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Vertical tooth preparation as a new era of conservative tooth preparation part (1)

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A healthy relationship between dental restorations and the periodontium is of fundamental importance to ensure clinical success in both the function and esthetic harmony of full coverage restorations. One of the most common complications derived from fixed prostheses is gingival recession, which constitutes an important clinical concern. This problem is largely associated with the iatrogenic effects produced during dental preparation or as a result of a poor prosthetic fit; it will compromise esthetics, and thus is particularly detrimental in the anterior region. Subgingival horizontal preparations have been conventionally indicated in cases of aesthetic demand; however, they are related to adverse periodontal reactions, such as inflammation, bleeding, deeper probing, and recession [(1)].Fig.1.

It has been suggested that thicker soft tissue biotypes are associated with less tissue recession, higher crestal bone levels, and better aesthetics. A thin tissue biotype has been shown to be more prone to tissue recession. Furthermore, there is evidence that thick soft tissue may be protective against crestal bone loss. As a result of these findings, many authors have recommended the routine use of connective tissue grafts to thicken the labial soft tissue to >2 mm. This is an important clinical finding because, traditionally, soft tissue grafts have been used to enhance the thin soft tissue, to thicken labial soft-tissue around teeth[(2)]

The biologically oriented preparation technique (BOPT) is a protocol whereby vertical preparation eliminates the anatomical emergence profile of the crown corresponding to the cement-enamel union (CEJ) to create a new emergence with a prosthesis that imitates the natural tooth at the very moment it is positioned. The protocol for the manufacture of the provisional prosthesis is of key significance as it determines the new emergence context, placing it at different levels within the gingival sulcus. This allows the surrounding soft tissue to adjust its form and position to accommodate the new prosthetic profile, thereby guiding the healing, the reinsertion, and the thickening of the gingival tissue [(3)].Fig.2.

Types of margin preparation:

1) vertical preparation:

– edgeless:

(gingitage, BOPT ,verti prep, no finish line);

– shoulderless (bevel):

feather edge / knife edge / chisel edge (rising taper).

2) horizontal preparation:

Fig.1: Tissues outside the green lines are lost during vertical preparation and shoulder preparation are marked with a blue pattern.

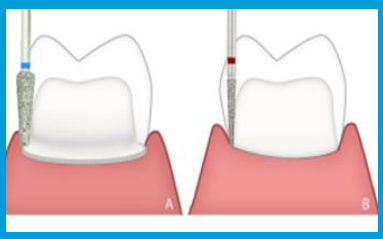

Fig. (2): Illustration showing the difference between A conventional and B vertical preparations

Horizontal preparation. Numerous authors point out that shoulder (90°) and chamfer (45°) preparations do not differ significantly. Chamfer-type preparation is recommended in clinical cases where the application of metal restoration is fabricated, e.g. complete metal cast, PFM (lingual surface), as well as for full-ceramic pressed, cast and milled CAD/CAM restorations due to a lack of volume changes at the sintering stage. Shoulder type preparation can be used for all-ceramic (layered, infiltrated with liquid glass) or PFM (facial surface) restorations, with or without an all-ceramic shoulder. Shoulder type preparation is currently indicated in most cases [4].

Vertical preparation – shoulderless. As mentioned above, the shoulderless type of tooth crown preparation (also known as bevel preparation) has been referred to differently according to the rising taper: feather edge, knife edge, chisel edge, but researchers agree that for many years it has been the most conservative approach towards dental structure and the less prone to marginal gap [5]. At present, shoulderless preparation has been practically abandoned due to the application of modern laboratory_technologies and to its numerous defects

Vertical preparation – edgeless. The 'rotary gingival curettage' (gingitage, verti prep, edgeless) method, originally developed by Vick Pollard and Rex Ingraham, has been further developed by Di Febo, Carnevale, and more recently by Ignazio Loi [6]. It is also known as the 'biologically oriented preparation technique' (BOPT) and can be prepared through the following steps :

1) placing the finish line subgingivally, 2) sealing the preparation coronally to the finish line, and 3) shaping the natural edge of an emergence profile above the cemento-enamel junction (CEJ, with the creation of a new prosthetic emergence edge adjacent to the gingival edge (prosthetic cemento-enamel junction / PCEJ). The boundary range of this preparation may be located at different depths of the gingival pocket, depending on the available biological width. Fig.3.

Adversaries of the method claim that it often results in irreversible damage to the periodontal attachment and violates the biological width. Supporters, however, pay attention to using special round-ended 2 degrees tapered diamond burs with a non-working tip (batt bur). Fig.4. It has coronal diameter of 1.2 mm, apical diameter of 0.7 mm, and non-cutting end of 1 mm, which reduces or avoids damage to the connective attachment and allows a tooth-guided preparation procedure [4].

The length of the non-cutting end and its width should be chosen according to the biological width (BW). Rotary curettage leads to minor bleeding but is limited only to oral sulcular epithelium. According to research results, such new epithelium is thicker and adheres closely to a new prosthetic restoration; however, it is conditioned by manufacturing a very precise, smooth and polished temporary and final reconstruction.

Fig.3: Biologically oriented preparation technique(BOPT)

Fig.4: Batt bur

I**ndications of Verti prep** are in prosthetic restorations where monolithic zirconium oxide crowns or zirconia reinforced lithium disilicate crowns are planned and the finish line can be very thin and precise. It can also be used in the case of short teeth, where improved retention can be obtained by a more parallel preparation, in mandibular incisors where creating a shoulder finish line would lead to almost complete removal of the tooth's crown and in periodontally affected tooth with gingival recession or furcation involvement [4].

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