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RESEARCH ARTICLE

ARTICULATING PAPERS IN PROSTHODONTICS: A KEY TOOL FOR PRECISION DENTISTRY

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ABSTRACT

Articulating paper is crucial in prosthodontics as it facilitates accurate occlusal analysis, pinpointing high spots, evaluating restorations, and preventing post-operative issues. It enhances treatment precision, ensuring patient comfort and functionality while minimizing discomfort, muscle pain, and chewing difficulties. Articulating paper provides an objective tool to prevent overadjustment, maintaining the integrity of dental prostheses and restorations, ultimately improving patient outcomes and satisfaction in dental procedures. It is a vital tool in dentistry, its correct use and critical evaluation is necessary.

INTRODUCTION

Prosthodontics is a specialized branch of dentistry that deals with the restoration and replacement of teeth and their supporting structures. Within this field, precision and accuracy are paramount to achieving successful treatment outcomes. One vital tool that plays a significant role in ensuring precise dental restorations is the articulating paper.

The patient's perception of occlusal thickness ranges from 12.5 to 100 micron. The thickness of an occlusal registration strip should be below the patient's perception. Thick occlusal registration strip or one that a patient can perceive between the teeth has a disadvantage of indicating tooth contact between opposing teeth when no tooth contact exists. Any presence of supra-contact should be removed below the threshold of appreciation. When teeth oppose each other, an interference is perceived at approximately 20 microns. An implant opposing a natural tooth detects an interference at 48 microns; therefore, it is more than twice as poor. An implant crown opposing an implant crown perceives the interference at 64 microns, and when a tooth opposes an implant overdenture, the awareness is 108 microns (five times poorer than teeth opposing each other).

Occlusal indicators are of two types: ie qualitative and quantitative. Articulating paper is a type of qualitative occlusal indicator. Other occlusal indicators are also available.

Qualitative indicators

- Wax
- Elastomeric impression material
- Articulating paper
- Articulating silk
- Articulating film
- Metallic shim stock film
- High spot indicator
- Occlusal spray
- Quantitative indicators
- T-Scan occlusal analysis system
- Virtual dental patient

Understanding Articulating Papers: Articulating papers are the most frequently used qualitative indicators to locate the occlusal contacts intraorally. They are thin, flexible strips or sheets coated with a color-indicating substance, typically ink or a wax-like material. These papers come in various thicknesses and shades, allowing dentists to choose the most suitable option for their specific needs. They have a spongelike structure of a soft micro fleece paper containing a colouring agent and a bonding agent (e.g., Transculase-Bausch Articulating paper) between the two layers of the film. When a patient bites down on the articulating paper, the colouring agent gets expelled and the binding agent binds it on the teeth.

Articulating paper for complete dentures: When evaluating occlusion for complete dentures or partial dentures, a medium to thick articulating paper is commonly used. Due to the resiliency and compressibility of the underlying mucosa beneath complete dentures, very fine articulating papers cannot be used. Most commonly used 200 microns and 100 microns articulating papers are used in different colors to demarcate centric and eccentric contacts.

Articulating paper for tooth supported fixed prosthesis: For single crowns or small bridges, a medium thickness articulating paper (around 12 to 30 microns) is commonly used. This thickness provides good sensitivity to detect occlusal contacts while allowing for precise adjustments. Restoration over natural tooth shows a physiological movement of around 25-28 microns, corresponding to the thickness of periodontal ligament space. However, prosthesis movement under 25lb vertical force and with 2mm connectors is 12 microns movement for one pontic and 97 microns movement for two pontic span, therefore a thicker articulating paper (around 30 to 40 microns) may be more appropriate to handle the greater forced distribution. (prosthesis movement due to flexion)

Articulating paper for implant supported prosthesis: Implant supported prosthesis requires a thick articulating paper despite of showing the least amount of vertical displacement (5 microns) as compared to natural teeth (25 microns) and mucosa (approx. 1mm). The reason behind this is the decreased proprio-awareness in implants. When teeth oppose each other, an interference is perceived at approximately 20 microns. An implant opposing a natural tooth detects an interference at 48 microns; therefore, it is more than twice as poor. An implant crown opposing an implant crown perceives the interference at 64 microns, and when a tooth opposes an implant overdenture, the awareness is 108 microns (five times poorer than teeth opposing each other).

The Role of Articulating Papers in Prosthodontics

- **Occlusal Analysis:** Articulating papers are invaluable in evaluating the occlusal relationship between the upper and lower teeth. Through occlusal analysis, prosthodontists can identify any premature contacts or high spots that might lead to issues like discomfort, improper force distribution, or premature wear of dental restorations. Adjusting the occlusion precisely using articulating papers ensures a harmonious bite and improved longevity of the prosthesis.
- **Assessing Dental Restorations:** Whether it's crowns, bridges, or dentures, the accuracy of dental restorations is critical for their success. Articulating papers aid in verifying the fitting and occlusal balance of these restorations. By carefully adjusting the dental prostheses using the marks left by the articulating paper, dentists can ensure that the patient's bite is correctly aligned, minimizing the risk of complications in the future.
- **Diagnostic Tool:** Articulating papers are an essential diagnostic tool during the treatment planning phase. They help dentists visualize and record the patient's existing occlusion, which is crucial when designing complex dental prostheses. By understanding the occlusal relationship beforehand, prosthodontists can create more accurate and patient-specific treatment plans.
- **Bite Adjustment:** When patients complain of discomfort or pain during chewing, articulating papers aid in identifying areas of excessive pressure. By pinpointing these spots, dentists can adjust the bite precisely, leading to improved patient comfort and functionality.
- **Patient Education:** Articulating papers offer a visual aid for patient education. Dentists can show patients their bite and explain the areas that need adjustment. This helps patients better understand their dental condition and the necessity for any recommended dental procedures.

The Advantages of Articulating Papers

- **Cost-Effective:** Articulating papers are relatively inexpensive compared to some of the newer digital occlusal analysis technologies. They provide a cost-effective option for dental practices, making them accessible to a broader range of professionals.
- **Simplicity and Ease of Use:** Articulating papers require minimal setup and are easy to use. They do not demand specialized training or complex equipment, making them accessible to all dental professionals.
- **Real-Time Evaluation:** Unlike digital technologies that may require complex setups and data analysis, articulating papers provide real-time feedback. Dentists can immediately see the occlusal contacts and adjust the bite during the patient's appointment, enhancing efficiency and accuracy.
- **Widely Accepted:** Articulating papers have been a standard tool in prosthodontics for many years and are widely accepted and utilized by dental professionals. Dentists are familiar with their use, making integration into clinical practice seamless.

Other options

Articulating silk

- It is made up of a micronized color pigment, embedded in a wax-oil emulsion.
- has an extremely high color reservoir capacity.
- Since it has a soft texture, pseudo markings are not produced
- silk is highly tear-resistant and, because of its low thickness and good flexibility, adapts perfectly to cusps and fossa.
- However, it loses its marking ability when stain components are dried and can be ruined by saliva.
- Articulating Silk is especially suitable for the use on a laboratory model because one strip can be used up to ten times and is thus extremely economical.
- Highly suitable for ceramic and gold.

Articulating film

- The articulating film has only a thickness of 8 μ , which is much less than the thickness perception level of the patient.
- It is made up of an emulsion with a thickness of 6 μ , which is hydrophobic and contained inside a polyester film.
- It must be used with special holders in a dry environment.
- It is universally applicable, both intraorally and on lab models.

High spot indicator

- This is supplied in the liquid form
- indicated for use in the laboratory to check the proximal contacts of crowns, inlays, onlays, telescopic crowns and clasps.
- The liquid is applied with a brush on the proximal surface of the coping
- The solvent evaporates within seconds leaving behind a film thickness of 3 μ
- The dye is then seated in the cast, and on removal, the proximal contact area is delineated as an area of show through in the base material of the crown.
- Used to test high spots on highly polished occlusal surfaces such as gold or ceramic.
- can easily be removed after use. Hot water, mechanical friction (toothbrush or dental floss), alcohol, isopropyl alcohol and steaming will also loosen residual color deposits.

Metallic shim stock film

- The shim stock film has a metallic surface on one side and the other side is colour coded.

- It is mainly indicated for use in the occlusal splint therapy in order to accurately mark the contacts on the soft splint in the laboratory

Occlusal spray

- It is a universal color indicator to test the occlusal contacts and accurate fit of crowns and bridges.
- easy to handle and leaves a thin coloured film which can easily be removed with water, leaving no trace of residues.
- Apply at a distance of 3-5 cm onto the occlusal surface or inside the bridge or crown.
- When testing occlusion or trial seating the bridge or crown, all contact points will be immediately visible.
- It can be used for proximal contacts when trial seating crowns and bridges. It contains physiologically safe ingredients and is filled with environmentally neutral propellants.

T-scan

- The T-Scan occlusal analysis system is a Microsoft compliant system that can record a given contact sequence in 0.01-s increments.
- It consists of a piezoelectric foil sensor, a sensor handle, both hardware and software for recording, analyzing and viewing the data.
- The T-Scan identifies the time magnitude, distribution and timing of the occlusal contacts.

CONCLUSION

Articulating papers are indispensable tools in the field of prosthodontics. Their use allows dentists to achieve accurate occlusal adjustments, leading to successful dental restorations with improved longevity and patient satisfaction. Through occlusal analysis and diagnostic evaluation, articulating papers aid in designing precise treatment plans that cater to each patient's unique needs.

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