Characteristics of Subjects with Secondary Otalgia

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Aims: *To investigate whether secondary otalgia is associated with cervical spine disorder (CSD), temporomandibular disorders (TMD), or both, and to describe the pain characteristics and the comorbidity of secondary otalgia in subjects with and without CSD and TMD.* ***Methods:*** *A mailed questionnaire was sent to a random sample of 2,500 people aged 25 to 65 years. Altogether 1,720 recipients responded. Inclusion criteria were pain inside or around the ear without infection, tumor, or trauma, of 6 or more months duration, and a pain frequency of at least once a month. Altogether 152 respondents fulfilled the criteria, and of these 100 participated in the clinical examinations and interviews.* ***Results:*** *Based on standardized examinations and interviews, 91 subjects had secondary otalgia and 9 had primary otalgia. Most (85%) of the 91 subjects with secondary otalgia also had signs and symptoms of TMD and/or CSD and were therefore classified into 3 groups: CSD (35%), TMD (20%), or "Combination," ie, signs and symptoms of both TMD and CSD (30%). Subjects without CSD or TMD (15%) reported the same level of intensity and impact of otalgia on daily living and psychological distress as the others but less frequent head and neck pain and fewer sleep-related problems.* ***Conclusions:*** *Most of the subjects reporting secondary otalgia also suffered from CSD or TMD or both. Thus, in patients with secondary otalgia, an examination of the cervical spine and the stomatognathic system should be routinely performed.* J OROFAC PAIN 2004;18:226–234

Key words: cervical spine disorder, epidemiology, questionnaire, temporomandibular disorder

Secondary otalgia,[1] ie, earache not caused by primary ear pathology, is quite common in patients suffering from earache; indeed, it is found in 1 out of 2 patients with secondary earache.[1] Such pain is quite often explained as caused by a neurological disorder of unknown etiology. As a consequence, no effort is made to look for the primary cause of the pain (eg, clinical examination of the cervical spine, the masticatory system, or the cranial and cervical nerves). However, pain often irradiates from the structures of the cervical spine and/or the masticatory system.

An epidemiological study noted that 12% to 16% of investigated subjects reported that they suffered from secondary otalgia during a 2-year follow-up period.[2] The subjects with secondary otalgia had more masticatory muscle and temporomandibular joint (TMJ) area tenderness to palpation and also more frequently reported neck and shoulder pain than the individuals without secondary otalgia.[2,3] Moreover, the prevalence of secondary otalgia was quite high (40% to 49%) in the group of subjects in need for treatment

of temporomandibular disorders (TMD).[2] These subjects visited a physician for earache 14 times as often as the subjects not in need of treatment for TMD.[2] Secondary otalgia can be relieved by the application of a stabilization splint as demonstrated in a randomized, blind controlled trial.[4]

However, none of the studies mentioned above[2–4] reported on the localization, duration, frequency, intensity, or impact of secondary otalgia on daily life. The aims of the present study were therefore to investigate whether secondary otalgia is associated with cervical spine disorder (CSD), TMD, or both, and to describe the pain characteristics and the comorbidity of secondary otalgia in subjects with and without CSD and TMD.

Materials and Methods

The present survey was carried out from March 1999 to November 2000 in Jyväskylä, Finland. The Ethics Committee of the Health Care District of Central Finland approved the study. The investigation comprised 2 phases. In the first, a screening phase, screening for secondary otalgia was conducted with a mailed, self-administered questionnaire. A total of 2,500 people aged either 25, 35, 45, 55, or 65 years were randomly selected from a database of 77,867 names kept by the municipal administrative court in Jyväskylä. Two hundred fifty men and 250 women were selected from each age group by including every tenth name in each age group (the groups were listed in alphabetical order). In the second phase, the subjects with secondary otalgia filled out a standardized self-report and psychometric questionnaire and were clinically examined and interviewed.

Subjects and Screening

In the screening phase, 2,500 people received a mailed questionnaire about secondary otalgia designed for the survey. If the questionnaire was not returned, a second letter was sent 4 weeks later. Altogether 1,720 people (69%), 785 men and 935 women, filled out the questionnaire properly and returned it. The number of nonrespondents was 780 (31%), 465 men and 315 women.

The questionnaire consisted of a set of questions related to demographic data, and to the presence of secondary otalgia, TMJ pain, recurrent headache, and neck and shoulder pain (Fig 1). TMD pain was defined as pain or ache in the areas of the masticatory muscles or the TMJ, ie, in front of the ear. Headache, neck ache, and shoulder

1. How often have you perceived aural pain during the preceding 6 months?
a Less often than once a month b Once a month
c Twice a month d 3 times a week
e Weekly

2. How long have you had aural pain?
a Less than 6 months b 6 months
c 9 months d A year
e 2 years or longer

3. How intense has your aural pain been at its worst?
a Very weak b Weak
c Strong d Very strong

4. How much has aural pain decreased your performance in daily activities and work?
a Not at all b Very little
c Somewhat d Much
e Very much

5. Has aural pain made you feel blue?
a Not at all b Very little
c Somewhat d Much
e Very much

6. How many times altogether have you visited a physician during the last year? (take into account all visits despite different causes of visits and specialties of physicians)
_____

7. Have you had headache?
a Not at all b Less often than once a month
c Once a month d Every other week
e Weekly f Twice a week
g 3 to 4 times a week h Daily

8. Have you had neck ache?
a Not at all b Less often than once a month
c Once a month d Every other week
e Weekly f Twice a week
g 3 to 4 times a week h Daily

9. Have you had shoulder ache?
a Not at all b Less often than once a month
c Once a month d Every other week
e Weekly f Twice a week
g 3 to 4 times a week h Daily

10. Have you had at least once during the preceding 6 months pain or ache in the masticatory muscles or temporomandibular joint in front of or inside of the ear without any diagnosed infection?
a No b Yes

11. Have you had, during the preceding 10 years, an accident or trauma to the head, neck, or skull?
a Not at all b A blow to the jaw
c A blow to the face
d A rear-to-end motor vehicle accident
e A blow to the jaw or face in a motor vehicle accident
f Unconsciousness due to a motor vehicle accident
g Displacement of the jaws
h Locking of the jaws

Fig 1 Questionnnaire on secondary otalgia (n = 2,500). First, the subjects answered questions about gender, age, education and occupation. They were then asked to answer these questions on aural pain.

ache were defined as recurrent if they occurred at least twice a month. The inclusion criteria for secondary otalgia were *(1)* pain inside or around the ear, *(2)* pain duration of at least 6 months, *(3)* pain frequency of at least once a month, and *(4)* absence of past and present history of infection, tumor, or trauma. The subject was considered to have secondary otalgia if he or she was aware of aural pain fitting these criteria.

In the second phase of the investigation, an invitation to participate in the study together with a written description of the clinical examinations and interview was mailed to the 152 respondents (9%, 63 men and 89 women, mean age 49 years) who had secondary otalgia according to the answers to the mailed questionnaire. Of these 152 respondents, 100 (66%) participated in the clinical examinations and interviews (42 men and 58 women, mean age 49 years). Informed consent was obtained from all subjects. The other 52 (34%; 20 men and 32 women, mean age 48 years) did not respond to the invitation.

Before the clinical examinations and interviews, the subjects also filled out a questionnaire about characteristics of secondary otalgia and the impact of secondary otalgia on their daily living, ability to concentrate at work, and sleep. The questionnaire also included 12 questions about problems related to sleep and a question about the presence of chronic pain elsewhere in the body. Chronic pain was defined as pain that had lasted for at least 6 months and that was located outside of the ear, eg, in the back, stomach, neck, limbs, or head. The subjects also estimated the intensity of secondary otalgia by drawing a vertical line on a 100 mm visual analog scale (VAS) with the anchor points of 0 = no pain and 100 = the most intensive pain you can imagine. In the same way, the subjects also estimated the impact of secondary otalgia on daily living (0 = not interfering, 100 = impossible to live a normal life), concentration (0 = not interfering, 100 = impossible to concentrate), and on sleeping (0 = not interfering, 100 = impossible to sleep).

Clinical Examination

An experienced otologist (SK) performed a standardized otolaryngologic examination and interview to rule out primary otalgia. The otologic examination included inspection of the ears, nose, mouth, nasopharynx, and larynx and bilateral palpation of the ventral, lateral, and dorsal neck regions, the larynx, the thyroid, and the submandibular and parotid glands. The maxillary sinuses were examined with ultrasound, and acoustic tympanometry was used for examination of the mobility of the eardrums. The otologic interview included questions about general health, intake of medication, respiratory infection prior to otalgia, physician visits, sick leave taken because of otalgia and diagnostic assessments, and therapies for otalgia. Based on the otologic examination and interview, 9 subjects were diagnosed with primary otalgia and were excluded from further analyses.

Next, the same otologist performed a standardized cervical spine examination and interview. The examination of the cervical spine consisted of guided active and passive cervical flexion, extension, flexion with rotation, and rotation with extension. Three clinical signs were recorded: *(1)* reduced mobility of cervical spine, *(2)* pain on palpation of the neck muscles (muscles of the skull base and the semispinalis capitis, trapezius, rhomboid, and levator scapulae muscles), and *(3)* pain on guided active movements of the cervical spine (flexion, extension, flexion with rotation, rotation with extension). A cervical spine movement was graded as reduced when it was at least 50% smaller than that of the opposite side. The range of movements of the cervical spine was, however, not quantified. The interview regarding CSD and related symptoms included questions about neck ache and shoulder ache, physician visits and sick leaves because of CSD, and diagnostic assessment of and therapies for CSD.

During the same visit, a specialist in stomatognathic physiology (MK) performed a standardized clinical dental and stomatognathic examination and interview. The clinical examination included the measurement of mandibular movements, the assessment of painful guided and nonguided mandibular movements and of muscle and TMJ tenderness to palpation, and the registration of TMJ sounds (clicking and crepitation) and jaw locking. The following muscles were palpated: anterior and posterior temporal muscle, attachment of the temporal muscle, deep and superficial portion of the masseter, medial and lateral pterygoid muscles, and posterior portion of the digastric muscle. The degree of muscle tenderness was evaluated according to a 4-point scale (0 = no tenderness, 1 = tenderness reported by the subject, 2 = tenderness with a palpebral reflex, 3 = withdrawal reaction). The TMJs were palpated both laterally and from inside the external acoustic meatus.

Interview

To prevent reported symptoms from influencing the clinical findings, the interview examination

Table 1 Prevalence of Subjects in the CSD, TMD, and Combination Groups with Neck Muscles Tender to Palpation or Stiff or Painful Movements of the Cervical Spine

	No. of muscles tender to palpation				No. of cervical spine movements							
					Stiff				Painful			
Group	0	1	2	3	CRFL	CFLE	CEXT	CREX	CRFL	CFLE	CEXT	CREX
CSD	29	0	2	1	6	3	2	3	2	1	2	0
TMD	16	1	0	1	1	0	0	5	0	0	0	5
Combined	22	2	2	1	5	2	1	5	4	0	1	10
Total	67	3	4	3	12	5	3	13	6	1	3	15

In this and subsequent tables, CSD = cervical spine disorder; TMD = temporomandibular disorder; Combined = combined CSD and TMD; CRFL = cervical rotation with flexion; CFLE = cervical flexion; CEXT = cervical extension; CREX = cervical rotation with extension.

was not conducted until the clinical examination was complete. The interview comprised questions on TMD symptoms and symptoms related to TMD such as head and neck region pain, facial and lingual pain, ear symptoms, clenching and bruxism, globus, dysphagia, voice problems, and trauma. Facial pain was defined as pain in the facial region (excluding headache and pain in the ear or tooth). The intensity of facial pain was assessed by means of a verbal scale from 0 to 10 (0 = no pain, 10 = maximal pain). The presence of bruxism was assessed by asking "Have you noticed keeping your teeth tightly together or grinding your teeth in situation others than eating?" No clinical criteria of bruxism were used in the analyses.

Psychometric Examination

After the clinical examinations and the interviews, the participants filled out the Finnish version of the Brief Symptom Inventory (BSI). This is a shortened version of the Symptom Check List 90 (SCL-90) questionnaire.[5] It consists of 53 questions in 9 subscales (somatization, obsessive-compulsive, interpersonal sensitive, hostility, depression, anxiety, phobic anxiety, paranoid ideation, and psychotism) measuring psychological distress during the previous month. The answers are graded on a 5-point scale from 0 to 4 based on the amount of perceived distress.

Classification of the Subjects with Secondary Otalgia

The subjects with secondary otalgia were classified into 3 different subgroups: the CSD group, the TMD group, or the "Combination" group. The CSD group comprised subjects with 1 or more clinical signs of CSD but without need for TMD treatment. The subjects with a need for TMD treatment but without signs of CSD were placed in the TMD group. The Combination group consisted of subjects with signs and symptoms of both CSD and TMD. The diagnosis of TMD treatment need was made when an experienced clinician (MK) estimated that the TMD symptoms and signs were severe enough to require treatment.[6] The inclusion criteria were therefore based on a report of suffering by the subjects and/or the presence of clear clinical signs of TMD, such as tenderness of muscles and TMJ on palpation, restricted or painful jaw movements, and joint noises (clicking, crepitation).[6] The subject was placed in the Combination group if he or she had 1 or more CSD symptoms and was in need of treatment for TMD. The subjects not fitting into the clinical groups were classified into the "Neither" group (neither signs of CSD nor need for treatment for TMD).

Statistical Analysis

Differences between groups were analyzed by means of the chi-square and Student *t* tests (SPSS Regression Models). In the within-group analyses, a nonparametric chi-square test with equal distribution expectancy was used (SPSS Regression Models). The differences between and within groups were considered as statistically insignificant with a $P > .05$, almost significant when $.01 \leq P < .05$, significant when $.001 \leq P < .01$, and highly significant with a $P < .001$.

Results

Of the 91 subjects with secondary otalgia, 35% were placed in the CSD group, 20% in the TMD group, 30% in the Combination group, and 15% in the Neither group (nonparametric $\chi^2 = 8.9$, $P = .030$). The clinical examination of the cervical spine revealed 10 neck muscles tender to palpation,

Table 2 Percent Distribution of Subjects with Secondary Otalgia with Symptoms and/or Signs of TMD

	CSD (n = 32)		TMD (n = 18)		Combined (n = 27)		Neither (n = 14)		Total (n = 91)	
	n	%	n	%	n	%	n	%	n	%
Symptoms										
Tiredness or stiffness of the jaws*	3	9.4	3	16.7	4	14.8	2	14.3	12	13.2
Intermittent locking of the jaws*	2	6.3	1	5.6	0	0	0	0	3	3.3
Difficulties in opening the mouth continuously*	0	0	0	0	1	3.7	0	0	1	1.1
Pain in maximal opening of the mouth*	0	0	2	11.1	0	0	0	0	2	2.2
Pain during mastication in the TMJ, muscles, or in front of the ear*	5	15.6	10	55.6	13	48.1	1	7.1	29	31.9
Signs										
Tenderness on lateral palpation of the TMJ*	10	31.3	11	61.1	15	55.6	2	14.3	38	41.8
Clicking of the jaws†	15	46.9	10	55.6	13	48.1	5	35.7	43	47.3
Crepitus of the jaws*	6	18.8	1	5.6	5	18.5	5	35.7	17	18.7
Painful jaw movement*	8	25.0	6	33.3	15	55.6	3	21.4	32	35.2
Muscles tender on palpation‡		2.6		7.7		8.2		1.6		5.1

*No statistical analysis because frequency of subjects was less than 5 in 1 or more groups.
†Not statistically significant.
‡$F = 27.8$, $P < .001$.

Table 3 Distribution of Genders Among the Clinical Groups (n = 91)

	CSD (n = 32)		TMD (n = 18)		Combined (n = 27)		Neither (n = 14)	
	n	%	n	%	n	%	n	%
Male	15	47	3	17	9	33	8	57
Female	17	53	15	83	18	67	6	43
Total	32	100	18	100	27	100	14	100

$\chi^2 = 6.9$; $P = .074$.

33 restricted cervical spine movements, and 25 painful cervical movements (Table 1). Sixty percent of subjects with TMD also had CSD; 46% of subjects with CSD also had TMD.

Table 2 shows the prevalences of the different symptoms in the different groups. Because of sample sizes in most of the groups, statistical tests for intergroup differences could be performed only for signs of joint clicking and number of muscles tender to palpation. Only the latter varied with statistical significance among the groups ($P < .001$).

The subjects in the TMD group were significantly younger (40 ± 15 years) than those of the Combination (51 ± 13 years) or CSD groups (55 ± 12 years) ($F = 7.5$; $P = .001$). The mean age of the subjects in the Neither group was 45 years. The post hoc analyses revealed that the subjects of the CSD and Combination groups were older than those of the TMD group ($P = .05$). The ratio between women and men was 5:1 in the TMD group and 2:1 in the Combination group (Table 3). However, the differences in the gender distribution between the clinical groups were not statistically significant.

Secondary otalgia showed a slight tendency to be more frequently located in the right ear (37%) or in both ears (37%) than in the left ear (25%) (Table 4). The subjects in the Neither group reported bilateral otalgia (7%) less often than those in the other groups (43%) ($\chi^2 = 6.5$; $P = .039$).

Thirty-two percent of subjects with secondary otalgia reported that the pain had lasted for at least 2 years, 66% reported that it was strong or very strong, and 34% reported that it occurred at least 3 times a month (Table 4). No statistically significant differences in pain duration, intensity, or frequency were found. Fifteen percent reported secondary otalgia with a duration of at least 2 years, a frequency of at least 3 times a month, and a strong intensity. These subjects were evenly distributed across the CSD, TMD, and Combination groups (accounting for 15% to 20% of each group), but none of them belonged to the Neither group.

Subjects in the Neither group reported recurrent shoulder ache significantly less often (21% vs 65%, $\chi^2 = 12.1$; $P < .001$), and less often recurrent headache (14% vs 49%; $\chi^2 = 11.0$; $P = .012$) and TMD pain (43% vs 74%, $\chi^2 = 11.2$; $P = .011$) than the subjects of the other groups (Table 5). There were no statistically significant differences between Neither-group subjects and those of the other groups for prevalence of neck ache, bruxism, general disease, trauma to the head and face region, or chronic pain.

Table 4 Subjective Characteristics of Secondary Otalgia Among All Groups (n = 91)

	CSD		TMD		Combined		Neither		Total	
	n	%	n	%	n	%	n	%	n	%
Localization										
Right ear	10	31	9	50	7	26	8	57	34	37
Left ear	8	25	2	11	8	30	5	36	23	25
Both ears	14	44	7	39	12	44	1	7	34	37
Duration (mo)										
12 to 23	22	69	13	72	16	60	11	79	62	68
24 or more	10	31	5	28	11	40	3	21	29	32
Intensity										
Very weak or weak	14	44	6	33	7	26	4	29	31	34
Strong or very strong	18	56	12	67	20	74	10	71	60	66
Frequency										
1 to 2 times a month	21	66	13	72	15	56	11	79	60	66
≥ 3 times a month	11	34	5	28	12	44	3	21	31	34

Table 5 Prevalence of General Diseases; Bruxism; Trauma; Recurrent Headache, Neck Ache, and Shoulder Ache; TMD Pain; and Chronic Pain Among All Groups (n = 91)

	CSD		TMD		Combined		Neither		Total			
	n	%	n	%	n	%	n	%	n	%	χ^2	*P*
General diseases	23	72	9	50	19	70	9	64	60	66	2.8	.425
Bruxism	12	38	15	83	24	89	8	57	59	65	20.4	< .001
Trauma	7	22	3	17	9	33	1	7	20	22	4.1	.248
Recurrent headache	13	41	7	39	18	67	2	14	40	44	11.0	.012
Recurrent neck ache	18	56	9	50	21	78	7	50	55	60	5.1	.165
Recurrent shoulder ache	19	59	10	56	21	78	3	21	53	58	12.1	< .001
TMD pain	19	59	16	89	22	82	6	43	63	69	11.2	.011
Chronic pain	17	53	12	67	22	82	7	50	58	64	6.5	.092

The subjects in the Neither group reported waking up early in the morning significantly less often (57% vs 88%, χ^2 = 8.4; *P* = .004) and waking up in the night because of otalgia less often (29% vs 64%, χ^2 = 6.0; *P* = .019) than those in the other groups. The answers to the other questions related to sleeping problems did not differ significantly between the subjects of the Neither group and those of the other groups.

In terms of VAS scores, no significant differences were found between the Neither group and the other groups regarding maximal pain intensity of secondary otalgia (36 and 35, respectively), and average pain intensity of secondary otalgia (26 vs 29), or the impact of secondary otalgia on daily living (14 vs 21), concentration ability (14 vs 21), or sleeping (12 vs 19).

The analyses of the BSI revealed that the number of positive symptoms was lower in the Neither group[7] compared with the others[8] (F = 4.1; *P* = .045). No statistically significant differences were found in General Symptom Index (0.6 vs 0.8), Positive Symptom Distress Index (1.3 vs 1.4), or Positive Symptom Total (30.1 vs 41.4). This was also the case for the 9 subscales of the BSI (Fig 2).

Discussion

The association of TMD and CSD in patients with otalgia is well known. The present population-based study, which included only subjects with a clinically proven diagnosis of secondary otalgia, is in accord with previously published data from patient studies[9–22] and from population studies including subjects with TMD symptoms reporting otalgia.[2,23–26] These results support the fact that secondary otalgia is often a form of pain referred from other structures, ie, from those of the masticatory system and from the cervical spine. The diagnosis of secondary otalgia requires therefore the examination of the masticatory system and the cervical spine structures.

Most (60%) of the subjects with secondary otalgia and TMD also had moderate or severe signs or symptoms of CSD. This figure is higher than that

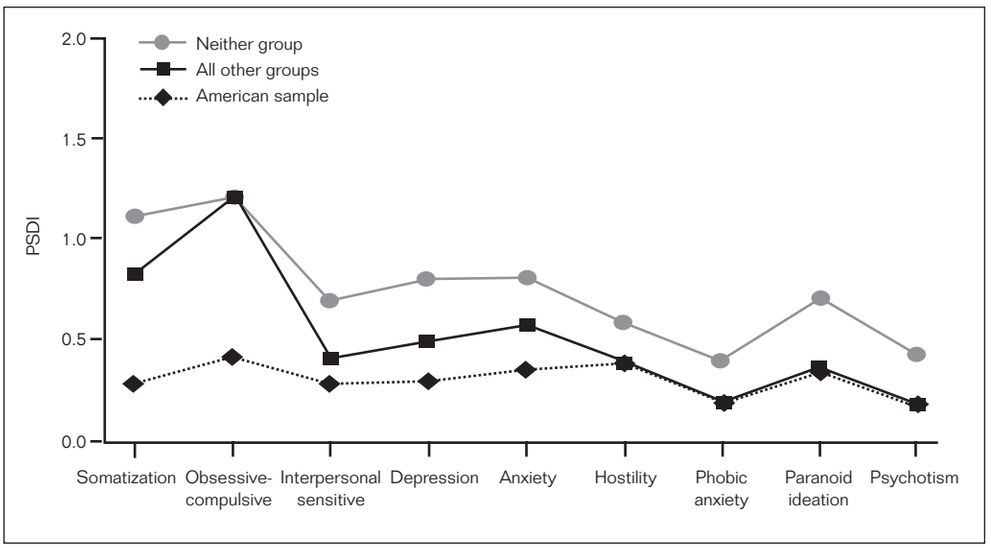

Fig 2 The means of the 9 subscales of the Brief Symptom Inventory for the subjects in the Neither group and the subjects in the TMD, CSD, Combination groups. None of the differences seen in the diagram between the Neither group and the other secondary otalgia groups were statistically significant. For comparison, the means of the subscales of an American sample of nonpatients are shown.[5] PSDI = Positive Symptom Distress Index. PSDI is the mean score of symptoms graded on a scale from 0 (no symptom) to 4 (very much). Each of the 9 subscales were graded on this scale.

reported in the population study by Ciancaglini et al,[7] which showed that 49% of subjects with moderate or severe TMD symptoms also reported CSD symptoms, compared with 29% of the subjects without TMD symptomatology. The difference in the results between these 2 studies may be explained by the different study design: Only in our study was the diagnosis of secondary otalgia confirmed by clinical examination.

About 1 out of 3 subjects with secondary otalgia reported a pain occurrence of at least 3 times a month, 2 out of 3 a strong or very strong pain intensity, and 2 out of 5 pain that had lasted for at least 2 years. Altogether 15% of the subjects of the clinical groups reported this combination of pain intensity, frequency, and duration. Thus, secondary otalgia can cause a frequent and long-lasting burden on everyday life. The same conclusion had been reached in a retrospective analysis of aural symptoms of consecutive patients attending a tertiary craniofacial pain unit, which showed that aural symptoms had a measurable impact on the quality of life of the subjects.[22]

In patients, recurrent headache is often associated with both TMD and CSD.[8,27–29] The results of the present study suggest the same trend in a population-based sample.

The Neither Group

The percentage of the subjects not fitting in the CSD, TMD, or Combination groups was surprisingly low, only 15%. This may mean that the inclusion criteria used had a low threshold for positive neck signs, or that subjects with neck pain often suffer also from secondary otalgia. The subjects in the Neither group did not report a higher pain intensity than the subjects in the CSD, TMD, and Combination groups, nor did they report that secondary otalgia had a worse impact on the quality of life.

The subjects in the Neither group reported waking up early in the morning less often than the other subjects, which may be 1 factor improving their coping ability with secondary otalgia. At least half of the subjects in the Neither group reported bruxism and general disease, which is well in accordance with the figures in our earlier report.[3] The respective values for the subjects with secondary otalgia were 53% and 61%. Trauma history was at least 2 to 3 times higher in the clinical groups than in the Neither group. Indeed, only 1 of the 14 subjects in the Neither group reported trauma to the head and face region. This 3-fold difference was not statistically significant, probably because the sample size was too small. However, trauma to face, head, or neck region could be

1 precipitating factor leading to the recurrence and/or the chronicity of secondary otalgia among the subjects of the CSD, TMD, and Combination groups. Trauma history has been shown to be associated with TMD history[30–33] among TMD patients and the same seems to be true also in the general population.

The subjects of the Neither group did not report significantly more psychological distress than the others. This result could have been influenced by the too-small sample size or by the ability of these subjects to cope with secondary otalgia occurring once a month or more often. An American study of nonpatients[5] reported lower mean scores for these dimensions and indices than the present study, which may reflect differences between the 2 cultures in expressing psychological distress.

Participation

The positive response rate to the mailed questionnaire was 69%, which is within the range (59% to 79%) reported by studies using a mailed questionnaire.[24,26,34,35] In the other 2 population-based studies of symptoms related to TMD, a mailed questionnaire was not used.[23,25] In the second phase of the present study, 66% of the 152 subjects reporting secondary otalgia participated in the clinical examinations. However, the nonparticipants did not differ significantly from the participants as far as age and gender are concerned.

Signs and Symptoms and Inclusion Criteria

The study was aimed at finding all possible signs and symptoms associated with secondary otalgia by means of the clinical examinations and the interviews conducted by the 2 specialists. Thus, the questions in the mailed questionnaire were intentionally broad in order to be able to screen and interview subjects with different causes of secondary otalgia, such as TMD and CSD. For the same reason the questions were formulated in such a way that the subject was not able to differentiate between the different possible causes of aural pain. The criterion of frequency of at least once a month or more often was selected to differentiate a clinically relevant phenomenon from seldom or very seldom occurring otalgia.

Subjects were included in the CSD group if they had 1 or more positive signs. Symptoms such as neck or shoulder ache occurring at least twice a month were reported by more than 50% of the subjects and were not used as inclusion criteria. The TMD group included only subjects considered in need of TMD treatment.[6] Because the etiology of TMD is not only multifactorial but varies also between individuals,[36] no specific criteria for TMD treatment need are available. According to Magnusson et al,[37] the assessment of TMD treatment need should thus be based on the clinician's experience and on a conservative approach to treatment. The need for TMD treatment has been evaluated at between 7% and 9% among the general population.[6,37] In this study the inclusion criteria were conservative in order to avoid overestimating the number of subjects in the TMD group.

Conclusions

Most of the subjects reporting secondary otalgia also had signs and/or symptoms of CSD or TMD. Thus, an examination of the cervical spine and the stomatognathic system must be routinely performed in the diagnostic process of patients with secondary otalgia.

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