



Comparative study of the prevalence of temporomandibular joint osteoarthritic changes in cone beam computed tomograms of patients with or without temporomandibular disorder

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Objectives. To compare the prevalence of temporomandibular joint (TMJ) osteoarthritic changes in cone beam computed tomography (CBCT) images of temporomandibular disorder (TMD) and non-TMD patients.

Study Design. A retrospective analysis of CBCT images of the joints of TMD and non-TMD patients was performed. The presence or absence of osteoarthritic changes (condylar erosion, osteophyte, subcortical cyst, or generalized sclerosis) in each TMJ was evaluated. The prevalence within the two study groups were compared by using Chi-square statistics.

Results. At least one type of osteoarthritic change was present in 78.6% of joints in the TMD group and 79.7% in the non-TMD group. No significant difference was found in prevalence of osteoarthritic changes between the TMD and non-TMD groups in the overall study sample or within the subsets of gender and age in the groups.

Conclusions. The lack of a significant difference in prevalence of TMJ osteoarthritic changes in TMD and non-TMD patients highlights the equivocal relationship between osseous TMJ morphology and degenerative bone disease. (Oral Surg Oral Med Oral Pathol Oral Radiol 2015;120:78-85)

It is currently accepted that imaging of the temporomandibular joint (TMJ) should only be performed if imaging may have a diagnostic and therapeutic impact.¹ However, there is still no clear evidence indicating when patients with temporomandibular disorder (TMD) should undergo an imaging procedure. Therefore, clearly defined referral criteria based on scientific evidence for imaging of the TMJ are needed,¹ especially when it involves ionizing radiation.

The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD), provides a standardized approach to the diagnosis of TMDs.² In 2009, as part of the RDC/TMD Validation Project,³ comprehensive TMJ diagnostic criteria were developed for image analysis. An osseous diagnosis of osteoarthritis of the TMJs was defined as the presence (in TMJ images) of TMJ deformation caused by subcortical cyst, surface

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erosion, osteophyte, or generalized sclerosis; and computed tomography (CT) was advocated as the imaging modality of choice for osseous tissues.³ However, the clinical significance of such morphologic changes of the osseous component of the TMJs is questionable considering the conflicting findings about the relationship between the radiographic findings on CT or cone beam CT (CBCT) and the clinical signs and symptoms.^{4,5} Furthermore, some authorities have highlighted the need for testing the hypothesis that patients with TMD who have TMJ-related pain and dysfunction with specific clinical symptoms do not differ from control patients with regard to the presence of specific imaging signs of TMJ osteoarthritis.⁶

Although there are numerous studies that have investigated osseous TMJ morphology in symptomatic patients, only one study has compared the prevalence of osteoarthritic changes in the CBCT images of symptomatic and asymptomatic patients, investigating only one type of osteoarthritic changes (surface erosion).⁵ However, that study excluded symptomatic patients who were free of

Statement of Clinical Relevance

The results of this study highlight the equivocal relationship between osseous temporomandibular joint (TMJ) morphology and degenerative bone disease and may aid in further assessment of the clinical significance of such morphologic changes and in the development of clearly defined criteria for TMJ imaging.

Table I. Causes of exclusion of patients

<i>Cause of exclusion</i>	<i>No. of patients excluded (No. of TMJs)</i>
No occlusal stops (including completely edentulous jaws)	22 (44)
History of orthodontic treatment	9 (18)
Craniofacial abnormalities	6 (12)
Full mouth rehabilitation	4 (8)
Trauma/maxillofacial surgery	3 (6)
Insufficient clinical information	3 (6)
Polyarthritic disorder (Sjogren syndrome)	2 (4)
Total	49 (98)

TMJ, temporomandibular joint.

Table II. Causes of exclusion of individual TMJs

<i>Cause of exclusion</i>	<i>No. of TMJs excluded</i>
Motion artifacts	75
Degraded image quality	2
TMJ ankylosis	1
Total	78

TMJ, temporomandibular joint.

radiographically detectable osteoarthritic changes. The exclusion of such an important patient cohort may have overestimated the prevalence of erosions in symptomatic patients compared with asymptomatic patients.

Therefore, this study aims to investigate the prevalence of TMJ osteoarthritic changes in sectional CBCT images of all TMD and non-TMD patients imaged within a certain period and to compare the prevalence between the two groups. The results of the study may help TMD investigators and clinicians more clearly assess the clinical significance of such morphologic changes and aid in the development of clearly defined, evidence-based referral criteria for imaging of the TMJs.

MATERIALS AND METHODS

The design of the present study is a retrospective comparative survey of CBCT images of patients attending the King Saud University College of Dentistry and who had undergone a CBCT examination (for any reason) in which the TMJs were visible. The study protocol was submitted for review by the Dental Ethics Review Board of the College of Dentistry Research Center and was granted approval (registration number NF 2228); the study is in compliance with the Helsinki Declaration. Analysis of CBCT data sets from the archives of the Radiology Department of the College of Dentistry was undertaken. The inclusion criteria were all the retrievable CBCT data sets acquired during a consecutive period (January 1, 2008 to November 9, 2010) and which included the TMJs within the field of view (FOV) of the CBCT volume. The patient’ files

were then reviewed, and patients whose files or CBCT images indicated the presence of any of the conditions listed in Table I or Table II were excluded from the study.

The patients were then classified as “TMD patient” or “non-TMD patient.” A patient was classified as a “TMD patient” if the review of the patient’s file indicated that he or she was referred for CBCT imaging of the TMJs, was undergoing TMJ therapy, was being followed up by a TMJ specialist, or had any signs, symptoms, or complaints related to the TMJs. The patient’s gender and age at the time of CBCT imaging were also noted. Lack of mention in a patient’s file of any one of the following led to inclusion of the patient within the asymptomatic group: TMD signs or symptoms; any therapy related to the TMJs; examination or follow-up by a TMJ specialist; or referral for CBCT imaging of the TMJs.

The full specifications of the CBCT device used to obtain the images, the reformatting software, and the viewing device and conditions have been described in a previous article.⁷ The CBCT images were acquired with an Iluma device (Imtek Imaging, 3M company, St. Paul, MN) which utilized a large FOV flat panel detector 19 × 24 cm in size. The images had been acquired using 3.8 mA and 120 kVp with either the full FOV or with collimation to one-half its height. The scan time was either 39.9 seconds or 20 seconds. The reconstructed voxel size was 0.29 mm.

Two calibrated oral and maxillofacial radiologists with 8 and 12 years of experience, respectively, in TMJ imaging and interpretation, and 5 years of experience each in interpretation of CBCT images, performed the reformatting and interpretation of the TMJ sectional images. The CBCT data sets were processed with reformatting software (IlumaVision 3-D, Imtek Imaging, 3M company). Corrected sagittal and coronal images of each TMJ were obtained using the orthogonal reformatting module of the reformatting software. Images were viewed as 0.29-mm thick contiguous slices (thinnest slice thickness possible). The images were viewed on a liquid crystal display (LCD) monitor (Dell Ultrasharp 2408 WFP- 24” Widescreen Flat Panel Monitors) in a dimly lit room. All the slices were viewed throughout the entire thickness of the TMJ in both the sagittal and coronal planes. The examiners were permitted to adjust window level and width and magnification for optimal clarity.

The examiners evaluated the presence or absence of osteoarthritic changes in the condylar component of each TMJ. The criteria used for radiographic diagnosis of osteoarthritis were those defined by the RDC/TMD Validation Project,³ that is, the presence of subcortical

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