DETERMINATION OF ACCURACY AND RELIABILITY OF A NEW RECORD TRANSFER SYSTEM

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Doctors Degree in Fixed Prosthodontics.

By

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DEDICATION

To my Family

Mother and father, husband, kids and friends, who supported me with patience, and constant encouragement in every way possible. There are no words to express my gratitude.

To the soul of

my Father

I wish he were here.

INTRODUCTION.

Fixed prosthodontics is the branch of dentistry concerned with the replacement and/or restoration of teeth by artificial substitutes that are not readily removed from the mouth. This imposes the problem, that any existing discomfort or maladjustment of the restoration renders a constant influence on the stomatognathic system which in turn could lead to negative changes and dysfunction.

The occlusion of teeth is frequently overlooked or taken for granted in providing restorative dental treatment for patients. This may be partly due to the fact that the symptoms of occlusal disease are often hidden from the practitioner not trained to recognize them or to appreciate their significance. The long-term successful restoration of a mouth with cast metal or ceramic restorations is dependent upon the maintenance of occlusal harmony.

In order to produce restorations that need minimal chair side adjustment, fabricating an accurate tooth replacement requires accurate reproduction of the patient's mouth situation in the dental laboratory. This demands meticulous recording of the existing inter-maxillary relations and mandibular movements, and translating them to numerical values for articulator setting. Thus, a thorough understanding of the masticatory system and the used instrumentation as well as comprehension of the existing limitations is mandatory.

The mandibular movement is three dimensional; to be able to register and analyze the movement it was necessary to break it down into the three spatial planes.

Though the clinical significance was strongly debated, yet Pantography was long considered the gold standard registration method for accurate prosthetic constructions along the use of fully adjustable articulators.

The digitizing revolution of the 20th century has invaded all fields of our lives from the simplest house hold tools till the most sophisticated space industry. The dental profession profited a great deal from this especially in the field of restoration production where the **Computer Aided Design** and **Computer Aided Milling (CAD/CAM)** is taking more and more over. This led to modifying the clinical procedures to adapt to the computerized fabrication steps; some examples are digitized optical impressions, laser scanned models/dies, electronic jaw movement registration and virtual articulators.

The latest developments in restorative and prosthetic dentistry include the electronic registration. It records the patients exact mandibular movements in **six point freedom** and the recorded data can be either used in the classical table articulator as individualized readings or transferred to the computer to be used with other softwares such as virtual articulator or in CAD/CAM.

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In order to be able to fabricate an accurate dental restoration, there should be a thorough understanding and comprehension of the mandibular kinematics.

I. Mandibular Kinematics.

Kinematics is the study of patterns of motion with respect to time [24]. The kinematics study of the functional relationship between mandible and maxilla is extremely complex in nature. It is related to mechanical and neuromuscular principles. It commonly involves a combination of movements in the sagittal, frontal and horizontal planes. These complex movements are varying greatly among individuals and within the same individual during all functional or non-functional positions [62].

The two joints work synchronically for the jaw to move. The movement is initiated by the neuromuscular system and is controlled by the shape of the bones and function of muscles and ligaments. The upper and lower teeth articulate together to form a rigid stop of motion [18, 93, 108]. The measurement and reproduction of those condylar movements is the basis for the use of articulators.

Thus the determinants of the mandibular movements are posteriorly the right and left temporomandibular joints through the unchangeable condylar path, anteriorly the teeth of the maxillary and mandibular arches, and overall the neuromuscular system [113] [Figure 1].

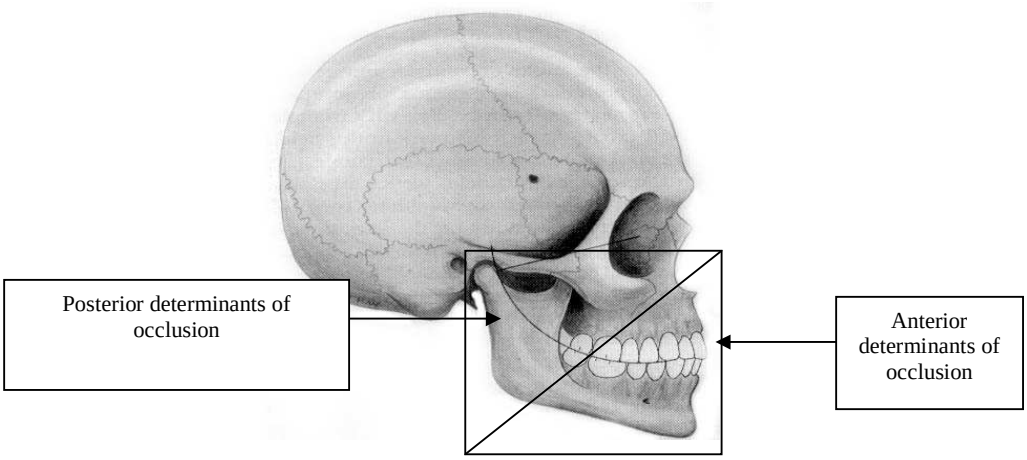

Figure 1: the determinants of occlusion, posteriorly the TMJ and partly the posterior teeth, anteriorly the teeth.[*]

The dentist must relate an understanding of the mandibular movements to their useful clinical application in the treatment of patients, in order to select and adjust recording devices and articulators for restoration construction [18, 62].

The anterior determinants, the teeth, provide guidance to the mandible in several ways. The posterior teeth provide the vertical stops for mandibular closure. They also guide the mandible into the position of maximum intercuspation, which may or may not coincide with the optimum position of the condyles in the glenoid fossae. The anterior teeth (canine to canine) help to guide the mandible in right and left lateral excursive movements and in protrusive movements. Dentists have indirect control over this determinant. Procedures done to the teeth may be reflected in the response of the neuromuscular system. Deflective occlusal contacts or steep incisal guidance from opposing canines can change the pathway of mandibular movements [62].

[*] Ahlers M. O.: simulation of occlusion in restorative dentistry: the Artex system. Dental concept Verlag GmbH, Hamburg, Germany. 2000.