Clinical Applications of Current and Advanced Diagnostic Imaging Modalities for Oral Diseases

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EDITORIAL

The discovery of the X-ray by WC Roentgen in 1895 marks the beginning of the history of diagnostic imaging of the human body. In the next year, X-ray radiographs were first applied to visualize the inner structures of the tooth. Since then, a number of diagnostic imaging modalities have been developed. Many reports have suggested the usefulness of diagnostic modalities such as digital radiographs, Cone-Beam Computed Tomography (CBCT), multi-detector row CT, Magnetic Resonance Imaging (MRI), ultrasonography, and nuclear medicine including Positron Emission Tomography (PET-CT) for diagnosis of diseases affecting the oral and maxillofacial regions. However, dentists are mostly unaware of their application as diagnostic tools. Therefore, oral radiologists carry the responsibility of educating dentists and promoting the use of current diagnostic tools in the dental field.

The CBCT can be used to evaluate and three-dimensionally measure periodontal bone defects and the presence of periapical lesions and caries more accurately [1-3]. The CBCT is superior to Two-dimensional (2D) imaging in the visualization of bone topography and lesion architecture but is not more accurate than 2D imaging for bone height [4]. Moreover, CBCT can reveal apical lesions and root fractures, identify canals, and characterize internal and external root resorption (Figure 1). As the interesting topics in our fields for medical doctors, the contents should be paid attention to in PET-CT using fluorine-18-labeled (18F) fluoro-2-deoxy-D-glucose (FDG) for the evaluations of oral cancers [5,6]. As one of them, most patients with oral cancer had various areas in the oral cavity other than the primary lesions with the standardized uptake value of the highest point within the regions of interest (SUVmax) values of 18F-FDG over 2.5 (Figure 2). These areas included the frontal intrinsic muscles of the tongue, upper and lower marginal parts of the oribcularis oris muscle, sublingual glands, palatine tonsils, pharyngeal tonsil, lingual tonsil, maxilla, and mandible. Almost all patients exhibited multiple positive areas showing dental inflammation in the maxilla and mandible on 18F-FDG-PET-CT. Moreover, the SUVmax of 18F-FDG on the PET-CT in these areas widely overlapped the SUVmax in primary tumors. It is no surprise that radiologists find it difficult to identify primary oral cancers. Therefore, the areas of accumulation should be precisely identified and appropriately diagnosed by CT, MRI, and 18F-FDG-PET-CT, because 18F-FDG accumulation can occur in multiple areas in the oral cavity of oral cancer patients.

With an increase in the aged population in developed nations including Japan, there is a rise in the prevalence of systemic illnesses as well as the need for various medicines and subsequent medical expenses. This calls for a closer connection between medical and dental examination data. Dental panoramic tomography is increasingly used in dental offices worldwide, and the findings are considered to provide valuable information regarding subjects’ general health. In fact, some recent reports have referred to the possible diagnosis of general health conditions using incidental radiological findings detected on dental panoramic radiographs [7-13]. Taguchi et al demonstrated that mandibular inferior cortical findings (cortical width and shape) on dental panoramic radiographs may be associated with osteoporotic fracture risk in Caucasians and with endothelial dysfunction (Figures 3 and 4) [7,8,11,13]. Others have suggested that the presence of carotid artery calcification on dental panoramic radiographs may be a useful marker of the future incidence of vascular disease (Figure 5) [9,10]. In addition, a calcified stylohyoid complex with advanced calcifications on panoramic radiographs is associated with heel bone density determined by ultrasound densitometry, as well as with serum calcium levels [12].

When dental examination findings indicate the possibility of an underlying systemic illness, dentists should inform the patients and refer them to a medical examiner for a detailed check-up. Therefore, we believe that a closer connection between
medical and dental examination data may improve the overall health of patients.

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REFERENCES


