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CASE REPORT

THE INFLUENCE OF THE MARGINAL ADAPTATION OF THE PROSTHETIC CROWN ON THE GINGIVAL TISSUE – CASE REPORT

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Abstract. Soft tissue management has a major influence on the esthetic result of a restorative dentistry treatment. The esthetic zone not only plays a significant role in the physical appearance of a person, but it also has a subtle but definite influence on the psychology of that person.
The clinical exam of a 22 year-old female revealed a chronic gingivitis around the central right incisor (tooth 1.1). Moreover, the probing depths around 1.1 were increased, and were accompanied by severe bleeding. As such, the patient was dealing with a displeasing appearance of her smile which determined her to deprive herself of the social communication instrument that laughter is.
We proceeded to removal of the crown and contoured a shoulder preparation of the tooth. We gave the periodontium time to heal (10 days), as well as time for the swelling to go down.
The final impression was taken only after the gingival architecture was considered to be stable (another 14 days). During the whole treatment, the patient wore a provisional crown which played a significant role in the healing process of the gingival tissue.
The final restoration consisted of a full ceramic crown (with ideal marginal adaptation), which provided a superior translucency and, as such, a more natural appearance of the tooth.
This restorative dentistry case emphasizes the importance of marginal adaptation of a prosthetic crown for preserving the health of the marginal periodontium of the tooth, as well as the esthetic aspect.
Keywords: chronic gingivitis, dental esthetics, gingival architecture, incisor, PFM crown, restorative dentistry, smile outline, translucency

Introduction

The frontal teeth, together with the surrounding soft tissue and the lips, form the esthetic zone [*Mosby's Dental Dictionary*]. This area plays a very important role in the physical appearance of a person, but also on the psychology of that person [*Patel RR et al.*]. This is why prosthetic reconstruction of single elements in this area represents a challenge for the dental practitioner. But maybe the most important factor in the esthetic zone is the appearance of the soft tissue [*Bichacho N.*]. The level of the attached gingiva, how much of the soft tissue the patient reveals during smile, and the

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Abbreviations
PFM – porcelain fused to metal
Tooth 1.1. – right maxillary central incisor
Tooth 2.1 – left maxillary central incisor
Tooth 1.2 – right maxillary lateral incisor
Tooth 2.2 – left maxillary lateral incisor
Tooth 1.3 - maxillary right canine
Class III restoration – a restoration on a frontal tooth which does not involve the incisal edge
Class IV restoration – a restoration on a frontal tooth which involves the incisal edge

health of the periodontal tissues are very important elements that can have a significant influence on esthetics, and must all be taken into consideration when planning a restorative dentistry intervention [*Ravon NA et al.*]. We hereby report a restorative dentistry case in order to emphasize the importance of marginal adaptation of a prosthetic crown for preserving the health of the marginal periodontium of the tooth, and also the esthetic aspect.

Case report

A 22 year-old female patient presented to our clinic for the rehabilitation of the esthetic zone. The chief complaint was the inflammation of the gingiva around the central right incisor (tooth 1.1), which caused a displeasing appearance of her smile. This was the reason why she developed a habit of covering her mouth with her hand when smiling, while continuously trying to avoid laughing.

The clinical exam revealed a chronic gingivitis around the porcelain fused to metal (PFM) crown seated on tooth 1.1 and around the natural crown of tooth 1.3, and failing composite class III and IV restorations of teeth 1.2 and 2.2 (figure 1). The probing depths around 1.1 were increased, and were accompanied by severe bleeding.

The PFM crown was, according to the patient, approximately 2 years old, and the inflammation had occurred few months after the final cementation of the crown.

The radiological exam revealed a poor marginal adaptation of the PFM crown, and a root canal treatment of tooth 1.1.

Figure 1. Intraoral aspect of tooth 1.1

We decided to remove the crown, perform a thorough cleaning, make a provisional crown and reassess the situation in 10 days. Before removing it, we took an impression of the upper jaw, to serve as guide for chair-side manufacturing of the provisional crown.

After the removal of the crown, we contoured a shoulder preparation of the tooth, as opposed to the initial imprecise knife-edge preparation, which was the main cause of the poor marginal closure of the crown [*Goldberg et al.*] (figure 2). After tooth preparation, the impression taken earlier was filled with a self-curing composite material (Structur Premium, Voco), placed on the maxillary arch, which was removed after the setting of the material, thus immediately obtaining a provisional crown, without the use of the dental laboratory.

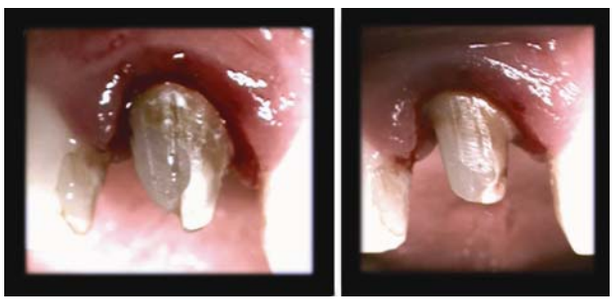

Figure 2. The initial knife-edge preparation (left) versus the shoulder preparation (right)

In this case, the provisional crown has the advantage that the patient leaves the dental office restored, as if nothing had happened, but also plays a significant role in the healing process of the gingival tissue. With the old crown with its poor adaptation and contaminated margins out of the way, the periodontium has time to heal, the swelling will go down, and we will be able to predictably make a new crown.

Since radiologically the root canal treatment was correct, there were no signs of apical periodontitis, and the coronal obturation was intact, we decided not to perform an endodontic retreatment.

The patient was instructed to maintain a good oral hygiene, with daily brushing and flossing, and to use an antibacterial mouth rinse solution (Corsodyl - 0.2% chlorhexidine gluconate solution).

10 days later, at the second appointment, the gingival inflammation had diminished (figure 3), so we decided in favor of the final preparation. The abutment was reinforced with a fiberpost (Nordic), cemented with dual cure composite (Paracore, Colthene Whaledent) (figure 4).

In order to expose the gingival sulcus, we used the 2 retraction cords technique, placing a #000 retraction cord (Ultradent) impregnated with Viscostat (Ultradent), followed by a #0 sized retraction cord. The preparation margins were prepared with high speed burs and finished using ultrasonic tips

Figure 3. The prosthetic restoration of tooth 1.1, 10 days after the removal of the old crown

Figure 4. Abutment restoration and preparation

(Kavo Sonic Flex). In order to maintain a good marginal closure of the provisional crown, we added acrylic resin to the cervical portion of the crown (Unifast Trad, GC) using a brush, and we seated it on the prepared tooth. After the setting of the material, we removed the excess material and we polished the margins.

The provisional crown was cemented using a temporary luting material (Temp Bond, Kerr). (5)

Figure 5. The aspect of the gingival profile of tooth 1.1 before impression

2 weeks later the soft tissue appeared to be completely healed (figure 5), so we decided to take the impression, after placing the retraction cords (figure 6). We used an addition silicone impression material (Affinis, Colthene Whaledent) (figure 7). In order to achieve a more accurate transfer to the dental laboratory of the different color shades of the neighboring teeth we used intraoral photographs, with the shade guide close to the teeth (see fig. 7). This way, under a constant illumination close to daylight color temperature (around 5500 degrees Kelvin), the color of the teeth is better approximated to the colors on the shade guide (we used Vita Classic and Vita 3D Master shade guides).

Figure 6. The aspect of the dental abutment, before the impression

Figure 7. A precise preparation and a good impression are key factors to the outcome of the treatment

Figure 8. Transmitting all color information, including the color of the natural abutment, to the dental laboratory

For the final restoration we chose a full ceramic crown, which provided a superior translucency and, as such, a more natural appearance of the tooth (figure 8). The marginal closure of the crown was checked, and afterwards it was cemented using a light cured luting composite (Choice, Bisco). In another appointment we replaced the failing obturations on the lateral incisors (figure 9) (fig 9)

Figure 9. The translucency of the prosthetic work is similar to that of the natural crowns

Figure 10. Intraoral images during replacement of the fillings on the lateral incisors. Note the massive destruction of the teeth

Figure 11 depicts the final look of the patient's smile, after replacing the fillings on the lateral incisors.

Figure 11. The final look of the patient

Conclusion

The management of the gingival tissue has a major effect on the esthetic result of a restorative dentistry treatment. Also, the marginal adaptation of the prosthetic crown has a direct effect on the physiology of the periodontal ligament.

Discussions

We chose this case report because it emphasizes the importance of the correct marginal closure of the prosthetic crowns on natural teeth, although this discussion can be extended to the adaptation of the crowns on implant supported abutments, and to the marginal adaptation of the fillings (composite, ceramic onlays or amalgam).

Literature fails in providing abundant data on this subject. The ideal preparation of the dental abutments should be performed so as to create a precise limit of the preparation [*Bottino et al., Schätzle et al.*]. If the adaptation of the crown is not precise, there is a large gap between the margin of the crown and the abutment, which may shelter bacterial colonies, responsible for gingival inflammation. Leknes et al. demonstrated that the character of subgingival root instrumentations significantly affects gingival inflammatory reactions, most likely by influencing subgingival plaque formation. Another reason for the inflammation is the irritation induced by the sharp edges of the metal crown, directly pushed into the gingival sulcus.

Concerning our patient, there were two possible causes for the gingivitis: one was the irritation of the periodontal tissue caused by the poor marginal closure of the initial crown, with retention of food and without the possibility of self cleaning [*Lang et al.*]. The second possible cause was the violation of the biological width of the crestal bone.

Studies have shown that a biological width of a minimum of 3 mm between a restoration and the alveolar bone must be maintained in order to have a healthy gum aspect [*Amiri-Jezeh et al., Vergel de Dios et al.*]. In this situation, we need to raise a flap and surgically recontour the crestal bone – crown lengthening procedure [*McNeely TE*].

Radiologically, the distance between the margin of the crown and the surrounding bone was of approximately 2 mm, but due to the incidence and to the angulation of the alveolar process it might not have been exact. Since the old PFM crown was not well adapted, we decided to remove it and to replace it with a provisional crown, with closure on the dental substance and without overhanging margins. If the violation of the biological width had been the cause of inflammation, even with replacement of the crown the inflammatory process wouldn't have passed, so surgery would have been necessary.

But after only 10 days the gingival tissue showed signs of improvement, so we ruled out the possibility of the biological width violation.

Basically, the marginal periodontium healed by itself, without anti-inflammatory or antibiotics medication, just by moving the preparation margins on the dental surface instead of leaving the crown hanging into the gingival sulcus.

Each time we reconfigured the preparation line, the provisional crown was modified so as to fit the new situation. Also, the impression was taken only after the gingival architecture was considered to be stable.

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