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Case Report

Vertical tooth preparation technique in aesthetic zone: Report of two patients

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ABSTRACT

Introduction: Abutments can be prepared in fixed dental prosthesis using horizontal and vertical preparation techniques.
Materials and Methods: In vertical preparation abutments are prepared without a finish line by introducing a diamond rotary instrument into the sulcus to eliminate the cementoenamel junction and creating a new prosthetic cementoenamel junction. Vertical preparation technique in fixed dental prosthesis allows us to retrieve biologically compromised situations. With vertical preparations and over contoured provisional crowns, one can control zenith positions and thicken gingival biotypes. This in time gives us long lasting, stable tissue aesthetics around definitive restorations.
Conclusion: This article describes 2 patients whose dental abutments were prepared using vertical preparation technique and 12 months follow up for restoration of teeth in aesthetic zone.
Clinical Significance: Vertical preparation technique provides feather edge preparation and with interaction between preparation, restoration and gingiva aid in gingival thickening and adaptation to new prosthetic cementoenamel junction (CEJ) achieving soft tissue stability over long term.

1. Introduction

Replacing missing tooth with conventional tooth supported fixed dental prostheses has been time tested and reliable. Obtaining an excellent aesthetic result with preservation of biological structures is major challenge in reconstructive dentistry. Tooth preparation for a fixed dental prosthesis involve either horizontal preparation involving a defined margin or vertical preparation with no defined margin.

Horizontal margins are distinct, readily visible on tooth and impression and produce better adaptation of the restoration, hence are preferred. However, in literature vertical preparation has proven to reduce the marginal gap of the restoration and create a less irritating environment within the gingival sulcus.[1–3]

With vertical preparation operator can correct the position of CEJ both on prepared and unprepared tooth creating a new prosthetic CEJ leaving the gingival margin at the desired position obtaining optimal esthetic. Also, increasing gingival thickness by reorganizing CEJ generates better soft tissue stability in long term.[4,5]

This clinical report describes 2 patients rehabilitated with FDPs using vertical preparation technique.

2. Clinical Report

2.1. Patient 1

A 35-year-old man came fractured front tooth. Intraoral examination revealed fractured maxillary right central incisor (Figure 1). The treatment plan was fabricated to rehabilitate fractured incisor using fibre post and core and

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provide a lithium disilicate crown using vertical preparation protocol.

Fig. 1: a&b: Pretreatment intraoral view

A double probing was done to measure the depth of the gingival sulcus, bone level and to locate CEJ which limited the preparation.

Post space was made and post and core was done using prefabricated fibre post and core kit (Figure 2)

Fig. 2: a: Preparation of post space and fibre post selection; **b:** Core build up

Tooth preparation was done by reducing the incisal edge by 2 mm followed by axial walls reduction by 1 mm with a chamfer diamond rotary instrument (ADO-881, G014; Ancladén SL). Internal wall of sulcus and tooth were prepared at same time with a conical diamond rotary instrument introduced at an angle of 15 degrees (862.514.012 BOPT drills; Sweden & Martina) with a grit size of 100/200 micron and a diameter of 1.2 mm. First stage eliminated 1 mm from the emergence of the anatomic crown. Then, diamond rotary instrument was positioned parallel to the tooth axis at the level of CEJ & marginal tooth structure was removed with body of bur instead of tip thereby eliminating the finish line.

Epithelial tissue from area of the free epithelial sulcus and junctional epithelium was removed simultaneously to coronal connective tissue to a depth of 0.3 mm (Figure 3).

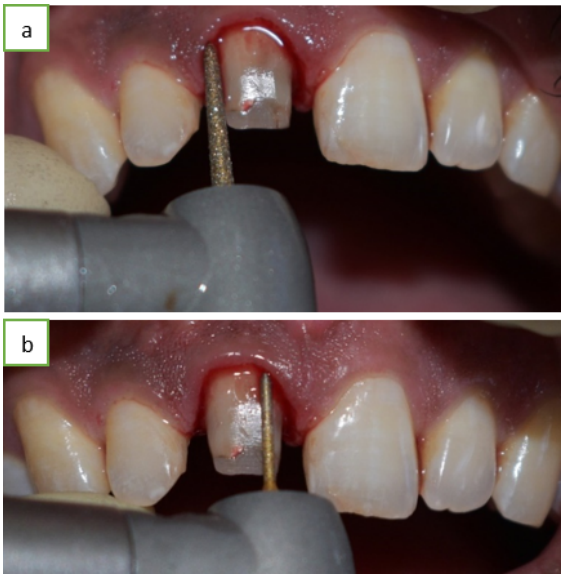

Fig. 3: a: Chamfer elimination using medium gritconical shaped diamond point; **b:** Finishing using fine grit flame conical diamond point.

This procedure creates blood clot at the marginal level stimulating fibroblast differentiation and with healing, a new periodontal structure around the re-established emergence morphology of the interim restoration is generated and stabilized subsequently around the definitive prosthesis (Figure 4).

Fig. 4: Intrasulcular bleeding indicating gingitage

Interim crown was relined and adapted and located at a depth of 0.5 to 1mm into sulcus creating a prosthetic CEJ with the new emergence profile (Figure 5).

After 4 weeks, the soft tissues healed (Figure 6), the interim crown was removed and impression was made using 2-step impression technique with elastomers (Light Body

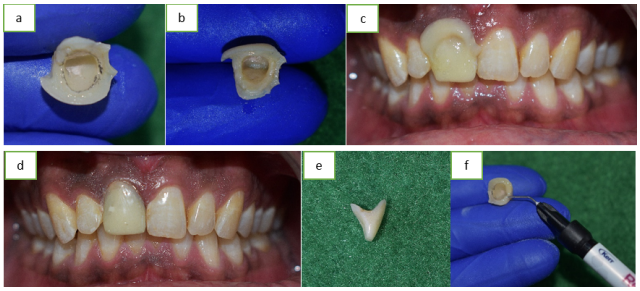

Fig. 5: Adjustment and relining of interim restoration, **a:** Temporary crown relined with self-curing methyl methacrylate; **b:** Inner thin line - intrasulcular wall and outer thick wall- gingival profile; **c:** marking of intrasulcular line; **d:** Space between Inner and outer lines filled with flowable composite; **e:** Finished temp crown with margin; **f:** Temporary crown in-situ with improved emergence profile.

and Virtual putty; Ivoclar Vivadent AG) using double cord retraction method. (Ultrapack #000; Ultradent Products Inc).

Fig. 6: Healed soft tissue cuff at4 weeks follow up.

The definitive lithium disilicate crown (Figure 7) was fabricated based on biologic and functional parameters of the interim.

Fig. 7: a&b: definitive restoration in situ

2.2. *Patient 2*

A 40-year-old man came with fracture right central incisor and discoloured lateral incisor in maxillary arch. (Figure 8). The treatment plan was made to rehabilitate central incisor using fibre post and core and prepare both central and lateral incisor using vertical tooth preparation protocol to receive zirconia crowns.

Fig. 8: Pretreatment intraoral view.

Central incisor was restored with post and core and both teeth were prepared with a conical diamond rotary instrument (862.514.012 BOPT drills; Sweden & Martina) with a 200 grit size followed by 100 grit and a 1.2 mm diameter, following the same procedure as in patient 1 (Figure 9). Interim restorations were customised and relined with an auto polymerizable acrylic resin (Sintodent White; Sintodent).

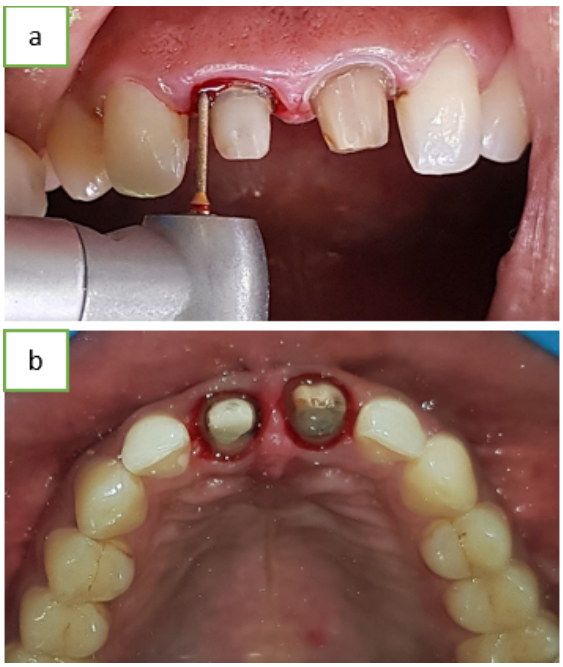

Fig. 9: a: Vertical preparation using conical rotary diamond; **b:** Intrasulcular bleeding after preparation

This technique produced 2 areas: a circumferential line that determined the extension of the gingival sulcus produced by penetrated acrylic resin and an outer circumferential area that marked the position of the gingival margin. A groove between these two lines indicates distance between the gingival margin and the margin-milling depth. This groove was filled with photopolymerizing flowable composite resin (Filtek Supreme XTE flow; 3M ESPE). Excess was trimmed and margin was polished to give a new emergence profile (Figure 10).

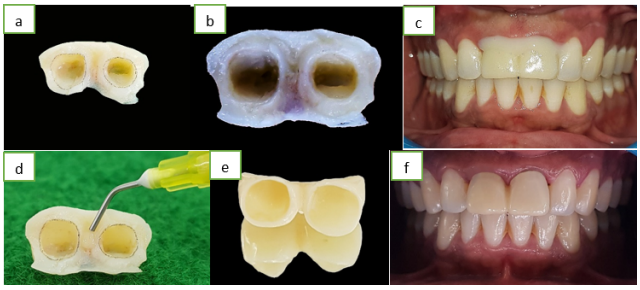

Fig. 10: Adjustment and relining of interim restoration; **a:** Temporary crowns relined with self-curing methyl methacrylate; **b:** Inner thin line - intrasulcular wall and outer thick wall- gingival profile; **c:** Marking of intrasulcular line; **d:** Space between Inner and outer lines filled with flowable composite; **e:** Finished temp crown with margin; **f:** Temporary crown in-situ with improved emergence profile.

Upon healing after 4 weeks, impression procedure was carried out and definitive zirconia crowns (Figure 11) were fabricated based on biologic and functional parameters of the interim.

Fig. 11: Definitive restorations in situ

Both patients were assessed at 3, 6, and 12 months after definitive restorations showing no mechanical, esthetic, or biologic complications.

3. Discussion

Vertical preparation technique places restoration margin at subgingival level. These margins have been associated with periodontal inflammation and gingival recession.[6,7] Though, in our cases, this technique exhibited good soft tissue health, free of any signs of inflammation. This technique maintains biologic width by controlling invasion into sulcus without involving the epithelial attachment.[8] CEJ is reorganized by means of the prosthesis permitting good organization of new tooth contours.[9,10]

After preparation fibroblasts stimulate and migrate to the prepared area, promoted by stabilization of blood clot by means of interim restoration.[11] Based on clinical situation, interim restoration may be modified to guide soft tissue maturation and position gingival margin aiding in soft tissue esthetics.[12] This technique is accompanied by increasing gingival tissue thickness and increased vascularization produced as a result of eliminating the CEJ and deepithelizing the gingival sulcus helping in long-term stability.[13]

Vertical preparation technique has certain drawbacks like being complex and time consuming. Prosthetic margin is difficult to locate since there is no finish line as reference. Inexperienced operator may cause invasion of gingival sulcus compromising the biological width. Also, long-term studies are still awaited for this technique.

4. Conflict of Interest

None of the authors have a conflict of interest to disclose.

5. Source of Funding

None.

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