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Accuracy of digital panoramic radiography in the diagnosis of temporal bone pneumatization: A study in vivo using cone-beam-computed tomography

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ABSTRACT

Purpose: The objective of the study was to determine the diagnostic accuracy of panoramic radiographs in the evaluation of pneumatization of the temporal bone, with confirmation of the diagnosis by cone-beam-computed tomography (CBCT) images.
Methods: Images of 200 patients' digital panoramic radiographies and CBCT were examined by three evaluators regarding the presence or absence of pneumatization on temporomandibular joint (TMJ) fossa and/or articular eminence. When present, the defect was classified as uni- or multilocular, and as unilateral or bilateral. Areas under the ROC curve were compared to assess the accuracy of panoramic radiograph.
Results: The values obtained in the comparisons ranged from Az = 0.67 to 0.55 (Az = area under the ROC curve).
Conclusions: The panoramic radiograph, is not the exam of choice for detecting the presence of these air cells based on its medium to low accuracy for diagnosis of pneumatized articular eminence and TMJ fossa when compared to CBCT.

1. Introduction

The skull has several cavities filled with air, which is called pneumatization. These pneumatic areas can arise at different locations, in addition to paranasal sinuses, including the temporal bone (Orhan et al., 2005). The development of the air cells is preceded by a formation of bone cavities and a physiological process related to periosteal activity that promotes the increase of the air cells (Ojala, 1957). There is wide variability in the extent of temporal aeration. In some patients, air cells are limited to the roof of the temporomandibular joint (TMJ) fossa, and in others they extend into the articular eminence (Groell and Fleishmann, 1999; Sümbüllü et al., 2012). In 1985, Tyndall and Matteson termed pneumatized articular eminence (PAT) as accessory air cells that occur at the base of the zygomatic arch and articular eminence of the temporal bone (Tyndall and Matteson, 1985). For cases in which the pneumatization is restricted to the TMJ region, the defect can be termed pneumatization of the glenoid fossa (PGF). PATs are clinically asymptomatic and radiographically appear as radiolucent defects. They can be unilateral or bilateral and have two pattern types: unilocular or multilocular.

Surveys regarding the incidence of pneumatization of the articular eminence were performed based on panoramic images used for assessment and diagnosis of the defect, and results ranged from 1% to 3.42% (Orhan et al., 2005; Kaugars et al., 1986; Carter et al., 1999; Hofmann et al., 2001; Yavuz et al., 2009). On the other hand, Miloglu et al. assessed this prevalence on cone-beam-computed tomography (CBCT) images and found a significantly higher prevalence of PAT (8%) (Miloglu et al., 2011). In a recent study performed by Ladeira et al., 21.3% of individuals presented with PAT and 38.3% presented with PGF (Ladeira et al., 2013).

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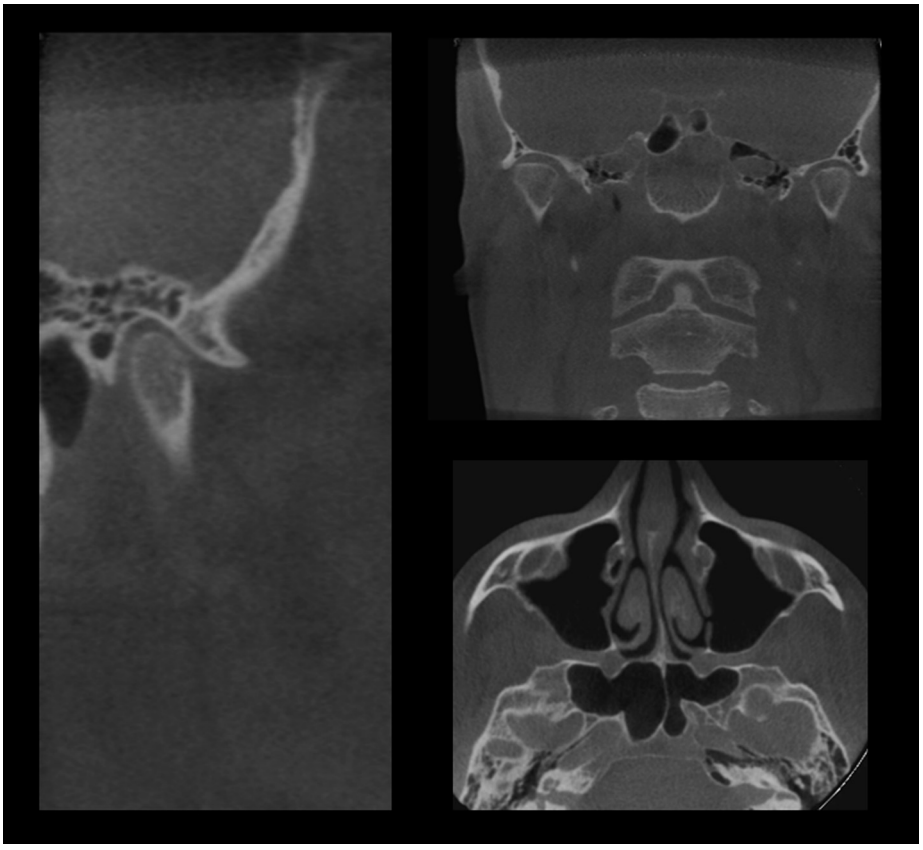

Fig. 1. CBCT image (Multiplanar reconstruction) showing an example of multilocular bilateral pneumatized TMJ fossa.

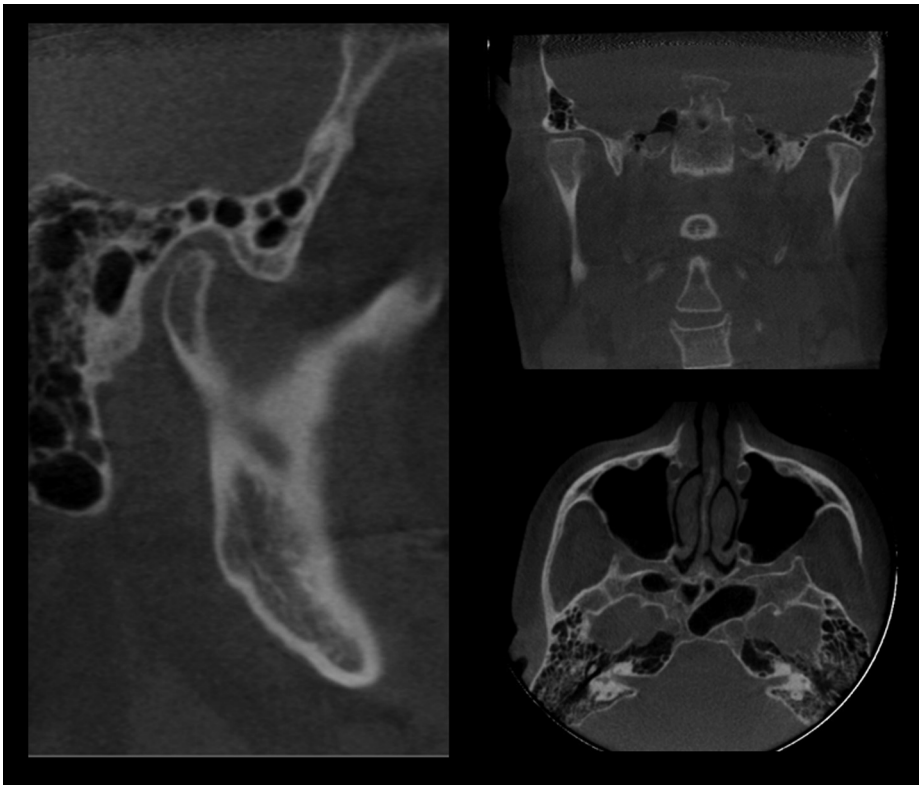

Fig. 2. CBCT image (Multiplanar reconstruction) showing an example of multilocular bilateral pneumatized articular fossa and eminence.