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Radiomics and Oral Health: Images are Far More than Pictures, they are DATA!

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Commentary:

Technology is advancing swiftly. Nowadays new tools may help to integrate multiunit inputs leading to a more efficient approach to enable solving complex problems with less efforts. This is surely applicable to oral healthcare, where increasing storage of information have led to the development of new advancing diagnostic and treatment modalities.

In medicine, there are various ways for generating big data , such as genomics, proteomics, etc. Analogous to these "omics" group, imaging could also be used widely to create and preserve a detailed omics group itself named "radiomics" The main aim of radiomics is generating "Big Data". Big data can be defined as "a term that describes large volumes of high velocity, complex and variable data that require advanced techniques and technologies to enable the capture, storage, distribution, management, and analysis of the informatio.1

Radiomics is a journey from hypothesis to evidence and also generating new hypothesis from the past evidences. Radiomics is a mathematical approach or a quantitative outlook to the medical imaging.1 It can be defined as the combined computerized quantification of radiographic image phenotypes. The steps involved in radiomics are as follows-

1. Image acquisition
2. Segmentation of the region of interest
3. Morphological/ Statistical/ Textural feature extraction
4. Modelling

This conception is widely (but not exclusively) been used in the field of oncology, and is based on the hypothesis that biomedical images carry data regarding disease-specific processes, which are undetectable to human eye.2,3,4 Through arithmetic extraction of spatial distribution of imaging signal intensities and pixel correlations , radiomics quantifies textural information and generates new multipurpose data. 5 This analysis can be performed on various biomedical images from different modalities and creating a combined, well- organized, easy-to-understand cross-modality approach using the potential additive value of imaging information extracted, e.g., from orthopantomography (OPG), magnetic resonance imaging (MRI), computed tomography (CT), cone-beam computed tomography (CBCT) and positron-emission-tomography (PET), instead of evaluating each modality separately by its own. This emerging branch has opened new prospects in diagnosis, disease classification, treatment options and also claimed to reduce chances of operator errors. 5,6

In head and neck radiology, however the attempts made are sparse. Augmented Dentomaxillofacial Radiology is an emerging interesting branch dealing with radiomics along with Artificial intelligence, machine learning and active participation of a radiologist.6 Radiomics has shown it's crucial role in automated determination of skeletal and dental age in forensic dentistry, differentiation of different jaw tumours, imaging guidelines for autonomous AI- driven robotics for performing surgeries and biopsies. In head and neck cancer however attempts to perform consistent investigations are sparse, CT and MRI – based radiomics has driven great attention by dentomaxillofacial specialists. Improvement in quality of the images, imaging processes and imaging analysis are the main advantages of using radiomics.

Future scope of this technique is as follows-

1. Revolutionization of Augmented Dentomaxillofacial Radiology
2. Better Estimation of Head & Neck Tumour Diagnosis & Prognosis
3. Forensic Dentistry
4. Guide for Artificial intelligence guided Treatments

But there are few limitations, rather challenges which come along with the branch of radiomics. Some of them are-

1. Lack of standardization
2. Difficult to reproduce
3. Conflicts in data sharing

Here, we try to present state-of-the-art aspect of radiomics in oral healthcare.

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