

OM because this tumor demonstrates a high recurrence rate. All 3 imaging modalities have inherent advantages and disadvantages; however, all of these modalities should be routinely used in the diagnosis of OM. Results of MRI can further help map the margins and greatly aid in resection with clear margins.

Acknowledgments: Sakamoto J, Kurabayashi T, Harada H, Tokyo Medical and Dental University, Tokyo, Japan.

References

1. Asaumi J, Matsuzaki H, Miki Hisatomi, Konouchi H, Shigehara H, Kishi K. Application of dynamic MRI to differentiating odontogenic myxomas from ameloblastomas. *Eur J Radiol.* 2002;43:37-41.
2. Srinivasan K, Seith BA, Sharma R, Kumar A, Roychoudhury A, Bhutia O. Diffusion-weighted imaging in the evaluation of odontogenic cysts and tumours. *Br J Radiol.* 2012;85:e864-e870.
3. Fujita M, Matsuzaki H, Yanagi Y, et al. Diagnostic value of MRI for odontogenic tumours. *Dentomaxillofac Radiol.* 2013;42:20120265.
4. Kheir E, Stephen L, Nortje C, Janse L, Rensburg V, Titinchi F. The imaging characteristics of odontogenic myxoma and a comparison of three different imaging modalities. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2013;116:492-502.
5. Kotaki S, Sakamoto J, Asai S, Kuribayashi A, Uzawa N, Kurahayashi T. A case of odontogenic myxoma in which magnetic resonance imaging aided diagnosis. *Dent Radiol.* 2017;57:54-56.

QUANTIFICATION OF TMJ RHEUMATOID ARTHRITIS ON POSITRON EMISSION TOMOGRAPHY SCANS USING ROVER

SOFTWARE M. MUPPARAPU, S. OAK, Y.C CHANG, and A. ALAVI, UNIVERSITY OF PENNSYLVANIA SCHOOL OF DENTISTRY, PHILADELPHIA, PA

Background: Inflammation of the temporomandibular joint (TMJ) has a relatively high correlation (> 17%) to the late stages of rheumatoid arthritis (RA). RA is a chronic inflammatory autoimmune disease that causes cartilage and bone destruction. Cell activity of TMJ was measured by using 2 radiotracers, [18 F]-fluoro-2-deoxy-D-glucose (FDG) and [18 F]-sodium fluoride (NaF), for staging and surveillance of RA.

Objective: The aim of this study was to quantify the region of interest (ROI) volumes of FDG- and NaF-based TMJ positron emission tomography (PET) images by using the ROVER software.

Materials and Methods: Institutional review board (IRB) approval was obtained for 20 previously diagnosed patients with RA. From this cohort, 17 anonymized patients with NaF and FDG-PET/CT scans were reviewed by 3 calibrated investigators. When there was disagreement, a fourth investigator who is an expert in PET/CT, was used. The standardized uptake values corrected (SUV-Mean Cor) were calculated and recorded on ROVER. The collected data and literature review findings were collated and analyzed to provide a holistic comparison table. The clinical applications, advantages, and disadvantages of 8 imaging techniques were reviewed.

Results: The average ROI volumes differed between FDG- and NaF-based PET images in every case, showing a higher quantification for NaF-based scans. In 1 case, ROI mean total

corrected value was 23.25 when NaF-PET was used, as opposed to 6.7 when FDG-PET was used. There was a similar trend among other cases included in the study. The NaF-PET ROI values appeared higher than the standard FDG-PET ROI values in the cases where the RA activity was quantified. SUV can be obtained by dividing the ROI activity concentration (KBq/L) by the decay-corrected amount of injected FDG (KBq/L) times the weight of the patient in grams. ROVER automatically calculates the average and maximum SUVs for all patients.

Discussion: With the use of ROVER, it is possible to collect accurate measurements of TMJ disease activity from both FDG-PET and NaF-PET images. NaF-PET appeared to be a more sensitive technique.

References

1. Fosse P, Kaiser MJ, Namur G, de Seny D, Michel G, Hustinx R. 18 F-FDG PET/CT joint assessment of early therapeutic response in rheumatoid arthritis patients treated with rituximab. *Eur J Hybrid Imag.* 2018;2:6.
2. Elzinga EH, van der Laken CJ, Comans EF, et al. 18 F-FDG PET as a tool to predict the clinical outcome of infliximab treatment of rheumatoid arthritis: an explorative study. *J Nucl Med.* 2011;52:77-80.
3. Kubota K, Ito K, Morooka M, et al. FDG PET for rheumatoid arthritis: basic considerations and whole-body PET/CT. *Ann NY Acad Sci.* 2011;1228:29-38.
4. Chaudhari AJ, Bowen SL, Burkett GW, et al. High-resolution 18 F-FDG PET with MRI for monitoring response to treatment in rheumatoid arthritis. *Eur J Nucl Med Mol Imag.* 2010;37:1047.

CLINICAL AND RADIOGRAPHIC MANIFESTATIONS WITH 3-DIMENSIONAL PRINTED MODEL OF TRUE BONY ANKYLOSIS OF THE TEMPOROMANDIBULAR JOINT: A CASE REPORT

M. PAHADIA, S. RAJMOHAN, A. VYAS, R. KATKAR, and H. GEHA, UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER SCHOOL OF DENTISTRY, SAN ANTONIO, TX; PRIVATE PRACTICE, INDORE, INDIA

Clinical Presentation: We present a case of a 20-year-old male who presented with facial asymmetry, severe trismus since early childhood, generalized physical weakness, and other skeletal deformities, including pigeon chest and kyphoscoliosis. No clear history of trauma was elicited. However, early childhood trauma was considered a possibility.

Differential Diagnosis: Severe trismus can be caused by various etiologies, including trauma, temporomandibular joint (TMJ) disorders, benign and malignant neoplasia, infections, and iatrogenic causes. However, with the history and clinical presentation, a TMJ condition, including bony and fibrous ankyloses, was considered.

Diagnosis and Management: Multidetector computed tomography (MDCT) was performed. Radiographic features were consistent with stage IV bony ankyloses of the left TMJ, according to the classification system of Sawhney et al. A 3-dimensional (3-D) printed medical model of the skull and the mandible was used for surgical simulation. Gap arthroplasty with interpositional temporalis muscle flap was performed, followed by vigorous physiotherapy. After surgery, mouth opening increased significantly from 0 to 35 mm. One year clinical follow-up was done.

Discussion: TMJ ankylosis is a pathologic condition in which the mandible is fused to the glenoid fossa by bony or fibrotic tissues, interfering with mastication, speech, oral hygiene, and nutrition. Multiple factors, including trauma, arthritis, infection, congenital deformities, or iatrogenic causes, can result in ankylosis, but trauma remains the most common etiology. In growing individuals, it can result in very severe craniomaxillofacial deformities and can also affect the airway. This case report discusses the clinical and radiographic features affecting the craniomaxillofacial structures associated with TMJ ankylosis and the applicability of 3-D printing in treatment planning. Because TMJ ankylosis can affect multiple aspects of the patient's life, an interdisciplinary management approach is required.

References

- Hegde RJ, Devrukhar VN, Khare SS, Saraf TA. Temporomandibular joint ankylosis in child: a case report. *J Indian Soc Pedod Prev Dent.* 2015;33:166-9.

STATIONARY INTRAORAL DIGITAL TOMOSYNTHESIS USING CARBON NANOTUBES FIELD EMISSION X-RAY TECHNOLOGY:

CLINICAL PROTOTYPE E. PLATIN,^{a,b} A. TUCKER,^b O. ZHOU,^c and J. LU,^c ^aUNIVERSITY OF NORTH CAROLINA, ADAMS SCHOOL OF DENTISTRY, CHAPEL HILL, NC, ^bXINVIVO INC., MORRISVILLE, NC, and ^cUNIVERSITY OF NORTH CAROLINA DEPARTMENT OF PHYSICS AND ASTRONOMY, CHAPEL HILL, NC

Background: Tuned aperture computed tomography (TACT) and intraoral tomosynthesis were studied in the past and demonstrated improved detection of various dental diseases. However, interest in TACT waned because the technology was not viable for clinical use. Recently, interest resurged with the advent of the carbon nanotube field emission x-ray source array technology. Researchers from the University of North Carolina (UNC) Department of Physics and Astronomy and the UNC School of Dentistry designed, patented, and conducted several benchtop studies to demonstrate its utility.¹

Objective: The aim of this study was to develop a viable stationary intraoral tomosynthesis imaging device for clinical use.

Materials and Methods: XinVivo, an imaging device startup company, developed a prototype system designed for intraoral imaging applications.²

Results: The prototype met all the requirements for clinical use and met the U.S. Food and Drug Administration (FDA) requirements for intraoral imaging devices.

Discussion: The clinical prototype met all manufacturer specifications. Preliminary studies indicated that stationary intraoral tomosynthesis (s-IOT) provides increased image quality and feature conspicuity at a dose comparable with that in a single 2-dimensional (2-D) intraoral radiography.³

Conflict of Interest: Otto Zhou, J. P. Lu, Andrew Tucker, and Enrique Platin have financial interest in XinVivo and are listed as inventors on the patent.

References

- Shan J, Tucker A, Gaalaas L, et al. Stationary intra-oral digital tomosynthesis using a carbon nanotube x-ray source array. *Dentomaxillofac Radiol.* 2015;44:20150098.

- Inscoe C, Platin E, Mauriello S, et al. Characterization and preliminary imaging evaluation of a clinical prototype stationary intraoral tomosynthesis system. *Med Phys.* 2018;45:5172-5185.
- Puett C, Inscoe C, Hilton R, et al. Stationary digital intraoral tomosynthesis: demonstrating the clinical potential of the first-generation system. *SPIE 10573. Phys Med Imag.* 2018;10573OE.

MICROCOMPUTED TOMOGRAPHY OF CALCIUM-HYDROXIDE EXPOSED VITAL NERVE TISSUE: A PILOT PROTOCOL

D.D. RICE, A. GRANDHI, G. ROQUE TORRES, J. GUO, and L. BAKLAND, LOMA LINDA UNIVERSITY SCHOOL OF DENTISTRY, LOMA LINDA, CA

Background: Calcium hydroxide (CH) preparations are used in many endodontic procedures. Extrusion of CH into the mandibular canal may cause inferior alveolar nerve (IAN) injury. With an in vivo rat sciatic nerve sample, this phenomenon was subjectively imaged by using multiple modalities.

Objective: The aim of this study was to determine if histologic differences were evident on microcomputed tomography (MCT), scanning electron microscopy (SEM) and hematoxylin and eosin (H&E)-stained light microscopy in control and test nerve sections.

Materials and Methods: Fourteen sciatic nerve samples were harvested from 7 laboratory rats after CH paste was placed in vivo for a set amount of time. A control was taken on the same nerve more dorsal than the test site. Specimens were scanned on an MCT unit (SkyScan1272, Bruker, Kontich, Belgium) at 2.5 μ m, 1200 ms, rotation step of 0.2, frame of 3, and random movement of 30. Samples were observed under a scanning electron microscope (FEG 250; ThermoFisher, Waltham, MA) at \times 200, \times 400, \times 800, \times 1000, and \times 1500 magnifications under the low-vacuum secondary electron detector (LFD). Images were interpreted to determine if differences were present in the CH samples compared with the controls.

Results: Preliminary findings showed promise for demonstrating nerve structure and form. In addition, the animal model protocol appears helpful for testing CH and other substances on nerve tissue in vivo.

Discussion: MCT and SEM imaging are effective tools in evaluating nerve structure and change in conjunction with H&E-stained histologic samples.

Acknowledgments: We would like to thank John Chrysler and John Hough for their assistance with surgical and specimen preparations during this project.

References

- Brodin P, Ørstavik D. Effects of therapeutic and pulp protecting materials on nerve transmission in vitro. *Scand J Dent Res.* 1982;91:46-50.
- Swanlung O, Vehkalahti MM. Root canal irrigants and medicaments in endodontic malpractice cases: a nationwide longitudinal observation. *J Endod.* 2018;44:559-564.
- Vennemeyer JJ, Hopkins T, Hershcovitch M, et al. Initial observations on using magnesium metal in peripheral nerve repair. *J Biomater Appl.* 2015;29:1145-1154.
- Zhu Z, Huang Y, Zou X, et al. The vascularization pattern of acellular nerve allografts after nerve repair in Sprague-Dawley rats. *Neurol Res.* 2017;3:1014-1021.