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DENTAL TECHNIQUE

Defining margins and emergence profile in vertical preparations: A digital technique

Chiara Maria Morini, Dr med dent, MAS,[a] Leonardo Franchini, CDT,[b] and Carlo Massimo Saratti, Dr med dent, MAS[c]

ABSTRACT

The application of a digital workflow to the biologically oriented preparation technique (BOPT) is described. The BOPT places prosthesis margins apical to the free gingival margin, promoting natural gingival adaptation and long-term tissue stability. The digital method described here addresses the clinical challenges of impression making and the accurate replication of the emergence profile from the interim to the definitive restoration. (J Prosthet Dent xxxx;xxx:xxx-xxx)

Achieving a harmonious balance between white esthetics and pink esthetics is a primary goal in esthetic dentistry.[1] The biologically oriented preparation technique (BOPT) has emerged as a promising prosthetic approach to accomplishing these goals.[2] One of the claimed advantages of the BOPT is promoting a more natural adaptation of the gingival tissue to the prosthetic emergence profile.[3] Clinical studies have shown stable probing depths, the maintenance of free gingival margins, and increased gingival thickness, demonstrating the technique's ability to support long-term periodontal health and stability.[1,4,5] Digital application to the BOPT presents several clinical challenges during the scanning phase, including managing the collapsed gingiva after removing the interim restoration, adequate depth of field, and scanner precision.[6,7] Clinically, the ability to scan vertical preparations is available,[8] and a predictable digital method is described.

DENTAL TECHNIQUE

The technique is described for a 42-year-old man in good general health with a complete arch dentition who sought to improve his smile. No carious lesions or excessive periodontal pocketing was present. His dental history indicated that trauma had caused a fracture with pulp exposure of the maxillary left central incisor approximately 20 years previously. (Fig. 1).

1. Obtain a silicone mold (AlgiNot FS; Kerr Corp) of the existing central incisor crown, remove the crown (Fig. 2A), and isolate the tooth with a dental dam to provide a dry, contamination-free environment for endodontic retreatment.
2. Build up the tooth structure using layered composite resin (Inspiro Body i4; Edelweiss DR) to provide a foundation for crown preparation (Fig. 2B).
3. Perform a vertical, edgeless preparation of the tooth by maintaining a total convergence angle between 6 and 8 degrees and following the protocol described by Loi et al.[2]
4. Use bis-acryl resin (Protemp 4; 3M ESPE) and the silicone mold to fabricate an interim crown.
5. Design the emergence profile with a 60-degree angle perpendicular to the preparation wall along its entire contour (Fig. 2C).
6. Cement the interim crown (Temp Bond NE; Kerr Corp) and leave it in place for a 6-week healing period to enable optimal soft tissue healing (Fig. 3).

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[a]Assistant Professor, Division of Cariology and Endodontology, University of Dental Medicine, University of Geneva, Geneva, Switzerland.
[b]Private practice, Florence, Italy.
[c]Lecturer, Division of Cariology and Endodontology, University Clinics of Dental Medicine, University of Geneva, Geneva, Switzerland.

Figure 1. Preoperative intra-oral frontal view.

Figure 3. The final aspect of the interim crown achieved after marginal rebasing.

7. Place a double loop of displacement cord (Medi-Kord n.10; La Maison Dentaire SA) with no additional hemostatic agent into the gingival sulcus to maximize exposure of the foundation restoration (Fig. 4).
8. Perform an intraoral scan (IS 3800; Dexis) of both arches in maximal intercuspation (Fig. 5A).
9. Capture detailed scans of the interim crown while seated in the mouth and outside the mouth to record its morphology (Fig. 5B).
10. Conduct a trial fitting to ensure proper adaptation, function, and esthetic validation of the definitive crown. The chosen material for this patient was a monolithic zirconia (Zirconia Thor 1200 MPa; Orodent) with a facial cut-back design to enhance the esthetic outcome with a feldspathic ceramic layering (VITA VM 9; VITA Zahnfabrik).
11. Definitively cement the zirconia crown using glass ionomer cement (Ketac Cem; 3M ESPE), ensuring complete seating and stability (Fig. 6A).
12. Confirm successful adaptation and seamless integration of the crown with the surrounding dental structures at the 1-month follow-up (Fig. 6B).

DISCUSSION

The BOPT presents technical difficulties during the laboratory phase because accurately identifying the exact location of the crown margin can be challenging and sometimes confusing.[9] A potential solution to this issue is duplicating the interim crown to transfer the clinical information to the dental laboratory technician.[10] However, transferring the duplicate of the interim crown using a digital scan is more precise and faster when using digital technology compared with conventional techniques. The analysis enabled by the digital workflow also offers a reliable reference for the dental laboratory technician, allowing the production of a restoration that mirrors the

Figure 2. After crown removal (A) and endodontic retreatment, the tooth was re-prepared according to the BOPT protocol (B) to achieved the intended gingival conditioning (C).

Figure 4. Digital scan of tooth abutment (A). Interim crown in place (B). Interim crown (C).

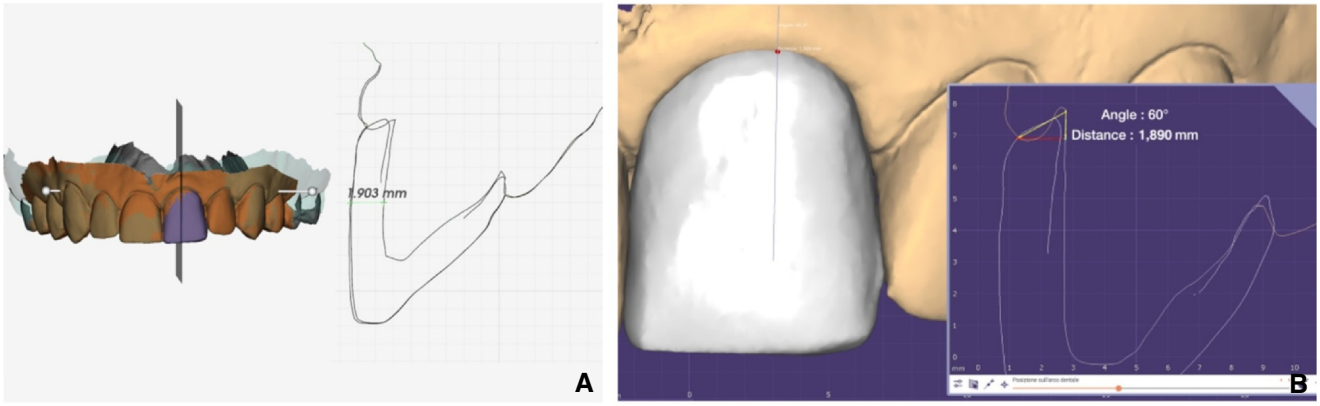

Figure 5. Superimposed scan to verify acquisition accuracy (A). To facilitate recreation of the same emergence profile and prosthetic thickness as those of definitive crown (B).

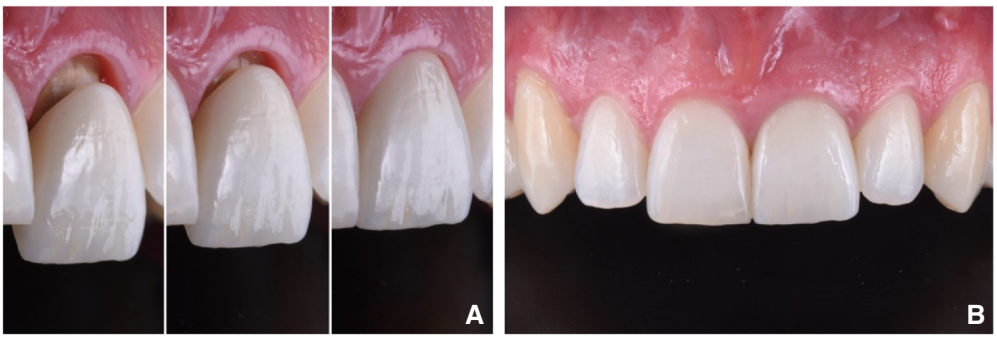

Figure 6. Definitive crown evaluation (A). 1 month after placement (B).

fit and contour of the interim crown (Fig. 7). This process minimizes the need for adjustments and ensures a seamless transition from the interim to the definitive restoration, preserving the health and stability of the gingival tissues.[11] Despite its advantages, integrating the BOPT with a digital workflow requires a learning curve across all clinical stages, including tooth preparation, tissue conditioning, and gingival displacement. For optimal digital scanning, it is essential that the scanning light penetrate deep into the prepared tooth surface. This necessitates a precise and thorough opening of the gingival sulcus, achievable only through a well-executed tooth preparation with an appropriate convergence angle. Additionally, proper gingival conditioning—achieved through the interim restoration—and effective displacement using a cord are crucial steps in maintaining a light-

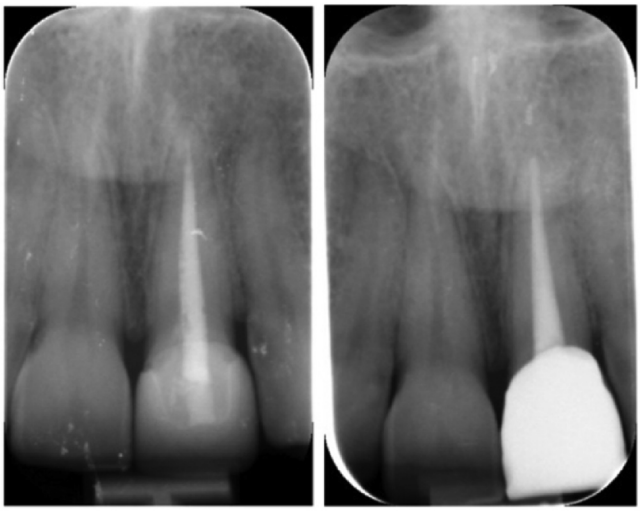

Figure 7. Preoperative and Postoperative periapical radiographs.

accessible environment, allowing for the precise capture of the dental abutment.

SUMMARY

The integration of digital workflows in managing vertical preparations offers clear advantages. Intraoperatively, it allows for the immediate verification of scanning accuracy, reducing the potential for errors and improving clinical outcomes. In the laboratory, it ensures the precise transfer of critical information from interim to definitive restorations, resulting in highly accurate and esthetically pleasing outcomes.

PATIENT CONSENT

Written consent for research and publication was obtained from the patient, who approved the publication of this information in the clinical report.

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Corresponding author:
Dr Chiara Maria Morini
Division of Cariology and Endodontology
University of Dental Medicine
University of Geneva
Rue Lombard 19
Geneva 1205
SWITZERLAND
Email: chiara.m.morini@gmail.com

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