

Discussion/Conclusions: Image sharpening can create artifacts that could be misinterpreted. Although image sharpening significantly affects spatial resolution, no significant effect was seen on dynamic range or contrast resolution.

Acknowledgments

This study was supported by a grant from the Center for Dental Research, Loma Linda University. The authors also wish to thank Dental Imaging Consultants, LLC, for their support with the phantom imaging; Cyber Medical Imaging, Inc. for support of sensors and software; Dentsply-Sirona, Inc. for support of software; and Doug C. Yoon, Chief Technology Officer, XDR Radiology for his sacrifice of time and for his extensive knowledge toward this project and the donation of sensors and software.

References

- 1 Brett D, Carmichael F. The impact of digital image processing artefacts mimicking pathological features associated with restorations. *Br Dent J*. 2011;211:167-170.
- 2 Mah P, McDavid WD, Dove SB. Quality assurance phantom for digital dental imaging. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2011;112:632-639.
- 3 Udupa H, Mah P, Dove SB, McDavid WD. Evaluation of image quality parameters of representative intraoral digital radiographic systems. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2013;116:774-783.

EPITHELIOID RHABDOMYOSARCOMA OF THE ORAL CAVITY, NOVEL LOCATION OF A RARE ENTITY: A CASE REPORT. J.P. CASTRO CUELLAR, N. HANDOO, R. BAYON, S. SOUSA MELO. UNIVERSITY OF IOWA, IOWA CITY, IA

Background: Rhabdomyosarcoma, a malignant neoplasm, is characterized by skeletal muscle differentiation. Only 33 cases of the epithelioid variant have been reported, and just 8 of them were located in the head and neck region. This aggressive entity usually presents as a fast-growing, asymptomatic infiltrative mass and presents predominantly in adults.

A 53-year-old male, who was edentulous and a former smoker, presented with enlargement of 2 months' duration in the right maxillary vestibule. A clinically palpable mass was noted under the mucosa. No adenopathy or cranial nerves deficit was observed on physical examination. The initial panoramic radiograph showed a corticated radiolucent entity located on the right maxilla, with extension into the right maxillary sinus. Multidetector computed tomography (MDCT) and positron emission tomography/computed tomography (PET/CT) were performed. CT revealed an enhancing soft tissue mass of the right alveolar ridge with extension to the maxillary sinus, with erosion of the anterior and lateral walls of the sinus and the adjacent alveolar ridge. PET/CT showed a right maxillary fluorodeoxyglucose (FDG) high uptake and right neck level IIA lymph nodes with mild uptake. An incisional biopsy was performed. The histologic appearance and immunohistochemical profile supported a diagnosis of high-grade epithelioid rhabdomyosarcoma. The treatment protocol was right maxillectomy and right neck dissection with adjuvant radiation therapy. After 1.5 years, follow-up CT was performed and did not show any signs of recurrence or metastatic disease.

Discussion/Conclusions: Epithelioid rhabdomyosarcoma is a rare variant of rhabdomyosarcoma. To the best of our knowledge, none has been reported in the oral cavity region; thus, this is the first case of this aggressive variant described in this location. This entity may develop without any apparent symptoms or signs of a malignant entity, thus mimicking the appearance of a benign neoplasm or inflammatory process. A comprehensive multidisciplinary approach is advised to diagnose and treat this entity accordingly.

References

- 1 Neville B, Damm D, Allen C, Chi A. *Oral and Maxillofacial Pathology*. 4th ed. St. Louis, MO: Elsevier; 2016.
- 2 Jo VY, Mariño-Enriquez A, Fletcher CDM. Epithelioid rhabdomyosarcoma: clinicopathologic analysis of 16 cases of a morphologically distinct variant of rhabdomyosarcoma. *Am J Surg Pathol*. 2011;35:1523-1530.
- 3 Yu L, Weng Lao I, Wang J. Epithelioid rhabdomyosarcoma: a clinicopathological study of seven additional cases supporting a distinctive variant with aggressive biological behaviour. *Pathology*. 2015;47:667-672.
- 4 Pappo AS, Dirksen UR. Rhabdomyosarcoma, Ewing sarcoma, and other round cell sarcomas. *J Clin Oncol*. 2018;36:168-179.

EVALUATION OF ARTIFACTS GENERATED BY TITANIUM, ZIRCONIUM, AND TITANIUM-ZIRCONIUM ALLOY DENTAL IMPLANTS IN MRI, CT, AND CBCT IMAGES: AN IN VITRO STUDY. H. DEMİRTURK KOCASARAC^{A,B}, G. USTAOGLU^{A,B}, S. BAYRAK^{A,B}, R. KATKAR^{A,B}, H. GEHA^{A,B}, M. NOUJEIM^{A,B}. ^AUNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT SAN ANTONIO, SAN ANTONIO, TX, ^BABANT IZZET BAYSAL UNIVERSITY, BOLU, TURKEY

Background: Magnetic resonance imaging (MRI) or computed tomography/cone beam computed tomography (CT/CBCT) should be performed in implant therapy when the conventional image is not adequate or when more information is needed to improve the patient's treatment. Therefore, 3-D imaging may be required even when the implants are present in the field of view (FOV). Thus, determining the most suitable imaging technique and setting for each type of implant material will facilitate the radiologists' ability to give the best care to the patient.

Objective(s): The aim of this study was to assess the amount and structure of artifacts caused by titanium grade 4 and 5, zirconium, and titanium-zirconium alloy implants in MRI, CT, and CBCT with several acquisition protocols and to correlate the findings to the radiation dose given by 2 different CT machines and different CBCT exposure settings.

Study Design: Three phantoms were built by embedding titanium, zirconium, and titanium-zirconium alloy implants in ultrasound gel. MRI, CT, and CBCT images were acquired using multiple sequences and settings. For MRI, the artifact was described as the length of signal void beyond the limits of the implant. For CT and CBCT, the artifact was calculated by subtracting the gray level of the darkest pixel from the one of the lightest pixel.

Results: Titanium and titanium-zirconium alloy implants created extensive artifacts in MRI as a result of high

susceptibility, whereas zirconium implants could be correctly depicted with only minor distortion artifacts. However, in CT and CBCT, titanium and titanium–zirconium alloy implants generated less severe artifacts than zirconium.

Discussion/Conclusions: MRI images were less affected by the artifacts from zirconium implants, whereas CT and CBCT images showed fewer artifacts from titanium and titanium–zirconium alloy implants. CBCT, especially at low dose settings, produced the least amount of radiation compared with high-resolution settings and 2 CT machines.

Acknowledgments

The authors would like to thank Dr. Deahl, Dr. Mealey, and Dr. Danaci for their valuable contributions to this study.

Reference

- 1 Tyndall DA, Price JB, Tetradis S, et al. Position statement of the American Academy of Oral and Maxillofacial Radiology on selection criteria for the use of radiology in dental implantology with emphasis on cone beam computed tomography. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2012;113:817-826.

EVALUATION OF BONE HEALING AFTER APICAL RESECTION BY ULTRASONOGRAPHY. K. KAMBUROGLU, G. SONMEZ, F. YILMAZ. ANKARA UNIVERSITY, ANKARA, TURKEY

Background: Apical resection is a reliable method for the treatment of teeth with persistent periapical lesions or in cases where nonsurgical treatment is not successful. Generally, outcome assessment of apical resection is based on 2-D periapical radiographs. Ultrasound imaging is based on reflection of sound waves at the interface between 2 different tissues and is also recognized as the most risk-free imaging modality.

Objective(s): Our aim was to evaluate healing of bone after apical resection by using ultrasonography.

Study Design: Ethical approval and patient consent were obtained. Three patients with periapical lesions of endodontic origin were examined with cone beam computed tomography (CBCT) and ultrasonography before surgery. ACUSON S 2000 color Doppler ultrasonography unit with 15 MHz intraoperative probe was used to obtain ultrasound images. In all patients, root canal treatment and apical resection surgery were performed. In 1 patient, during apical surgery, bone graft (Creos Graft, Nobel Biocare Services AG, Zurich, Switzerland) and resorbable collagen membrane (Creos xenoprotect, Nobel Biocare Services AG, Zurich, Switzerland) were used. The other cases were left to secondary healing. Three months after apical resection, periapical radiographs and ultrasonographic examination were performed for follow-up assessment.

Results: The resection area was filled with bone, and hyperechogenic bone healing was monitored by ultrasonography in the patient in whom bone graft and membrane were placed. In 1 patient, the resection area was filled with soft tissue, and ultrasound showed an echogenic area surrounded a hyperechogenic bone border. No internal vascularization was detected. In the other patient, ultrasonography showed a well-contoured anechogenic area with no vascularization, and 3 months after apical surgery, the tooth was extracted.

Discussion/Conclusions: Ultrasound imaging can be a useful tool for the monitoring of apical surgery outcomes without ionizing radiation. Further research is essential with inclusion of more patients.

References

- 1 Evirgen S, Kamburoglu K. Review on the applications of ultrasonography in dentomaxillofacial region. *World J Radiol.* 2016;28:50-58.
- 2 Setzer FC, Shah SB, Kohli MR, et al. Outcome of endodontic surgery: a meta-analysis of the literature—part 1: comparison of traditional root-end surgery and endodontic microsurgery. *J Endod.* 2010;36:1757-1765.

EVALUATION OF CBCT SCANS WITH METALLIC ARTIFACTS FOR ASSESSMENT OF DIAGNOSTIC QUALITY. K. BABALOLA, A. TADINADA. UNIVERSITY OF CONNECTICUT, FARMINGTON, CT

Background: Cone beam computed tomography (CBCT) is increasingly being used in dentistry for diagnosis and treatment planning. However, the presence of metals in the form of coronal restorations, implants, and endodontic post and cores results in the generation of artifacts. Beam hardening artifacts, streaks, and scatter are the main types of metallic artifacts and, when present, cause image degradation that may compromise the accuracy of diagnosis. Depending on the severity of the artifact and the diagnostic task, images may be unusable.

Objective(s): The objective of this study was to retrospectively evaluate CBCT scans with metallic artifacts and assess whether or not the presence of metal affects diagnosis of a specific entity.

Study Design: A total of 105 scans from the archives of the Department of Oral and Maxillofacial Radiology at University of Connecticut, School of Dental Medicine, were evaluated for this study. The scans were divided into 3 groups comprising referrals for implant site evaluation, for endodontic evaluation for root canal morphologies/anatomy, and for crown/root fractures, respectively. Inclusion criteria were scans that had metallic artifacts. The scans were analyzed to determine if these artifacts positively or negatively influenced diagnosis. All images were evaluated by a radiology resident in training (K.B.) and a board certified Oral and Maxillofacial Radiologist (A.T.).

Results: Of the scans analyzed for implant treatment planning, 100% were deemed to be of diagnostic quality. For root canal morphology and anatomy, 94% were adequate for diagnosis, whereas 6% were not. For evaluation of fractures, 63% were adequate for diagnosis, and 37% were not adequate for diagnosis.

Discussion/Conclusions: In this study, a large percentage of the scans were adequate for diagnosis despite the presence of metallic artifacts except for root fractures.

Acknowledgments

I acknowledge Dr. Tadinada's mentorship and great support for this study.