and TMJ complaints in patients with secondary otalgia is of great importance in determining the etiology.

In this study, we evaluated the characteristics of pain and its relationship with cervical and TMJ in patients with otalgia who were admitted to our outpatient clinic with otalgia complaints and no obvious otorhinolaryngological pathologies. We believe that the data obtained may help to narrow down the possible causes of secondary otalgia.

### Materials and methods

The study was conducted between February and September 2016 in patients with otalgia admitted to the otorhinolaryngology clinic of the Sakarya University Training and Research Hospital. Approval by the ethics committee of the Sakarya University was obtained prior to the study. Inclusion of patients in the study was conducted in two stages. Patients older than 18 years with ear pain and a normal otologic examination were initially evaluated with a diagnosis of secondary otalgia.

The absence of previous mandibular or cervical trauma, surgical history, absence of known tooth and gum diseases were determined as inclusion criteria.

#### Patient Examination

A detailed otorhinolaryngologic examination was performed on patients diagnosed with secondary otalgia. The nasal cavities, pharynx, oral cavity, nasopharynx, and larynx were evaluated. In patients with no findings of a clear pathology related to otalgia in these regions, the jaw and cervical joints were then examined and evaluated. During the temporomandibular area examination, the presence of pain and tenderness in the joint point and the masticator muscle during jaw movements, and the presence or absence of crepitation or dislocation was assessed.

During the cervical region examination, patients were asked to perform active and passive cervical flexion, extension, and rotation movements. The presence of any motion restriction in the neck joints or pain during joint movements was evaluated and recorded. In addition, the presence of palpation, pain, and stiffness in the neck muscles (muscles of the skull base and the semispinalis capitis, trapezius, rhomboid, and levator scapulae muscles) was evaluated and recorded.

As a criterion of restricted neck movements, movement limitations in the side with pain that was 50% more than that of the contralateral side was evaluated.

#### Questionnaire evaluation and grouping

General characteristics of the patients' age, gender distribution, and duration of pain were assessed and recorded. Patients were asked to complete a questionnaire that was originally written in the Turkish language. This questionnaire consisted of 9 questions to identify pain characteristics and to classify the otalgia as being related to CRD and TMD pathologies (Figure 1). In the questionnaire survey, patients were identified as having complaints about the TMJ and cervical region. A total of 200 patients of these patients, who were diagnosed as having cervical and/or TMJ pathologies in the detailed examination, were included in the study. Patients were allocated to the TMD, CRD, or both TMD and CRD (mixed) groups. Those who had complaints

<b>1-How long have you had ear pain?</b>		
<b>2-How intense has your ear pain?</b>		
<b>Please describe the severity of the pain.</b>		
Weak 0 1 2 3 4 5 6 7 8 9 10 Strong		
<b>3-Describe the location of your pain.</b>		
Front of ear	Inside of ear	Behind the ear
<b>4-Please indicate the relationship between the pain and the time of day.</b>		
Often during the day	Often at night	No difference
<b>5-How is the pain process?</b>		
Continuous	Intermittent	
<b>6-Do you have pain during jaw movements?</b>		
<b>7-Do you have any jaw joint disorders?</b>		
<b>8-Do you have pain in the cervical region?</b>		
<b>9-Do you have any cervical region disorders?</b>		

Figure 1

Questionnaire on secondary otalgia

in both regions were included in the mixed group. On the VAS used, pain less than 5 was classified as mild/tolerable, while a score greater than 5 was classified as severe/unbearable.

#### Statistical analysis

Statistical analysis was performed using IBM SPSS version 20.0 statistical software for Windows (IBM Corporation, Armonk, New York, USA). Mean  $\pm$  standard deviation (SD) was used for continuous variables and percentage values were used for categorical variables. Kolmogorov-Smirnov analysis was performed for normality analysis and non-parametric tests were preferred based on the results of this analysis. Mann-Whitney U test was used for bilateral comparisons between groups, and Kruskal Wallis test was used for multiple comparisons. In case of statistical significance as a result of multiple comparisons, Friedman test and pairwise comparisons were performed as post-hoc tests. Chi square test was used for comparisons of categorical variables. P values less than 0.05 were considered statistically significant.

Kruskal Wallis test was used to compare the groups in terms of age, gender, and pain duration. Chi square test was used to assess whether there

Table 1

Group data (age, gender, pain duration) comparison

	TMD Group n=92	CRD Group n=95	Mixed Group n=13	Total n=200	P*
<b>Mean Age±SD</b>	44.50±12.4	43.67± 13.1	51.62±31.4	44.14±11.2	0.376
<b>Gender, n (%)</b>					
Male	6 (10.35)	10 (10.52)	1	31 (15.5)	0.346
Female	52 (89.65)	80 (84.21)	12	169 (84.5)	
<b>Pain Duration</b>	132.7±18.3	141±31.3	129.45±17,5	134±22.3	0.706

n: number of patients, SD: standard deviation, \*Kruskal Wallis test.

Table 2

Comparison of patients' pain characteristics (localization, occurrence during the day, continuity, and severity)

	TMD Group (n/%)	CRD Group (n/%)	Mixed Group (n/%)	Total (n/%)	P*
<b>Pain Localization</b>					
Front	23 (39.65%)	15 (15.78%)	5 (38%)	50 (25%)	<b>0.001</b>
Inner	30 (51.72%)	32 (33.68%)	6 (46%)	91 (45.5%)	
Back	5 (8.62%)	48 (50.52%)	2 (16%)	59 (29.5%)	
<b>Course during day</b>	5 (8.62%)	15 (14.57%)	4 (30%)	27 (13.5%)	0.343
Day Night	9 (15.51%)	18 (17.47%)	2 (15%)	34 (17%)	
No difference	44 (75.86%)	62 (67.96%)	7 (55%)	139 (69.5%)	
<b>Continuity</b>					
Continuous	8 (13.8%)	13 (12.62%)	0	29 (14.5%)	0.435
Intermittent	50 (86.2%)	90 (87.38%)	13 (100%)	171 (85.5%)	
<b>Pain Severity</b>					
Severe/ unbearable	18 (31.03%)	25 (26.31%)	5 (38%)	31 (15.5%)	0.732
Mild/ tolerable	40 (68.97%)	70 (73.68%)	8 (62%)	169 (84.5%)	

n: number of patients. \* Chi-square test.

was any difference between the groups in terms of gender, pain localization, severity, intra-day relationship, and frequency of pain.

## Results

### Patient Characteristics

The age of patients participating in the study ranged from 18 to 80 years. Mean age was 44.14±11.2 years. Of the patients, 31 (15.5%) were males and 169 (84.5%) were females. Pain duration ranged from 4 to 730 days. The general average duration of pain was 134±22.3 days (Table 1).

Twenty nine (14.5%) patients stated that their pain was continuous, whereas 171 (85.5%) patients stated that their pain was intermittent. Of the patients, 50 (25%) described pain in front of the ear, 59 (29.5%) in back of the ear, and 91 (45.5%) inside the ear. One-hundred thirty eight (69%) patients defined their pain as mild/bearable, whereas 62 (31%) described their pain as severe/

unbearable. When the pain course during the day was evaluated, 27 (13.5%) patients stated that the pain was more prominent during the daytime and 34 (17%) stated that the pain was more prominent at night. One-hundred thirty nine (69.5%) patients stated that their pain did not differ within a given time frame (Table 2).

### CRD Group

There were 95 (47.5%) patients in the CRD group. Mean age of the patients was 43.67± 13.1 years. Ten patients were males (10.52%) and 80 were females (84.21%). Mean age was 43.67 years. In patients with cervical ear pain, the average duration of pain was 141±31.3 days. Of these patients, 48 (50.52%) stated that they felt pain in the back of the ear, 15 (15.78%) felt pain in front of the ear, and 32 (33.68%) felt pain inside the ear. In the CRD group, 25 (26.31%) patients described their pain as severe/unbearable and 70 (73.68%) described their pain as mild/bearable. When the daily course of pain was

evaluated in this group, 18 (17.47%) patients stated that their pain increased at night, and 15 (14.57%) patients stated that their pain was more prominent during the day. Sixty-two (67.96%) patients stated that there was no difference in their pain throughout the day. Thirteen (12.62%) patients stated that the pain was continuous, and 90 (87.38%) patients stated that the pain was intermittent.

#### *TMD Group*

The number of patients in the TMD group was 92 (46%). The mean age in this group was 44.50±12.4 years. Mean duration of pain was 132.7±18.3 days. Six patients (10.35%) were males and 52 were females (89.65%).

In the TMD group, 23 (39.65%) patients stated that the pain was in front of the ear, 5 (8.62%) stated that the pain was at the back of the ear, and 30 (51.72%) stated that the pain was inside the ear. Eighteen (31.03%) patients described their pain as severe/unbearable, whereas 40 (68.97%) described their pain as mild/bearable. Nine (15.51%) patients in the TMD group stated that the pain was more prominent at night, 5 (8.62%) stated that pain was more prominent during the day, and 44 (75.86%) stated that there was no difference in the pain between day and night. In this group, 8 (13.8%) patients stated that their pain was continuous and 50 (86.2%) stated that their pain was intermittent.

#### *Mixed Group*

The mixed group included 13 (6.5%) patients. Mean age in this group was 51.62±31.4 years. Mean pain duration was 129.45±17.5 days. Twelve patients (92%) were females and only 1 patient (8%) was male. All patients in this group stated that their pain was intermittent. Five patients (38%) described the pain as being in front of the ear, 6 patients (46%) described pain inside the ear, and 2 (16%) patients described the pain as being at the back of the ear. Four (30%) patients stated that their pain was more prominent during the day, 2 (15%) stated that their pain was more prominent at night, and 7 (55%) patients stated that the pain did not differ between day and night. Eight patients (62%) described their pain as severe/unbearable, whereas 5 (38%) patients described it as mild/bearable.

#### *Comparison of Groups*

There were no significant differences between any groups in terms of mean age ( $p = 0.376$ ) and

average duration of pain ( $p = 0.706$ ). No significant differences in gender distributions were found between the pain groups ( $p = 0.346$ ). However, when we looked at the general population of patients, the majority of patients were females (Table 1).

Comparing groups in terms of pain characteristics, pain in the TMD group was more often localized to the inner (51.3%) and front (40.8%) ( $p = 0.001$ ) sections of the ear, and the pain in the CRD group was mostly localized behind the ear (47.6%,  $p = 0.001$ ).

When daily pain course was examined between the groups, no significant correlation in pain course was found in any of the groups ( $p = 0.343$ ). When the groups were assessed for pain frequency, there were no significant differences between the groups in terms of pain continuity ( $p = 0.435$ ).

When the severity of pain was examined between groups, most patients in the three groups described the pain as mild / tolerable. There was no significant difference between groups in this issue ( $p = 0.732$ ) (Table 2).

## **Discussion**

In children, otalgia is mostly of real otologic origin, while the most common causes of otalgia in adults are cervical pathologies, TMD, and dental pathologies.<sup>5,6,7</sup> Dental and gingival pathologies may be detected by oropharyngeal assessment and detailed anamnesis. However, it may not always be possible to distinguish ear pain caused by TMJ or cervical pathology in the initial evaluation and in a crowded outpatient clinic setting. Since the two most common etiologic causes are temporomandibular and cervical pathologies, we evaluated these two etiologies in our study. Although there are studies on the etiological causes of otalgia in the literature, there are not many studies that evaluate diagnostic characteristics.

There is a common effect of multiple mechanisms in the development of secondary otalgia. This is due to the fact that the ear and the external ear canal develop from different developmental roots and have different sensory-neural innervations. Since visceral and somatic senses are carried to the brain through the same neurons, patients may not always be able to localize the pain correctly.<sup>6,7</sup> While the auriculotemporal nerve (5th cranial nerve) is affected in TMD, dental diseases, or diseases involving the mandibular bone, pathologies of

cervical origin are characterized by ear pain caused by the greater auricular (C2) and lesser occipital (C3) nerves.<sup>8</sup> In patients with TMD, otalgia is caused by both the TMJ itself and by spasms in masticator muscles. These patients often feel pain in the ear or the preauricular area while chewing and talking. In a previous study, otalgia was observed in 42% of patients with TMD.<sup>9</sup> In the same study, it was noted that the patients in this group were mostly female. In our study, the ratio of patients who had complaints of reflected otalgia due to TMD was 46%. In these patients, there was tenderness around the TMJ and complaints about the movement of the joint. The patients in this group described the pain as being in the inner part and front of the ear, and as bearable and intermittent. There was no significant difference in pain during the day and at night when compared with the other groups.

Causes of cervical otalgia frequently include osteoarthritis associated with the neck and traumatic cervical nerve pathologies.<sup>10</sup> In a study of 123 patients with ear pain complaints, 88% were found to have an underlying cause of cervical spine pathology.<sup>11</sup> In another study on referred otalgia etiology, the majority of secondary otalgia patients were those with cervical joint disorders.<sup>12</sup> In our study, the number of patients in the cervical joint group was higher. The patients in this group described the pain as mostly being behind the ear. The majority of patients in this group also described the pain as bearable, which was similar to the TMD group. The majority of the patients in all three groups stated that there was no specific course of the pain during the day, and that the pain was mostly intermittent.

In addition to the standard otorhinolaryngologic examination, a detailed examination aimed at determining the etiology plays a significant role in the evaluation of otalgia. Palpation of the jaw muscles in patients suspected of TMD, and palpation and evaluation of the neck muscles in patients with spinal joint disorders gains importance.<sup>6,13</sup> Radiological evaluations may be helpful in this regard, but it is not always possible to make a differential diagnosis by a radiological examination. In particular, magnetic resonance imaging can help identify structural abnormalities in the cervical and spinal region.<sup>14</sup> In the study performed by Kuttilla et al., patients who had referred otalgia complaints were divided into two groups according to TMD and cervical pathologies based only on examination

findings and questionnaire results.<sup>15</sup> In our study, we also used a questionnaire consisting of 9 items and muscle joint examination methods. In our study, there was a significant difference in the localization and severity of pain in both groups.

There was no difference between the groups in terms of the daily pain course and pain frequency. In similar studies conducted on this subject, cervical joint pathology was reported mostly in women and in younger patients.<sup>11,16</sup> In our study, it was striking that there was no difference between the groups in terms of gender and age. However, it was interesting to note that the majority of patients were females.

We evaluated the differential diagnosis of patients with a short questionnaire during our study. We believe that this questionnaire could be helpful to other clinicians in the evaluation of patients with secondary otalgia. When the overall data were evaluated in otalgia due to TMD and CRD, certain symptoms and examination findings were helpful in making the differential diagnosis. Therefore, it is especially important to question the localization of the pain and add this information to the examination of orofacial and CRD palpation in these patients. Another important point in our study was that there were 13 patients with both TMJ and cervical problems. For this reason, in order to differentiate between the etiologies in patients with secondary otalgia, it may not be sufficient to focus on one single area. In order to accelerate the differential diagnosis, unnecessary loss of time will be prevented for both physicians and patients. Detailed future studies, which include patients with other etiologies, will provide additional data about secondary otalgia.

## Conclusion

Most of the patients reporting secondary otalgia had signs and/or symptoms of CRD or TMD pathology. The evaluation of the characteristics of the pain and a detailed examination of the cervical spine and orofacial region must be performed routinely in the process of diagnosing patients with secondary otalgia. As shown in our study, the pain experienced by patients was localized on the front side due to TMD, whereas it was localized behind the ear in patients with CRD. However, there was no distinguishing difference when we looked at other findings about the pain characteristics. We

believe that the examination findings will be more helpful in the differential diagnosis.

## References

1. Shah RK, Blevins NH. Otagia. *Otolaryngol Clin North Am.* 2003;36(6):1137-1151.
2. Yanagisawa K, Kveton JF. Referred otalgia. *Am J Otolaryngol.*1992;13 (6):323-327.
3. Kuttilla S, Kuttilla M, Niemi PM, Le Bell Y, Alanen P,Suonpää J. Secondary otalgia in an adult population. *Arch Otolaryngol Head Neck Surg.* 2001;127(4):401-405.
4. Charlett SD, Coateswoth AP. Referred Otagia a structured approach to diagnosis and treatment. *J Clin Pract.* 2007;61 (6):1015-1021.
5. Mansbach AL, Brihaye P, Casimir G, Dhooghe I, Gordts F, Halewyck S, Hanssens L, Lemkens N, Lemkens P, Leupe P, Mulier S, Van Crombrugge L, Van Der Veken P, Van Hoecke H. Clinical aspects of chronic ENT inflammation in children. *B-ENT.* 2012;8(19):83-101
6. Keersmaekers K, De Boever JA, Van Den Berghe L. Otagia in patients with TMD disorders. *J Prosthet Dent.* 1996;75(1):72-76.
7. Powers WH, Britton BH. Nonotogenic otalgia: diagnosis and treatment. *Am J Otolaryngol.*1980;2(2):97-104.
8. Carol A, Bauer, Herman A, Jenkrs. Otologic symptoms and syndromes. In: Flint PW, Haughey BH, Lund VJ, et al. *Cummings otolaryngology Head and neck surgery.* 4th ed. Mosby Inc, New York; 2005:2820-2867.
9. Ramirez LM, Ballesteros LE, Sandoval GP. Otological symptoms among patients with temporomandibular joint disorder. *Rev Med Chil.*2007;135(12):1582-1590.
10. Neilan RE, Roland PS. Otagia. *Med Clin North Am.* 2010;94(5):1031-1046.
11. Jaber JJ, Leonetti JP, Lawrason AE, Feustel PJ. Cervical spine causes for referred otalgia. *Otolaryngol Head Neck Surg.* 2008;138(4):479-485.
12. Kim SH, Kim TH, Byun JY, Park MS, Yeo SY. Clinical Differences in Types of Otagia. *J Audiol Otol.*2015;19(1):34-38.
13. McNeill C ,Ed. *Temporomandibular disorders: Guidelines for classification, assessment, and management.* Chicago: Quintessence, 1993.
14. Chen RC, Khorsandi AS, Shatzkes DR, Holliday RA. The radiology of referred otalgia. *AJNR AM J Neuroradial.*2009;30(10):1817-1823.
15. Kuttilla S, Kuttilla M, Le Bell Y, Alanen P,Suonpää J. Characteristics of Subjects with Secondary Otagia. *J Orofacial Pain.* 2004;(18): 226-234.
16. Alshami AM. Prevalance of spinal disorders and their relationships with age and gender. *Saudi Med J.* 2015;36(6):725-730.

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