Between BOPT and BTA

A case report on shaping the gingival contour around tooth-supported restorations by means of provisional resin crowns

By Dr Feng Liu, China

In consideration of the health of periodontal tissue around natural teeth, the location of the crown margin is preferably placed supragingivally or flush with the gingival margin so that the contour of the restoration will not influence the gingival contour. However, in the case of covering the original colour of the abutment tooth, forming the ferrule, and/or improving retention and resistance form, the crown margin can be placed subgingivally. Because the sulcular depth around a healthy natural tooth is around 1 mm, the cervical margin of the crown is usually located 0.5 mm below the free gingival margin. Thus, an implant-supported crown, a tooth-supported crown, or a provisional resin crown can hardly influence the gingival contour.

However, when the sulcular depth of the abutment is sufficiently deep, as with a thick gingival biotype, it is possible to sculpt the gingival contour around the abutment teeth using provisional resin crowns. The treatment process will be demonstrated in this article through a typical case with a seven-year retrospective review.

Case report

A 48-year-old female patient whose general health condition was good, was referred to the Peking University Hospital of Stomatology in Beijing in China in 2008. The patient’s main concern was the restoration of her maxillary anterior teeth that had been compromised by severe dental caries and treated with root canal therapy. The patient had no discomfort and desired not only restoration of the definitive anterior teeth but also an aesthetic outcome. However, financial limitations meant not all her dental problems could be addressed.

The dental examination revealed that tooth #22 was missing and tooth #23 had shifted mesially. In addition, there were visible defects on teeth #21, 11 and 12. The roots of teeth #21 and #22 were apparently palatally inclined and so were the crowns. Tooth #21 was slightly inclined to the palatal side and so was the crown.

During examination of the occlusion, a deep overbite and a large overjet of the anterior teeth became evident. In addition, the contour of the patient’s gingival line was inharmonious. The angle of her mouth was asymmetrical when she smiled (Figs. 1-4).

Treatment plan

For patients with malocclusion and misalignment of teeth, the restorative procedures should be performed once the primary orthodontic treatment has been completed. However, considering the length of treatment and her financial limitations, the patient refused orthodontic treatment and only accepted the restorative treatment. Since the patient’s inharmonious gingival line may have interfered with the final aesthetic outcome, certain methods to improve the gingival contour were considered before tooth preparation.

Crown lengthening has been widely used for improving the contour of the gingival line. However, even if the contour of the gingival line could be modified through periodontal surgery from the vertical direction, the palatally inclined maxillary anterior teeth would cause the inclination of the teeth’s long axes in the sagittal direction. Therefore, the ideal aesthetic outcome would be difficult to achieve (Figs. 5).

In this case, the restoration’s entire labial face needed to be shifted labially so that the height of the gingival contour could be improved (Figs. 6). Therefore, a more suitable treatment option was considered.

During further examination, we found that the patient had a thick gingival biotype with a 3 mm deep gingival sulcus around the maxillary right lateral incisor and maxillary left central incisor and 1 mm deep around the maxillary right central incisor (Figs. 7 & 8). In implant dentistry, when the soft tissue around the implant is of a thick biotype, modifying the contour of the soft tissue by shaping the transmucosal soft tissue with provisional resin crowns of a certain shape has been proved to be an effective method for improving the aesthetic outcome.

However, for restoring defective natural teeth, there is insufficient clinical evidence to prove whether provisional resin crowns are capable of shaping the gingival contour. Such a treatment protocol was deemed worth attempting in the current case.
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right central incisor and maxillary left central incisor would be shifted in the apical direction by 2.5 mm, 0.7 mm and 2.5 mm, respectively. The entire restoration would be inclined to the labial side by 1.5 to 2 mm so that the palatally inclined roots would not interfere with the aesthetic outcome (Figs. 9–14).

In order to preview the expected outcome and guide the treatment, a diagnostic wax-up was prepared. On the model, the incisal edges of both central incisors were located on the palatal side of the red line (wet-dry border) of the lower lip; hence, the position of the incisal edges was to be shifted 2 mm to the palatal side of the red line; the gingival line of the maxillary central incisors by 1.5 mm. The gingival contour of the maxillary incisors was modified to improve the patient's deep overbite and large overjet. We decided to shift the incisal edges of the maxillary central incisors by 1.5 to 2 mm so that the palatally inclined roots would not interfere with the aesthetic outcome.

Tooth preparation and provisional restoration

According to the diagnostic wax-up, two silicone indices were fabricated. One of the indices was cut in the labial-lingual direction to guide the preparation of the abutment teeth. The margin of the prostheses was designed to be placed 0.5 mm subgingivally (Figs. 15–17). The provisional restorations would be fabricated according to the other silicone index, in which the improvement of the aesthetic outcome could be observed clearly. The shape of the provisional restorations was not designed to emulate the eroded natural teeth, but for the cervical part of the restorations to cover the labial gingiva. After a long period of remodelling and reshaping, the intra-oral examination showed recession of the gingiva and exposure of the shoulders on the labial side of both teeth #21 and #12 (Fig. 24). The margins of tooth #12 could also be observed and the gingiva was healthy. At this appointment, the post and cores were placed and further tooth preparation was carried out to shift the margins in the apical direction. The new provisional restorations were fabricated according to the patient’s wishes.

The provisional restorations and gingival collars around the abutment teeth were established. Once the provisional crowns had been removed, the gingival contour around the abutment teeth was similar to the soft-tissue collar around dental implants. The final impression was taken in order to fabricate the master model, which would replicate the gingival contour accurately (Figs. 30–32). The final all-ceramic restorations were fabricated according to the master model.

Completin the final restorations

Once the final restorations had been completed, the clear transgingival contours of the crowns could be seen and were consistent with the shape of the gingival collars around the abutment teeth. When compared with the diagnostic wax-up, the transgingival contours of the restorations and gingival collars around the abutment teeth were examined carefully. The transgingival contours of the restorations should maintain the shape of the gingiva, but not increase the pressure, allowing the gingiva to remain healthy and maintaining the contour in the long term (Figs. 36–39).

Revisits

The one-week follow-up after placement of the final restorations found that the gingiva was healthy and stable around the crowns. When compared with the preoperative intra-oral photographs, the aesthetic outcome was a significant improvement (Figs. 1, 3, 40–43).

The patient unfortunately did not attend the remainder of the follow-ups until seven years after placement of the final restoration. At this appointment, the examination revealed an undesirable oral health status, with a Debris Index (DI) and Dental Calculus Index (DCI) of 1. The gingivae was mildly reddened and swollen. However, the health of the gingiva around teeth #21 and 12 was better than around any other teeth. Around tooth #12, the gingiva was healthy and the gingival contour was stable without noticeable gingival recession. Around teeth #21, slight gingival recession was observed.
found with slight reddening and swelling of the gingiva. However, the aesthetic outcome of the modified gingival contour had been maintained (Figs. 44–47).

Discussion

Shaping the transmucosal contour around implants using provisional crowns has been frequently used in implant dentistry. By using an individualised transfer coping, the collar-like soft-tissue contour around an implant can be replicated on the working model accurately.16 In this manner, the contour around implants using provisional crowns has been frequently used in implant dentistry. By using an individualised transfer coping, the collar-like soft-tissue contour around an implant can be replicated on the working model accurately.16 In this manner, the contour of the final restoration will fit the exact contour of the soft tissue, thus assuring the long-term stability of the shape and position of the soft tissue around the implant.

In this case, the treatment protocol was drawn from the experience of the restorative process of implant-supported crowns. Taking advantage of the relatively deep gingival sulcus and thick biotype, the gingival contours around the abutment teeth were modified by the provisional restorations; therefore, the gingival contour was reshaped in 3-D. Consequently, the gingiva was healthy, proving the effectiveness of the treatment protocol applied.

In this case, the treatment protocol lay between the concept of the biologically oriented preparation technique (BOPT) and biological tissue adaptation (BTA), both of which have gained gradual acceptance.19 According to the BTA approach, cutting part of the gingiva directly may damage the biologic width; thus, the gingiva is stimulated to regenerate. However, the larger labial cervical convexity of the provisional or final restoration will interfere with the regeneration of gingiva in the vertical direction. The gingiva will only be able to regenerate along the contour of the restorations, and thus a gingival sulcus with a sealing function will develop and the gingival contour will be consistent with the shape of the restorations.19

In the BOPT approach, the gingival–alveolar relationships are defined as y-D biologic width and the relationship between the gingival contour and restorations is deemed to be a stable relationship.19 In the present case, the treatment protocol differed from BTA, however, the outcome of the final restorations was similar.

Both BOPT and BTA are creative aesthetic gingival treatment concepts that have been established in recent years. The protocol applied in the current case study lay somewhere between these two approaches. After seven years of follow-up, the maxillary right lateral incisor and maxillary left central incisor demonstrated better aesthetic outcomes compared with the maxillary right central incisor, for which the restorative procedure was close to conventional restoration. Such a result encourages some consideration.

Editorial note: A complete list of references is available from the publisher.

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