

CLINICAL REPORT

## Vertical preparation for fixed prosthesis rehabilitation in the anterior sector



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Gingival tissue stability around fixed prosthetic restorations is one of the most demanding objectives for dentists.<sup>1,2</sup> The most common problem with this type of rehabilitation is gingival margin recession, which can expose the tooth-restoration finish line<sup>3</sup> and which has been associated with gingival biotype (quality and quantity of keratinized gingival tissue), the iatrogenic effects of tooth preparation, chronic inflammation due to inadequate prosthodontic marginal fit, and trauma by the patient (for example, traumatic tooth brushing). The preparation of the tooth that is to receive the fixed prosthesis involves both the reduction of the tooth with diamond rotary instruments and finish line design.<sup>4</sup>

Finish line design for fixed prostheses can be classified as horizontal (straight shoulder, bevel shoulder, curved chamfer, flat chamfer); vertical (for example, feather edge finish line)<sup>5,6</sup>; and without finish line, as described by Loi and Felice.<sup>4</sup> The preparation technique without a finish line is also known as the biologically oriented preparation technique (BOPT).<sup>4</sup> In this protocol, the crown's anatomic emergence profile at the cementoenamel 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.

BOPT allows the correction of the anatomic cementoenamel junction (CEJ) in nonprepared teeth and the elimination of finish lines in teeth that have been previously prepared; the possibility of repositioning the prosthetic finish line at different levels of the gingival sulcus, at a depth

### ABSTRACT

This clinical report describes a biologically oriented preparation technique (BOPT) for teeth and an implant for the esthetic rehabilitation of the maxillary anterior sector. The technique was designed to create an anatomic crown with a prosthetic emergence profile that simulated the shape of the natural tooth. (*J Prosthet Dent* 2015;114:474-478)

less than 0.5 to 1 mm, depending on available biologic width (controlled incursion into the sulcus); the option of leveling the emergence profile and adapting it to the anatomy of the new prosthetic cementoenamel junction (PCEJ); the preservation of more dental structure; simpler impression making; the optimal restoration-tooth margin<sup>7</sup>; and increased prosthetic retention because of the telescopic prosthesis design. Finally, it allows the gingiva to thicken and adapt to new shapes, leading to greater gingival stability in the medium to long term.<sup>2</sup>

The disadvantages of BOPT are that it is a more complex technique and requires longer chair time and a longer learning curve; it is difficult to situate the prosthetic margin in the correct location because there is no dental finish line; if the dentist or laboratory technician lacks experience of the technique, the gingival sulcus<sup>4</sup> may be damaged; it is difficult to remove excess cement. Finally, the technique has little scientific support, in that the literature does not contain any prospective clinical studies evaluating its efficacy.<sup>4</sup>

This clinical report describes the BOPT used to prepare teeth and an implant for the esthetic rehabilitation of the maxillary anterior sextant.

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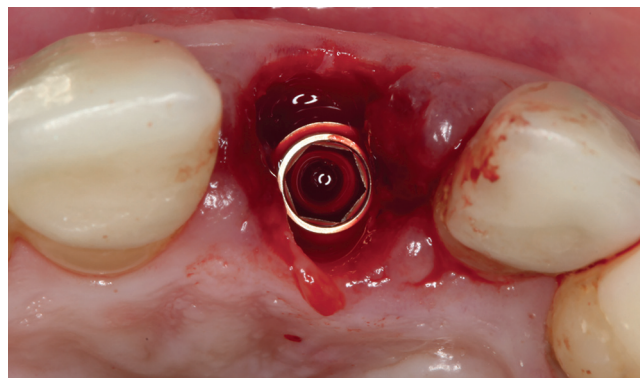
A 48-year-old woman without remarkable medical history (American Society of Anesthetists [ASA] Type I) presented at the Prosthodontics and Occlusion Unit of

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**Figure 1.** Preoperative intraoral view.



**Figure 2.** Immediate postextraction implant placement in maxillary left incisor position.



**Figure 3.** Removal of existing ceramic restorations in anterior sector.



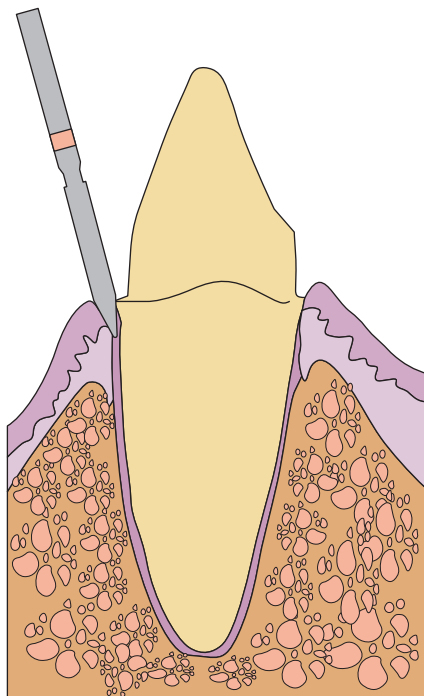
**Figure 4.** Foundation restorations placed and teeth prepared without finish lines.

the Faculty of Medicine and Dentistry at Valencia University, Spain, seeking to improve her maxillary anterior esthetics. The patient had feldspathic porcelain jacket crowns on the maxillary left and right canines, maxillary left and right lateral incisors, and left and right central incisors (Fig. 1). These prostheses were ill fitting and the teeth had secondary caries and inflammation of the interdental papillae. Diagnostic casts revealed an irregular occlusal plane with deviation toward the incisal plane of the restorations on the left side. Radiographic examination (periapical and panoramic radiographs, cone beam computed tomography) revealed slight generalized periodontal disease. The maxillary left incisor exhibited gingival recession of 2 mm and root resorption. After a diagnostic waxing, it was decided to replace the restorations in the maxillary anterior sector with zirconia complete coverage crowns and to extract the maxillary left incisor, replacing it with an implant and implant-supported zirconia restoration. All preparations were made using a BOPT protocol of vertical preparation without finish lines.

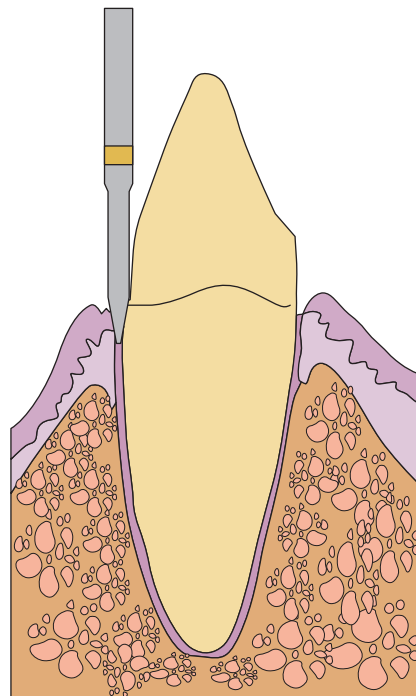
After basic periodontal treatment (scaling and root planing), the maxillary left incisor was extracted, and a conical implant (4.25-mm width and 13-mm length) with

an internal hexagon prosthetic platform (Khono; Sweden & Martina) was immediately placed (Fig. 2). The space between the facial surface of the implant and the cortical bone was filled with tricalcium betaphosphate synthetic particulate bone graft (easy-graft CRYSTAL; Sunstar Guidor Degradable Solutions AG). Then, an immediately loaded interim prosthesis was cemented on a conical abutment without a finish line. The crown's prosthetic margin was situated 0.5 mm from the gingival margin. The patient was prescribed 1 g amoxicillin (GlaxoSmithKline) twice daily for 6 days, starting 1 hour before surgery, 600 mg ibuprofen (Bexistar; Laboratory Bacino) 3 times per day for 5 days, and 0.12% chlorhexidine mouthwash (GUM; John O Butler/Sunstar) twice daily, starting 3 days before surgery and for 2 weeks after. Oral hygiene instructions were given, and a soft diet was recommended for 8 weeks. The sutures were removed 7 days after surgery.

Three months later, the existing ceramic restorations were removed from the maxillary anterior teeth (Fig. 3). Any caries were removed, and the foundation restorations (Sintodent White; Sintodent) were placed. All the teeth were prepared with BOPT to eliminate the existing finish line (Fig. 4), which was done with a conical 1.2-mm-diameter diamond rotary instrument with 100-



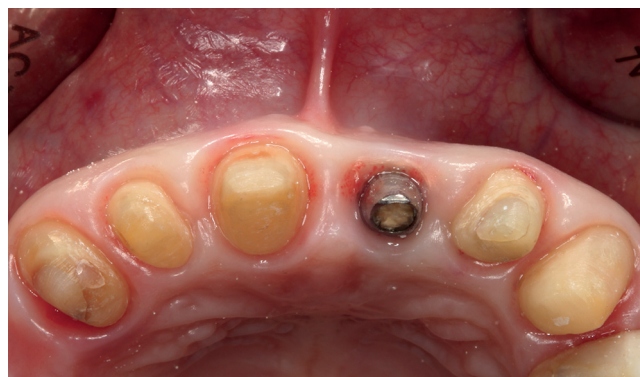
**Figure 5.** Elimination of finish line termination. Rotary instrument inclined at angle of 15 degrees to tooth's long axis.



**Figure 6.** Polishing prepared surface with 20- $\mu$ m particle diamond rotary instrument. Creation of single axial plane crown-root.



**Figure 7.** Modification of interim restorations until ideal gingival emergence achieved.



**Figure 8.** Occlusal view of healed keratinized gingiva around prepared teeth and implant.

to 200- $\mu$ m particle size (862.534.012, BOPT drills; Sweden & Martina). The rotary instrument penetrated the gingival sulcus at an angle of 15 degrees to the tooth's long axis (so that it cut with the instrument's body rather than the tip) (Fig. 5). Both the tooth and gingiva were prepared at the same time, creating a vertical axial plane. During BOPT, the rotary instrument interacted with the internal wall or the internal sulcus and the gingival epithelium (up to the point where the CEJ was situated). The purpose of the tooth preparation was to eliminate the emergence component of the tooth's crown anatomy and the preexisting prepared finish line. This permitted the creation of a finished area, within which the crown margin could be displaced coronally. Preparation was

completed by smoothing the entire surface with a 20- $\mu$ m diamond finishing rotary instrument (862.504.012, BOPT drills; Sweden & Martina) (Fig. 6). The interim restorations were then relined and adjusted (Fig. 7). In this way, a new prosthetic angular component was formed with a new PCEJ situated in the gingival sulcus at a depth of 0.5 to 1 mm, respecting the available biologic space (controlled invasion of the gingival sulcus).

This protocol for the dental preparation and fabrication of interim restorations was designed to stabilize the coagulate that had formed in the gingival sulcus during the preparation. The intrasulcular zone of the interim restoration margin supported the gingival margin circumferentially. The healing process determined the





**Figure 9.** View of healed keratinized gingiva (maxillary right central incisor).



**Figure 11.** Gingival emergence of definitive prosthetic crowns.

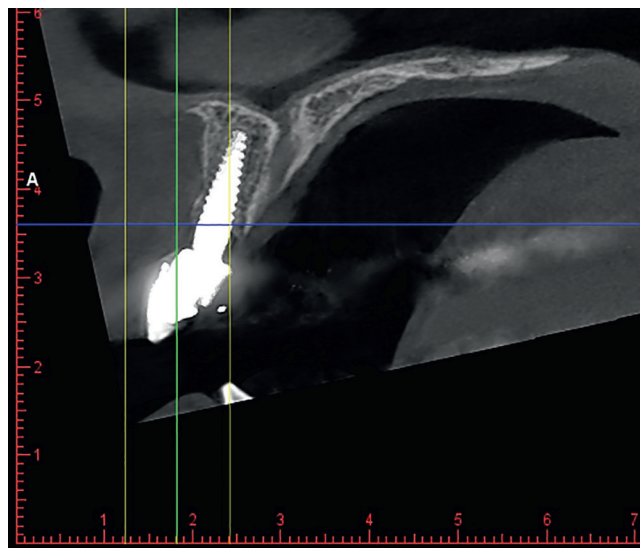
reinsertion and thickening of gingival tissue, which adapted to the new emergence profile.<sup>4</sup>

The interim restorations were maintained for 3 months. During this time, the prosthesis emergence was modified to achieve gingival adaptation and promote health (Fig. 8). After the adaptation period (Fig. 9), definitive impressions were made with polyvinyl siloxane (Putty and Light Elite HD; Zhermack) impression material. The definitive casts were articulated with a cross-mounting technique.<sup>6</sup> Six zirconia copings (IPS e.maxZirCAD; Ivoclar Vivadent AG) were fabricated by computer-aided design and computer-aided manufacturing. They were evaluated clinically for marginal and internal adaptation. After the complete coverage crowns (IPS e.maxCeram; Ivoclar Vivadent AG) had been placed, the esthetics, marginal and internal fit, interproximal contacts, and occlusion were evaluated at the bisque bake stage. Minimal occlusal adjustments were required.

The internal surfaces of the zirconia restorations were airborne-particle abraded with tribochemical silica-coated 30  $\mu\text{m}$   $\text{Al}_2\text{O}_3$  (CoJet Prep; 3M ESPE). A zirconia primer was then applied for 5 seconds (Z-PRIME Plus; Bisco) and air dried. The teeth were also treated with 35% orthophosphoric acid for 40 seconds, followed by a 30-second application of a desensitizer (Gluma; Heraeus



**Figure 10.** Postoperative intraoral view.



**Figure 12.** Tomographic image of implant and bone after 1 year of functional loading.

Kulzer). A custom titanium implant abutment (Sweden & Martina) was tightened to 30 Ncm, and its seating was verified with periapical radiograph. The zirconia crowns were cemented with dual-polymerizing resin cement (RelyX Unicem 2 Automix; 3M ESPE) that was light polymerized. The patient was instructed in oral hygiene, care of the new prostheses, and the wearing of a heat-polymerized clear occlusal device.

The patient returned for evaluation after 6 months and 1 year and did not present any mechanical or biological complications (Figs. 10, 11). At the 1-year visit, a cone beam computerized tomograph was made of the implant-supported restoration to evaluate osseointegration in the facial cortical bone (Fig. 12).

## SUMMARY

BOPT is a restoration protocol that aims to imitate natural teeth so that convex dental anatomy is transferred to

the definitive prosthetic restoration. In this way, a free interaction with the gingiva can take place so that it adapts, shapes, and seats itself around the new shapes and profiles. Controlled randomized prospective clinical studies are needed to confirm the technique's efficacy.

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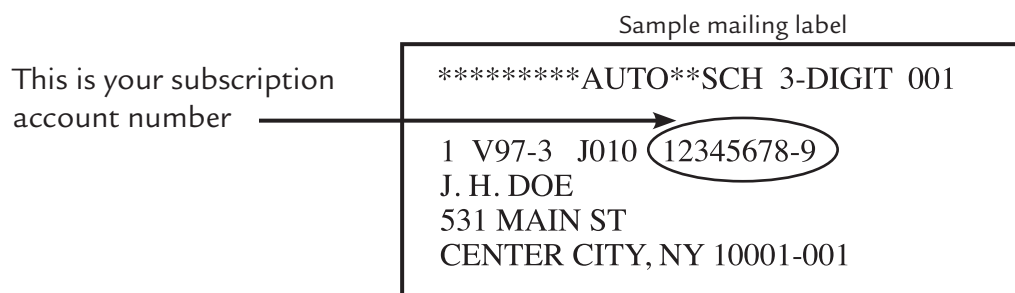
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