Signs and symptoms of temporomandibular disorders in children with different types of headache

Marjo-Riitta Liljeström, Tapio Jämsä, Yrsa Le Bell, Pentti Alanen, Pirjo Anttila, Liisa Metsähonkala, Minna Aromaa and Matti Sillanpää

Institute of Dentistry and Department of Child Neurology, University of Turku, Turku, Finland

Liljeström M-R, Jämsä T, Le Bell Y, Alanen P, Anttila P, Metsähonkala L, Aromaa M, Sillanpää M. Signs and symptoms of temporomandibular disorders in children with different types of headache. Acta Odontol Scand 2001;59:413–417. Oslo. ISSN 0001-6357.

Headache is a common symptom among children and teenagers. Both bruxism and muscle and joint tenderness have been found in children with headache. Children with migraine headache report more temporomandibular disorder (TMD) symptoms than do those with tension-type headache. The aim of the present study was to investigate the association of different types of headache with TMD and sex in children. Altogether 297 randomly selected schoolchildren aged 13–14 years participated in a blind study setting. There were no statistically significant differences between the headache groups with regard to TMD signs, although the migraine and migraine-type headache groups had the highest percentage of subjects with more severe TMD signs. Nor were there any statistical differences between sexes or between the headache groups with regard to subjective symptoms of TMD. The present results with children differed from earlier results with adults. First, no association was found between tension headache and TMD, and, second, no sex difference in TMD children was observed at this age. □ *Adolescents; children; headache; sex; temporomandibular disorders*

Marjo-Riitta Liljeström, University of Turku, Lemminkäisenkatu 2, FI-20520 Turku, Finland. Tel: +358 2 333 8282, fax: +358 2 333 8356, e-mail: marjo-riitta.liljestrom@utu.fi

Headache is a common symptom among children and teenagers. Epidemiological research during the past 2 decades has shown that the prevalence of recurrent headache has increased in young age groups. Today, 20%–35% of 7-year-old children have recurrent headache, and the prevalence of headache increases with age (1–3). The frequency of headache is highest in young adults, decreasing in older age groups. Before puberty, the frequency of headache is about the same for boys and girls. After that, girls start to have headache more than boys, and after puberty headache occurs more often in women than in men (3–7).

Temporomandibular disorders (TMD) can be defined as a cluster of symptoms and signs involving masticatory muscles or the temporomandibular joints, or both. Studies in adolescents have shown that 35%–62% of subjects have some signs or symptoms of TMD, although they are mostly mild and fluctuating (8, 9). In an epidemiological study of children and adolescents 33% had muscle tenderness on palpation, and 8%–14% had moderate or severe TMD signs (10).

Several clinical and epidemiological studies in adults indicate that there is an association between tension headache and TMD (11–23). Many of these studies have shown that subjects with headache, especially with tension headache, and TMD patients show similar symptoms and signs. The severity of TMD correlates with the intensity and frequency of headache. TMD treatment has also resulted in reduction of headache factors.

There are only a few studies of TMD and headache in children and teenagers (8, 9, 24). None of these studies has analyzed the association between TMD and different types of headache in children.

The aim of the present study was to investigate the association of different types of headache with TMD and sex in children.

Subjects and methods

The study sample was drawn from an earlier population-based sample comprising a total of 1135 6th-grade children aged 12–13 years in 35 primary schools in the city of Turku, southwestern Finland. These children had been classified into five headache groups or as free from headache in accordance with the criteria of the Committee of the International Headache Society (IHS) in 1998 (25). No sex differences within or between the headache groups were observed in this study (26). For the present study a maximum of 70 children from each headache group and from among the healthy controls was randomly selected. As a result, our sample consisted of 310 children aged 13–14 years of age (mean age, 13.4 years) (Fig. 1).

On the basis of an extensive examination by a physician and a physiotherapist the subjects were reclassified into headache subgroups in accordance with their present clinical status. After that, 297 children, 146 girls and 151 boys, came to the Institute of Dentistry for a thorough stomatognathic examination. The interval between the medical and dental examination was 1–2 weeks on average. Two dental examiners were involved, neither of whom knew the results of the medical examination.

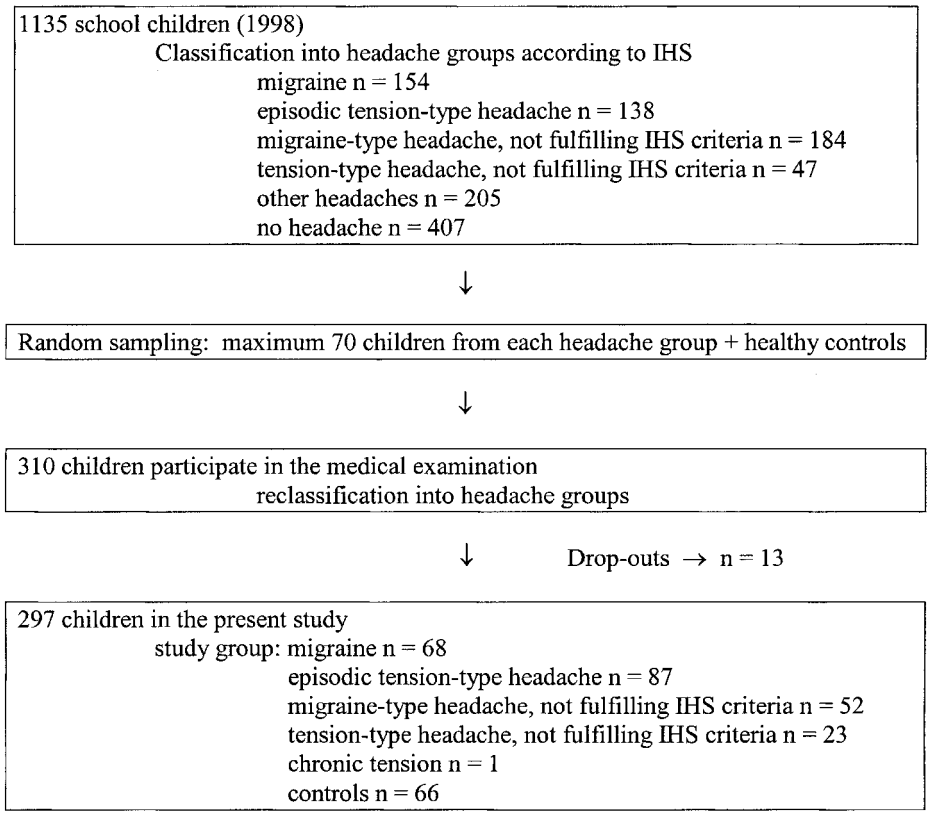

Fig. 1. The sequence of subject selection for the present study.

Interview

The first examiner interviewed the subjects with regard to TMD symptoms, using a standardized protocol in this blinded study setting. Questions were asked about joint sounds, jaw mobility, pain while chewing, sensation of fatigue in the jaw, pain or sensation in the ear or throat, and parafunctions, such as bruxism.

Clinical examination

The interview was immediately followed by a stomatognathic examination made by the second examiner without knowing the results of the interview. The range of mandibular movements was measured. The sounds of the temporomandibular joints were examined using a stethoscope. Pain and locking or luxation of the joints on movements of the mandible were recorded. The temporomandibular joints were palpated laterally and posteriorly, and tenderness of the joints was recorded. The following masticatory muscles were palpated bilaterally: the anterior and posterior portions and the insertion into the coronoid process of the temporal muscle, the deep and superficial portions of the masseter muscle, the posterior portion of the digastricus muscle, and the medial and lateral pterygoid muscles. No tenderness was recorded if the subject did not react to the palpation. Mild tenderness was present if the subject verbally reported any pain during palpation. Moderate or severe tenderness gave rise to blink reflex or resulted in a withdrawal.

Scoring of the clinical signs

The clinical signs were scored from 0 to 2 for every muscle, depending on the degree of tenderness of the muscle to palpation. Joint tenderness was also graded depending on whether it was lateral, posterior, or both. One point was given to each joint if any sound was registered. Difficulties in guiding the mandible into the centric relation (CR) or pain recorded during this manipulation scored one point. When these points were added together (maximum, 35) the child was given a score for the severity of TMD signs (Table 1). The TMD signs were classified as no signs when the sum score was 0, very mild when the score was between 1 and 4, and mild or moderate when the score was 5 or more. Information on which headache group the child belonged to was received from the medical examiner for the statistical analyses.

Examiner calibration and intraexaminer variation

Before the study began the methods of the clinical

Table 1. Temporomandibular disorder score drawn from the clinical examination

Variable	Score 0	Score 1	Score 2	Total
Pain on opening	No	Yes		1
Pain on jaw movements	No	Yes		1
Muscle pain on palpation (14 sites)	No	Mild	Moderate	28
Pain on palpation of joints	No	One side	Both sides	2
Joint sounds	No	One side	Both sides	2
Pain or stiffness on guiding the mandible	No	Yes		1
Maximum				35

Table 2. Percentage distribution of temporomandibular disorder (TMD) signs in different headache groups

TMD signs	Migraine, $n = 68$	Migraine-type, not fulfilling IHS criteria, $n = 52$	Episodic tension-type, $n = 87$	Tension-type, not fulfilling IHS criteria, $n = 23$	Controls, $n = 66$	Total, $n = 296$
No signs	15	17	29	13	29	66
Very mild	63	60	55	70	56	175
Mild or moderate	22	23	16	17	15	55

examiner were calibrated with those of experienced clinicians at the Institute of Dentistry. During the study clinical data from 33 subjects were collected for evaluation of intraexaminer variation. The result showed that the scores for 23 of 33 subjects were identical. In six subjects the difference between the two examinations was 1 point of 35, and in four subjects the difference was 2 points.

Study approval

Informed consent was obtained from all the study subjects and their legal guardians. The study received approval from the Joint Ethics Council of the Medical School, University of Turku, and the University Hospital of Turku.

Statistical methods

The differences between the groups were tested applying the Wilcoxon rank sum test. The cut-off point for the P value of more than 0.05 was applied.

Results

All headache groups were similar with regard to TMD signs, and there were no statistically significant differences between the groups. However, the migraine-type headache groups had the highest percentage of subjects with mild or moderate TMD signs. The children in the tension-type headache group, not fulfilling the IHS criteria, had most TMD signs on the whole, whereas the episodic tension-type headache group and healthy controls showed least overall TMD signs (Table 2). Girls had more moderate TMD signs in all groups than boys, although the differences were not statistically significant.

Only the children in the tension-type headache group, not fulfilling the IHS criteria, reported difficulties in opening the mouth. Children with migraine and episodic tension-type headache reported locking of the joints. Migraine children had most earache. Nocturnal bruxism was reported most by the children in the tension-type headache group, not fulfilling the IHS criteria. There were no statistically significant differences between the groups with regard to subjective symptoms of TMD (Table 3).

Table 3. Percentage distribution of (TMD)-related symptoms in different headache groups

TMD symptoms	Migraine, $n = 68$	Migraine-type, not fulfilling IHS criteria, $n = 52$	Tension-type, $n = 87$	Tension-type, not fulfilling IHS criteria, $n = 23$	Controls, $n = 66$
Fatigue or stiffness of the jaw	—	6	3	4	—
Difficulties in opening	—	—	—	4	—
Pain in opening	19	19	—	—	17
Locking	2	—	1	—	—
Earache	9	—	6	—	5
Nocturnal bruxism	10	—	—	22	17

Discussion

The present results with children differed from earlier results with adults in two respects. First, no association was found between tension-type headache and TMD, and, second, no sex difference was observed in TMD children.

In the present study migraine tended to be associated with TMD, whereas earlier studies in adults have repeatedly shown that tension and combination headaches are closely associated with TMD (11–23). It is possible that children with migraine are more pain-sensitive than children with other headache types. Children with migraine reported neck and shoulder pain, recurrent abdominal pain, back pain, otalgia, and depression significantly more often than children with nonmigrainous headache. On the other hand, in children with nonmigrainous headache the frequency of headache episodes correlated with the frequency of other pains (27). The discrepancy between studies in adults and children may be partially due to the present IHS criteria, which may not be appropriate in diagnosing children's headaches (28, 29). This is especially true in subjects with tension-type headache. The IHS criteria are based on headache characteristics and associated symptoms. All headaches can be classified on the basis of these criteria, but these headache groups might include heterogeneity. The characteristics and the development of headache in children are not very well known. There are also difficulties in the classification of TMD because of the large variations in signs and symptoms. Furthermore, it may be possible that the type of headache may change over time. Already during this study some of the children had changed from one headache category to another.

The lack of sex difference in TMD is in contrast to earlier results in studies of adults, which have shown a clear difference in TMD signs and symptoms between men and women (30). On the other hand, our results are in line with studies of headache in children, which show no sex difference between boys and girls before puberty (4), and with earlier studies of children with TMD, which show no sex difference at this age (31). This may indicate that puberty brings along hormonal changes that increase the risk of headache and TMD for girls. Preliminary studies suggest that estrogen might play a role in TMD disorders, but the information is not definitive at this point (32, 33).

One explanation of the differences could be variations in clinical methods. However, much attention was paid to the blinding and calibration of the clinical examiner before the start of, and during, the investigation. Furthermore, the investigators were extremely careful about the blinding of the investigation; the interviewer did not know the headache group of the subject, nor did the clinical examiner know the headache group or the result of the interview.

We conclude that an association between TMD and tension-type headache is not observed in children, nor is sex difference in TMD observed at the age of 13 to 14 years. To explain the association between TMD and headache in children and teenagers and the sex difference seen in adults, longitudinal studies are needed.

Acknowledgement.—The financial support of Odontologiska Samfundet i Finland is gratefully acknowledged.

References

1. Sillanpää M, Anttila P. Increasing prevalence of headache in 7-year-old schoolchildren. Headache 1996;36:466–70.
2. Sillanpää M. Changes in the prevalence of migraine and other headaches during the first seven school years. Headache 1983; 23:15–9.
3. Bille B. A 40-year follow-up of school children with migraine. Cephalalgia 1997;17:488–91.
4. Wöber-Bingöl C, Wöber C, Wagner-Ennsgraber C, Zebenholzer K, Vesely C, Geldner J, et al. IHS criteria and gender: a study on migraine and tension type headache in children and adolescents. Cephalalgia 1996;16:107–12.
5. Waters WE. Community studies of the prevalence of headache. Headache 1970;9:178–86.
6. Waters WE. The Pontypridd survey. Headache 1974;14:81–90.
7. Nikiforow R. Epidemiological studies on headache in Northern Finland. A survey of an urban and rural area [thesis]. Oulu: Oulun Yliopiston julkaisuja; 1981.
8. Nilner M. Prevalence of functional disturbances and diseases of the stomatognathic system in 15–18 year olds. Swed Dent J 1981; 189–97.
9. Wänman A, Agerberg G. Mandibular dysfunction in adolescents. I. Prevalence of symptoms. Acta Odontol Scand 1986;44:47–54.
10. Egermark-Eriksson I. Mandibular dysfunction in children and in individuals with dual bite [thesis]. Swed Dent J 1982; Suppl 10.
11. Magnusson T, Carlsson GE. Recurrent headaches in relation to temporomandibular joint pain-dysfunction. Acta Odontol Scand 1978;36:333–8.
12. Magnusson T, Carlsson GE. Changes in recurrent headaches and mandibular dysfunction after various types of dental treatment. Acta Odontol Scand 1980;38:311–20.
13. Magnusson T, Carlsson GE. A $2\frac{1}{2}$ year follow-up of changes in headache and mandibular dysfunction after stomatognathic treatment. J Prosthet Dent 1983;49:398–402.
14. Reik L, Hale M. The temporomandibular joint pain-dysfunction syndrome: a frequent cause of headache. Headache 1981;21: 151–6.
15. Forssell H, Kangasniemi P. Correlation of the frequency and intensity of headache to mandibular dysfunction in headache patients. Proc Finn Dent Soc 1984;80:223–6.
16. Forssell H, Kangasniemi P. Mandibular dysfunction in patients with muscle contraction headache. Proc Finn Dent Soc 1984;80: 211–6.
17. Forssell H, Kirveskari P, Kangasniemi P. Changes in headache after treatment of mandibular dysfunction. Cephalalgia 1985;5: 229–36.
18. Reik L. Unnecessary dental treatment of headache patients for temporomandibular joint disorders. Headache 1985;25:246–8.
19. Kirveskari P, Alanen P, Karskela V, Kaitaniemi P, Holtari M, Virtanen T, et al. Association of functional state of stomatognathic system with mobility of cervical spine and neck muscle tenderness. Acta Odontol Scand 1988;46:281–6.
20. Schokker RP, Hansson TL, Ansink BJJ. Craniomandibular disorders in patients with different types of headache. J Craniomandib Disord Facial Oral Pain 1990;4:47–51.
21. Schokker RP, Hansson TL, Ansink BJJ. Differencies in headache patients regarding response to treatment of the masticatory system. J Craniomandib Disord Facial Oral Pain 1990;4:228–32.
22. Karppinen K. Purennan hoito osana kroonisten pää-, niska-ja hartiakipujen hoitoa [thesis]. Turku: Turun Yliopiston julkaisuja; 1995.

23. Molina OF, dos Santos J, Nelson SJ, Grossman E. Prevalence of modalities of headache and bruxism among patients with craniomandibular disorder. J Craniomandib Pract 1997;15:314–25.
24. Magnusson T, Carlsson GE, Egermark I. Changes in subjective symptoms of craniomandibular disorders in children and adolescents during a 10-year period. J Orofacial Pain 1993;7: 76–82.
25. Headache Classification Committee of the International Headache Society. Classification and diagnostic criteria for headache disorders, cranial neuralgia and facial pain. Cephalalgia 1988;8 Suppl 7:1–96.
26. Anttila P, Metsähonkala M, Aromaa M, Sourander A, Salminen J, Helenius H, et al. Determinants of tension-type headache and migraine in children. Cephalagia. In press 2001.
27. Anttila P, Metsähonkala L, Michelsson M, Helenius H, Sillanpää M. Comorbidity of other pains in school children with migraine and in those with nonmigrainous headache. J Pediatr 2001; 138:176–80.
28. Metsähonkola L, Sillanpää M. Migraine in children—an evaluation of the IHS criteria. Cephalalgia 1994;14:285–90.
29. Hämäläinen ML, Hoppu K, Santavuori PR. Effect of age on the fulfilment of the IHS criteria for migraine in children at a headache clinic. Cephalalgia 1995;15:404–9.
30. Kuttila M, Niemi P, Kuttila S, Alanen P, Le Bell Y. TMD treatment need in relation to age, gender, stress and diagnostic subgroup. J Orofac Pain 1998;1:67–74.
31. Könönen M, Nyström M, Kleemola-Kujala E, Kataja M, Evälahti M, Laine P, et al. Signs and symptoms of craniomandibular disorders in a series of Finnish children. Acta Odontol Scand 1987;45:109–14.
32. LeResche L, Sauners K, von Korff M, Barlow W, Dworkin SF. Use of exogenous hormones and risk of temporomandibular disorder pain. Pain 1997;69:153–60.
33. Dao TTT, Knight K, Ton-That V. Modulation of myofascial pain by the reproductive hormones: a preliminary report. J Proshet Dent 1998;79:663–70.

Received for publication 2 January 2001
Accepted 5 June 2001