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Biologically oriented preparations in fixed prosthodontics

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Abstract

Introduction: The management of soft tissues in fixed prostheses is of high importance, mainly in the aesthetic area. Biologically oriented preparations are intended to manage the emergence profile to seek the best aesthetic and biological results.

Objective: The objective of this work is to analyze the literature about BOPT, the protocol that is carried out in the preparation and taking of the impression as well as its advantages and disadvantages.

Methods: The search for published articles was carried out using the PubMed and Google Scholar database. Keywords used for the search include “Biologically oriented preparation technique”, “vertical preparation” and “BOPT”.

Results: The BOPT technique seeks to improve aesthetics by managing tissue through vertical preparation, exchange of the CEJ and provisionalization. It is a technique with different steps and a large learning curve, however, among its advantages is the possibility of rehabilitating fractured teeth, improving the reparation of the pieces and improving aesthetics.

Conclusions: Having different types of fixed prosthesis preparation gives the clinician the opportunity to choose to seek the best result in the final restoration. The BOPT technique could be the technique of choice when reparing pillars, seeking better aesthetics or for a fracture.

Keywords: Biologically oriented, BOPT, vertical preparation

1. Introduction

One of the significant complications associated with dental preparation for fixed prostheses is gingival recession, which can result in sensitivity, cavities, and compromised aesthetics, particularly in the anterior sector ^[1]. In 2008, Ignazio Loi introduced the Biologically Oriented Preparations (BOPT) to enhance the stability of periodontal tissues. This technique involves a vertical preparation with immediate provisionalization to effectively manage the tissues around the preparation ^[2].

Clinical observations highlight the impact of dental emergence profiles and the quality of gingiva on the shape, thickness, and scalloping of the margin ^[3]. Literature suggests that employing BOPT may contribute to a reduced incidence of periodontal disease, gingival recession, and improved mechanical stability. However, current clinical evidence remains insufficient ^[1].

The objective of this study is to analyze the existing literature on BOPT, focusing on the protocols involved in preparation and impression-taking, as well as examining the advantages and disadvantages associated with this technique.

2. Methods

The research for published articles was carried out using Google Scholar and PubMed databases. Keywords used for the search include “Biologically oriented preparation technique”, “vertical preparation” and “BOPT”.

3. Results

3.1 Dental preparation in fixed prosthesis

The utilization of fixed dental prosthesis remains a primary option for restoring dental structure [4]. However, a potential complication associated with the preparation for a fixed prosthesis is the instability of the gingival tissue. Factors contributing to this complication include the gingival biotype, preparation design, and the location of the finishing line. An incorrect fit or interface may create a conducive environment for the accumulation of bacteria, posing a risk to periodontal structures and potentially leading to prosthesis failure.

The choice of finishing line varies, and its selection depends on factors such as the treatment plan, prevailing trends, and the type of material used [5].

3.1.1 Vertical preparation

In conventional dental practice, clinicians typically establish a finish line on dental abutments to accommodate a restoration, either above the gumline (supragingivally) or below it (subgingivally). The subgingival placement is more prone to induce gingival inflammation [6]. The termination lines are broadly categorized into two main groups: horizontal termination lines, such as curved chamfer, flat chamfer, and straight shoulder, and vertical lines, which encompass feather or knife-edge margins. An innovative approach to tooth preparation, circumventing the need for a finishing line, is the Biologically Oriented Preparation Technique (BOPT).

3.1.2 BOPT Technique

The technique known as the biologically oriented preparation technique (BOPT) involves the prosthetic restoration of a tooth without a defined finish line, coupled with the immediate placement of a provisional crown [7]. Originating in 2008 through the work of Ignazio Loi, it draws inspiration from studies conducted by Carnevale and Di Febo in the 1990s. These studies focused on a clinical prosthetic protocol for cases with significant periodontal involvement [8]. The protocol included the preparation of teeth, following the elevation of a flap up to the bone crest, aiming to eliminate undercuts, ease tooth preparation, and reduce root concavity. After allowing tissues to heal for 8 to 12 weeks, prosthetic rehabilitation was performed, resulting in a remodeling of the dentogingival complex [9]. In contrast to the previous protocol, the BOPT technique can be applied interchangeably to all teeth and does not necessitate the use of flaps.

Diverse fixed prosthesis preparation methods offer clinicians the flexibility to select the most suitable approach for optimal final restoration. The BOPT technique may be preferable when repreparing pillars to enhance aesthetics or address fractures.

3.2 Considerations Related to Periodontal Health

The tooth, being the only part of the human body passing through an epithelium, has a crucial connection with periodontal health and tooth survival through the transmucosal junction apparatus. Coined as the "biological space" in the sixties, this anatomical unit comprises a keratinized gingival sulcus, a junctional epithelium, and connective tissue [10], with attributed dimensions of 0.69 mm, 0.97 mm, and 1.07 mm, respectively [11]. The BOPT technique extends beyond a mere prosthetic procedure, incorporating elements of a periodontal surgical procedure that potentially enhances surrounding tissues by providing increased thickness and stability.

The periodontal regeneration process aligns with the fundamental principles and stages of wound healing: hemostasis, inflammation, proliferation, and remodeling [12]. Following tooth preparation and prosthesis placement, the periodontium undergoes various healing phases leading to the generation of a new ligament [13]. In adherence to the basic principles of wound healing, and based on existing studies, several biological phenomena can be elucidated.

3.3 Clinical protocol

The first step in performing the BOPT technique involves performing a diagnostic wax-up and creating a provisional restoration. The most important characteristic that this provisional must have is that it makes contact with the gingival margin to facilitate relining. On the other hand, burs for tooth preparation will have a decreasing particle size: 120 μ - 40 μ - 20 μ [3].

After applying local anesthesia, probing is performed to show at what level the junctional epithelium is located. Subsequently, the preparation of the stump or the carving of the natural tooth is carried out. Once the tooth has been prepared at the supragingival level, infragingival carving will proceed [14]. Once the preparation and polishing of the tooth with discs and gums is complete, the temporary relining phase begins.

The first step of the relining phase is to check the correct fit of the temporary, eliminating any interference. A concave space is thus created between the hardened acrylic resin in the groove and the hardened buccal resin spill on the gum [15].

This step is characteristic and unique to BOPT preparation as it differentiates it from conventional techniques. The shape that the provisional crown acquires is convex and ovoid so that it stabilizes and retains the clot formed in the sulcus [16].

The bleeding caused by the rotating instrument generates a clot, a precursor to new supracrestal tissue, which must come into contact with the anatomical margin of the provisional prosthesis. The function of the provisional prosthesis is to guide the healing, reattachment and thickening of the periodontal tissue [17]. This allows the surrounding soft tissue to adjust its shape and position, forming a new cement-prosthesis profile and obtaining phenotypic modifications with minimal gingival recession.

Subsequently, the margin is carefully polished and cemented with temporary cement. The temporary crown will remain in your mouth and will not be removed for at least 4 weeks.

3.4 Advantages and disadvantages of BOPT

3.4.1 Advantages

In the context of the Biologically Oriented Preparations (BOPT), it is crucial to eliminate the Cementoenamel Junction (CEJ) and any previously established preparation lines. When dealing with previously treated dental pieces, utilizing this type of preparation can be advantageous, particularly in retreatment scenarios [8].

During the impression-taking process, there isn't always a requirement for a distinct line; instead, it is sufficient to capture the groove and reproduce it accurately. This approach promotes a more conservative method and offers flexibility in managing the finishing line at different levels without compromising the final restoration's quality of marginal adaptation [18].

Furthermore, BOPT contributes to the stability of gums in both the short and long term, facilitating the development of an ideal emergence profile, especially in aesthetically critical areas.

3.4.2 Disadvantages

Certain clinicians highlight potential drawbacks associated with the Biologically Oriented Preparations Technique (BOPT). One concern is the risk of overcontouring of the restoration, leading to potential issues in achieving the desired anatomical shape. Another challenge mentioned is the unpredictable regeneration of soft tissue and the associated risk, particularly in managing bleeding during the procedure [2].

During the cementation phase, dealing with excess material can be complex due to the nature of the BOPT preparation. The provisionalization time required for effective tissue management is considered a disadvantage, as it extends to a minimum waiting time of 4 weeks. Additionally, practitioners may face a steep learning curve when adopting BOPT, which could pose challenges in mastering the technique [8].

4. Conclusion

The Biologically Oriented Preparations Technique (BOPT) contributes to enhanced aesthetics by effectively managing the tissue surrounding the tooth through vertical preparation, the exchange of the Cementoenamel Junction (CEJ), and allowing time for provisionalization. While this technique involves multiple steps and presents a steep learning curve, its advantages include the ability to restore fractured teeth, improve the reparation of dental pieces, and enhance overall aesthetics.

The availability of various types of preparations provides clinicians with the flexibility to choose the most suitable approach to achieve the optimal result in the final restoration. BOPT may be the technique of choice, especially in scenarios involving reparation of pillars, where improved aesthetics are sought, or in cases of tooth fractures.

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