

EDITORIAL

Occlusal Indicators - A Step Towards Betterment

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The Integrity and function of masticatory system has a huge impact on a person's quality of life.¹ Occlusion, the static relationship between the masticating surfaces is the fundamental concern of prosthetic and restorative dentistry. The occlusal contact time implies no time lapse between first and the last occlusal contact when the mandible is closed, to achieve this simultaneous occlusal contact relationship.² Any delay in the occlusal contact timing is termed as occlusal interference and can lead to severe discomfort and derangement in the stomatognathic system.² Planning, and execution of predictable functional and aesthetically pleasing restorations depend heavily on the accurate diagnosis of occlusal abnormalities. Additionally, it's critical to identify the static, functional and dynamic occlusion in order to maintain the health of the teeth, gums, joints, and muscles.³ Faulty and overfilled restoration may cause occlusal interferences. These deleterious discrepancies can cause functional problems that are perceived after the completion of treatment.⁴ To ensure an optimal occlusion and to further minimize occlusal discrepancy, it is necessary to understand the patterns of static and dynamic teeth contact.⁵ The presence of occlusal discrepancy may not be readily apparent when clinically examining the patient. Therefore, further occlusal analysis is required where occlusal indicators play an important role in identifying occlusal problems.³ Health professionals should evaluate dental prosthetics/natural teeth for contact, duration, and occlusal load. Recording a bite should not significantly affect dental structures or soft tissue position. Choosing the right occlusal indicator for this purpose allows the dentist to work with precision and provides valuable information about the occlusion and its force.¹

Premature occlusal contacts are identified using occlusal indicators which may be either physical (Qualitative) or digital(Quantitative). The major distinction between the qualitative and quantitative occlusion indicators is that the latter measures the tooth contact events. Due to the reduced cost and ease of use, qualitative indicators are the most frequently used materials for registering the occlusion.² The density of the contacts can be

inferred from the markings' blackness which is attributed to the bonding of the colouring or staining agent to the tooth surface, provided the tooth surface is sufficiently dry.³

Qualitative occlusal indicators consist of articulating paper, articulating silk strips, photo occlusion wafers, interocclusal wax record, articulating foil film, metallic shim stock, mylar strip, high spot indicator liquid, carborundum abrasive paper, impression materials like ZOE, alginate, polyether silicone bite, silicone putty, black silicone, transparent acetate sheet, occlusal sprays. The main disadvantage with qualitative occlusal indicators is the inter tester variability, reproducibility and dimensional stability that are least. Also, they lack quantitative time and force descriptive capabilities, and the thickness of the indicator can lead to early flexion of the jaw and alter the occlusal pattern.

Quantitative occlusal analysers measure the occlusal contact time. Quantitative occlusal indicator devices are reliable, reproducible and show less inter-tester variability as compared to qualitative occlusal indicators.³ Dental Sound Checker introduced by Watt was to examine occlusal contact sound patterns during closure to detect potential occlusal disturbances which produced a high amplitude long sound on slow closure and short low amplitude sound on quick closure.⁶

Quantitative occlusal indicators with transducers gauge the bite force as well. There are different types of transducers used in quantitative occlusal indicator sensors - Strain Gauge Transducer, Piezoresistive Transducer, Piezoelectric Transducer, Pressure transducers and Pressure Sensitive Films. The strain gauge transducer(used in Dentoforce2 and IDDK) causes discomfort to the subjects when biting on it due to the hardness of the bite fork. The change in bite force is related to the position of the sensor relative to the dental arch. More distal is the sensor, greater is the bite force due to the mechanical leverage.¹

A piezoresistive transducer(FSR151, Flexiforce) has high sensitivity, dynamic response, high accuracy, good stability, wide operating temperature range thus overcoming the problem of strain gauge transducer. The resistance of the sensor decreases

with increasing pressure. Piezoresistive sensors are inexpensive, easy to use and have been successfully used in many studies.

A piezoelectric transducer uses the piezoelectric effect of a piezoelectric material (Quartz, Polycrystalline ceramics) to convert the measured pressure into an electrical signal. The piezoelectric material generates electric charges on the surface after being forced and measuring circuit amplifies and transforms the impedance to give electrical output proportional to the external force. T scan System uses the piezoelectric transducer in its sensor.¹ The T-scan is used for thorough assessment of the occlusion. It contains grid-based sensor technology designed for occlusal analysis. It provides precise measurement and reduces subjective interpretation and can measure occlusal surface contact timing. This precision helps set treatment parameters. Repeated use, sharp teeth can affect their sensor sensitivity. The T-Scan system produces 0.6mm occlusal interferences and can replicate altered occlusal contact info via force and time analysis modes. Disruption in thickness impairs closure, but T-Scan III detects early contact points for full mouth rehabilitation.¹

A system similar to T scan was introduced in the year 2017 called Accura in Korea. It had low cost, convenient maneuverability with instantaneous tracking of alterations in occlusal forces. The sensor contains polyimide material with 160 micron thickness. This can be connected to a computing device via Wireless Fidelity (WiFi).⁶

A pressure transducer converts the pressure of a liquid or gas into an electrical signal. When the fluid in the chamber absorbs the force, the pressure inside the chamber increases, which is transmitted to the pressure gauge and measured. Based on the chamber content, pressure transducers can be divided into pneumatic transducers and hydraulic transducers.

The pressure-sensitive film is composed of two polyethylene terephthalate films and several microcapsules containing a chromophore sandwiched between them. On biting, the microcapsules and colour formers disintegrate thereby causing the components contained in the capsule to react with the developer to change colour according to the pressure applied, different colour densities are formed. As the pressure increases, the colour becomes more intense. This technology is used in Dental Prescale and the data is analysed using Occluzer FPD-705.¹

It's essential that natural teeth and dental prosthesis should be in physiologic occlusion. Occlusal trauma occurs if there is no harmonious occlusal scheme on natural teeth and results in an adaptive response like thickened lamina dura, occlusal wear, or a traumatic

response, including mobility or a widened PDL. In the implant occlusion, the appropriate term is occlusal overload. Occlusal overload causes damage to the prosthesis, abutment, implant structure, or the surrounding alveolar bone.⁷ Therefore controlling implant occlusion within the physiologic limits of the fixture environment influences long-term implant success. Implant success depends not only on the priority of planning but also in emphasizing the significance of maintenance, including radiographic evaluation, inspection of the implant restoration components, and occlusal monitoring. The idea of implant protected occlusion permanence remains unanswered: "occlusion of a fixed implant prosthesis developed at insertion may change significantly in the first 18 months after placement".⁸ The maintenance of implant protected occlusion requires periodic evaluation and intervention, for successful implant restorations. Restorative dentists should inculcate the habit of periodic review which should include occlusal examination post prosthetic rehabilitation.

CONFLICT OF INTEREST

There is no conflict of interest

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