

Editorial

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

Yasuhiro Morimoto^{1,3*}, Masufumi Oda¹, Shinji Kito¹, Tatsuro Tanaka¹, Nao Wakasugi-Sato¹, Shinobu Matsumoto-Takeda¹, Shun Nishimura¹ and Hirofumi Koga²

¹Division of Oral and Maxillofacial Radiology, Kyushu Dental University, Japan

²Kitakyushu PET Center, Nishinippon Sangyoiseikai, Japan

³Center for Oral Biological Research, Kyushu Dental University, Japan

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 front intrinsic muscles of the tongue, upper and lower marginal parts of the orbicularis oris muscle, sublingual glands, palatine tonsil, pharyngeal tonsil, lingual tonsil, maxilla, and mandible. Almost all patients exhibited

Corresponding author

Yasuhiro Morimoto, Division of Oral and Maxillofacial Radiology, Kyushu Dental University, 2-6-1 Manazuru, Kokurakita-ku, Kitakyushu 803-8580, Japan, Tel: 81-93-285-3092; Fax: 81-93-285-3094; Email: rad-mori@kyu-dent.ac.jp

Submitted: 16 January 2014

Accepted: 17 February 2014

Published: 28 February 2014

ISSN: 2333-7095

Copyright

© 2014 Morimoto et al.

OPEN ACCESS

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]. Ohters 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.

Sources of support in the form of grants

This study was supported in part by grants-in-aid for scientific research from the Ministry of Education, Science, Sports to YM.

REFERENCES

1. Morimoto Y, Tanaka T, Yamamoto N, Kodama M, Seta Y, Habu M, et al. New Trends and Advances in Oral and Maxillofacial Imaging. *Curr Med Imaging Rev.* 2009; 5: 226-237.
2. Nair MK, Nair UP. Digital and advanced imaging in endodontics: a review. *J Endod.* 2007; 33: 1-6.
3. Lofthag-Hansen S, Huuonen S, Gröndahl K, Gröndahl HG. Limited cone-beam CT and intraoral radiography for the diagnosis of periapical pathology. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2007; 103: 114-119.
4. Tyndall DA, Rathore S. Cone-beam CT diagnostic applications: caries, periodontal bone assessment, and endodontic applications. *Dent Clin North Am.* 2008; 52: 825-84, vii.
5. Kito S, Koga H, Kodama M, Habu M, Kokuryo S, Yamamoto N, et al. Variety and complexity of fluorine-18-labelled fluoro-2-deoxy-D-glucose accumulations in the oral cavity of patients with oral cancers. *Dentomaxillofac Radiol.* 2013; 42: 20130014.
6. Kito S, Koga H, Kodama M, Yamamoto N, Kokuryo S, Habu M, et al. Reflection of ¹⁸F-FDG accumulation in the evaluation of the extent of periapical or periodontal inflammation. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2012; 114: e62-69.
7. Taguchi A, Suei Y, Sanada M, Ohtsuka M, Nakamoto T, Sumida H, et al. Validation of dental panoramic radiography measures for identifying postmenopausal women with spinal osteoporosis. *AJR Am J Roentgenol.* 2004; 183: 1755-1760.
8. Taguchi A, Suei Y, Sanada M, Higashi Y, Ohtsuka M, Nakamoto T, et al. Detection of vascular disease risk in women by panoramic radiography. *J Dent Res.* 2003; 82: 838-843.
9. Ohba T, Takata Y, Ansai T, Morimoto Y, Tanaka T, Kito S, et al. Evaluation of the relationship between periapical lesions/sclerotic bone and general bone density as a possible gauge of general health among 80-year-olds. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2005; 99: 355-360.
10. Tanaka T, Morimoto Y, Ansai T, Okabe S, Yamada K, Taguchi A, et al. Can the presence of carotid artery calcification on panoramic radiographs predict the risk of vascular diseases among 80-year-olds? *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2006; 101: 777-783.
11. Okabe S, Morimoto Y, Ansai T, Yoshioka I, Tanaka T, Taguchi A, et al. Assessment of the relationship between the mandibular cortex on panoramic radiographs and the risk of bone fracture and vascular disease in 80-year-olds. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2008; 106: 433-442.
12. Okabe S, Morimoto Y, Ansai T, Yamada K, Tanaka T, Awano S, et al. Clinical significance and variation of the advanced calcified stylohyoid complex detected by panoramic radiographs among 80-year-old subjects. *Dentomaxillofac Radiol.* 2006; 35: 191-199.
13. Taguchi A, Sanada M, Suei Y, Ohtsuka M, Lee K, Tanimoto K, et al. Tooth loss is associated with an increased risk of hypertension in postmenopausal women. *Hypertension.* 2004; 43: 1297-1300.

Cite this article

Morimoto Y, Oda M, Kito S, Tanaka T, Wakasugi-Sato N, et al. (2013) Clinical Applications of Current and Advanced Diagnostic Imaging Modalities for Oral Diseases. *J Radiol Radiat Ther* 2(1): 1027.