Accuracy of Orthopantomography for Apical Periodontitis without Endodontic Treatment

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Abstract

Introduction: This study aimed to evaluate the diagnostic accuracy of orthopantomography (OPT) for the detection of clinically/surgically confirmed apical periodontitis (AP) without endodontic treatment using cone-beam computed tomographic (CBCT) imaging as the reference standard. **Methods:** One hundred twenty patients without endodontically treated AP (diseased group) were detected via CBCT imaging using the periapical index system. They were divided into groups of 10 each according to the size of the lesion (2–4.5 mm and 4.6–7 mm) and the anatomic area (incisor, canine/premolar, and molar) in both the upper and lower arches. Another 120 patients with a healthy root and periapex (healthy group) were selected. Each diseased and healthy patient underwent OPT first and a CBCT scan within 40 days of the OPT. The periapical index system was also used to assess AP by OPT. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy for OPT images with respect to CBCT imaging were analyzed. The k value was calculated to assess both the interobserver reliability for OPT and the agreement between OPT and CBCT imaging. **Results:** OPT showed low sensitivity (34.2), negative predictive value (59.3), and diagnostic accuracy (65.0) and high specificity (95.8) and positive predictive value (89.1). Interobserver reliability for OPT was substantial (k = 0.71), and agreement between OPT and CBCT imaging was fair (k = 0.30). The best and worst identified AP were located in the lower molar area and the upper/lower incisor area, respectively. **Conclusions:** OPT showed high specificity and positive predictive value. However, overall, it was not an accurate imaging technique for the detection of untreated AP, especially in the incisor area. *(J Endod 2017;■:1–7)*

Key Words

Apical periodontitis, cone-beam computed tomographic imaging, diagnostic accuracy, orthopantomography, panoramic radiography, periapical index

Significance

Apical periodontitis is a very common and often asymptomatic clinical problem that has to be treated, especially when anticancer therapy is expected. Therefore, there should be a reliable imaging technique available to detect apical periodontitis. Can OPT fulfill this task?

Apical periodontitis (AP) is a periapical bone lesion arising from an endodontic infection determined by microorganisms penetrating into the root canal up to the apex (1). The defense mechanism in the apical periodontium leads to resorption of the apical bone, which appears as a radiolucency around the root on radiographs (2, 3).

AP is often asymptomatic and generally recognized by incidental findings during routine radiographic examinations using periapical radiography and orthopantomography (OPT) (4). These techniques have significant limitations because of 2-dimensional imaging of 3-dimensional structures, anatomic noise, superimposition, and geometric distortion effect (5–7). In addition, to be radiographically visible, periapical radiolucency should reach nearly 30%–50% of the bone mineral loss (8). For all these reasons, AP might be present even when it is not radiographically identified (9). This is especially the case if AP is confined within the cancellous bone, without the involvement of the cortical bone (10–12).

Recently, cone-beam computed tomographic (CBCT) imaging has proven to perform well for the volumetric study of bone structures (13), including the detection of periapical bone lesions (14–16). Furthermore, CBCT imaging involves a low radiation dose compared with multislice computed tomographic imaging (17), is only moderately affected by metal artifacts (18), offers a high spatial resolution (0.075–0.4 mm isotropic voxel) (19), and allows accurate 2-dimensional/3-dimensional measurements without distortion and magnification (20–22). Nevertheless, the routine use of CBCT imaging in endodontic practices is not justified (23). This imaging technique must be performed only in patients with unclear or contradictory clinical signs and symptoms using a small field of view (FOV) (24).

Biopsy represents the only way to get a histologic confirmation of AP, but it is an invasive procedure and complications can occur. Therefore, definite indices based on the radiologic features of the periapical bone lesions are generally used to detect and classify AP in routine clinical practice (25–27).

Only 1 article compared the accuracy of OPT and CBCT imaging for the assessment of AP (28) although it did not distinguish among lesions of different sizes. The aim of this retrospective study was to evaluate the diagnostic accuracy of OPT in the detection of clinically/surgically confirmed AP without endodontic treatment using CBCT imaging as the reference standard.

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0099-2399/$ - see front matter

http://dx.doi.org/10.1016/j.joen.2017.06.020

Material and Methods

Patients

Between November 2011 and December 2016, we selected from our CBCT database all patients with at least 1 not endodontically treated radiolucent periapical bone lesion using the following key words: radiolucent periapical bone lesion, apical periodontitis, endodontically treated, root canal treatment, and size (Fig. 1). One hundred twenty patients (67 women and 53 men) 22–84 years old (mean age = 57 years) were enrolled in the disease group. One AP lesion was selected for each of them. The clinical queries for the CBCT examinations were implant planning (76 patients), dental extractive planning (34 patients), and focal bone lesions (10 patients). This study was approved by the research ethics committee, and informed written consent was obtained

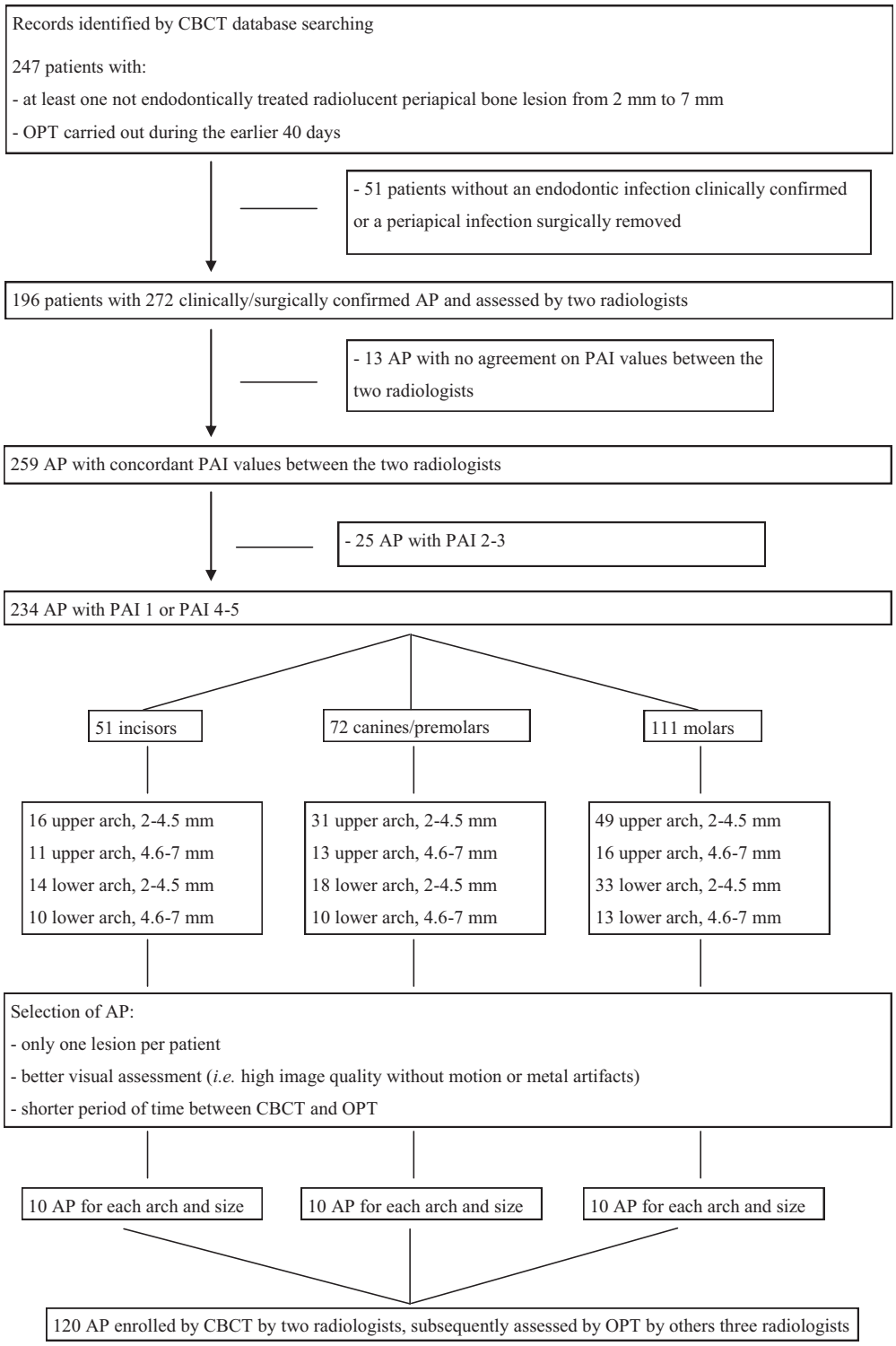

Figure 1. A flowchart of the selection criteria for enrolling patients and AP.