Working Processing in dentistry: Accurateness of T- Scan

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Abstract

Occlusion is common topic of discussion in many field of dentistry: orthodontics prosthodontics, implant dentistry, oral and maxillofacial surgery, periodontics, and pedodontics. Different methods have been used to evaluate the correct occlusion. Recently, t-scan has become more popular to record the pattern of occlusion.

Keywords: Accuracy, Clinical Application, Occlusion, Sensor, T-Scan.

Background

To Establish A Diagnosis Of Occlusal Pathology, It Is Essential To Have An Objective Knowledge Of The Patients' Mandibular Dynamics And To Develop A Method That Enables The Dentist To Analyze.

Different methods of ruling out and recording occlusion

The use of visual assessment technique and the test which examines teeth for mobility and fremitus have been the primary modality to rule out occlusal pathology for a long time.

T-Scan

Assembly the T' Scan System is a dental device used to analyze teative occlusal force that is recorded intraorally bya pressure-mapping sensor. The system components include a sensor and support, a handle assembly, the system unit, computer software and a printer. The sensor is the key component.

Sensor

T-Scan sensors are available in two sizes: large and small. Large size sensor can accommodate arch up to 66 mm wide and 56 mm deep and contains 1370 sensels whereas small size sensor can accommodate arch up to 58mm wide and 51mm deep and contains 1122 sensels. Each sensel within a T-Scan sensor is limited to 256 possible values2 and the system provides eight different sensitivity settings.

Mechanism

When patients bite on the sensor, the resultant change in electric resistance is converted into images on the screen. The program can be operated in two modes: time analysis and force analysis. The former provides information on the location and timing of contacts displaying on the screen with the first, second and third or more contacts in different colors. The latter shows the location of contacts and their relative forces in five different shades of colours Within the force analysis mode, two sub modes can be selected, i.e., the instantaneous which records contact s at specific mandibular positions and the `sequential' which analyses the contacts throughout mandibular movement. Therefore, it can assess the initial occlusal contact, the order that all the occlusal contacts occur in, and the amount of relative occlusal force loading at each contact.

Accuracy of T-scan

Precise analysis of occlusal contacts is a problem in functional diagnostics that has not yet been satisfactorily resolved.4,5 But in 1987, the development of a prototype computerized occlusal analysis (T-Scan; Tekscan Inc, South Boston, Mass)1 claimed to record the occlusal contact by computer analysis of information from a pressure sensitive film which overcomed all the problems in recording occlusion. But Moini et al.6 then compared the reproducibility of T-scan with silk marking paper and reported that it was not as accurate as the silk ribbon. Al.10 showed that T- Scans only effective between the load of 0.98 N to 20.59 N and the value is not reproducible at higher loads. In vitro study on accuracy and repeatability of the T-Scan II system conducted by Hirano et al11 reported that T-Scan force recordings were acceptably precise, especially for the moderately high level and default level. Koos et al.12 reported that the level of accuracy is acceptable and no

interferences arouse from change in foil or repeated measuring was detected with T-Scan III .The author didn't find any inaccuracy as mentioned in the past, which may be due to an upgrade in T-Scan III. Throckmorton et a1.13 reported that without either shim stock or bite guard, the T-Scan sensors are not reliable enough for recording of absolute occlusal forces. Shim stock on T-Scan is more reliable than bite guards in accuracy.

Advantages & Disadvantages

Studies have shown that it can measure location and timing of tooth contact and occlusion in 3D. The tooth contact information is presented by demonstrating moments of time in the sagittal axis and transverse axis of the occlusal plane. Premature contacts and interferences can be identified in the dynamic occlusion instead of static. Not only can the distribution of forces per tooth be displayed but also distribution of forces in two halves of the jaw can be calculated. Moreover, the force distribution can be further separated into anterior and posterior relationships12.

Factors to be considered while reading occlusion

The major factors which need to be considered while recording occlusion are age, sex and state of dentition15, attitude of the investigator16, position of the transducer in the mouth17, vertical facial morphology18 and head position19-23.Additional factor that may influence occlusal force data are extent to which the teeth and jaws are separated when the measurements are made, whether the force is exerted unilaterally or bilaterally and the patients head posture during measurements.

The recordings allow dentists to see the subjects' mandibular movements on the screen, to train him to bite with maximum intercuspal contacts and to check the position's stability. After this training, the subject should be asked to perform various bites in a natural unforced

way. Recordings should thus be made of the lower arch and then printed in two dimensions. The time analysis mode should then be selected from the system menu. Interface of two teeth should be measured in both zones. Force analysis mode can be chosen later which provides the operator with data on the location and relative force of tooth contact. On the bottom of the screen, bite length can be read. Within force analysis, two additional modes can be selected, i.e., instantaneous (which registers mandibular positions) and sequential (which registers the intensity of contacts during mandibular movement).

Clinical Application of T-Scan in Different Field S of Dentistry

Orthodontics

Most of the patients might suffer from improper occlusal contacts due to severe malocclusion. One of the goals of orthodontic treatment is to improve occlusion achieving proper bite force. The use of T-scan before and after orthodontic treatment for every patient helps to attain the goal of correcting malocclusion and maintaining the proper bite force.25

T-Scan occlusal analysis system is helpful to meet the needs of patients for reliable measurement of occlusal biting forces.27

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