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RESEARCH

Prevalence of clinical and radiographic signs of osteoarthrosis of the temporomandibular joint in an older persons community

M Schmitter*[,1], M Essig[3], V Seneadza[1], Z Balke[1], J Schröder[2] and P Rammelsberg[1]

[1]*Department of Prosthodontics and* [2]*Section of Geriatric Psychiatry, University of Heidelberg, Heidelberg, Germany;* [3]*MRI and Neuroimaging, Department of Radiology, German Cancer Research Centre, Heidelberg, Germany*

Objectives: The aim was to assess the prevalence of osteoarthrosis (OA) in the temporomandibular joint (TMJ) in a sample of older people by use of contrast agent-enhanced MRI.
Methods: 30 patients (73–75 years old) were drawn from a representative sample and were examined clinically. The shape of the condyle was assessed using gadolinium-enhanced MR images, which were evaluated by two independent raters. Statistical assessment was performed by using descriptive statistics, the χ^2 test and kappa statistics.
Results: Agreement between raters was excellent with respect to the presence/absence of OA (kappa = 0.8). Only one subject reported pain in a TMJ. Fine and/or coarse crepitus was not heard in any subject. MRI showed that 70% displayed signs of OA in at least one TMJ. There were no gender-related differences in the prevalence of OA ($P > 0.05$).
Conclusion: Gadolinium-enhanced MRI showed that OA of the TMJ is common in older people (70%), although the prevalence of clinical signs of OA is very low.
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Keywords: magnetic resonance imaging; osteoarthrosis; temporomandibular joint; older people

Introduction

Temporomandibular disorder (TMD) is a collective term for a heterogeneous array of physiological disorders associated with the temporomandibular joints (TMJs) and related musculature.[1] Besides other subtypes of TMD, osteoarthrosis has been described as a severe TMD subtype, occurring for example in patients presenting with rheumatoid arthritis,[2] but also in representative samples.[3] Since arthritis and rheumatic conditions represent the leading causes of disability in the USA,[4] and whereas the prevalence of osteoarthrosis has been assessed for different joints (wrist, hand, knee) in representative samples, it would be of interest to assess the prevalence of osteoarthrosis (OA) of the temporomandibular condyle since the TMJ is one of the most frequently used joints and a limitation of chewing ability influences the quality of life.[5]

When assessing the prevalence of OA, the first challenge is the widely recognized disparity between objective diagnosis, based on imaging evidence, and patient-reported symptoms of pain or disability.[6] However, objective diagnoses (such as imaging modalities) provide more reproducible results and facilitate more accurate comparative studies.[6] Although several studies have assessed the prevalence of OA of the knee and other joints in representative samples using imaging modalities, little is known about the prevalence of OA in the TMJ.[7] In addition, the available database on clinical examinations with predictive values for degenerative joint diseases is insufficient.[8] Moreover, the clinical assessment of TMJ pain and impairment seems to be even more complicated than in other joints because of the close relationship to other functional structures. Consequently, the results of prevalence studies based on clinical examination might be biased.[9] Furthermore, the reliability of the diagnosis of OA of the TMJ based on a clinical examination remains uncertain.[10]

As the prevalence of OA is related to gender and age and might present a reduced progression in some joints after 75 years, an examination of the TMJs of a representative sample of older people to include both

*Correspondence to: Prof Dr Marc Schmitter, Poliklinik für Zahnärztliche Prothetik, Im Neuenheimer Feld 400, 69120 Heidelberg, Germany; E-mail: Marc_Schmitter@med.uni-heidelberg.de
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females and males and based on both clinical and imaging techniques would be useful.[11] Thus, the purpose of the present study was to assess the prevalence of OA of the TMJ in a representative sample based on a standardized clinical examination, which is described in detail elsewhere,[1] and with use of contrast agent-enhanced MRI.

Materials and methods

Study sample

An interdisciplinary longitudinal study of adult development (ILSE) was conducted in two German urban areas (Heidelberg and Leipzig). ILSE is a prospective study on adult development in Germany based on two birth cohorts born in 1930–32 and 1950–52.[12] Subjects were randomly identified and recruited using the community registers. As it is compulsory for each resident in Germany aged 16 years and above to be registered, this recruitment procedure yielded an almost representative sample from each community. A detailed description of the sample and of the sampling procedure has been given elsewhere.[13] The study was approved by the review board of the University of Heidelberg and all participants gave informed consent. In the present study, a subsample ($n = 30$, 15 males and 15 females) of the subjects born between 1930 and 1932 (Heidelberg sample) were included. In order to recruit these 30 subjects, the subjects from Heidelberg were asked to participate in the MRI examination until 15 men and 15 women consented. All these subjects ($n = 30$) were examined by a calibrated examiner using a standardized clinical examination procedure[1] (research diagnostic criteria for temporomandibular disorders, RDC/TMD), which was developed in 1992 to establish an international examination standard for TMD. The RDC/TMD examination included metric measurement of the range of mandibular motion, muscle and joint palpation with defined pressure and a record of joint sounds. The age of the subjects at the time of the examination was 74.39 ± 0.93 years for men and 74.82 ± 0.78 years for women. Additionally, limitations and pain were recorded. In addition to a clinical examination, contrast agent-enhanced MRI scans of the TMJs in both the open- and closed-mouth positions were acquired.

Acquisition and assessment of MR images

Contrast agent-enhanced (Magnevist; Schering AG, Berlin, Germany) MR images of the TMJs in the open-mouth and closed-mouth positions were acquired by use of a 1.5-T tomograph (Symphony; Siemens, Erlangen, Germany) with TMJ surface coils (12.0 cm diameter, Siemens). Three subjects refused to receive the contrast agent, so these MR images were acquired without gadolinium enhancement. The settings used were T_1 Flash 2D, slice thickness 3 mm, distance factor 20%, flip 30°, field of view 120 mm × 120 mm, time of repetition 208 ms, time of echo 10.2 ms, base resolution 256, phase resolution 80%, bandwidth 70 Hz/Px. The magnetization-prepared gradient-echo technique was used to improve the contrast of the tissue by acquiring the spins in different relaxation. This technique optimizes imaging of the cartilage and is both time-effective and cost-effective. The images were assessed independently by two raters unaware of the clinical findings but informed about the imaging technique used. The raters assessed the shape of the condyle and classified it as "signs of OA present" or "no signs of OA present". The MRI diagnosis of TMJ OA was defined as the presence of flattening, subchondral sclerosis, surface irregularities, erosion of the condyle or presence of condylar deformities associated with flattening, subchondral sclerosis, surface irregularities, erosion and osteophytes.[14] Additionally, the severity of the OA was rated (slight, moderate, severe).[15] If the raters did not agree, a consensus diagnosis was produced.

Statistical assessment

SPSS 14.0.1 (SPSS, Chicago, IL) was used for descriptive analysis, non-parametric tests and to calculate kappa statistics. The χ^2 test was used to analyse differences between female and male subjects with regard to OA. Kappa statistics were used to assess agreement between the raters with regard to the presence of OA (qualitative variable).

Results

Clinical findings

One subject reported pain in one TMJ. Fine and/or coarse crepitus was not heard for any of the subjects. In two subjects, a reciprocal clicking was noticed during opening, closing and protrusion; this disappeared during protrusive opening. None of the subjects reported a functional limitation.

Agreement between the raters

Kappa statistic analysis was performed and resulted in an excellent agreement between the raters (kappa = 0.799) with respect to the presence or absence of OA (Table 1).

Table 1 Cross-table to assess the agreement between the two raters with respect to the shape of the condyle ($n = 60$ condyles)

		Alteration of the shape of the condyle: rater 1		
		Yes	*No*	*Sum*
Alteration of the shape of the condyle: rater 2	*Yes*	30	5	35
	No	1	24	25
	Sum	31	29	60

Table 2 Details about the results of the MRI examination with respect to the presence of osteoarthrosis

	Prevalence	
	Absolute numbers	*%*
No osteoarthrosis	9	30 (4 males, 5 females)
Osteoarthrosis of one condyle	6 (2 moderate and 4 slight alterations)	70 (11 males, 10 females)
Osteoarthrosis of both condyles	15 (1 severe, 2 moderate and 12 slight alterations)	

Presence of osteoarthrosis of the TMJ (MRI)
30% of the subjects ($n = 9$) did not show any signs of OA in the condyles whereas 70% ($n = 21$) displayed signs of OA in at least one condyle (Table 2; for example of MRI see Figure 1).

There were no significant differences in the presence of OA in males and females (χ^2 test, $P > 0.05$). 73.3% of males and 66.7% of females showed signs of OA using MRI. 16 subjects exhibited slight alterations of the TMJ (flattening, small erosions), 4 subjects had moderate alterations of the condyle (subchondral sclerosis; surface irregularities) and only 1 subject showed severe alterations (massive condylar deformities).

Presence of disc displacement (MRI)
Disc displacement was common in the present study sample: eight subjects (two males and six females) presented disc displacement with or without reduction.

Discussion

Although OA is an essential problem, there is a lack of information about the prevalence of OA of the TMJ in older people based on both standardized clinical examination and imaging.

The results of the present study demonstrated that OA is very common (70%) in a non-patient group aged 73–75 years, although the clinical signs are rare. This finding confirms the results presented by Bagge et al[11] that even moderate or severe radiographic OA can be present without clinical signs. However, most subjects in the present study showed only slight alterations of the TMJ. Thus, the low frequency of clinical signs of OA (*e.g.* pain) is explainable.

Bernhardt et al[3] assessed the prevalence of degenerative TMJ changes using a clinical examination and MRI in males and females of different ages and found a prevalence of 25%. Additionally, these authors found joint pain in 12.7% (18.2% within patients presenting with OA). These results appear to be in contradiction to the results of the present study. However, in the study of Bernhardt et al the subjects were 20–49 years old and the lower prevalence of OA is understandable. Some studies indicate that subjective (reported) symptoms decrease with age while objective symptoms increase,[16] which is also applicable to the present study. Another study concluded that abnormal condylar findings in the TMJ in older people are not at all or only weakly correlated with signs of TMDs.[17] Keeping this in mind, the results of the present study can be conclusively integrated in the results of other studies. In the present study, no gender-related differences with respect to the prevalence of OA were found, which contradicts the results of other studies dealing with OA. However, most other studies included a wider age distribution. Additionally, the sample size in the present study was limited. Furthermore, with increasing age, gender-related differences might be reduced, both objectively and subjectively.

In the present study, contrast agent-enhanced MR images of the TMJ were used to assess the presence of OA. This method seems to be suited for detecting changes in the structure of the condyle of the TMJ.[18] This technique enables detection of smaller alterations also, and might therefore (in addition to the aforementioned other reasons) be responsible for the higher prevalence of OA in the present study.

However, the size of the sample in this study is limited and only older people living in a highly industrialized country were included. Additionally, a

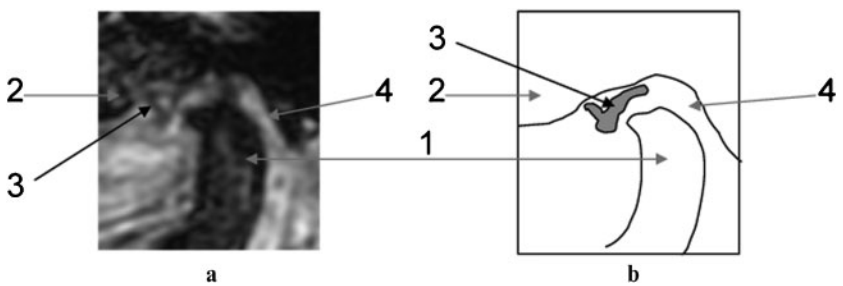

Figure 1 MRI showing alterations of the shape of the condyle (gadolinium enhanced) (a) and the schematic drawing (b). 1, condyle; 2, tuberculum articulare; 3, discus articularis (deformed); 4 retroarticular tissue

subsample of the representative sample was drawn and analysed, calling into question the representative character of the sample. These aspects must be considered when the results of this study are discussed.

In summary, by using gadolinium-enhanced MRI the present study demonstrated that OA of the TMJ is common in older people (70%) in an industrialized country, although the prevalence of clinical signs of OA is very low. Additionally, it was shown that most subjects displayed slight alterations of the TMJ, whereas severe alterations were very rare.

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