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Recent advances in orthodontic diagnostic aids

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Abstract

Diagnosis is a crucial step that bridges the gap between clinical assessment and medical or dental therapy. The diagnosis can be changed based on the clinical examination, radiographic interpretation, and test data. Since its inception, the field of dentistry has seen several advancements. Study casts and periapical x-rays have given way to cone beam computed tomography, magnetic resonance imaging, and ultrasound in dental diagnostic records. Orthodontic diagnosis necessitates a thorough examination of the patient's circumstances, taking into account both objective and subjective results. The creation of a comprehensive database of relevant information is at the heart of the problem-oriented approach information. Recent advances in diagnostic aids have been discussed in this paper.

Keyword: Recent advances, Orthodontic diagnosis.

Introduction

Over the last year, technological and mechanical aids have become increasingly important in orthodontics and Dentofacial orthopaedics diagnosis and treatment planning. Imaging articulator, jaw tracking, and functional analysis are examples of these

technologies[1].The clinical evaluation, medical therapy, and dental treatment are all linked by diagnosis[2].

Complex statistical assessments of development patterns and dentoskeletal relationships were available in the 1970s with the incorporation of computers and cephalometric technologies.

Computed tomography, ultrasound, nuclear medicine, magnetic resonance, and digital angiography are all examples of digital imaging. Digital imaging has recently been used to traditional radiography, with the benefits of picture storage and transmission[3].

The recent advancement of three-dimensional computed aided tomography (CT) has resulted in more precise preoperative planning for a variety of surgical procedures. The three-dimensional CT scan techquine allows for a more detailed and precise evaluation of particular places on the skeleton than the two-dimensional approach[4].

With the goal of eliminating the use of paper in orthodontics and the already existent replacement of dental cast models, a new technology has arisen that will save the patient and the clinic an time.

Digital study models

Digital study models were described by Stevens R D et al. The digital study models assist an orthodontist in sending the patient's alginate impression or existing plaster model to dental imaging firms, where the impression or plaster study models are processed into a virtual 3D picture on the computer. They may be found on the company's website at any time[5].

Traditional plaster study models have been around for a long time, but they have a lot of drawbacks. For starters, plaster study models are prone to breakage. The use of plaster for measurements and exhibition can wear it down, reducing accuracy and increasing the risk of fracture. Another notion that presents both space and temporal issues is storage.

Plaster models can be replaced with digital models, which are more accurate, efficient, and simple to use. Digital models have the potential to revolutionize orthodontics practice using current technology and future uses. They make exact measurements and visualizations of therapy outcomes possible. The capacity to complete diagnostic setups rapidly, obtain perfect bracket placement from the start of therapy, and improve patient-clinician communication all have favorable effects on treatment[6].

Conventional CT scan

It was created by Sir Godfrey Honsfield in 1967, and five generations of the system have been produced since the original prototype.

The initial first version had only a single radiation source and detector, and data was collected slice by slice. Second generation have multiple detectors within the plane of the scan. The detector and data collecting technologies have improved in the third generation. A moving radiation and a fixed detector ring were incorporated in the fourth generation. The fifth-generation projections are so fast that they can record the patient's heartbeat[7].

The use of several slices of a picture aid in the creation of a three-dimensional image. However, the CT's soft tissue contrast isn't very effective.

Cone Beam Computed Tomography

In Europe, cone-beam CT (CBCT) was developed in 1998 with the goal of providing a remedy to the drawbacks of conventional CT[8].

CBCT Systems with a Wide “Field of View” are used to assess the entire head and neck region. The maxilla and mandible are evaluated with a medium FOV, whereas impacted teeth, root morphology, supernumerary teeth,

and regions of implants or orthodontic micro implants are evaluated with a small FOV[7].

The Benefits of CBCT are[9]:

- Real-size data,
- Three-dimensional presentation,
- Two-dimensional display is available as an option (posteroanterior cephalogram, lateral cephalogram, TME imaging, and panoramic radiography)
- Image with a high resolution.
- The dose of radiation is smaller than that of a CT scan. It has been proven that the CBCT radiation exposure is up to 98 percent lower than that of CT.
- Assessment of Impacted Teeth and Craniofacial Anomalies
- Evaluation of the Airway and Sinus
- TMJ assessment

Stereophotogrammetry

Stereophotogrammetry is a method of creating 3D models by shooting things using a pair of setup cameras and merging photographs obtained from two distinct orientations. Stereophotogrammetry provides a number of advantages, according to studies[10]:

- It is a non-contact, non-invasive technology
- No radiation exposure
- Effective at recording changes in face morphology and soft tissue (38–40).
- It is simple to use in paediatric patients especially infants.
- It may be used in conjunction with CBCT pictures.
- 3D pictures may be seen on a personal computer and utilised as a means of communication between doctors.

Laser Scanning (3D Laser Scanning)

A non-invasive approach for collecting face morphology and soft tissue is laser scanning. The method's validity has been demonstrated in several research. “According to Kau and Richmond”, laser scanning systems are less costly and easier to use, in addition to providing realistic 3D facial models[11].

Laser scanning can be used for

- Assessment of facial asymmetry
- 3D analysis of face
- Evaluation of soft tissue changes
- Scanning the dental cast

Oblique lateral transcranial radiography

The lateral component of the temporomandibular joint is seen via an oblique lateral transcranial projection. There is no depth measurement taken. TMJ using oblique transcranial TMJ radiographs are an accurate means of radiographically examining the lateral side of the temporomandibular joint. It is more accurate than lateral tomography since lateral tomography can have difficulties identifying landmarks due to condyle displacement[12].

Conclusion

The technical developments in keeping diagnostic data indicated above may benefit not just orthodontists, but also the whole dentistry community. These innovations may be used in various areas of dentistry to keep track of patients' information. Researchers and developers are working tirelessly to make dental practise easier all around the world. Their work and devotion to these developments are commendable, and we hope they continue to make progress with technical breakthroughs in the future.

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