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

Shaping the soft-tissue contour around implants with provisional resin crowns after implant placement has become a frequently used technique in implant dentistry. For most implant-supported restorations, there is a 3 to 4 mm transmucosal attachment surrounding both the implant and the restoration. Therefore, adjusting the soft-tissue contour by modifying the emergence profile of the provisional crowns to optimise the aesthetic outcome has become a regular practice in implant dentistry.1

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.2 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.2 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.3 Thus, an implant-supported crown, a tooth-supported crown or a provisional crown can hardly influence the gingival contour.

However, when the sulcular depth of the abutment is sufficiently deep, as with a thick gingival biopsy, 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 periodontal disease 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 of her dental problems could be addressed.

The dental examination revealed that tooth #22 was missing and tooth #21 had shifted mesially. In addition, there were visible defects on teeth #21, 11 and 22. The tooth surfaces 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 with 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.3,4 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 biopsy 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 prosthetic resin crown of a certain shape has been proved to be an effective method for improving the aesthetic outcome.6,7

However, for restoring definitive 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.

Fig. 1: Pre-op photograph showing the occlusal relationship of the anterior teeth.— Fig. 2: Pre-op photograph of the maxillary anterior teeth.— Fig. 3: Pre-op photograph of the maxillary anterior dental arch.— Fig. 4: The inclined axis of the tooth would have resulted in an unfavourable aesthetic outcome.— Fig. 5: The labial side of the restorations would be shifted labially.— Fig. 6: The probing depth of the gingival sulcius around the maxillary left central incisor was 3 mm.— Fig. 7: The clinical view of the pre-op model.— Fig. 8: The gingival contour was marked on the model.— Fig. 9: The gingival contour was modified on the model.— Fig. 10: The diagnostic wax-up showing the upright-shaped gingival contour.— Fig. 11: Occlusal view of the diagnostic model.— Fig. 12: The diagnostic wax-up showing the upright-shaped gingival contour.— Fig. 13: Occlusal view of the diagnostic model.— Fig. 14: The diagnostic model.— Fig. 15: The provisional restorations placed in the mouth.— Fig. 16: The completed tooth preparation.— Fig. 17: The provisional restorations replicated from the diagnostic wax-up.— Fig. 18: The provisional restorations.— Fig. 19: The provisional restorations.— Fig. 20: The completed tooth preparation.— Fig. 21: The gingiva was covered by the labial side of provisional restorations.— Fig. 22: The provisional restorations appeared just as if they had erupted from the gingival sulcus (diagrammatic sketch).— Fig. 23: Two weeks after placement of the provisional restorations, the gingival contour had begun preliminary remoulding and the margin of the abutment teeth had been exposed.

Dental Tribune Asia Pacific Edition | 3/2016
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Diagnosis wax-up

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 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).

corresponding to the other silicone index, in which the improvement of the aesthetic outcome could be observed clearly. However, 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 that time, the intra-oral examination showed recession of the gingiva and exposure of the shoulders on the labial side of both teeth #21 and tooth #11 (Fig. 24). The margins of tooth #11 could also be observed and the gingiva was healthy. At this appointment, the post and cores were placed and further tooth preparation was regarded as tooth preparation and provisional restoration.

Tooth preparation and provisional restoration

According to the diagnostic wax-up, two silicone indices were fabricated. One of the indices was cut in the labiolingual 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 accurately, the form of erupted natural teeth would be established (Figs. 22 & 23). The impressions for the posts and cores were taken at the same time. Because the restorations were palatally inclined, a gold alloy post and cores was chosen.

Shaping the gingival contour

The patient attended a follow-up two weeks after placement of the provisional restorations. At that time, the intra-oral examination showed recession of the gingiva and exposure of the shoulders on the labial side of both teeth #21 and #11 (Fig. 24). The margins of tooth #11 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 to increase the convexity of the cervical part in order to enhance the effect of the gingival contour shaping. In accordance with the patient’s wishes, the incisal edges of the crowns were extended slightly by about 1 mm (Figs. 25–27).

After another two weeks, the patient returned to our clinic and examination found that the gingival contour had changed noticeably and the reconstruction of the transgingival gingival contour was almost complete. The gingiva around the restorations was healthy (Fig. 25). The transgingival parts of the restorations were modified and the incisal edges were shortened in keeping with the patient’s wishes.

Two weeks after the new provisional crowns had been placed, the patient returned to our clinic for further treatment. At that time, the patient expressed her satisfaction with both the gingival contour and the position of the incisal edges (Fig. 29). 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.

Completing 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. The patient attended a follow-up appointment two weeks after placement of the final restoration. When comparing the seven-year follow-up photographs, the aesthetic outcome was significantly improved (Figs. 1, 3, 40–43).

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 Debies Index (+) and Dental Calculus Index (+). The gingivitis was mild and the gingiva was generally reddened and swollen. However, the health of the gingiva around teeth #21, #11 and #12 was better than around any other teeth. Around tooth #11, the gingiva was healthy and the gingival contour was stable without noticeable gingival recession. Around tooth #11, slight gingival recession was
“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.”

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. In this manner, the contour around implants using provisional restorations; therefore, the gingival contour is replicated to the working model the gingiva. Once the gingival contour has been achieved, the contour is placed to maintain the gingival contour and provisional restorations with the same transgingival 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 this 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 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 final 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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