

# Craniomandibular Disorders in Patients With Meniere's Disease: A Controlled Study

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*This study compares the frequency of signs and symptoms of craniomandibular disorders and dental conditions in patients diagnosed with Meniere's disease and in control subjects from a population sample. Thirty-one patients (12 men, 19 women) diagnosed with Meniere's disease were referred from three otolaryngologic clinics for clinical examination and possible treatment of craniomandibular disorders. Thirty-one control subjects were selected from the population in the same area of Sweden (Ystad). Both groups were subjected to a screening of their symptoms with a self-administered questionnaire and to a routine stomatognathic examination. The function of the masticatory system was further calculated according to the index of Helkimo for both anamnestic dysfunction (A<sub>i</sub>) and clinical dysfunction state (D<sub>i</sub>). Clinical symptoms of craniomandibular disorders such as pain in the face or jaw; pain on movement of the mandible; fatigue of the jaws; and pain located in the vertex area, the neck/shoulder area, and the temples all occurred significantly more often in the patient group. Findings at the clinical examination included a statistically higher frequency of tenderness to palpation of the masticatory muscles, the temporomandibular joint, and the upper part of the trapezius muscle in the patient group compared to that of the control group. The findings indicate a much higher prevalence of signs and symptoms of craniomandibular disorders in patients diagnosed with Meniere's disease than in the general population.*

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Meniere's disease has a classic symptom triad consisting of vertigo, fluctuating hearing loss, and tinnitus. Since the French otologist Meniere first described the symptoms in 1861 in a report<sup>1</sup> of pathologic findings in a young woman who died after suffering from vertigo, tinnitus, and deafness, the diagnosis has often been a catchall for dizziness of unknown origin.<sup>2</sup>

In 1938, Hallpike and Cairns<sup>3</sup> from London and Yamakawa<sup>4</sup> from Osaka independently discovered what they thought to be the pathologic findings in definitive cases of this syndrome. They found in most cases, but not all, gross dilatation of the endolymphatic system with no inflammatory changes. In 1947, Williams<sup>5</sup> proposed the term *endolymphatic hydrops* (EH) as a more accurate description for Meniere's disease. However, although EH is a pathologic finding, Meniere's disease is a clinical entity, and later research has not been able to find a significant correlation between Meniere's disease and EH.<sup>2</sup> The etiology of Meniere's disease is still unknown<sup>2</sup>; consequently, there is no accurate therapy.

In 1978, the Meniere's Disease Research Committee<sup>2</sup> proposed the current diagnostic criteria for Meniere's disease, which include (1) repeated attacks of vertigo, (2) fluctuating cochlear symptoms (tinnitus and/or hearing loss), and (3) exclusion of central nervous system involvement, tumor of the eighth cranial nerve, and other cochleovestibular diseases. If all three conditions are met, the diagnosis is considered definite. If only the first and third or the second and third are met, the diagnosis is considered suspicious or uncertain. Repeated attacks of vertigo include episodes of dizziness that are without specific cause and accompanied by nausea or vomiting, lasting several minutes to several hours. There may be some episodes of nonwhirling dizziness included in the series of vertigo. A mixed type of spontaneous nystagmus (horizontal and rotatory) is observed in most subjects during attacks. In subjects with a single first attack, differential diagnosis with sudden sensorineural deafness is especially important to meet the criteria. For the fluctuating cochlear symptoms criterion, tinnitus and/or hearing loss often fluctuate synchronously with the vertiginous attacks. Many patients complain of fullness in the ear and hypersensitivity to intense sound in the affected ear. Hearing tests reveal a marked fluctuation of the threshold of hearing in the low and middle tone range. Loudness recruitment is observed. Only one ear is usually affected, however, bilateral involvement is not rare. To exclude central nervous system involvement, tumor of the eighth cranial nerve, and other cochleovestibular diseases, a thorough history, neurologic examination, and specific clinical examinations including equilibrium function tests and audiologic tests must be performed. At times it is necessary to review the patient's history to obtain the required chronologic information necessary for establishing the correct diagnosis.

Researchers in the field of Meniere's disease have developed several examinations and tests to investigate and support the great number of theories about the ailment. Since the description by Hallpike and Cairns,<sup>3</sup> EH has played a central part as the etiology of Meniere's disease in investigations on the disease. As Jongkees<sup>6</sup> stated, "the existence of a multitude of therapies, with enthusiastic defenders of their efficacy, is the best proof of the lack of a good therapy."

Although the disease is usually unilateral, it may also be bilateral.<sup>2</sup> The onset usually occurs between 30 and 50 years of age and affects both genders relatively equally.<sup>2</sup> The incidence in Sweden is 1:2,200,<sup>7</sup> or approximately 4,000 new

cases a year in a population of 8.5 million, and there are extrapolated figures showing that between 40,000 and 50,000 patients occasionally suffer from Meniere's disease.<sup>7</sup> The disease is not in itself lethal, even though suicides have been reported. A large number of the patients suffer severely from the symptoms, resulting in large costs for individuals and the community.

Tinnitus is a very frequent symptom, with prevalence rates of about 17%, and 0.5% to 1% claim that tinnitus seriously affects their lives.<sup>8,9</sup> With prevalence figures of about 1% for the single symptom, disabling tinnitus should be experienced by 85,000 people in Sweden. Assuming that 10% of these patients are continuously on sick leave, the direct and indirect costs for these 8,500 patients would total approximately US \$300 million a year. If the prevalence and incidence figures are the same in the USA as in Sweden, the total costs could be about US \$7,500 million a year.

In two epidemiologic studies from Göteborg,<sup>10,11</sup> vertigo was shown to be a very common symptom. In the study by Tibblin et al,<sup>10</sup> 20% to 30% of the women and 3% to 14% of the men reported vertigo. Vertigo was equally common in all age groups of women between 25 to 66 years. For men aged 30 to 67 years, the older they were, the more often they reported vertigo. In the study by Sixt and Landahl<sup>11</sup> regarding 75-year-old individuals, 40% of the women and 30% of the men reported vertigo. In a large group of individuals, vertigo was found to cause severe problems with nausea and vomiting. The ailment can be severely handicapping.

Hearing damage and hearing loss have often been associated with a higher frequency of tinnitus. On the contrary, in a thesis by Lindberg in 1989,<sup>9</sup> no evidence was found that a greater degree of hearing loss (patients who have had a hearing aid fitted) leads to more pronounced tinnitus. In the same study, it was found that the frequency of stress symptoms such as headache, facial muscle tension, and sleep disturbances are strongly correlated with tinnitus. In a study by Ciancaglini et al,<sup>12</sup> a strong correlation between deafness and craniomandibular disorders (CMD) and an association among dizziness, tinnitus, and CMD were reported.

In a recent thesis by Rubinstein,<sup>13</sup> an association between signs and symptoms of CMD and tinnitus was indicated. A correlation between tinnitus and tension in the lateral pterygoid muscle has also been found.<sup>14</sup> In general practice, there are patients diagnosed with Meniere's disease who show signs and symptoms of CMD. The aim of

this study, therefore, was to investigate the prevalence of CMD and the dental conditions in a group of patients diagnosed with Meniere's disease.

## Materials and Methods

To make systematic comparisons between the patient group and the control group, and between individuals, a self-administered questionnaire similar to the one used in the study by Agerberg and Helkimo<sup>15</sup> was implemented. For the clinical stomatognathic examination of the temporomandibular joint (TMJ), the masticatory muscles, mandibular mobility, and pain on mandibular movement, a standardized record was used to make systematic comparisons possible.<sup>16</sup>

Data from 31 patients with the diagnosis of definite (25 patients) or suspicious (six patients) Meniere's disease who participated in the study were collected during a 3-year period. The duration of the symptoms of the disease varied between 1 and 27 years with a mean of 8 years. The correct otologic diagnoses were obtained through the patients' otologic records. No tumors were suspected. In the Meniere's disease group (19 women and 12 men), the mean age was 55 years with a range of 29 to 86. Thirty of the patients were diagnosed as having unilateral Meniere's disease: 13 on the right side and 17 on the left side. The youngest, a 29-year-old woman, was diagnosed with bilateral Meniere's disease. Most of the patients suffered from tinnitus on a disabling level.

The 31 control subjects were sampled from the same part of southern Sweden from the national registration system and matched to the Meniere's disease patients by gender and age. They were invited by a telephone call from the examiner to participate in a stomatognathic examination free of charge. Twelve of the people could not participate because of personal illness or parents' illness, or they were not found at the registered address, and three refused to participate. In these cases, the next person on the list in the national registration system was chosen.

Both the patient group and the control group had to answer the self-administered questionnaire at the clinic before the clinical examination. The questions were designed to be answered by yes or no. The questionnaire was also formulated in such a way that the answers would provide information on the frequency of 15 different symptoms (pain in the face or the jaws, headache, pain on movement of the jaw [opening and chewing], difficulties in opening wide or biting a large bolus, feelings of

fatigue in the jaws, TMJ clicking, TMJ crepitus, TMJ luxation or locking, toothache, shooting pains and tenderness in the teeth, migraine, vertigo and nonwhirling dizziness, tinnitus, feelings of fullness in the ear, and burning pain/sensation in the mouth or tongue), the most annoying complaints, their location, the degree of severity, and the effect (if any) their symptoms had on their general way of life. Subjects were asked to describe the type of pain, if any, the duration of pain, and complaints, any parafunction, chewing habits, and masticatory problems. They were asked to estimate their present level of tinnitus on one of three levels: (1) tinnitus audible only at night; (2) tinnitus audible over a normal speech level; and (3) tinnitus audible over traffic sound.

The respondents were asked to estimate their present severity of symptoms on a five-point graded scale. They were asked to estimate on a visual analog scale (VAS) their present mood of nervousness, how their work/study suited them, and how they experienced their state of home life.

The clinical stomatognathic investigation was carried out according to a CMD standardized record in which capacity of mandibular mobility was measured<sup>17</sup> and TMJ function was estimated. Tenderness to palpation of the masticatory muscles (the temporalis muscle, the lateral pterygoid muscle, the masseter muscle, and the digastric muscle); of the upper part of the trapezius muscle in the area of the atlas, the axis, and the third cervical vertebra; of the median trapezius muscles; and of the levator muscles of the scapulae was estimated. Tenderness to palpation of the TMJs and the pain at mandibular movement was recorded.

During the palpation of the muscles and the TMJs, a considerable effort was made to estimate the three diagnostic levels of tenderness to palpation: (1) the patient feels tenderness to palpation; (2) the patient exhibits a palpebral reflex to palpation; and (3) the patient shows a defensive reaction to palpation.<sup>18</sup> Occlusal disturbances as interferences in retruded position (RP) and on the laterotrusion and mediotrusion sides were recorded, as well as occlusal stability and bruxing facets, as described by Wänman and Agerberg.<sup>18</sup>

## Indexes

Some of the symptoms reported formed the basis of the Anamnestic Dysfunction index (A<sub>i</sub>) of Helkimo,<sup>19</sup> which is based on the severity of the reported symptoms. In the clinical investigation, the Clinical Dysfunction index (D<sub>i</sub>) according to Helkimo<sup>19</sup> was used. The addition of the five parts

(A to E) included in the index gives the level of the clinical dysfunction in the range of 0 to 25, where 0 indicates no clinical dysfunction, 1 to 4 indicates a mild clinical dysfunction, 5 to 9 indicates a moderate clinical dysfunction, and 10 to 25 indicates a severe clinical dysfunction.

### Statistical Analysis

The data from the questionnaires and the clinical records were processed in a computer (Ericsson-Nokia, Sweden) with a standard program (Paradox-2, USA). The statistical calculation of differences between the Meniere's disease group and the control group was made by chi square tests.

### Results

The most common complaints in the patient group were vertigo, tinnitus, and a feeling of fullness in the ear, which appeared statistically more often in the patients than in the control subjects ( $P < .001$ ). Everyone in the patient group and three subjects in the control group suffered from tinnitus. It was found that 22 patients (71%) and three control

subjects (10%) estimated their tinnitus to be audible over a normal speech level. Of the control group, one subject considered tinnitus and one subject considered dizziness to be the worst complaint; one half of the patient group considered tinnitus and one third considered dizziness to be the worst complaint ( $P < .001$ ).

Common symptoms of CMD, such as pain in the face or the jaw, pain on movement of the jaw, and feelings of fatigue of the jaw, were reported statistically more often by the patients than by the control subjects ( $P < .01$ ). Both groups reported about the same frequency of headache, but in contrast to the patients, headache was the most frequent complaint among the control subjects (Table 1).

About one third of the patients reported pain in the vertex and temporal regions, while only a few control subjects did so ( $P < .01$ ). Two thirds of the patients and one quarter of the control subjects had neck and shoulder pain ( $P < .01$ ). There were no statistically significant differences between the two groups with respect to chewing habits, but the patients reported impaired chewing ability more frequently than did the control subjects ( $P < .05$ ).

The patients were more aware of bruxing than were the control subjects ( $P < .05$ ). The patient group was also significantly more aware of the

**Table 1** Percentage Distribution of Reported Symptoms in 31 Patients With Meniere's Disease (MD) and 31 Control Subjects (C)

	Never		1-2 times a month		1-2 times a week		Several times a week		Daily		P
	MD	C	MD	C	MD	C	MD	C	MD	C	
Pain in the face or the jaws	48	87	19	7	13	3	10	0	10	3	**
Headache	32	48	35	35	13	3	10	7	10	7	NS
Pain on movement of the jaw (opening and chewing)	68	94	13	7	10	0	0	0	10	0	**
Difficulties in opening wide or biting a large bolus	90	94	0	3	3	0	0	0	7	3	NS
Feelings of fatigue in the jaws	58	97	7	3	10	0	7	3	19	0	**
Clicking in the TMJ	52	71	16	13	10	0	7	3	16	13	NS
Creptus in the TMJ	94	100	3	0	0	0	0	0	3	0	NS
Luxation or locking of the TMJ	87	100	7	0	3	0	3	0	0	0	NS
Toothache	84	87	13	13	0	0	0	0	3	0	NS
Shooting pains and tenderness in the teeth	71	84	13	10	10	0	0	0	7	7	NS
Migraine	77	94	23	7	0	0	0	0	0	0	NS
Vertigo and nonwhirling dizziness	10	94	36	3	23	0	3	0	29	3	***
Tinnitus	0	90	7	3	3	0	10	0	81	7	***
Feelings of fullness in the ear	71	97	3	3	0	0	13	0	13	0	**
Burning pain/sensation in the mouth or tongue	87	90	0	7	7	0	0	0	7	3	NS

P indicates the level of significance for the difference between the 31 patients with Meniere's disease and the 31 control subjects.

\*.01 <  $P \leq .05$ .

\*\*0.001 <  $P \leq .01$ .

\*\*\* $P \leq .001$ .

NS = not significant.

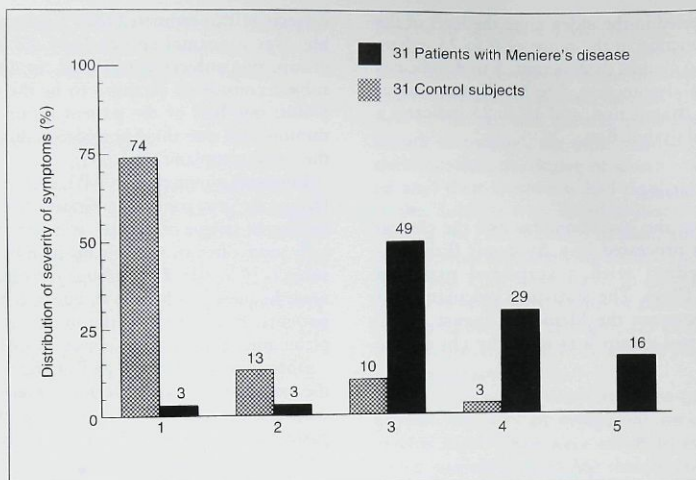


Fig 1 Percentage distribution of severity of the symptoms according to a five-point graded scale. 1 = none, 2 = slight, 3 = moderate, 4 = rather severe, 5 = very severe.

**Table 2** Percentage Distribution of Parafunction and Stress in 31 Patients With Meniere's Disease (MD) and 31 Control Subjects (C)

	MD	C	P
Tooth clenching	52	39	NS
Bruxing	26	7	*
Awareness of stress	53	19	**
Tension during stress	68	23	**

P indicates the level of significance for the difference between the 31 patients with Meniere's disease and the 31 control subjects.

\*.01 < P ≤ .05.

\*\*0.01 < P ≤ .01.

NS = not significant.

stress to which they were subjected and felt more tension during stress ( $P < .01$ ) (Table 2). On the VAS, no statistically significant differences were found between the patients and the control subjects with regard to nervousness, the suitability of work/study, and the state of home life.

Vertigo and tinnitus affected the patients severely; they also complained about facial pain, vertex pain, and pain in the neck and shoulder area. About one half of the patients were periodically on sick leave, had problems with their sleep, and claimed that their complaints had an influence

on their study and/or work. Three fifths of the patients stated that their troubles influenced their entire private life. Only one control subject reported such an influence on his/her life situation ( $P < .001$ ).

On a five-point graded scale, 74% of the control subjects claimed that they had no complaints at all, 23% stated that they had mild to moderate complaints; 94% of the patient group had moderate to very severe complaints ( $P < .001$ ) (Fig 1).

Symptom-free individuals according to the Case History index by Helkimo (A,0) were found significantly more often in the control group (65%) than in the patient group (35%). Severe symptoms of CMD were found significantly more often in the patient group (55%) than in the control group (23%) (Fig 2).

The number of residual teeth, the number of interferences, maximal mouth opening, and horizontal movements of the mandible were not statistically different between the groups. Only the occurrence of crossbite (16 in the patient group and seven in the control group) differed significantly between the two groups ( $P < .05$ ).

The dominant findings at the clinical examination were the much more frequent tenderness to palpation in the masticatory muscles ( $P < .001$ ) and the TMJs ( $P < .01$ ) of the patients than of the

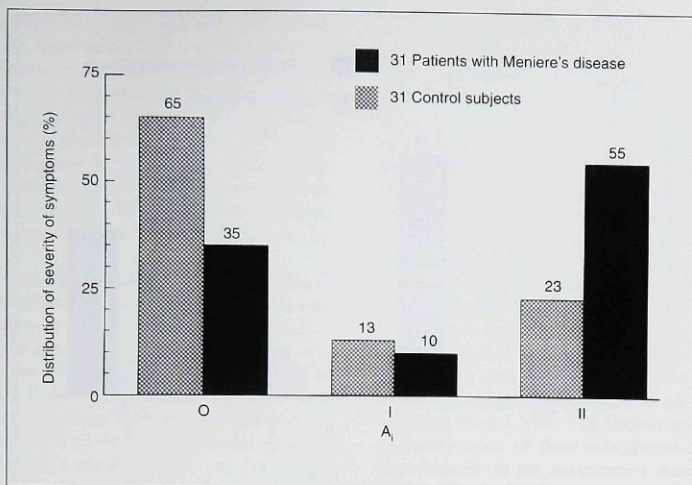


Fig 2 Percentage distribution of symptoms according to the Anamnestic Dysfunction index (A<sub>1</sub>).

control subjects (Table 3). The mean palpation scores of the masticatory muscles in the patient group were 3.6 and 3.7 areas that showed a palpebral reflex or a defensive reaction to palpation on the right and the left sides, respectively, compared with scores of 1.0 and 0.7 in the control group. The mean palpation score shows that palpebral reflex and defensive reaction to palpation is more than four times more frequent in the patient group than in the control group.

Palpation of the upper part of the trapezius muscle on the right and left sides showed different findings. On the right side, there was no statistically significant difference between the patient group and the control subjects; on the left side, there was a statistically higher difference between the patients and the control subjects ( $P < .001$ ). Barely one sixth of the control group showed a palpebral reflex or a defensive reaction to palpation in this area; seventh tenths of the patient group showed palpebral reflex or defensive reaction.

According to the Clinical Dysfunction index by Helkimo, it was found that the patients had statistically more impaired TMJ function ( $P < .01$ ). The patients, as compared to the control subjects, exhibited more frequent palpation tenderness of their masticatory muscles and TMJs ( $P < .001$ ). A

Table 3 Percentage Distribution of Areas in the Masticatory Muscles and TMJs According to Palpebral Reflex and Defensive Reaction to Palpation in 31 Patients With Meniere's Disease (MD) and 31 Control Subjects (C)

	Right			Left		
	MD	C	P	MD	C	P
Temporalis muscle						
Anterior part	39	3	**	58	3	***
Posterior part	13	0	***	16	0	***
Coronoid attachment	81	45	*	81	26	***
Lateral pterygoid muscle	90	32	***	87	19	***
Masseter muscle	90	16	***	87	19	***
Digastric muscle, venter posterior part	42	0	***	45	0	***
Lateral palpation of the TMJs	55	10	**	77	10	***
Posterior palpation of the TMJs	7	0	NS	39	7	**

P indicates the level of significance for the difference between the 31 patients with Meniere's disease and the 31 control subjects.

\*.01 <  $P \leq .05$ .

\*\* .001 <  $P \leq .01$ .

\*\*\*  $P \leq .001$ .

NS = not significant.

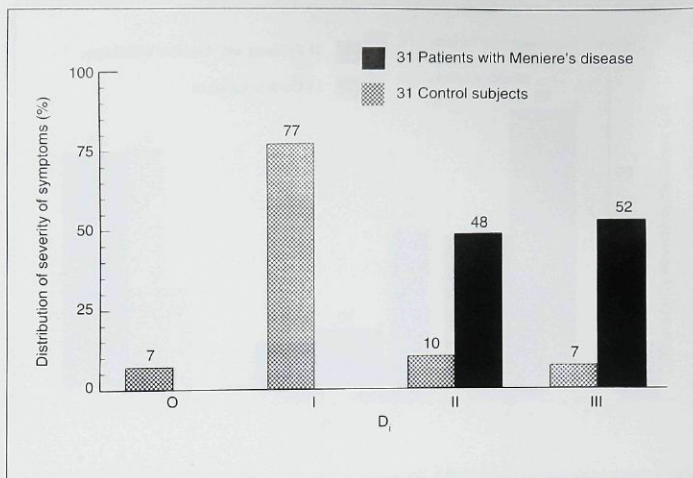


Fig 3 Percentage distribution of symptoms according to the Clinical Dysfunction index (D<sub>i</sub>).

**Table 4** Percentage Distribution of Signs of Dysfunction According to Helkimo's Index for 31 Patients With Meniere's Disease (MD) and 31 Control Subjects (C)

		Group	Group			
			0	P	1	5
Impaired mandibular movement	A	C	58	NS	42	0
	A	MD	48		48	3
Impaired TMJ function	B	C	39	**	61	0
	B	MD	7		90	3
Muscle pain	C	C	39	***	45	16
	C	MD	0		0	100
TMJ pain	D	C	81	***	16	3
	D	MD	10		52	39
Pain on movement of the mandible	E	C	84	*	13	3
	E	MD	55		26	19

P indicates the level of significance for the difference between the 31 patients with Meniere's disease and the 31 control subjects.

\*.01 < P ≤ .05.

\*\*0.001 < P ≤ .01.

\*\*\*P ≤ .001.

NS = not significant.

statistically significant difference between the patients and the control subjects with regard to pain on movement of the mandible was also found ( $P < .05$ ) (Table 4).

The mean Clinical Dysfunction score was 10.4 for the patient group and 2.9 for the control group. The mean score for the patient group corresponds to severe signs of dysfunction, and the mean score for the control group corresponds to mild signs of dysfunction.

None of the patients was completely without signs (D<sub>i</sub>0), and none had only mild signs of dysfunction (D<sub>i</sub>I). Of the control subjects, 84% were included in these two groups. Moderate to severe signs of dysfunction (D<sub>i</sub>II and D<sub>i</sub>III) were exhibited by 48% and 52% of the patients, respectively (Fig 3).

## Discussion

The 25 patients with the diagnosis of definite Meniere's disease conformed to all three conditions of the diagnostic criteria. The six patients with the diagnosis of suspected Meniere's disease conformed to conditions 2 and 3 of the diagnostic criteria. Three of the six never had vertigo or non-whirling dizziness, and the other three had just one

or two episodes of vertigo and only occasional nonwhirling dizziness. The age of onset of Meniere's disease in the patient group ranged from 17 to 59 years, with a mean of 47 years. This is the same period of onset as reported by Kitahara<sup>2</sup> and Pfaltz.<sup>20</sup> Of the patient group, 40% were males and 60% were females. The reports regarding gender distribution of the disease vary considerably. Some report a higher incidence among males, and others report a higher incidence among females.<sup>20</sup>

The prevalence figures of signs and symptoms of CMD in the control group seem reasonable and compare well with other epidemiologic studies.<sup>21,22</sup> In the control group, 10% reported tinnitus as a symptom in the self-administered questionnaire. In the thesis by Rubinstein,<sup>13</sup> tinnitus is cited as a very frequent complaint with prevalence estimates varying from 2.3% to 44.5% in different epidemiologic studies as a result of different definitions and different age groups. The occurrence of tinnitus in the control subjects also corresponds with previous prevalence figures estimated to be 17%, which includes approximately 1% who suffer from tinnitus on a disabling level.<sup>8</sup> According to English and North American estimations, there are much higher prevalences of tinnitus reported.<sup>23,24</sup>

Several authors have made the clinical observation that tinnitus is common in patients with CMD. Rubinstein<sup>13</sup> reported several findings that indicate an association between CMD and tinnitus. Goodfriend<sup>25</sup> stated that deafness, tinnitus, and vertigo, caused by pathologic factors of the TMJ abnormality, are among the primary complaints of patients with TMJ diseases. According to Curtis,<sup>26</sup> the otologic symptoms aural fullness, subjective hearing loss, tinnitus, and vertigo were among the most common of the nonmasticatory symptoms in CMD. These findings are also supported by Ciancaglini et al,<sup>12</sup> who found a strong correlation between deafness and CMD and an association among dizziness, tinnitus, and CMD.

The two-page questionnaire used in this study was designed to be easily understood by the patients. Most patients successfully answered the questionnaire, and only a few cases required supplementation. This fact indicates that the patients had a relatively clear picture of their symptomatology, as found in previous studies.<sup>15,21,22</sup> The questionnaire also provided a basis for estimating the quality and frequency of the present symptoms.

According to the self-administered questionnaire, the patients, as expected, had significantly more complaints about tinnitus, vertigo, and feelings of fullness in the ear. In the control group,

one person considered tinnitus and one person considered dizziness to be the most annoying problem. Two control subjects reported both tinnitus and dizziness, and one control subject reported tinnitus. These three control subjects scored highest of all control subjects on the CMD Dysfunction Index. Their scores were 3, 7, and 12 according to D<sub>1</sub>, showing that two of them had scores similar to the mean score of 10.4 in the patient group.

The patient group showed significantly more symptoms typical for CMD. Feelings of fatigue in the jaws is often a sign of tooth clenching and bruxing, habits of which the patients were significantly more aware than were the control subjects. Facial pain and pain in the jaws, pain on movement of the jaw, on opening, and on chewing are further symptoms usually found among patients suffering from CMD. The patient group had significantly more of these complaints correlated to hyperactivity in the masticatory muscles. Pain in the jaws, in the TMJ/ear areas, and in the temporal regions are also common symptoms among patients with CMD.

Both groups naturally exhibited a number of classical CMD pain symptoms. It was interesting to find that all the patients had some sort of pain, while approximately three fourths of the control subjects had no pain at all.

According to the Anamnestic Dysfunction index (A<sub>1</sub>) of Helkimo, the patients exhibited a significantly higher frequency of CMD symptoms than did the control subjects, who resembled an epidemiologic sample. In regard to complaints and symptoms, the patient group represented a group of patients with severe symptoms of CMD. The patients also had significantly more frequent pain and complaints of pain in the vertex area, the back of the neck, and the shoulder area. Most of the patients were already visiting physiotherapists because of their neck and shoulder problems. Neck complaints had previously been found to be frequent in CMD patients, and activation of the trapezius muscle was found to be induced by occluding hard.<sup>27</sup>

There was a statistically significant difference between the two groups as to how well they estimated they could chew their food. In addition, the patients were significantly more aware of parafunctions such as bruxing, which may be one reason for their neck problems. The patients had significantly more crossbite, probably indicating more instability in their dental occlusion.

The patients were significantly more aware of the stress to which they were being subjected, and they felt more tension during stress. It is known



that stress, consciously or unconsciously, in connection with an unstable dental occlusion, may induce some people to develop CMD. The patient group has more of these two elements than does the control group.

If the patients develop not only Meniere's disease but also severe symptoms of CMD during a long period of time, their symptoms may affect their lives, causing frequent sick leaves and problems with their sleep and affecting their work/study; these will be further analyzed. The reports of the patients indicate that these symptoms influence their social relations and entire private lives.

The dominant sign of CMD was the pronounced tenderness to palpation of the masticatory muscles in the patient group. This state indicates that tension is considerably high in this group. In the patient group, tenderness to palpation of the TMJs was found to be nearly as pronounced as tenderness to palpation of the masticatory muscles. The more frequent tenderness at palpation of the TMJs of the patients may be a result of the excessive loading of this area. Distributed into the dysfunction groups (D<sub>1</sub>) according to Helkimo, it is quite obvious that the patients suffer from severe CMD. With regard to the mean score in the group as well as in the individual scores, they have obvious pain at palpation of their masticatory muscles, which might be an indication of hyperactivity.

Palpation of the upper part of the trapezius muscle in the areas of the atlas, the axis, and the third cervical vertebra showed statistically significant differences between the two groups on the left side, and, as yet, we know of no logical reason. Without doubt, the great soreness at palpation in the patient group expresses signs of neck disorders and correlates well with their symptoms. In an ongoing study, comparisons will be made between the two groups regarding the state of the cervical spine. According to the thesis by de Wijer,<sup>28</sup> CMD patients with neck complaints should be examined for neck disorders.

Because the patients with Meniere's disease present a picture of advanced signs and symptoms of CMD, there was reason to attempt to treat their disorders. The encouraging initial and longitudinal effects of treatment of the CMD and Meniere's disease will be presented in separate articles.

## Conclusions

The results of this study show that patients diagnosed with Meniere's disease have signs of CMD that are much more severe than do a control group

of the general population. The present study also shows the following:

1. Patients diagnosed with Meniere's disease suffer more from typical symptoms of CMD as pain in the face or the jaw, pain on movement of the jaw, and feelings of fatigue in the jaw. They also report more chewing problems.
2. Control subjects with moderate or severe clinical signs of CMD report vertigo and tinnitus as symptoms.
3. Patients diagnosed with Meniere's disease report more pain in the back of the neck and shoulder area.
4. Patients diagnosed with Meniere's disease are more aware of parafunctions and the stress to which they are subjected, and they feel more tension during stress.
5. Patients diagnosed with Meniere's disease react with more palpebral reflexes and defensive reaction to palpation in the masticatory muscles, the TMJs, and the neck and shoulder area.

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## References

1. Meniere P. Maladie de l'oreille interne offrant les symptômes de la congestion cerebrale apoplectiforme. *Gaz Med Paris* 1861;3:88.
2. Kitahara M. Meniere's Disease. Tokyo: Springer, 1990.
3. Hallpike CS, Cairns H. Observations on the pathology of Meniere's syndrome. *J Laryngol Otol* 1938;53:625-655.
4. Yamakawa K. Über die pathologische Veränderung bei einem Meniere-Kranken. *J Otolaryngol Jpn* 1938;44:2310-2312.
5. Williams HL. The present status of the diagnosis and treatment of endolymphatic hydrops. *Ann Otol Rhinol Laryngol* 1947;54:614-646.
6. Jongkees LBW. Some remarks on Meniere's disease. *ORL J Otolaryngol Relat Spec* 1979;42:1-5.
7. Stahle J, Stahle C, Arenberg IK. The incidence of Meniere's disease. *Arch Otolaryngol* 1978;104:99-102.
8. Institute of Hearing Research. Epidemiology of tinnitus. In: Evered D, Lawrenson G (eds). *Giba Foundation Symposium 85: Tinnitus*. London: Pitman Medical, 1981:16-25.
9. Lindberg P. Assessment of Tinnitus Aurium. A Behavioural Approach to the Evaluation of Symptoms and the Effects of Intervention [thesis]. Uppsala, Sweden: University of Uppsala, 1989.
10. Tibblin G, Bengtsson C, Furunes B, Lapidus L. Symptoms by age and sex. The population studies of men and women in Gothenburg, Sweden. *Scand J Prim Health Care* 1990;8:9-17.

11. Sixt E, Landahl S. Postural disturbances in a 75-year-old population: I. Prevalence and functional consequences. *Age Ageing* 1987;16:393-398.
12. Ciancaglini R, Loreti P, Radaelli G. Ear, nose, and throat symptoms in patients with TMD: The association of symptoms according to severity of arthropathy. *J Orofacial Pain* 1994;8:293-296.
13. Rubinstein B. Tinnitus and craniomandibular disorders—Is there a link? [thesis]. *Swed Dent J Suppl* 1993;95:1-46.
14. Bjorne A. Tinnitus aureum as an effect of increased tension in the lateral pterygoid muscle [letter]. *Otolaryngol Head Neck Surg* 1993;109:969.
15. Agerberg G, Helkimo M. Symptomatology of patients referred for mandibular dysfunction: Evaluation with the aid of a questionnaire. *J Craniomand Pract* 1987;5:157-163.
16. Rieder CE. Comparison of the efficacy of a questionnaire, oral history and clinical examination in detecting signs and symptoms of occlusal and temporomandibular joint dysfunction. *J Prosthet Dent* 1977;38:433-440.
17. Agerberg G. Maximal mandibular movements in young men and women. *Swed Dent J* 1974;67:81-100.
18. Wanman A, Agerberg G. Mandibular dysfunction in adolescents: II. Prevalence of signs. *Acta Odontol Scand* 1986;44:55-62.
19. Helkimo M. Studies on function and dysfunction of the masticatory system. II. Index for anamnestic and clinical dysfunction and occlusal state. *Swed Dent J* 1974;67:101-121.
20. Pfaltz CR. *Controversial Aspects of Meniere's Disease*. Stuttgart, Germany: Georg Thieme, 1986.
21. Agerberg G, Inkapööl I. Craniomandibular disorders in an urban Swedish population. *J Craniomandib Disord Facial Oral Pain* 1990;4:154-164.
22. Agerberg G, Bergenholz A. Craniomandibular disorders in adult populations of West Bothnia, Sweden. *Acta Odontol Scand* 1989;47:129-140.
23. Coles RRA. Epidemiology of tinnitus. (1) Prevalence. *J Laryngol Otol [Suppl]* 1984;9:195-202.
24. National Center for Health Statistics. Hearing levels of adults by race, region and area of residence. United States, 1960-1962. Vital and Health Statistics Publication, Series II, No. 26. Hyattsville, MD: Department of Health, Education, and Welfare, 1967.
25. Goodfriend DJ. Symptomatology and treatment of abnormalities of the mandibular articulation. *Dental Cosmos* 1933;75:844-852,947-957.
26. Curtis AW. Myofascial pain-dysfunction syndrome: The role of nonmasticatory muscles in 91 patients. *Otolaryngol Head Neck Surg* 1980;88:361-367.
27. Hagberg C, Agerberg G, Hagberg M. Regression analysis of electromyographic activity of masticatory muscles versus bite force. *Scand J Dent Res* 1985;93:396-402.
28. Wijer A de. *Temporomandibular and cervical spine disorders [thesis]*. Utrecht, The Netherlands: Elinkwijk BV, 1995.

## Resumen

### Desórdenes Craneomandibulares en Pacientes con Enfermedad de Meniere: Un Estudio Controlado

Este estudio compara la frecuencia de los signos y síntomas de los desórdenes craneomandibulares (DCM) y las condiciones odontológicas en pacientes diagnosticados con enfermedad de Meniere y en los sujetos de control de una muestra de la población. Treinta y un pacientes (12 hombres y 19 mujeres) diagnosticados con enfermedad de Meniere fueron remitidos de tres clínicas otolaringológicas, para un examen clínico y un posible tratamiento de los DCM. Se seleccionaron 31 pacientes de control de la población en la misma área de Suecia (Ystad). Ambos grupos fueron sometidos a un examen de selección de sus síntomas con un cuestionario auto-administrado, y a un examen estomatognático de rutina. La función del sistema masticatorio fue calculada además de acuerdo al índice de Helkimo tanto para la disfunción anamnéstica (A), como para el estado de disfunción clínica (D). Los síntomas clínicos de los DCM tales como dolor en la cara o la mandíbula; dolor al mover la mandíbula; fatiga de las mandíbulas; y dolor localizado en el área occipital; el área del cuello/hombro; y la región lateral de la cabeza, todos se presentaron mas a menudo en el grupo experimental, lo cual fue significativo. Los hallazgos del examen clínico incluyeron sensibilidad a la palpación de los músculos masticatorios, la articulación temporomandibular, y la parte superior del músculo trapecio. Esta sensibilidad estadísticamente presentaba una frecuencia mas alta en el grupo experimental en comparación con el de control. Los hallazgos indican una prevalencia mas acentuada de los signos y síntomas de los DCM craneomandibulares en pacientes con enfermedad de Meniere, que en la población general.

## Zusammenfassung

### Myoarthropathien bei Patienten mit Ménière-Krankheit: Eine kontrollierte Studie

Diese Studie untersucht die Häufigkeit von Zeichen und Symptomen bei Patienten mit Ménière-Krankheit verglichen mit einer Kontrollgruppe bezüglich des Auftretens von Myoarthropathien und des dentalen Zustands. 31 Patienten (12 Männer, 19 Frauen) mit Ménière-Krankheit wurden von drei otolaryngologischen Kliniken zu einem klinischen Untersuchung und eventueller Behandlung von Myoarthropathien überwiesen. Aus der Bevölkerung der gleichen Gegend von Schweden (Ystad) wurde eine Kontrollgruppe von 31 Probanden zusammengestellt. Beide Gruppen unterließen ein Screening ihrer Symptome mittels eines Fragebogens und einer routinemässigen klinischen Untersuchung. Mit dem Helkimo-Index für die anamnestiche Dysfunktion (A) und dem klinischen Dysfunktionsstatus (D) wurde die Funktion des Kauystems beurteilt. Klinische Symptome von Myoarthropathien wie Gesicht- oder Kieferschmerzen, schmerzhaftige Beweglichkeitseinschränkungen des Unterkiefers, Ermüdung der Kaumuskulatur und Schmerzen im Schläfen-, Nacken- und Schulterbereich traten bei der Patientengruppe signifikant öfter auf. Die Resultate der klinischen Untersuchung beinhalteten eine statistisch höhere Frequenz von Druckschmerzhaftigkeit der Kaumuskulatur, des Kiefergelenks und des oberen Anteils des M. trapezius bei der Patientengruppe verglichen mit der Kontrollgruppe. Diese Resultate zeigen eine viel höhere Prävalenz von Zeichen und Symptomen von Myoarthropathien bei Patienten mit Ménière-Krankheit als bei der durchschnittlichen Bevölkerung.