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Occlusion and occlusal indicating materials

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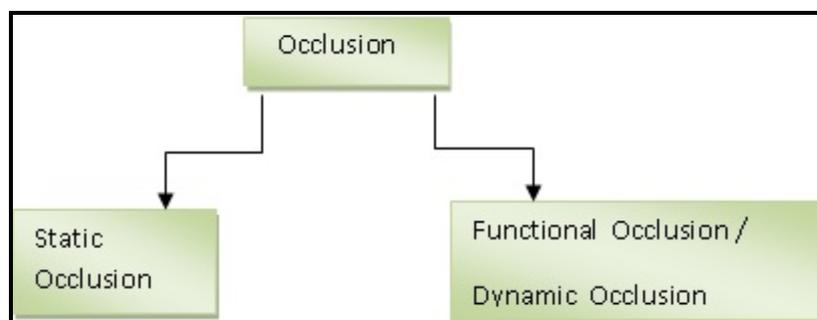
Abstract

In dentistry it is important for us to understand occlusion and errors produced during recording it. Over the years many occlusion testing materials have been used. The correct occlusion possess as much a challenge for dentist and technician. High spots measuring just a few microns can cause dysfunctions like temporo-mandibular pain. The purpose of this review is to discuss the various occlusal indicator materials and make us well aware of different advantages and disadvantages of each that will help us to chose the occlusal indicating material.

Keywords: occlusion, occlusal indicator material, occlusal interference, occlusal contact

Introduction

The alignment and occlusion of the dentition are extremely important for mastication as per JPO occlusion is the static relationship of the teeth and is basic to all aspects of dentistry. The activities of chewing, swallowing and speaking greatly depend not only on their intra arch position but also on the inter arch tooth position^[1]. FIG-1



Occlusal contacts are subjected to constant change tooth restoration, extraction and prosthetic care always change the occlusal proportions.

An occlusal interference of only few microns can trigger severe dysfunction. In order to avoid any unpleasant sensation, leading to temporomandibular joint pain and myalgia various materials and methods have been used to detect occlusal interferences. Achieving occlusal markings over some restorations such as gold, metal alloys and ceramics and on moist occlusal surfaces has been a difficult task^[2].

Classification of tooth-contact patterns

The tooth contact patterns were classified into four groups as follows^[2]:

1. Cuspid protected occlusion^[3]

Canine guidance can be used successfully in complete denture treatment as it provides better mandibular denture retention, esthetic appearance, and chewing ability.

2. Group function occlusion^[4]

Group function as multiple contact relations between maxillary and mandibular teeth in lateral movements on the working side whereby simultaneous contact of several teeth acts as a group to distribute occlusal forces. The group function of the teeth on working side distributes the

occlusal load. The obvious advantage is maintenance of the occlusion. The group function philosophy appears to be one of the physiologic wear. Several authors have suggested that occlusal wear is a natural, beneficial and inevitable in a well-developed occlusion. Group function of working side is indicated whenever the arch relationship does not allow the anterior guidance to do its job of disoccluding the nonfunctioning side.

3. Full balanced occlusion ^[5]

Balanced occlusion comprises realization of tooth contacts at the working side as well as at the balancing side, at the same time. The aim of this study was to assess the influence of balanced occlusal arrangement of artificial teeth on the decrease in reduction of edentulous alveolar ridge. Balanced occlusion is a favored occlusal design in setting of artificial teeth in conventional complete dentures which preserves edentulous ridge and influence the stability of dentures. Influence of balanced occlusion in complete dentures on the decrease in the reduction of an edentulous ridge. ⁵

There are 138 possible contacts in the dentition with normal occlusion. 90% of the total units actually make exact contact in dentitions with normal occlusion. ²

Methods of evaluating occlusal relationship ^[2]

Methods of evaluating occlusal relationship can be of two types:-

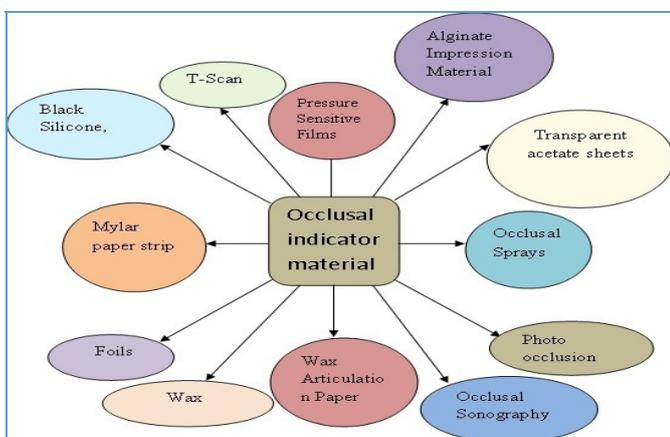
- 1) Qualitative methods
- 2) Quantitative methods

Both qualitative and quantitative methods are used for the evaluation of occlusion. In the qualitative method, only the localization of the occlusal contact points can be determined; the sequence or density of the contacts cannot be evaluated. With the quantitative method of evaluating occlusal relationships, the sequence and density of the contacts can be differentiated.

Materials used as occlusal indicator

Various materials used as an occlusal indicator are as follows ^[2]

T-Scan, Pressure Sensitive Films, Alginate Impression Material, Transparent acetate sheets, Black Silicone, Mylar paper strip, Polyether rubber impression bites, Wax Articulation Paper, Occlusal Sprays, Photo occlusion, Foils, Occlusal Sonography



Mylar Paper / Shimstock films ^[6, 7]

The shim stock was positioned over the tooth evaluated. When the participants close in Intercuspal Position, teeth holding the shimstock were considered to have occlusal contact with their

antagonists. Anderson *et al.* ^[6] reported on the reliability of dentists' ability to evaluate occlusal contacts in the intercuspal position. Shim stock and an articulating film were compared in the evaluation of occlusal contacts of 337 antagonist occlusal pairs in 24 young adults by two examiners. Shim stock displayed better reliability than articulating film and appeared suitable for clinical measurement of occlusal contacts in intercuspal position ^[6, 7].

Polyether occlusal indicator ^[8]

Durbin and Sadowsky described a silicone impression material method for examining occlusal contact patterns. The locations of the contacts were then transferred to study models

Alginate Impression Material ^[9]

Number and location of perforations were registered as occlusal tooth contacts for each subject. The observed perforations were analyzed according to the frequency of occlusal contacts. Most subjects had asymmetric distribution in number and location of occlusal contacts

Transparent Acetate Sheet ^[10]

It is based on occlusal sketch technique that aimed to provide a simple and reliable means of recording and transferring information about the location of marked occlusal contacts. The authors marked static occlusal contacts of 20 sets of models were recorded in a pseudo-clinical situation, by three dentists and in addition by one dentist on two occasions using a schematic representation of the dental arch - the 'occlusal sketch'. As per Daves *et al.* the occlusal sketch is a simple, inexpensive and easy way of recording the results of an occlusal examination using marking papers.

Articulating paper ^[11]

Articulating papers are used to detect high spots, the width, thickness and dye type of the articulating paper helps it to leave a mark. The color coating of many articulating papers consists of waxes, oils and pigments, a hydrophobic mixture which repels saliva. High spots can be detected easily as dark marks and contacts as light marks. The disadvantages of articulating papers have been that they can be affected by saliva, are thick and have a relatively inflexible base material; all of these factors contribute to greater number of pseudo contact markings. In the in vitro part of the study, a test model (mounted in an articulator and in a universal testing machine) was established with the use of maxillary and mandibular dentate casts. Articulating papers, foils, silk strips, and the T-Scan system were used to examine the loss of sensitivity of the recording materials after 3 consecutive strokes. The differences in the contact points of the test model determined by each of the recording materials were evaluated both in the articulator and in a universal testing machine. Authors concluded that multiple use of the recording materials tested may lead to inaccurate occlusal analysis results. It is recommended that the recording materials be used only once and that the teeth be dry during occlusal analysis.

Foil ^[12]

Foils are the thinnest indicator materials. Their marking capacity is less evident under reduced pressure and on glossy surfaces, thus greater pressure must be applied for application of foils. Authors studied the recording patterns of four foils, six paper materials, and four silk qualities at different pressures and surface morphologies. They concluded that Foils are the thinnest indicator materials and give more accurate

readings than paper and silk. However, under smaller loads their marking capacity is worse. This means that higher pressures must be applied for the clinical use of foils. The drawbacks of the more intensively marking papers and silk are their greater thickness and less flexible base material. This leads to a greater number of pseudo contact markings [12].

Wax [13]

As per authors articulating papers, particularly plastic strips and waxes, are the most commonly used materials. Occlusal contacts can be recorded by placing the wax on the occlusal surfaces of the maxillary posterior teeth and patient closing into maximum intercuspation. The wax occlusal records was examined in front of a light screen. Disadvantages are inaccuracy and problems of manipulation

Occlusal Sprays [2]

It can be challenging to mark an occlusal contact on glazed ceramic restorations. Untreated articulating paper does not leave a mark, necessitating the need for an alternate technique. Articulating ink ribbons leave smudge marks and inaccurate readings. Articulating sprays are easier alternative in these cases.

They are easy to administer (Arti-Spray, Bausch articulating paper Inc, Nashua, NH, USA) and leaves a thin colored film which can easily be removed with water, leaving no residues. They are applied at a distance of 3-5 cm onto the occlusal surface. When testing occlusion all contact points will be immediately visible. These are available in colors: red, blue, green and white.

Photo-Occlusion [14]

In this system, a thin photoplastic film layer is applied on the occlusal surface of the teeth; the patient then is asked to occlude on the film layer. The film layer is removed from the mouth and inspected under a polariscope light. The results were transferred to a graphic occlusal scheme.

Authors designed the study to test clinically the reproducibility of techniques by comparing two consecutive occlusal records and records made at 1-month intervals and to test the reproducibility of a color-marking technique under the same conditions, and to compare the location of occlusal contacts as registered by these two techniques.

Occlusion Sonography [15]

It detects tooth contact by the sounds generated during mouth closure.

The relationship between graphic records of sounds of occlusion and the types of tooth contact which produced them was investigated by the authors by filming various types of occlusal contacts with a Fastax rotating prism camera at approximately 1,000 frames per second the slinging of the teeth over each other was seen on the films as low amplitude vibrations and the tooth impacts as high amplitude one.

T-Scan [16]

The T-Scan instrument was designed to examine and record occlusal contacts by computer analysis of information from a pressure sensitive film. The T-Scan system digitally record both the location and timing of tooth contacts. The tooth contact information is presented by demonstrating moments of time in the sagittal axis and transverse axis of the occlusal plane.

Electrical resistance develops with the applied force. When the patient occludes on the sensor, the particles come together in

the force applied areas, diminishing the electrical resistance.

T Scan system demonstrates sufficient sensitivity and specificity as a diagnostic tool and reliability in intra oral conditions with presence of saliva.

It provides registration of dynamic occlusal information.¹⁶

Pressure Sensitive Films [17]

This device records the location and force of occlusal contacts with the force sensitive film.

An occlusal diagnostic system dental prescale system, Fuji photo film, Tokyo has recently been developed in japan. This system uses improved pressure sensitive sheets and a computer for analysis to make simple measurements of occlusal contact areas and occlusal pressures

Conclusion

Every occlusal indicator material has its own advantages and disadvantages. The decision about the use of all the materials depends upon the clinical situation, affordability, reliability and thorough knowledge about materials by the clinician

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