

Magnetic Resonance Imaging and Its Applications in Dentistry: A review

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Abstract

Magnetic resonance imaging (MRI) is currently one of the essential imaging methods in medicine. Since it is a non-invasive method that does not use ionizing radiation, its applications are getting more and more attention in the dentistry field. MRI is specifically used for the evaluation of soft tissues. Temporomandibular disorders, paranasal sinuses, determination of lesion contents and endodontics are just some of the application subjects. The aim of this review is to inform dentists and oral surgeons about the application fields of MRI.

Keywords: Magnetic Resonance Imaging, Advanced Imaging Techniques, Temporomandibular Disorders

Advanced imaging methods in dentistry

Advanced imaging methods that can be used in dentistry are examined under two categories as ionizing and non-ionizing radiation techniques. The most common methods using ionized radiation are x ray, cone beam computed tomography and computed tomography. The most commonly used methods for non-ionizing radiation are magnetic resonance and ultrasound [1]. The aim of this review is to inform dentists and oral surgeons about the application fields of MRI.

Magnetic resonance imaging

Magnetic resonance imaging (MRI) is currently one of the essential imaging methods in medicine. Since it is a non-invasive method that does not use ionizing radiation, its applications are getting more and more attention in the dentistry field. MRI is specifically used for the evaluation of soft tissues. Temporomandibular disorders, paranasal sinuses, determination of lesion contents and endodontics are just some of the application subjects. Since MRI sequences can be negatively affected by the respiratory movements, air in the oral and nasal cavity and metal restorative materials, it had not been prescribed in general practice [2].

Temporomandibular disorders

Temporomandibular joint disorders are common clinical conditions. Although it may have various reasons, the most common cause is internal derangements. It can be defined as the abnormal position of the articular disc [3]. MRI is considered as the gold standard to identify internal derangements [4]. It can provide information about effusion, bone marrow edema and lateral pterygoid muscle attachment and retrodiskal tissues to help the diagnosis of temporomandibular joint disorders. Osteoarthritic changes like

erosion, flattening and osteophytes can also be observed at MRI. Since temporomandibular joint disorders are a very complex group of diseases that requires assessment of both hard and soft tissues, it is very beneficial to have the imaging of soft tissues without using ionizing radiation for clinicians.

Pre-operative surgical planning in head and neck region

Complete radiological evaluation before any surgery in the head and neck region is crucial to avoid any damage to anatomical structures. Various imaging methods are used in oral and maxillofacial surgery such as panoramic radiography, computed tomography and MRI. Preservation of the inferior alveolar canal is critical in surgical procedures of this region. While computed tomography and plane radiographies can only detect osseous borders of inferior alveolar nerve (IAN), MRI can depict a clear distinction of IAN from surrounding structures [5]. A recent study reported that MRI can be very effective in distinguishing different lesions and soft tissue infiltrations [5].

Magnetic resonance imaging in endodontics

MRI is a recent attraction to the field of endodontics. MRI visualizes pulp morphology and periapical tissues which are main focuses of endodontics. It may also provide information about the vitality of pulp [6]. It can be an alternative to electrical pulp tests. Recent studies reported that it can be used to evaluate the effects of regenerative endodontic treatments [7]. Both in vitro and in vivo studies showed the applicability of its efficiency to assess regeneration of pulp [8].

There are a few disadvantages of MRI. Image artifacts can be seen often due to metal materials and patient movements [6]. Also, MRI examinations can be expensive. Some medical and dental centers may have a limited access to MRI [9].

In addition, evaluation of MRI imaging of salivary glands, paranasal

sinuses and cerebrovascular diseases have been reported [10]. As a result, dentists should be informed further about the use of MRI in dentistry. In order to achieve the goal of imaging without ionizing radiation, the use of MRI in dentistry should be encouraged.

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