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Vertical Preparation for Fixed Prosthehic Restorations in Anterior Region: A Case Report

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Abstract: ***In the past decade, many different authors have made a variety of attempts to find a tooth preparation technique for fixed dental prosthesis, which on one hand to satisfy the aesthetic requirements of patients, and on the other to maintain periodontal health. Abutment teeth can be prepared in different ways depending on the types of finish lines: preparations with defined margins (horizontal preparation) and without finish line (feather edge, knife edge, shoulderless). In this clinical case report the authors present a prosthetic treatment using the biologically oriented preparation technique (BOPT) in anterior area with zirconia restorations.***

Keywords: vertical preparation, BOPT, zirconia crowns, CAD/CAM

1. Introduction

One of the most common complications during prosthetic treatment with tooth-supported fixed restorations is recession of gingival margin, which is a reason for unsatisfactory aesthetic results [1, 2, 3, 4, 5, 6]. The apical migration of margo gingivalis can be caused by chronic gingival inflammation in response to poor marginal fit of fixed dental prostheses.

Tooth preparation can be classified as preparation with finish line/defined margin (horizontal) and preparation without finish line (feather edge, knife edge, shoulderless). Horizontal preparations include chamfer, shoulder, shoulder with bevel and inclined shoulder. The techniques without defined margin include feather or knife-edge finish line [4, 7, 8].

Horizontal preparations are indicated in cases when there is coincidence between clinical and anatomical crown, and periodontally healthy teeth. In such cases prosthetic margins are located near the cementoenamel junction (CEJ). Vertical preparation is preferred in cases when there is periodontal attachment loss, and clinical and anatomical crown do not coincide. In such cases the crown's margins are located apically from CEJ [9,10,11,12,13].

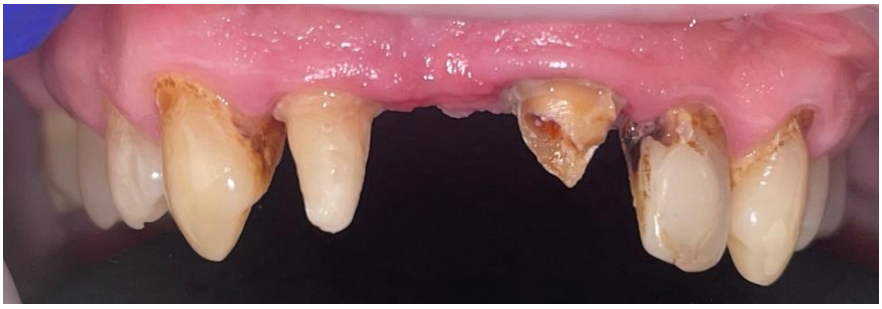
The BOPT (Biologically oriented preparation technique) protocol was published in 2008 by Ignazio Loy [14]. BOPT is a preparation technique in which there is no clearly defined margin between prepared and non prepared teeth surface. The technique allows to shape the crown emergence profile and guide the contours of the free gingival margin by specifically designed temporary restorations. In this way, excellent aesthetic results are achieved [15,16].The purpose of BOPT is to restore the natural anatomy of the tooth, which to be recreated with the definitive prosthetic restoration [17]. BOPT presents several clinical and biological advantages: less hard tooth tissues loss, easy impression taking technique; an opportunity to modulate the crown emergence profiles to create anaesthetic gingival contour, a possibility to coronalize margo gingivalis, an increase in gingival thickness; achievement of stable gingival margin in a long term. A lot of authors in their clinical studies confirm these statements. [4, 12, 14, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29].

2. Clinical Report

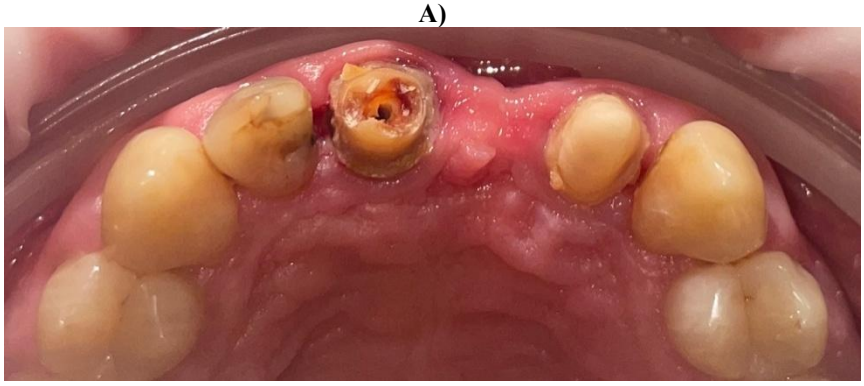
A 36-year-old male patient without medical history visited a private dental clinic with desire to correct and improve the esthetic outcome of an old prosthetic treatment in the anterior region of the upper jaw. The patient had an old acrylic fixed partial denture on the following abutment teeth: maxillary right lateral incisor and left central incisor. During intraoral check – up severe caries lesions and marginal inflammation were observed on both upper canines and left lateral incisor (**Fig.1**). After the initial examination the treatment plan was to restore the above-mentioned teeth with monolithic zirconiafixed dental prosthesis (FDP) from right canine to left central incisor and two single crowns on left lateral incisor and left canine.

Figure 1: Initial intraoral situation

After removal of the old prosthetic restoration, it was found that the abutment teeth were prepared with a defined horizontal preparation margin and the surrounding soft tissues were inflamed **(Fig.2)**. All of the caries lesions were removed and a restored with flowable composite (Gaenial Universal Flo, GC, Japan). Tooth 21 was build-up with a fiber post and dual-cure radiopaque composite (Gradia Core, GC, Japan). To determine the level of preparation so as not to invade the biological width, a gingival sulcus probing was performed. All of the abutment teeth were prepared following the biologically oriented preparation technique. First the pre-existing finishing lines were removed and the abutment teeth were prepared supragingivally using flame shaped diamond bur with 1,2mm diameter (Axis Dental G863.012).



A)



B)

Figure 2: The condition of abutment teeth and gingival tissues after removal of the old acrylic bridge. **A)**Frontal view; **B) Occlusal view**

The circumferential reduction of the abutment teeth is about 1.0 – 1.2 mm and the incisal reduction – between 1.5 -2.0 mm. For the subgingival preparation, the rotary instrument was introduced into the gingival sulcusat a depth of 1 mm below the level of the cement o-enamel junction CEJ at an angle of 10-15°. During the preparation, preparation of the teeth structures (removal of the emergence profile of the crown) and rotary curett age of the gingival epithelium covering the inner wall of the period ontalsulcusareper formed simultaneously. After that, the diamond bur is positioned parallel to the longitudinal axis of the tooth (0°), thereby preventing the creation of a finish line. To achieve a conical shape of the prepared tooth and a correct path of insertion upon completion of subgingival preparation, the buris placed with a slight converging angle of 3-6° to the incisal/ occlusal surface (coronally) (**Fig.3)**. The axial walls of the prepared teeth have an average angle of 6-8°. To smooth and refine the preparation, all steps are repeated using burs with finer abrasiveness (Axis Dental F863.012).

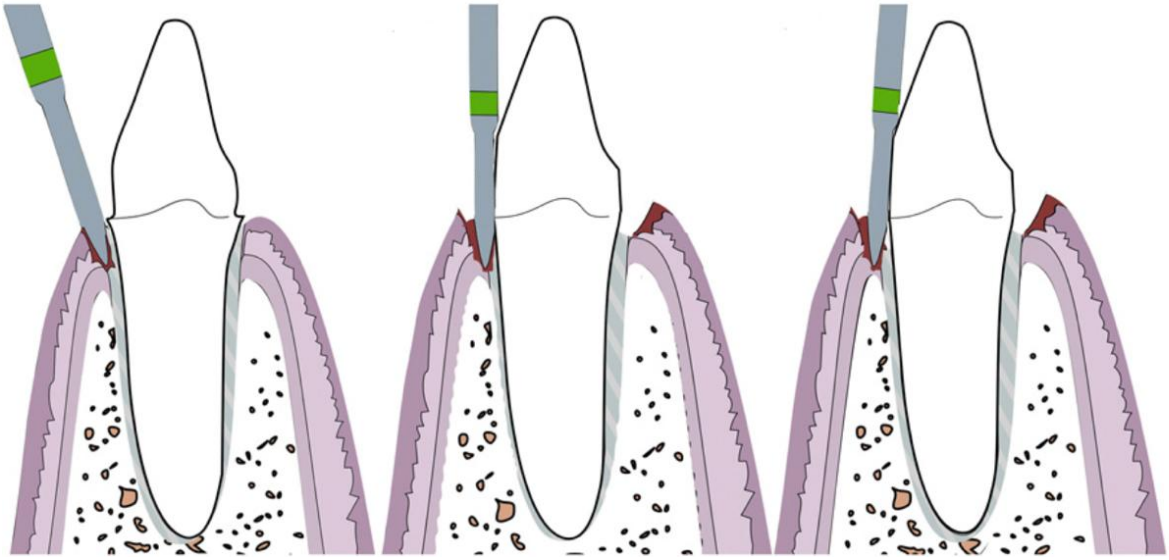


Figure 3: Stages of tooth preparation according to BOPT [31]

The interim restorations were fabricated from polymethyl methacrylate using milling machine. The new emergence profiles are created virtually in CAD software and the position of new prosthetic CEJ is placed 0,5-0,8 mm below margogingivalis. The provisional restorations were fixed with non-eugenol temporary cement (DentoTempAutomix, Itena Clinical) for two months (**Fig.4)**.

Figure 4: Cemented temporary restorations

During this period the healing process of soft tissues is completed and the adaptation of gingival margins to the new prosthetic emergence profiles is achieved. (**Fig.5)**.

A)

B)

Figure 5: Healing of gingival tissues after 2 months with provisional restorations **A)** Frontal view; **B)** Occlusal view

After that the final impression for definitive restorations was done with polyvinylsiloxane impression material (Express™, 3M ESPE). Gingival retraction was performed with double-cord technique and one-step two layered impression was taken from upper jaw.

Final restorations were designed and fabricated by computer-aided design and computer- aided manufacturing (CAD/CAD) system. Monolithic zirconia restorations (DD cubeX^2 ML, Dental Direkt, Germany) were manufactured by subtractive milling (CORiTEC® 150i, Imes-Icore, Germany) and sintered in furnace (Amann Girrbach). The marginal adaptation, the internal fit, approximal contacts and occlusion were adjusted using occlusion spray (Occlu Spray Plus, Hager Werken), articulating paper 40µ (Bausch, GmbH & Co. KG) and articulating foil 12µ (Bausch, GmbH & Co. KG). The definitive restorations were cemented with resin-modified glass ionomer cement (Fuji Plus, GC, Japan).

Figure 7: Fixed zirconia restorations

3. Summary

BOPT is an alternative method for treatment with FPD. Using this technique leads to increase of gingival thickness and provides soft tissue stability and good periodontal health.

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