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Magnetic Resonance Imaging in Dentistry

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Magnetic Resonance Imaging (MRI) is a powerful and versatile imaging modality utilizied in various medical fields. With the emergence of commercial medical MRI in the 1980s, several MRI applications, such as cardiac, abdominal, and cranial, started to evolve medical diagnostic imaging. Three-dimensional MRI assessment of morphology and function without ionizing radiation attracted attention in dental applications during 1980s [1]. Dental applications of MRI, however; was sparse compared to other medical applications. Most work in the field of dental MRI aimed at imaging soft tissues, testing the potential of implant planning [1], and imaging of the morphology and function of the temporo mandibular joint [2].

MRI has not been commonly used for oral and maxillofacial imaging because the acquisition of the sequences can be negatively influenced by motion of the body, respiration, air in the oral cavity and nasal cells, implants and metal materials [3]. However, the utilization of MRI, enabled evaluation of spatial relationship between anatomic structures and intraosseous jaw lesions when CT imaging can not provide clear depiction of the mandibular canal. MRI can also be useful to the typing of different expansive lesions, and to evaluate the possible infiltration of the soft tissue [3].

Also, Dynamic Contrast Enhanced (DCE) Magnetic Resonance İmaging (MRI), in which multiphase MRI scans are taken following the intravenous injection of a contrast agent, has been widely used in clinical practice. Asaumi et al. [4] demonstrated that DCE-MRI features of odontogenic myxomas are different from those of ameloblastomas and that a very slow gradual increase of Signal İntensity (SI) is characteristic of odontogenic myxomas. The utility of the DCEMRI in the differential diagnosis of salivary gland tumors, and lesions in the jaw bone was reported [4].

High-resolution anatomical detail is a feature for TMJ imaging. MRI may assist the clinician in determining whether primary or delayed treatment is indicated in cases of trauma to the TMJ. The saggital and coronal MRI of TMJ articulation are complimentary, and is important for a full assessment of joint dysfunction [5]. Using high-field strength surface coil MRI specific changes associated with disc derangement, trauma and previous surgery can be illustrated. In addition, the presence of soft tissue ingrowths, fibrosis and joint effusions can be determined [5]. Gadolinium may be used as a contrast agent in order to detect pannus formation in active rheumatoid or other inflammatory arthritis [5]. High-contrast sensitivity of MRI to tissue differences and the absence of ionizing radiation are the reasons why MRI has replaced CT for imaging soft tissue in patients with inflammatory arthritides, MRI has been shown to demonstrate disc destruction.

For a successful restorative treatment mapping of the shape of dental cavities is needed. MRI has been used in research of healthy and decayed teeth during last decade [6]. Several papers were presented showing usefulness of Spin Echo (SE) and Gradient Echo (GE) imaging, Single Point İmaging (SPI), SPRITE and STRAFI techniques for visualization of the dental surface geometry as well as for distinction between soft tissue (pulp) and mineralized tissue (enamel, dentine and root cement) in the extracted teeth. An important aspect of the MRI measurements is to obtain high contrast between the cavities and the tooth. This may be achieved by filling cavities with water or water solution of paramagnetic ions having high MR signal [7]. In addition to the caries visualization, dental MRI enables simultaneous imaging of the tooth pulp and can thus provide valuable information about relative location of the pulp and lesion in three spatial dimensions [2]. Authors demonstrated the feasibility of high resolution dental MRI to visualize and quantify carious lesions, including approximal lesions and occult dentin lesions, and measure the minimum distance to the dental pulp in vivo on a clinical 1.5 T MRI scanner [2]. Also, the ability of the ZTE which is a technique that robustly provide high-resolution high-quality images of samples with very short-T2 is very promising [7].

Bracher et al. [8] demonstrated the applicability of 3D UTE MRI for the identification of caries lesions. The direct comparison to the clinical standard radiograph and conventional spin-echo imaging reveals at least a similar sensitivity of 3D UTE MRI to X-rays and clearly shows the limitations of conventional spin-echo techniques, especially for the identification of small lesions. Limitations of 3D UTE owing to metal artefacts caused by dental fillings were less severe than expected [8].

References

1. Bracher AK, Hofmann C, Bornstedt A, Boujraf S, Hell E, et al. (2011) Feasibility of ultra-short echo time (UTE) magnetic resonance imaging for identification of carious lesions. Magn Reson Med 66: 538-545.
2. Tymofiyeva O, Boldt J, Rottner K, Schmid F, Richter EJ, et al. (2009) High-resolution 3D magnetic resonance imaging and quantification of carious lesions and dental pulp in vivo. MAGMA 22: 365-374.
3. Cassetta M, Di Carlo S, Pranno N, Stagnitti A, Pompa V, et al. (2012) The use of high resolution magnetic resonance on 3.0-T system in the diagnosis and surgical planning of intraosseous lesions of the jaws: preliminary results of a retrospective study. Eur Rev Med Pharmacol Sci 16: 2021-2028.
4. Chikui T, Obara M, Simonetti AW, Ohga M, Koga S, et al. (2012) The principal of dynamic contrast enhanced MRI, the method of pharmacokinetic analysis, and its application in the head and neck region. Int J Dent 2012: 480659.
5. Sinha VP, Pradhan H, Gupta H, Mohammad S, Singh RK, et al. (2012) Efficacy of plain radiographs, CT scan, MRI and ultra sonography in temporo mandibular joint disorders. Natl J Maxillofac Surg 3: 2-9.
6. Weglarz WP, Tanasiewicz M, Kupka T, SkÃ³rka T, SuÅ‚ek Z, et al. (2004) 3D MR imaging of dental cavities-an in vitro study. Solid State Nucl Magn Reson 25: 84-87.
7. Weiger M, Pruessmann KP, Bracher AK, Köhler S, Lehmann V, et al. (2012) High-resolution ZTE imaging of human teeth. NMR Biomed 25: 1144-1151.
8. Bracher AK, Hofmann C, Bornstedt A, Hell E, Janke F, et al. (2013) Ultrashort echo time (UTE) MRI for the assessment of caries lesions. Dento maxillofac Radiol 42: 20120321.

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