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Editorial

Maxillofacial imaging in dentistry- A reappraisal

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In his own mouth, Dr. Otto Walkhoff performed the first dental roentgenogram in January 1896 during a 25-minute exposure using a piece of glass imaging plate. Since then, dental imaging has advanced significantly across several dental specialties. Imaging techniques employed in dentistry can be classified into ionizing and non-ionizing, intraoral and extraoral, digital and analogue, two-dimensional (2-D) and three-dimensional (3-D) imaging.[1]

The diagnosis of disorders in the craniofacial region has been greatly facilitated in recent years by advancements in imaging techniques. In the maxillofacial region, three-dimensional radiographic diagnostic examinations are frequently used for the diagnosis and treatment of pathologies and conditions that, until a few years ago, required multiple radiographic examinations.[2] These examinations are analysed by software that allows for easy image viewing and various graphic reworkings. The most common and utilised 3-D assessment in dentistry nowadays is the CBCT. Researchers can easily employ, and optimise radiation for diagnostic reasons with CBCT, which is often essential in differentiating between various pathologies and conditions. They may also make surgical, endodontic, and implant treatments easier by supporting guided or navigated procedures.[3]

The patient's exposure to a radiation dose that may result in biological harm must always be considered when utilising CBCT as a diagnostic modality, which is why MRI (magnetic resonance imaging) is gaining popularity.[4] Recent studies have demonstrated that MRI can be utilised as a complete dental diagnostic tool, enabling both an investigation of the soft tissue architecture at certain frequencies as well as the volumes and bone density in other frequencies. In this context, recently released data demonstrates that MRI is superimposable and that it can be utilised, like CBCT, in the planning of guided surgery. This is a significant step towards radiation-free diagnostics, which are becoming more advanced and patient-protective.[5] The potential of 3-D imaging modalities is currently being further expanded by the use of artificial intelligence and machine learning. The evaluation and interpretation of 3-D images, such as CBCT and MRI, are difficult, laborious, and operator-dependent. Clinicians would therefore benefit from automated landmark recognition using machine learning. Different machine-learning approaches have been investigated for this. A feature-based and voxel-based method for automated landmark recognition in a CBCT is one such method for the evaluation of CBCTs.[6] The accuracy of this approach, meanwhile, has not been found to be very good. This results from the higher error susceptibility of registration-based approaches. Deep learning-based techniques have recently been used to assess 3-D scans. The automated landmark segmentation and identification in three-dimensional scans has some potential, but further research is needed to evaluate it.[7] The future seems bright for these modalities due to increased margins of success, which are supported by the non-invasiveness of

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these treatments and the absence of ionising radiation.

1. Conflict of Interest

None.

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