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## ORIGINAL ARTICLE

# Evaluation of missing-tooth effect on articular eminence inclination of temporomandibular joint

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## KEYWORDS

articular eminence;  
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temporomandibular  
joint

**Abstract** *Background/purpose:* Occlusion is an important component of temporomandibular joint (TMJ). Little is known about the association between missing teeth and TMJ changes. The purpose of this study was to determine if a correlation exists between unilateral missing posterior teeth and changes in the inclination of the articular eminence (AE).

*Materials and methods:* A total of 106 joints in 53 patients (20 men and 33 women) with unilateral posterior edentulism were included. In the same patients, the sagittal outline of the AE and glenoid fossa was traced in panoramic radiographs. The sagittal condylar path inclination was constructed by joining the crest of the glenoid fossa and the crest of AE. This was then related to the constructed Frankfurt's horizontal plane to determine the inclination of AE. The results were subjected to the one-way analysis of variance test. A P value of <0.05 was considered to be statistically significant.

*Results:* In this study 27% of the individuals were right posterior edentulous and 26% were left posterior edentulous. The mean value of AE inclination was 37.7°, ranging from 4° to 58°. A trend showing increased inclination angle in the nonmissing side compared with the missing side was observed (P > 0.05). The inclination of AE in men was higher than in women on both the missing side and the nonmissing side (P > 0.05). The symmetry equality between the missing and the nonmissing side joint was 1.89%. This value was higher (3%) in the female group

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than in the male group (0%). Comparing the absolute mean differences, the female group showed a lower difference (9.8°) than the male group (12.11°).

**Conclusion:** A wide range of values of AE inclination was found regardless of other factors such as side of teeth loss and the sex of patients.

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## Introduction

The temporomandibular joint (TMJ) is a complicated articular system located between the mandible and the temporal bone.<sup>1</sup> It enables the mandibular functions via a dynamic balance mechanism and has the ability to move within the three planes of space. The glenoid fossa creates the superior bone part and the mandibular condylar process creates the inferior bone part of the joint.<sup>2</sup> The articular eminence (AE) is part of the temporal bone on which the condylar process slides during mandibular movements. The inclination of the AE varies across the population and dictates the path of condylar movement as well as the degree of rotation of the disc over the condyle.<sup>3</sup> There is no doubt that the TMJ is one of the most complex joints of the body and its structure is further complicated by its close proximity to the dentition, muscles, and other oral structures.<sup>4</sup> Because of this intimate relationship with the dentition, it is essential for dentists to have a sound understanding of the stomatognathic system.

Previous studies have shown that tooth wear and tooth loss may cause deleterious effects at the TMJ such as resorption of the AE,<sup>4</sup> and may accelerate the development of degenerative joint disease.<sup>5</sup> Although there is a wealth of literature on the morphology of TMJ components,<sup>6–8</sup> little is known about the association between unilateral missing posterior teeth and the osteoarthritic changes in the TMJ, such as flattening of the AE in contemporary populations.

The purpose of this study was to determine if a correlation exists between unilateral missing posterior teeth and changes in the inclination of the AE. If a correlation can be found between easily measured factors such as tooth loss, and the less easily observed changes in the AE, these may be used as predictors of temporomandibular problems.

## Materials and methods

### Population

This study was conducted in the Oral Diagnosis and Oral Radiology Department of Tri-Service General Hospital, Taiwan, R.O.C. The measurements were performed retrospectively on panoramic records of 106 joints of 53 patients with unilateral posterior tooth loss who had previously visited the clinic. Patient ages ranged from 20 to 85 years. The exclusion criteria were as follows:

1. The presence of congenital craniofacial abnormalities and any systemic diseases which may affect joint morphology such as rheumatoid arthritis.

2. Patients with a fracture or pathologic lesions in the region of the AE, which interferes with performing the measurement on the region.
3. Patients who had reconstruction by prosthetics.

### Imaging procedures and measurements (panoramic radiography)

A single operator made all the radiographs in the same radiographic unit (CRANEX EXCEL CEPH, SORDEX, Milwaukee, WI, USA) with exposure factors of 67 kVp and 10 mA. The Pangea Dental (EBM Technologies, Taipei, Taiwan) software program was used for analyses. The images were shown on a 100% scale LCD monitor. Each measurement was repeated twice by two examiners. Ten panoramic radiographs were each traced independently by the observers to coordinate their findings before making interpretations.

The sagittal outlines of the left and right AE and glenoid fossae could be traced on the monitor. The left and right "orbitale" (the lowest point in the margin of the orbit) and the "porion" (the highest point in the margin of the auditory meatus) were identified and the Frankfurt horizontal plane was constructed by joining the two landmarks on each side. The most superior point on the glenoid fossa (the crest of glenoid fossa) and the most inferior point on the AE (the crest of AE) were identified and a second line to represent the mean condylar path inclination (CPI) was constructed by joining the two points. Using these two planes, the AE inclination was measured using the top-roof line method<sup>3,9</sup> which was the angle between the CPI plane and the Frankfort horizontal plane (Fig. 1).

### Statistical analysis

All statistical analysis was performed using SPSS 20 software (Statistical Package for the Social Sciences, IBM Software Group, Armonk, NY, USA) at the level of descriptive statistics, while the differences between arithmetic means were tested for significance using the Student *t* test. The percentage of equality and the mean absolute difference were made to show asymmetry of the measured inclination of the missing and nonmissing side joint on the same image. The one-way analysis of variance (ANOVA) test was used to determine differences in the bilateral, mean, and the difference of AE inclination between sex, age, and side of edentulous group. A *P* value of < 0.05 was considered statistically significant.

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