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Original Article

Comparison of articulating paper markings and T Scan III recordings to evaluate occlusal force in normal and rehabilitated maxillofacial trauma patients



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ABSTRACT

Background: Prosthodontic Rehabilitation of Treated Maxillofacial Trauma Cases by Evaluating Occlusal Force Distribution Using Computerized Occlusal Analysis.

Method: 30 patients were selected for the study. 15 normal and 15 treated trauma patients were subjected to T Scan analysis and evaluated for the occlusal force distribution.

Results: The results take into consideration the two parameters. Firstly the largest articulating paper mark (photographed) and secondly the T scan of the same patient. Comparison was made between the largest articulating paper mark and highest force tooth in the quadrant using T Scan. The matches and no matches were then tabulated for statistical analysis assessing the frequency of the matches to the no matches.

Conclusion: The ultimate advantage of a T Scan III analysis is that it can detect the amount of force as well as location of the highest intensity contacts of a single tooth which is very specific.

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Introduction

Maxillofacial trauma often leads to fracture of the facial bones and teeth.^{1,2} Facial fractures are usually treated by reduction and immobilization or fixation of the fractured segments,

followed by occlusal adjustments and restoration of missing teeth and soft tissues where necessary.³ The ultimate goal is optimal achievement of functional occlusal forces and maximum intercuspation.⁴ The patient's teeth should be restored in such a manner that they are able to take up full

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functional load during mastication of food.⁵ The occlusal tactile sensibility for natural teeth can be as low as 8–10 μm .^{6,7} Patients may be able to feel occlusal discrepancies of that dimension when the teeth are restored. Accurate methods of locating the altered occlusal contact points in maximum intercuspation clinically are essential during rehabilitation of maxillofacial trauma patients.⁸ These corrective adjustments are made by selectively grinding the marks to obtain occlusal stability,⁹ multiple contacts throughout the arches that exhibit simultaneity¹⁰ and reduce stress on the occlusal contacts and the periodontium.¹¹ Shimstock foil in combination with articulating paper markings have been advocated in the determination of occlusal tooth contacts that require adjustments.¹² Because the shimstock foil does not mark the selected teeth, the articulating paper markings are the primary guide for the operator when selecting which contacts require adjustment. In textbooks of occlusion it has been advocated that marked area is a representative of the load contained within the mark.^{13–15} The T-Scan III computerized occlusal analysis system (Tekscan Inc., South Boston, MA USA) overcomes the known limitations of articulating paper.¹⁶ It quantifies and displays relative occlusal force information, so the clinician can minimize repeated errors of incorrect occlusal contact selection that often occur from relying solely on the combination of dental articulating paper and patient feel. T-Scan III can help ensure that high quality and complete occlusal end results are predictably obtained from clinical occlusal treatment.¹⁷ The T-Scan III determines the contact time sequencing and the percentage of relative occlusal force between numerous occlusal contacts and then displays them for all dynamic analysis.¹⁸ This enables the clinician to better identify many interfering contacts that are not readily identified by articulation paper markings. Due to T-Scan system improvements made over the past 25 years, we are able to treat different occlusal problems successfully and provide patients with predictable high quality occlusal treatment end results which were not possible previously.

This study was undertaken to evaluate the occlusal force distribution and functional load in dentulous patients using computerized occlusal force evaluation system (T-Scan III) as compared to conventional method of articulating paper. The study proves T Scan III as an effective tool in measuring and comparing the occlusal force distribution in maxillofacial trauma patients before and after surgical, prosthetic rehabilitation.

Aims and objectives

1. To evaluate the occlusal force distribution and functional load in dentulous patients using computerized occlusal force evaluation system (T Scan III) as compared to conventional method of articulating paper.
2. To determine the relationship between size of largest paper mark and the percentage of force applied to the same tooth.
3. To rehabilitate the maxillofacial trauma cases to active occlusal force and make them fit for effective mastication.
4. To compare the measurement of occlusal forces using computerized and conventional methods.

Materials and method

This study was undertaken to rehabilitate the maxillofacial trauma cases to active occlusal force and make them fit for effective mastication. This study also compares the measurements of occlusal forces obtained by computerized and conventional methods. The following materials and methods were used-

1. T Scan III Computerized occlusal analysis system (Tekscan Inc., South Boston, MA USA) [Fig. 1]
2. Articulating paper [Products Dentaires SA Vevey Switzerland] [Fig. 2]
3. Camera [Canon Power Shot {SX220HS} 12.1 Megapixel]

Patients above 21 yrs of age who had complete set of permanent maxillary and mandibular teeth and treated maxillofacial trauma patients with complete set of permanent maxillary and mandibular teeth were selected. Patients with TMJ disorders, skeletal deep bite, skeletal and dental open bite, syndrome affecting the craniomaxillofacial apparatus, skeletal Class III malocclusion, cleft lip and palate and missing/grossly unrestored carious teeth were excluded.

A total of 30 cases who met the above inclusion and exclusion criteria were selected. The cases were divided into two groups as follows.

- a. Group 1: Normal dentulous group with complete set of 32 maxillary and mandibular permanent teeth
- b. Group 2: Maxillofacial trauma cases with complete set of 32 maxillary and mandibular teeth before surgery and after prosthetic rehabilitation.

Intraoral and Extraoral photographs of all the patients were taken prior to carrying out the analysis. All the patients were subjected to articulating paper occlusion recording. The articulating paper was placed intraorally and the subject was asked to clench their teeth firmly on the articulation paper. Standardized photographs were taken to compare the markings with those T Scan III multi-bite recordings at a later stage. All photographs were taken with a digital SLR camera (Canon) in manual mode. An intraoral mirror was placed in the mouth and photos of the articulating paper markings were captured accurately. The procedure was repeated until a clear photograph was obtained. A freehand sketcher (Adobe Photoshop



Fig. 1 – T-Scan III recording handle connects directly to a computer via a USB interface.

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