

Morphological Characteristics of the Temporomandibular Joint Articular Surfaces in Patients with Temporomandibular Disorders

Características Morfológicas de las Superficies Articulares de la Articulación Temporomandibular de Pacientes con Trastornos Temporomandibulares

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SUMMARY: The knowledge of the anatomical characteristics of the temporomandibular joint (TMJ) articular surfaces is essential to enable physicians and dentists to recognize the morphological changes that occur in this articulation in patients with temporomandibular disorders (TMD). Several researchers associate the TMD with changes of TMJ articular surfaces. The careful identification of bone changes related to TMJ is critical, since these abnormalities are associated with signs and symptoms of TMD and the knowledge of TMD signs and symptoms is fundamental for correctly diagnosing and for adequate treatment planning. The aim of this study was to evaluate the morphological characteristics of the TMJ articular surfaces in patients with TMD diagnosed according to the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD). In addition, the relationship between increasing age-osteoarthritis was evaluated. For the sample we selected 19 patients, 17 female and 2 male, referred to the "Unidad de Trastornos Cráneo Cervico Mandibulares (UCRACEM) - Universidad de Talca, Chile". The imaging assessment was carried out by Cone-Beam Computed Tomography (CBCT). In the imaging analysis of the articular surfaces 11 joints (28.94%) showed normal morphology. The bone changes found were: sclerosis, flattening, erosion, osteoarthritis, osteophytes, subcondral cysts. We found statistically significant difference between increasing age-osteoarthritis ($p=0.00$). Considering our results we concluded that bone changes of the TMJ articular surfaces in patients with TMD are very common, with sclerosis as the most frequent finding. It was also possible to conclude that there was a significant association between increasing age-osteoarthritis.

KEY WORDS: Articular surfaces; Cone Beam Computed Tomography; Temporomandibular disorders.

INTRODUCTION

The knowledge of the anatomical characteristics of the temporomandibular joint (TMJ) articular surfaces is essential to enable physicians and dentists to recognize the morphological changes that occur in this articulation in patients with temporomandibular disorders (TMD).

The TMD are a sub-classification of musculoskeletal disorders. These contain a wide range of craniofacial conditions with multifactorial etiology that mask several kinds of referred signs and symptoms from the temporomandibular joint (TMJ), masticatory and cervical muscles and associated structures. The signs and

symptoms of TMD are very common in the population (Salonen *et al.*, 1990). According to Alves & Cândido (2013) the TMJ articular surfaces are represented by the posterior slope of articular tubercle, anterior portion of mandibular fossa of temporal bone and anterior slope of head or condyle of the mandible.

The correct diagnosis of bone changes related to TMJ is critical, since these abnormalities are associated with signs and symptoms of TMD and the knowledge of TMD signs and symptoms is fundamental for correctly diagnosing the dysfunctions associated with this

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syndrome and for adequate treatment planning. The most common findings of TMD imaging are associated with internal derangement and morphological changes of the mandibular condyle. The TMJ osteoarthritis (OA) is non-inflammatory disease characterized by degeneration of the joint cartilage. Osseous abnormalities associated with OA include erosions, osteophyte formation, flattening, osteosclerosis, subchondral cyst (Emshoff *et al.*, 2001).

The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) is the most widely used TMD diagnostic system for conducting epidemiological and clinical research (Manfredini *et al.*, 2011).

The aim of this study was to evaluate the morphological characteristics of the temporomandibular joint articular surfaces in patients with temporomandibular disorders diagnosed according RDC/TMD, group III, and to evaluate the relationship between increasing age-osteoarthritis.

MATERIAL AND METHOD

For the sample we selected 19 patients, 17 female and 2 male, referred to the "Unidad de Trastornos Cráneo Cervico Mandibulares (UCRACEM) - Universidad de Talca, Chile," who meet the following inclusion criteria: 18 to 72 years old, both sexes, TMD diagnosis through Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) (group III). All individuals were clinically examined by two specialists, previously calibrated in the RDC/TMD.

The imaging assessment was carried out by Cone-Beam Computed Tomography (CBCT) examination at a private radiological clinic. For the preparation of the exam the patients were in a comfortable position, with the mouth closed in maximum intercuspsation position. The subjects were instructed to keep looking at a fixed point located one meter in front of them. Through the imaging examination bone changes were evaluated.

The data were analyzed by Fisher's exact test and considered to indicate statistical significance $p < 0.05$.

RESULTS

We analyzed 38 TMJ of 19 patients. In the imaging analysis of the articular surfaces, 11 joints (28.94%) showed normal morphology (Fig. 1a). We found that 55.26% of the joints showed sclerosis of mandibular head (11 right TMJ and 10 left TMJ), flattening of the mandibular head occurred in 52.63% (9 right TMJ and 11 left TMJ) (Fig. 1b), erosion occurred in 52.63% (8 right TMJ and 12 left TMJ) (Fig. 1c), osteophytes formation occurred in 50% (10 right TMJ and 9 left TMJ) (Fig. 1d), bone remodeling occurred in 39.46% (9 right TMJ and 6 left TMJ) (Fig. 1e), subchondral cyst occurred in 10.52% (3 right TMJ and 1 left TMJ) (Fig. 2), sclerosis of the mandibular fossa occurred in 7.89% (2 right TMJ and 1 left TMJ) and erosion of the mandibular fossa occurred in 2.63% (1 left TMJ). In addition to the changes in the articular surfaces we found in the joints analyzed the presence of loose bodies (2.63%) (Fig. 3).

We found statistically significant difference between increasing age-osteoarthritis ($p = 0.00$).

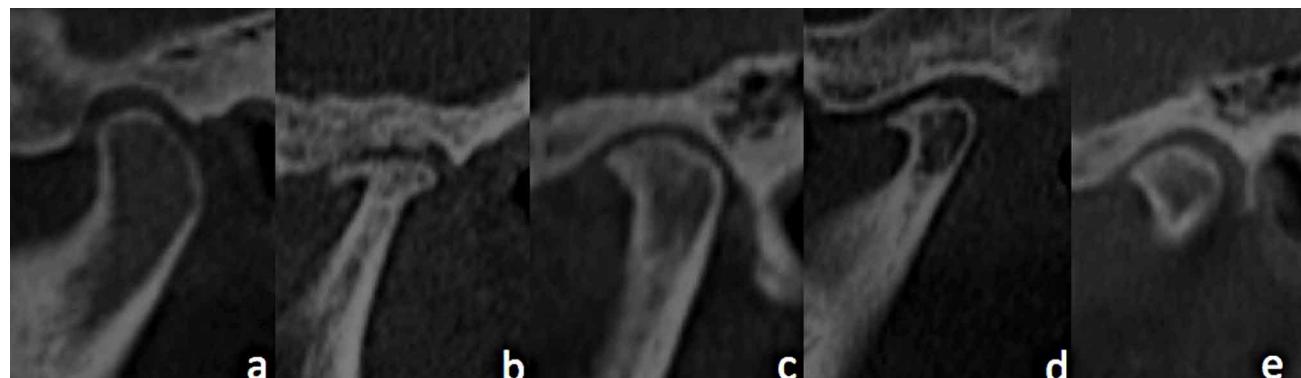


Fig. 1. Sagittal images of TMJ (closed mouth) a - normal morphology; b - flattening; c - erosion; d - osteophyte; e - mandibular fossa and articular tubercle showing bone remodeling.



Fig. 2. Coronal (a) and sagittal (b) images. Observe the hypodense image compatible with subchondral cyst (arrow).



Fig. 3. Coronal image (a), axial image (b) and sagittal image (c). Observe the presence of loose bodies (arrow).

DISCUSSION

The correct diagnosis of the morphological changes that occur in the temporomandibular joint, which allows successful treatment, depends on the knowledge of the anatomical characteristics of this articulation.

The TMD patients can have different imaging findings of soft and hard tissue abnormalities of the TMJ (Alkander *et al.*, 2010a). We agree with Greenan (1997), when affirming that an imaging examination should be part of clinical assessment routine with the aim of verifying degenerative bone changes in the TMJ.

Several authors proved the diagnostic efficacy of CBCT (Tsiklakis *et al.*, 2004; Alkander *et al.*, 2010b). In our study the imaging assessment was carried out by CBCT examination that showed diagnostic efficacy to detect TMJ osseous changes.

We agree with Oberg *et al.* (1971) and Kaplan *et al.* (1991) when affirm that there is a strong association between increased incidence of osteoarthritis and age. We found in our study, statistically significant difference between increasing age-osteoarthritis. Martínez-Blanco *et al.* (2004) indicate that changes in the joint tissues caused by aging may affect mechanical properties and facilitate the frequency of osteoarthritis. Wise *et al.* (2008) affirm that a clinical diagnosis of osteoarthritis, as well as, increasing age of the patient was found to have an impact on agreement on radiographic osseous changes.

In our study, we found 71.06% of joints with bony changes, results similar to those reported by dos Anjos Pontual *et al.* (2012) that found 71%. Koyama *et al.* (2007), Campos *et al.* (2008) and Alkander *et al.* (2010a) found lower values, but quite significant, with 63.7%, 64% and 61.3%,

respectively. Sclerosis, flattening, erosion and osteophytes formation were the most common findings in our study. Campos *et al.*, claim that the most common finding was osteophyte (40%). Alkander *et al.* (2010a) found more frequently erosion (42%) and sclerosis (40%), being rather unusual presence of osteophytes (13%). Alkander *et al.* (2010b) found deformity of the condyle (26%) and erosion (25%). Cevidanes *et al.* (2010) reported that flattening (60%), erosion (40%) and osteophytes (40%) were the most common findings. dos Anjos Pontual *et al.*, reported the presence of flattening (59%), osteophytes and flattening (29%) as the most common findings.

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RESUMEN: El conocimiento de las características anatómicas de las superficies articulares de la articulación temporomandibular (ATM) es fundamental para que clínicos y odontólogos reconozcan las alteraciones morfológicas que ocurren en la articulación de pacientes con trastornos temporomandibulares (TTM). Diversos investigadores asocian los TTM con alteraciones en las superficies articulares de la ATM. La identificación de los cambios óseos relacionados con la ATM es crítica, ya que estos se asocian a signos y síntomas de TTM, y el conocimiento de estos es fundamental para el correcto diagnóstico y adecuada planificación de tratamiento. El objetivo fue analizar las características morfológicas de las superficies articulares de la ATM en pacientes con diagnóstico de TTM, diagnosticado de acuerdo a los Criterios Diagnósticos para Investigación de los Trastornos Temporomandibulares (CDI/TTM), junto con analizar la relación existente entre incremento de edad-osteointesis. Fueron seleccionados 19 pacientes, 17 mujeres y 2 hombres, de la Unidad de Trastornos Cráneo Cervico Mandibulares (UCRACEM) - Universidad de Talca, Chile. La evaluación imagenológica se realizó mediante el examen de Tomografía Computarizada Cone-Beam (TCCB). En el análisis de las superficies articulares, 11 (28,94%) presentaron morfología normal. Los cambios óseos encontrados fueron: esclerosis, aplanamiento de la cabeza de la mandíbula, erosión, osteoartrosis, osteofitos y quiste subcondral. Hubo relación estadística significativa entre incremento de edad-osteointesis ($p=0,00$). Nuestros hallazgos nos permiten concluir que los cambios óseos en las caras articulares de la ATM en pacientes con TTM son frecuentes, y la esclerosis el hallazgo más común. También se encontró asociación entre incremento de edad y osteointesis.

PALABRAS CLAVE: Superficies articulares; Tomografía Computarizada Cone-Beam; Trastorno temporomandibular.

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