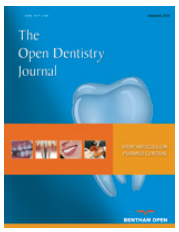

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EDITORIAL

3D Diagnosis in Dentistry

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1. INTRODUCTION

3D imaging is rapidly changing diagnostic procedures in all fields of dentistry. Intraoral scanners and three-dimensional radiographs, Tc and ConeBeam, have entered the routine of everyday clinical practice. Patient photography has also evolved into stereophotogrammetry, which obtains three-dimensional images of the face. The advancements in 3D technologies have stimulated the production of software that allows the anatomy of the dental patient to be reconstructed in three dimensions. Technological development has stimulated research in finding ways to improve diagnostic programming and therapeutic programming. In recent years, many articles have been published that compare 2D technologies to 3D technologies in dental diagnosis. At the same time, new 3D image analysis systems were studied, enhanced by the development of artificial intelligence systems based on machine learning. Research in the field of dentomaxillofacial radiology concerns automated diagnosis of dental and maxillofacial diseases, localization of anatomical landmarks for orthodontic and orthognathic treatment planning, and general improvement of image quality. Other recent research evaluates the quality and use of intraoral scanners and 3D software and printers for the design and implementation of therapeutic means. CAD / CAM technology is used in many fields of dentistry, especially in implantology, prosthetics, orthodontics, and maxillofacial surgery. Surgical guides for implantology and orthodontic miniscrews placement, provisional and definitive prosthetic restorations, and many orthodontic appliances are designed and built. In this field, research and technology are revolutionizing clinical procedures, which in many cases can follow a digital workflow.

Finally, many studies propose the evaluation of stereophotogrammetry as a means of integrating 3D diagnosis. In this field, scientific research has produced works on the evaluation of the means of image acquisition and on the positioning of landmarks that allow measuring the proportions of the facial volumes and accurately observing the effects of therapies on soft tissues.

As a demonstration of the novelty and scientific interest in this topic, the production of scientific works is constantly increasing. The researchers are trying to overcome the gap in the difficulty of using the technology through the proposal of automatic 3D image processing systems, which make clinical application easier.

This Guest Editor issue is particularly dedicated to updating the knowledge regarding the use of digital devices in the diagnostic process. One of the results in publishing articles on 3D diagnosis is to show the community of dentists how to use the new technologies in daily practice. I am grateful to the Editorial Board of The Open Dentistry Journal at Bentham OPEN for this special issue.

The articles collected in this issue report the novelties brought by digital technologies in orthodontics. One of the most peculiar effects of using new technologies is that dentists are allowed to study the face of the patient and measure it precisely. This aspect is very important for orthodontic diagnosis, but its importance is growing in all the fields of dentistry due to the increase of attention on the facial aspect. Facial esthetic today has the same importance as dental occlusion and function, thus has contributed to increasing the multidisciplinarity of dental intervention.

These aspects are described in the articles of this issue, briefly presented below:

1.1. Facial Asymmetry Detected with 3D Methods in Orthodontics: A Systematic Review

This systematic review aimed to compare 2D and 3D methods for facial analysis to assess the asymmetry. The methods for measuring facial asymmetry vary from photographic images of the face to radiographic images. The comparison is between the 2D methods, which are panoramic radiography (OPG), postero-anterior (PA) radiography, and digital photography, and the 3D methods include cone-beam computed tomography (CBCT), stereophotogrammetry, laser scanning, 3D optical sensors (computer-aided structural light)

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and contact digitalization. The revision of the selected articles allows listing the advantages and disadvantages of the various techniques. The results of this research highlight that among 2D techniques, the most reliable is the PA radiography. However, the 3D methods are more accurate, and among these, the CBCT is the one that provides the most information. The other 3D methods are valid when the measurements are based on a color-coded distance map [1].

1.2. 3D Facial Analysis in Class II Subdivision

In this article, the authors investigate the use of stereophotogrammetry in measuring the asymmetry of soft tissues in patients with a Class II subdivision malocclusion. The diagnosis of a Class II subdivision aims to ascertain if the asymmetry is due to a mandibular rotation or a maxillary asymmetric development. This difference has been identified in the diagnostic process by observing and measuring the cone-beam computed tomography (CBCT) of the patients. Stereophotogrammetry, compared to CBCT, has the advantage of being a non-invasive method to assess asymmetry. In this research, 32 patients with Class II subdivision were compared to a homologue group of subjects with Class I. The stereophotogrammetric images were analyzed by selecting landmarks and measuring the asymmetry on a color-coded distance map. The results show that the asymmetry on the soft tissues is more marked in patients with mandibular midline deviation [2].

1.3. Dental Arch Changes with Two Different Trans-Palatal Arches

Maxillary expansion is one of the most applied orthodontic therapies. Often, the therapeutic device is a Rapid Maxillary Expander (RME). After completing the expansion, the use of a trans-palatal arch (TPA) may prevent the relapse and continue the expansion at a dental level. This study compares the effect of two different TPAs in a group of 30 patients previously treated by RME. In order to measure the outcomes of the therapies, 3D dental casts were used. 3D dental casts are a verified tool to take accurate measurements and allow for more possibilities when compared to gypsum cast models. One of the advantages is the possibility of digitally superimposing two casts of the same patient, taken at different times of the therapy. In this research, the gypsum cast models were scanned and transformed into 3D models to make more accurate measurements [3].

1.4. Facial analysis of Nepalese subjects

The purpose of this study is to assess the facial cephalometric norms for a Nepalese population. This is necessary because most of the cephalometric norms are based on measurements taken on North American or European populations. This research aims to analyze the face, evaluate the variability between males and females, and determine cephalometric norms of Nepalese subjects based on Ricketts analysis [4].

CONCLUSION

The articles in this issue demonstrate that the new technologies are integrated into the clinical practice, and their use makes the diagnostic process more accurate. Articles and researches that investigate and report on the use of 3D devices contribute to promoting their use in dental offices. Contemporary technologies become time by time more accessible and easy to use. The modern dentist spends part of the working hours at the computer, combining the ability and knowledge in dentistry with skills in using computer programs. The epochal change that has taken part in our age is unstoppable and makes our profession more accurate, but it requires an effort from clinicians to become confident in the use of the new technological devices.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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