# Ear, Nose, and Throat Symptoms in Patients With TMD: The Association of Symptoms According to Severity of Arthropathy

**Riccardo Ciancaglini, MD, DMD**
Full Professor
Chair of Prosthetic Dentistry
IRCCS Ospedale San Raffaele
University of Milan
Milan, Italy

**Paolo Loreti, MD, DMD**
Resident
Department of Dentistry and Stomatology
Sao Paolo Hospital
University of Milan

**Giovanni Radaelli, MA**
Department of Informative Systems
University of Milan

**Correspondence to:**
Riccardo Ciancaglini
Professor of Prosthetic Dentistry
C.so Buenos Aires 18
Milan, Italy

*The association of the severity of temporomandibular arthropathy to ear, nose, and throat symptoms in patients with temporomandibular disorders has been poorly investigated in spite of its importance in clinical practice. The aim of this study was to see whether persons with more severe arthropathy have more ear, nose, and throat symptoms. Anamnestic and clinical evaluations were obtained at admission for 815 subjects with signs and symptoms of temporomandibular disorders of arthrogenic origin in physical tests. The severity of arthropathy was evaluated by a clinical index scoring joint sounds, tenderness to temporomandibular palpation, and pain severity in the temporomandibular joint region. Univariate analysis showed that the severity of arthropathy was significantly associated with ear, nose, and throat symptoms as a whole ($P < .001$) and specifically with deafness ($P < .001$) and dizziness ($P < .05$); however, tinnitus and earache were not statistically significantly associated. Multiple analysis showed deafness to be the only ear, nose, and throat variable independently associated with severity of arthropathy ($P < .01$). These findings lead to the conclusion that there is a considerable association between temporomandibular disorders of arthrogenic origin and ear, nose, and throat symptoms, especially deafness. They also suggest that further investigations should be done to compare the specific roles of craniocervical arthritis versus temporomandibular disorders in the etiology of ear, nose, and throat symptoms related to craniomandibular and craniocervical joint involvement.*
J OROFACIAL PAIN 1994;8:293–297.

Ear, nose, and throat (ENT) symptoms, such as deafness, dizziness, tinnitus, and earache, are common in patients with temporomandibular disorders (TMD).[1–17] Hypotheses of why ENT symptoms are associated with temporomandibular joint (TMJ) dysfunction have been suggested by several investigators.[1–5,11,13,16,18,19] Costen[1] observed 125 patients during a 2-year period. He found that 42 subjects (33.6%) had ear symptoms and the majority of the 42 ear cases complained of headache besides deafness, dizziness, or tinnitus, which he attributed to condylar posterior displacement pressing upon otic structures or dysfunction of the tensor palatini muscles.

Myrhaug[2,3] examined 1,541 patients with malocclusion and symptoms of TMJ arthropathy, of whom 500 (32.4%) had tinnitus and popping sensations in the ear, 437 (28.4%) reported dizziness, and 324 (21.0%) complained of earache. He suggested that symptoms were related to a loss of vertical dimension that induced

reflex contractions of the middle ear muscles, which was caused by noxious stimuli in the trigeminal area. Myrhaug proposed that the result of such contractions would be increasing derangement of the sound-conducting apparatus as the impedance increases.

Later, Arlen[4] described an otomandibular syndrome in patients with TMD, which included pain in and around the ear, dizziness, and tinnitus evaluated by audiograms and tympanograms. He showed that changes in impedance and reduction of the mobility of the tympanic membrane in TMJ patients were caused by tonic contractions of the tensor tympani muscle.

Komori et al[5] examined autopsy specimens of 12 Japanese adult cadavers by a superior approach through the middle cranial fossa. They found a bilateral ligament that they called the discomalleolar, which passed through the petrotympanic fissure and attached the neck of the malleus to the TMJ articular disc. They proposed that this ligament might be a factor in explaining the existence of the ENT symptoms associated with TMD. However, they concluded that further studies should be carried out to confirm the role of this ligament in the TMJ disorders.

Rodriguez Vazquez et al[18,19] recently confirmed Pinto's finding[20] that human embryos have a malleolomandibular ligament that connects the mandibular lingula and TMJ disc to the middle ear. These findings form an anatomic basis for the clinical relationship between TMD and ENT symptoms.[18,19]

To see whether there are more ENT symptoms in TMD patients with more severe arthropathy, a clinical cross-sectional study of patients referred to a TMJ clinic was conducted.

## Materials and Methods

Between January 1985 and October 1991, 815 patients with evidence of TMD were assessed at admission for severity of arthropathy and ENT symptomatology. Patients with a previously documented or recognized ENT pathology were not admitted to the study to minimize overlapping of primarily ENT pathologies on stomatognathic disorders. Also excluded were patients with TMD of myogenic origin according to the criteria of Hansson et al.[21] The patients were admitted consecutively to the clinic, and histories and clinical examinations were done subsequently by the same examiner. Eighteen additional patients were rejected because of suspected cervicogenic origin of ENT symptoms related to major neck traumatism or cervical strains. Therefore, 797 patients were included in the study (534 women and 263 men; mean age 37.4 ± 8.3 years; range 15 to 60 years).

The examinations included: general medical history; TMD history for ENT symptoms (deafness, dizziness, tinnitus, and earache) assessed by a questionnaire; palpation and auscultation of TMJs; and physical tests (active/passive cervical and jaw movements and resistance tests). Temporomandibular joint polytomography or computerized tomography (CT) at intercuspal position and at maximal mouth opening were performed to confirm the arthrogenic origin of the disorders and to exclude inflammatory diseases or tumors. The severity of arthropathy was scored by the Clinical Arthropathy Index (CAI).[22] This index includes the assessment of (I) TMJ noise, (II) spontaneous TMJ pain, and (III) tenderness of TMJ to digital palpation.

I. A TMJ noise that had lasted less than 3 months was scored 0. A noise that had lasted between 3 and 6 months was scored 1. A noise that had lasted more than 6 months was scored 2.
II. Spontaneous pain was scored 0 when absent and 3 when present.
III. No tenderness of TMJ to digital palpation was scored 0. A mild degree of tenderness, corresponding to a detectable pain, was scored 2. A sharp pain with physical reaction elicited by joint palpation was scored 3.

The overall CAI was determined by the sum of the single scores for the aforementioned examination steps, ranging from 0 (no arthropathy) to 8 (severe arthropathy).

Univariate statistical analysis was performed with the nonparametric Mann-Whitney test to compare severity of arthropathy in the patient group with ENT symptoms to that in the group without ENT symptoms. A multiple regression analysis was also applied, adjusting for confounding factors (age and sex), to assess the independent association of each symptom with the severity of arthropathy. In the multiple analysis, the statistical significance of the estimated coefficient $\beta$ related to the variables was calculated from the statistic $\beta/SE(\beta)$, in which $SE(\beta)$ is the standard error.

## Results

Table 1 shows the distribution of the 797 patients according to severity of arthropathy and ENT

**Table 1** Distribution of 797 Patients According to Severity of Arthropathy and ENT Symptoms*

| Severity of arthropathy (CAI) | All patients | No symptoms | | Deafness | | Dizziness | | Tinnitus | | Earache | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | n | % | n | % | n | % | n | % | n | % |
| 0 | – | – | – | – | – | – | – | – | – | – | – |
| 1 | 55 | 52 | 94.5 | 1 | 1.8 | 1 | 1.8 | 2 | 3.6 | – | – |
| 2 | 149 | 137 | 91.9 | 3 | 2.0 | – | – | 8 | 5.4 | 1 | 0.7 |
| 3 | 234 | 197 | 84.2 | 18 | 7.7 | 3 | 1.3 | 14 | 6.0 | 5 | 2.1 |
| 4 | 196 | 156 | 79.6 | 17 | 8.7 | 4 | 2.0 | 19 | 9.7 | 6 | 3.0 |
| 5 | 96 | 78 | 81.3 | 12 | 12.5 | 2 | 2.0 | 4 | 4.2 | 1 | 1.0 |
| 6 | 57 | 45 | 78.9 | 8 | 14.0 | 3 | 5.3 | 4 | 7.0 | – | – |
| 7 | 10 | 8 | 80.0 | 2 | 20.0 | – | – | – | – | – | – |
| 8 | – | – | – | – | – | – | – | – | – | – | – |
| Total | 797 | 673 | 84.4 | 61 | 7.6 | 13 | 1.6 | 51 | 6.4 | 13 | 1.6 |

*Percentages are for each specified level of arthropathy.

symptoms. A total of 124 patients (15.6%) had some symptoms. The percentage with deafness increased monotonically with severity of arthropathy, going from 1.8% (for CAI = 1) to 20% (for CAI = 7), whereas the maximal value for dizziness was 5.3% (for CAI = 6). The percentage for tinnitus and earache reached a maximum value of 9.7% and 3.0%, respectively (for CAI = 4), and showed no trend to increase with increasing severity of arthropathy. Two symptoms were present simultaneously in 12 patients (1.5%): 1 patient had deafness and dizziness; 7 had deafness and tinnitus; 3 had deafness and earache; and 1 had dizziness and tinnitus. Three symptoms (deafness, dizziness, and tinnitus) were present simultaneously in 1 patient (0.1%). None of the patients had all four ENT symptoms.

Table 2 shows the significance of the relationship between severity of arthropathy and ENT symptomatology. Statistically significant associations were found for the overall ENT symptoms ($P < .001$), deafness ($P < .001$), and dizziness ($P < .05$). Tinnitus and earache were not significantly associated.

A multiple regression analysis, in which the existence of the symptoms was adjusted for sex and age, was used to evaluate the independent association of each symptom with the severity of arthropathy (Table 3). At that analysis, deafness ($P < .01$) was the only ENT symptom significantly associated with the severity of arthropathy.

**Table 2** Association Between ENT Symptoms and Severity of Arthropathy

| Groups of comparison | Severity of arthropathy (CAI) | | | |
|---|---|---|---|---|
| | mean | SD | median | P* |
| No symptoms | 3.35 | 1.38 | 3 | |
| ENT symptoms | 3.81 | 1.23 | 4 | < .001† |
| No deafness | 3.37 | 1.36 | 3 | |
| Deafness | 4.10 | 1.26 | 4 | < .001† |
| No dizziness | 3.40 | 1.34 | 3 | |
| Dizziness | 4.15 | 1.46 | 4 | .046† |
| No tinnitus | 3.42 | 1.37 | 3 | |
| Tinnitus | 3.53 | 1.21 | 4 | .36 |
| No earache | 3.42 | 1.37 | 3 | |
| Earache | 3.54 | 0.78 | 4 | .57 |

*Nonparametric Mann-Whitney test.
†Statistically significant.

**Table 3** Multiple Regression Analysis With ENT Symptoms (Age- and Sex-Adjusted)

| Variable | β | SE (β) | P |
|---|---|---|---|
| Deafness | 0.53 | 0.20 | < .01* |
| Dizziness | 0.58 | 0.38 | .13 |
| Tinnitus | 0.02 | 0.19 | .93 |
| Earache | 0.18 | 0.38 | .63 |

*Statistically significant.

## Discussion

The percentage of patients in the present study with ENT signs and symptoms seems to have been smaller than those of other authors.[1-3] This may be because TMD patients with recognized ENT pathology were not entered into this study, which minimized overlapping of primary ENT pathology upon TMD pathology. Previous studies have shown TMD to be more frequent in a population

selected for the presence of tinnitus, and this was supported by a theoretic model linking tinnitus to signs and symptoms of TMD.[11]

More recently, other investigators have found that both tinnitus and vertigo are more prevalent in a TMD group of patients than in an age-matched control group.[14] Nevertheless, the underlying mechanism of the association is still controversial. In spite of the above-mentioned reports to demonstrate the mutual pathogenetic effects of TMD and ENT factors, the epidemiologic approach seems to be not quite sufficient to evaluate the problem in clinical samples. A clinical anamnestic index[22] has been used to evaluate whether there is any relationship between increasing ENT symptomatology and increasing severity of TMJ arthropathy. In this index, assessment of severity of arthropathy included assessment of TMJ noise, pain, and tenderness to palpation. Although the accuracy and sensitivity of the index have not been validated, it is a convenient procedure that is easy to teach and to be used by examiners with little expertise in TMJ clinical practice. It is also an inexpensive and easy approach for rating the severity of the arthropathy.

An increasing ENT symptomatology with increasing severity of arthropathy was observed. Therefore, as a preliminary hypothesis, it is believed that there is a relationship between the overall presence of ENT symptoms and severity of arthropathy, and the association was significant for deafness and dizziness. These results are consistent with the findings of Chole and Parker,[14] who found that some ENT symptoms were more prevalent in patients with TMD.

After adjustment for confounding variables in the current study, only deafness was independently associated with the severity of the arthropathy. In the present authors' experience, this symptom is often also associated with cervical arthritis. Therefore, it is difficult to reject the idea that an interaction between cervical and temporomandibular arthropathy can influence ENT symptomatology. As a result, like others,[23] present authors also suggest that further investigation should be carried out to clarify the role of craniocervical arthritis versus that of TMD in the etiology of ENT symptomatology related to craniomandibular/craniocervical joint involvement.

## References


1. Costen JB. Neuralgias and ear symptoms associated with disturbed function of the TMJ. JADA 1936;107:252–254.
2. Myrhaug M. Functional mechanism of vestibular vertigo. Acta Otolaryngol 1958; 188(suppl):202–205.
3. Myrhaug M. Clicking ear and pharyngeal tic associated with functional disturbances of the jaw. Acta Otolaryngol 1958;188(suppl):430–433.
4. Arlen A. Gelb H. Clinical Management of Head, Neck and TMJ Pain and Dysfunction. Saunders, 1977;181–194.
5. Komori E, Sugisaki M, Tanabe H, Kato S. Discomalleolar ligament in the adult human. J Craniomand Pract 1986,4:300–305.
6. Wedel A, Carlsson GE. A four-year follow-up, by means of a questionnaire, of patients with functional disturbances of the masticatory system. J Oral Rehabil 1986;13:105–113.
7. Franklin DJ, Smith RJ, Catlin FI, Helfrick JF, Foster JH. Temporomandibular joint dysfunction in infancy. Int J Ped Otorhinolaryngol 1986;12:99–104.
8. Schellhas KP. Temporomandibular joint injuries. Radiology 1989;173:211-216.
9. Wiegel W. Diagnostik und Therapie der Myoarthropathy (Costen-Syndrome). Laryngorhinootologie 1990;69: 373–377.
10. McKenna SJ, Hall HD. Audiometric assessment of patients with painful TMJ internal derangement: Failure of audiometry to change following arthrotomy. J Craniomandib Disord Facial Oral Pain 1990;4:109–112.
11. Rubinstein B, Axelsson A, Carlsson GE. Prevalence of signs and symptoms of craniomandibular disorders in tinnitus patients. J Craniomandib Disord Facial Oral Pain 1990;4:186–192.
12. Crooks MC, Ferguson JW, Edward JL. Clinical presentation and final diagnosis of patients referred to a temporomandibular joint clinic. NZ Dent J 1991;87:113–118.
13. Ash CM, Pinto OF. The TMJ and the middle ear: Structural and functional correlates for aural symptoms associated with temporomandibular joint dysfunction. Int J Prosthodont 1991;4:51–57.
14. Chole RA, Parker WS. Tinnitus and vertigo in patients with temporomandibular disorder. Arch Otolaryngol Head Neck Surg 1992;118:811–821.
15. Rubinstein B, Erlandsson SI. A stomatognathic analysis of patients with disabling tinnitus and craniomandibular disorders (CMD). Br J Audiol 1991;25:77–83.
16. Erlandsson SI, Rubinstein B, Axelsson A, Carlsson SG. Psychological dimension in patients with disabling tinnitus and craniomandibular disorders. Br J Audiol 1991; 25:15–24.
17. Vernon J, Griest S, Press L. Attributes of tinnitus that may predict temporomandibular joint dysfunction. J Craniomand Pract 1992;10:282–288.
18. Rodriguez Vazquez JF, Merida Velasco JR, Jimenez Collado J. Development of the human sphenomandibular ligament. Anatomical Rec 1992;233:453-460
19. Rodriguez Vazquez JF, Merida Velasco JR, Jimenez Collado J. Relationship between the temporomandibular joint and the middle ear in human fetuses. J Dent Res 1993;72:62–66
20. Pinto OF. A new structure related to temporomandibular joint and middle ear. J Prosthet Dent 1962;12:95–103.
21. Hansson TL. Craniomandibular disorders and sequencing their treatment. Australian Prosthodont J 1988;2:9–15.
22. Ciancaglini R, Sorini M, De Cicco L, Panizzari L. Assessment of arthropathy of TMJ by digital phonoarthrometry. J Craniomandib Disord Facial Oral Pain 1987;1:138–142.
23. Norre ME. Cervical vertigo. Acta Otholaryngologica Belgica 1987;41:232–249.

## Resumen

Síntomas en los oídos, nariz y garganta de pacientes con desórdenes temporomandibulares (DTM): La asociación de acuerdo a la severidad de la artropatía

La asociación de la serveridad de la artropatía temporomandibular a los síntomas de los oídos nariz y garganta de los pacientes con desórdenes temporomandibulares ha sido algo que no ha sido bien investigado a pesar de su importancia en la práctica clínica. El propósito de este estudio fue el de determinar si la existencia de artropatías mas severas aumenta el riesgo de presentar mas sítomas en los oídios, nariz y garganta. Se efectuaron evaluaciones anamnésticas y clínicas en 815 personas que presentaban signos y síntomas de DTM de origen artrogénico, en exámenes físicos. La severedad de la artropatía fue evaluada por un índice clínico que registraba los sonidos articulares, la sensibilidad a la palpación temporomandibular, y la severidad del dolor en la región do la articulación temporomandibular. El análisis univariado demostró que la severidad de la artropatía estaba asociada significativamente con los síntomas de los oídios, nariz y garganta en conjunto ($P < .001$) y especificamente con la sordera ($P < .001$) y el vertigo ($P < .05$); sin embargo, el tinitus y el dolor de oído no estaban asociados estadísticamente. El análisis mútiple demostró que la sordera fue la única variable de los oídos, nariz y garganta asociada con la severidad de la atropatía ($P < .01$). De aduerdo a estos hallazgos se concluye que existe una asociación considerable entre los DTM de origen atrtogénico y los síntomas de los oídios, nariz y garganta, especialmente la sordera. También indican que se deben realizar mas investigaciones para comprar los papeles específicos de la artritis craneocervical versus los DTM en la etiología do los síntomas del oído, nariz y garganta relacionados a los problemas de articulación craneocervical y craneomandibular



## Zusammenfassung

Ohr-, Nasen- und Halssymptome bei Patienten mit Myoarthropathien des Kausystems (MAP): Der Zusammenhang zwischen den Symptomen und der Schwere der Arthropathie

Trotz ihrer klinischen Wichtigkeit ist die Zuordnung der Schwere der Arthropathie zu Ohr-, Nasen- und Halssymptomen von Patienten mit MAP nur wenig untersucht. Das Ziel dieser Studie war, zu ermitteln, ob eine schwerere Arthropathie schwerere Ohr-, Nasen- und Halssymptome hervorruft. Für 815 Subjekte mit Symptomen von MAP arthrogenen Ursprungs wurden Anamnese und Befunde erhoben. Die Schwere der Arthropathie wurde mittels eines klinischen Index erhoben, der Gelenkgeräusche, Palpationsempfindlichkeit und Schmerzhaftigkeit in der Kiefergelenksregion einbezog. Die "univariate" Analyse ergab, dass die Schwere der Arthropathie signifikant korreliert war mit Ohren-, Nasen- und Halssymptomen als Ganzes ($P < .001$) und im Einzelnen mit Taubheit ($P < .001$) und Schwindel ($P < .05$); Tinnitus und Ohrenschmerzen waren damit nicht signifikant assoziiert. Die multiple Analyse zeigte, dass Taubheit das einzige Ohr-, Nasen- und Halssymptom war, das mit der Schwere der Arthropathie assoziiert ist ($P < .01$). Diese Resultate führen zum Schluss, dass ein Zusammenhang zwischen MAP arthrogenen Ursprungs und Ohr-, Nasen- und Halssymptomen, insbesondere Taubheit, besteht. Weitere Untersuchungen sollten den möglichen Zusammenhang zwischen der spezifischen Rolle craniocervicaler Arthritis einerseits und MAP andererseits in der Aetiologie von Ohr-, Nasen- und Halssymptomen zum Gegenstand haben.