ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 03 | March - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

PROSTHODONTIC REHABILITATION WITH ALL CERAMIC RESTORATION USING BIOLOGICALLY ORIENTED PREPARATION TECHNIQUE – CASE REPORT

Prosthodontics

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ABSTRACT

In the recent years there has been increasing demand for treatments aimed at improving dental esthetics. In this context, both patients and dentists prefer to preserve the teeth and surrounding soft structures as far as possible. Maintaining the health and stability of soft tissues always presents a challenge in treatments with fixed prostheses. There is a direct relationship between soft tissue health and bone tissue health. For this reason, maintaining tissue health, free of mucositis, is essential for long-term success of prosthetic treatments. Traditionally, there are two types of teeth preparations which include preparations with finishing lines also called as horizontal and preparations without finishing lines which are described as feather edge. This case report describes a preparation technique without a finish line known as the Biologically Oriented Preparation Technique (BOPT) which involves gingival modulation along with preservation of tooth structure. The technique resulted in improved emergence profile of crown, better esthetics and preservation of surrounding soft tissues.

KEYWORDS

BOPT, All ceramic crown, gingival modulation, soft tissue preservation.

INTRODUCTION

Soft tissue stability around fixed prosthetic restorations is one of the most essential objectives for dentists. One of the major clinical complications in fixed prosthodontics on natural teeth is the unsatisfactory esthetic result due to the apical migration of the marginal gingiva. The tendency of the gingival margin to migrate apically with time may be related to multiple factors that include inadequate quality and quantity of keratinized gingiva (thin biotypes are more likely to have recessions), reaction to a trauma during prosthetic work (preparation, gingival retraction), chronic inflammation due to prosthetic errors (technical problems like open margins, violation of the biological width, horizontal overcontour), trauma due to faulty tooth brushing technique [1,2]. Among all factors preparation technique and the corresponding geometry of the finish line is most relevant. Traditionally, there are two types of dental preparations: preparations with finishing lines, also called horizontal; and preparations without finishing lines, described as feather edge [3]. The preparation technique without a finish line is also known as the Biologically Oriented Preparation Technique (BOPT). In this protocol, the crown's anatomic emergence profile at the Cemento Enamel Junction (CEJ) is eliminated with diamond rotary instruments to create a new prosthetic junction, adapted to the gingival margin. The aim of this protocol is to create a new anatomic crown with a prosthetic emergence profile that simulates the shape of the natural tooth [4].This clinical report describes management of a case of endodontically treated maxillary anterior teeth with BOPT.

Clinical Report

21 year old male, a boxing sports person reported to Dept of Prosthodontics with chief complaint of broken upper front teeth resulting in an unesthetic smile. On presentation of history it was elicited the current clinical condition secondary to contact sports injury. Nothing relevant on evaluation of past medical history. Past dental history revealed endodontic treatment for 11 and 12. Intraoral examination showed full complement of teeth with good general periodontal health. Examination of maxillary anterior region showed Ellis class III fracture with respect to 11, 12 and discolored composite restoration (Fig 1). Radiological evaluation revealed 11 and 12 with obturated root canal without no periapical involvement. Treatment plan formulated included all ceramic restoration for 11 and 12 with BOPT technique.

Fig 1 – Pre Op view

Description of technique

Tooth preparation:

This includes intrasulcular mapping to assess epithelial attachment level with the help of periodontal probe (Fig 2). Conventional supragingival preparation was done which involves tooth preparation in the same manner as usually done in conventional tooth preparation for all ceramic which involves labial and lingual reduction of 1.2-1.5mm followed by incisal reduction of 2mm using a diamond flame shaped bur (Shofu Dental, Japan). Then the intrasulcular preparation was started by entering the sulcus with the bur tilted obliquely, so that it cuts with its belly and not with the tip, working at the same time on the tooth and gingiva (gingitage technique) and connecting this preparation plane with the axial one, into a single and even vertical surface (finishing area). In this way, the existed Cemento-Enamel Junction (CEJ) was removed. In BOPT, gingitage technique (Fig 3) was used to eliminate the emerging component of the dental anatomy. This will allow the creation of a finish area within which the crown margin can be moved coronally. The final step of the preparation is refining the entire surface with a 20-micron diamond bur to smooth out the surface.

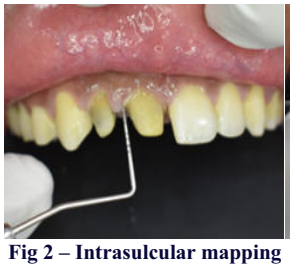

Fig 2 – Intrasulcular mapping

Fig 3 – Teeth preparation with gingitage

Provisional crown relining

In BOPT provisionalization is a very critical part of the technique. A hollowed acrylic crown (prefabricated using indirect technique) with a contour that follows the gingival margin was prepared which was checked for its fit, this temporary crown was relined with autopolymerising poly methyl methacrylate acrylic resin (DPI, India) directly in the mouth. Once it was set, the crown exhibited two distinct margins: a thin internal one, which records the intrasulcular part of the prepared tooth, while the thicker external one follows the external portion of the gingival margin. The space between the two margins is the negative image of the gingiva (Fig 4). The space between the two portions was filled with a light cured flowable composite resin (3M, Germany) to thicken the coronal margin and allow the creation of the crown contour. This was done to produce a new angular component which was formed together with a new CEJ that was positioned in the sulcus, no deeper than 0.5 to 1 mm, fully respecting the biologic width (controlled invasion of the gingival sulcus). After polishing, the crown was cemented and the excess cement material was removed.(Fig 5)

The intrasulcular portion of the temporary crown's margin supported the gingival margin circumferentially, allowed the clot stabilization into a fully structured gingival tissue (clot preservation). The healing process determines the reattachment and thickening of the gingival tissue, which will mold and adapt to the new emergence profile [4,5].

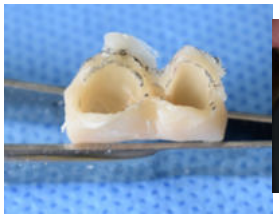

Fig 4 – Relining of provisional crown

Fig 5 - Provisionalization

Impression procedure:

After 4 weeks, when the gingival tissue was stabilized the final impression was made with addition silicone impression material (3M,Germany) using putty and light body consistency and poured with Type IV dental stone(DPI, India).

Laboratory procedure:

The most important step in final restoration includes laboratory procedure to accurately read and replicate the margins of preparation as there are no distinct finish lines. Since an improved control over the gingival levels is needed before exposing the finishing area, a black mark is traced with a 0.5 mm pencil over the gingival contour projecting it on the abutment's wall (black line). Afterwards, the gingival part around the abutment is removed, showing the subgingival area of the preparation reproduced on the model (Fig 6).

The apical part of the model was exposed and it was marked with a blue line. The area between the two lines was the "finishing area" and the "finishing line" for the restoration was marked with a red pencil, on which will fall the margin of the restoration. The position of the margins of the restoration depends on the depth of the sulcus and on the esthetic needs, keeping in mind that the crown margin will never invade the epithelial attachment. The red line becomes the reference margin for the ditching process. As for the concept of BOPT it is said that the gingival profile will adapt to emergence profile of the restoration rather than the restoration being shaped according to gingival contours. Hence restoration was fabricated on the master cast without the gingival component, creating a morphological, functional and esthetic ideal contour. The prosthetic restoration was then transferred on to the model with the gingiva to evaluate the contours in all three dimensions. The final restoration was cemented and excess cement was removed (Fig 7). Post op evaluation showed marked difference in form, function and esthetics.

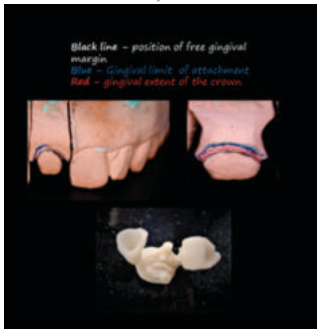

Fig 6 – Fabrication of all ceramic crown

Fig 7 – Post op view

DISCUSSION

Gingiva is that part of oral mucosa that covers the alveolar process of the jaws and surrounds the neck of teeth in a collar like fashion. Anatomically gingiva is divided into marginal, attached and interdental gingiva. Marginal gingiva is the border of teeth surrounding the teeth in the collar like fashion. It is demarcated from attached gingiva from free gingival groove. Attached gingiva is firm, resilient and tightly bound to underlying periosteum. Histologically gingiva have Junctional epithelium (JE), sulcular epithelium (SE) and oral epithelium (OE). JE is a stratified squamous non keratinizing epithelium and its thickness varies from 3-4 layers in early life[5]. According to the Gargiulo, Went &Orban, biological width (2.04 mm) is the combination of epithelial attachment (junctional epithelium) and the connective tissue attachment[6]. Whenever there is encroachment of biological width, the first and foremost reaction is inflammation which further progresses to form pocket formation which eventually leads to periodontitis. Hence it is important to respect biological width when planning for restoration so as to avoid these conditions[6].

On the basis of location finish lines were of two types supragingival and subgingival finish lines. Conventionally supragingival finish lines were used in most cases but subgingival finish line was also used in conditions such as superior esthetics, presence of existing restorations extending subgingivally, insufficient vertical length for retention and patients with high caries index[7]. Biologically Oriented Prepataion Technique (BOPT) has been popularized by by Dr Ignazio Loi, he advocated this technique using feather edge finish line with the aim to create new anatomic crown with a prosthetic emergence profile simulating natural tooth[8].

Advantages of this technique includes preservation of tooth structure, emergence profile and excellent esthetics. The other fundamental concept is that the finish line of horizontal preparations is located on the prepared tooth, while the finish line is the prosthetic crown's margin itself in the BOPT technique with no distinct margin hence the margin can be shortened or extended both in the provisional or permanent restoration at different intrasulcular levels, without harming the quality of fit and without invading the epithelial attachment because the finish area is always located above it (controlled invasion of the gingival sulcus).With the BOPT technique it is possible to transfer the emergent anatomy to the prosthetic crown. This allows a free interaction with the gingiva that will adapt, shape and settle forming new forms and profiles. In the BOPT technique, interaction between preparation restoration & gingiva, enables the gingiva to thicken and to adapt to new forms, resulting in increased stability both in the short and in the long term[9].

CONCLUSION

BOPT technique has proven successful in maintaining stability of pericoronal soft tissues, in natural teeth. With the BOPT technique, it is possible to interact with the surrounding tissues modifying their shape and scalloped architecture regardless of any pre existing dental or gingival limitation. The advantages are relevant considering that most of the clinical results are obtained only through the restoration itself, both provisional and final (margin position, emerging profile, tooth form). This is a novel and innovative technique which is an integration of newer technology with the classical concepts yielding promising outcomes in future. However more studies are required in future on this technique.

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