Soft and hard tissue management in the treatment of a discolored single tooth in the esthetic zone

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Abstract

When treating the color of a single tooth in the esthetic zone, it is a complex task to achieve the same visual effect as the rest of the teeth. In addition to the problem of the clinical crown color, if the patient has a thin periodontal biotype it is necessary to manipulate both the hard and soft tissue to achieve a good esthetic result. To change the biotype, a connective tissue graft needs to be performed. The graft must be stabilized exactly where it is needed, and the recipient area modified. The tooth needs to receive an adequate preparation so as to make the restoration thick enough to naturally mask the treated tooth, while also ensuring long-term stability.
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Introduction

One of the treatments requested most often by patients is a change in the color of their teeth. Today, people want to have whiter teeth to mask the effects of aging that their smile reveals. Tooth whitening is the ideal treatment option for this problem because it achieves very good results, while being minimally invasive for the patient.[1]

Problems with tooth color occur more often in certain teeth, eg, where root canal treatment has previously been performed. For this type of problem, other treatments such as internal bleaching[2,3] can provide an individual color correction that will result in the successful integration of the tooth with the other teeth in the smile. Unfortunately, internal bleaching does not always work, and sometimes there are relapses. Occasionally therefore, other solutions need to be found.

Another option to treat a discolored tooth is to mask the color with a lighter-colored restoration that matches the rest of the teeth. Such restorations can comprise different materials, such as composite resin or porcelain. This treatment option is a challenge for the clinician in the case of composite resin, and for the dental technician in the case of indirect porcelain.[4] For such difficult and demanding cases, it is greatly beneficial to enlist the help of a laboratory technician. Yet, even with this help, creating a restoration that integrates perfectly into the patient's intraoral environment requires an enormous effort and a very precise technique. It is also important to bear in mind that the color of porcelain is more stable than composite resin in the long term.

Case presentation

A 48-year-old patient presented for treatment on his right central incisor. The tooth had undergone root canal treatment when he was a teenager. The color had changed over time, and the several attempts that had been made to bleach the tooth internally had been unsuccessful (Figs 1a to c). The patient now sought a solution to this esthetic problem.

In this case, the main problem to address was the dark color of the clinical crown, but even if that problem was solved, the soft tissue would still be an issue. Soft tissue is an especially difficult challenge with thin periodontal biotypes[5,6] because, due to their transparency, the dark root can easily be seen. This complicates the esthetic integration of the restoration, even if the color of the other teeth has been copied perfectly.

Another challenge in this situation was that the patient's contralateral tooth had a composite resin restoration that was also stained. Although this could have been changed, it would have meant managing three different materials (enamel, composite resin, and porcelain) in the most esthetically demanding area of the patient's smile. Patients usually look for symmetries; they do this by comparing the tooth with the contralateral teeth. Central teeth are therefore the most demanding to treat because they are closest to the contralateral teeth.

Even if a good initial esthetic color result is achieved, the long-term behavior of the three materials will be different. Therefore, in time, differences between the composite resin and the porcelain will be visible and may present a prob-

Fig 1a to c Initial situation: frontal and lateral views.

lem for the patient. For this reason, apart from treating the tooth color and the periodontal area to hide the dark roots, the adjacent tooth also had to be restored with the same materials in order to achieve a better long-term result.

Changing the periodontal biotype

A thin biotype allows a dark root to be seen and thus leaves a gray shadow on the gingival margin of the restoration. It

Fig 2 Initial radiograph.

is therefore necessary to change the biotype into a thick one in order to prevent the dark root from showing through.[7] For this change of biotype, connective tissue grafting is necessary to thicken the very thin tissue.[8] Increasing the thickness in the buccal area will cause the soft tissue to be more voluminous there when compared to the rest of the anterior region. For this reason, not only is the graft added, but the root is also reduced in the area where the thickness has been increased. In this manner, the biotype is changed without changing the buccal appearance of the soft tissue (Fig 2).

Fig 3 Connective tissue graft.

Fig 4 Small flap release.

Fig 5 Small diamond bur used for root preparation.

Fig 6 New root shape.

Fig 7 The preparation gives space for the graft.

A diamond bur was used for the root reduction (Figs 5 and 6), thus creating the space needed to accommodate the volume acquired by the graft (Figs 7 and 8). The graft was taken from the area of the tuberosity.[9] Figure 3 shows the fibrous appearance of the tissue. Reabsorption of this type of tissue occurs less frequently. This allows for greater control over the volume.

A suspensory suture was used to stabilize the graft in order to secure it in the exact position where the space was created. The diagram in Figure 9 shows the path of the suture that was used to secure the tissue in the correct position. This suture was later covered by a partial thickness flap that exceeded the mucogingival line, in order to shift it coronally (Fig 4). To avoid any tension, the flap was then stabilized in this position using vertical double-crossed sutures (Fig 10),[10] which were removed after 2 weeks. It was then necessary to wait long enough for the modified tissue to mature and stabilize.

Fig 8 Connective tissue graft placed on the root preparation.

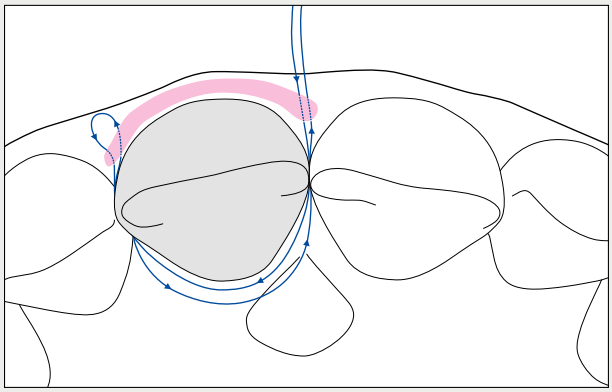

Fig 9 Suture diagram.

Fig 10 Vertical double-crossed suture.

Fig 11 3-months postsurgery.

After 3 months, the appearance of the tissue was good, and it was strong enough for the procedure to continue (Fig 11). As the soft tissue was now much thicker (Fig 12), the next step was to work on the hard tissue. In order to perform the veneer treatment, a tooth preparation had to be performed (Fig 13).[11]

The current trend in dentistry is to be as conservative as possible; this treatment is very conservative and requires the restoration to be a minimum thickness. This does not provide the laboratory technician with much freedom to work with different porcelain materials to mask the dark color of the treated tooth. The less space that is left for the restoration, the more opaque the porcelain has to be in order to block the color of the substrate being covered. If the technician had more freedom to play with the materials in an attempt to acquire an opaque base color and a greater translucency of the restoration, the result would be more natural, which in turn would better integrate the restoration with the other anterior teeth.

Fig 12 New soft tissue volume.

Fig 13 First preparation, similar thickness.

Fig 14 Second preparation, different thickness.

Fig 15 Shade guide: light color of left central incisor.

Fig 16 Shade guide: dark color of right central incisor.

The first step was to perform a similar preparation in terms of thickness on both central incisors, as is shown in Figures 14 and 18, and then increase the preparation on the darkest tooth, especially in the cervical[12] and incisal areas where greater translucency is required. As can be seen with the shade guides, the difference between the two teeth was very obvious, so this required different layering techniques and quantities of porcelain (Figs 15 to 17).[13] This

Fig 17 Shade guide.

Fig 18 Silicon matrix used for thickness control.

Fig 19 Final veneers.

Fig 20 Tooth preparation.

Fig 21 Try in: tooth 21.

Fig 22 Try in: tooth 11.

Fig 23 Final restorations.

thickness control during the preparation was aided by a silicone guide previously obtained from the wax-up.[14]

Once the preparations were completed, the surface of the treated tooth was polished, and an immediate dentin sealing (IDS) was performed in the areas where the preparation had come into contact with the dentin.[15] These procedures are usually carried out with any veneer treatment; an impression is made in the most accurate way possible in order to have the exact same information on the patient as on the working model, where the final restorations are made.

Once the veneers were made (Fig 19), they were tested to check the fit. The optical behavior of the restorations can be seen before cementation by using try-in glycerine (Figs 20 to 22). This is a very important step because once cemented, no further changes can be made to the restorations. Once everything was double-checked, cementation was the next step. When the restoration is very thin, using different types of bonding

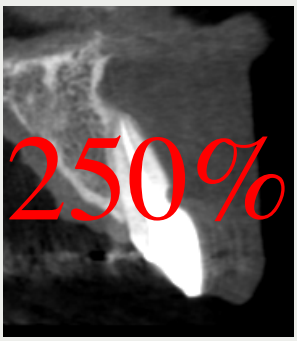

Fig 24 Cone beam computed tomography: tooth 11.

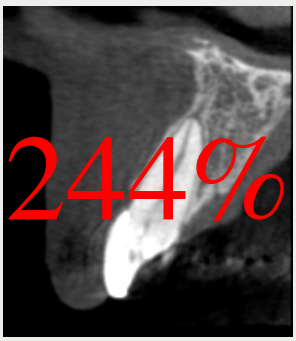

Fig 25 Cone beam computer tomography: tooth 21.

Fig 26 Final soft tissue volume.

Fig 27 1-year follow-up.

may be useful to vary the final color, but when the restoration is thick and is designed for opaqueness, the thin layer of cement does not have the capacity to vary the color of the final restoration (Fig 23). Thus, in this case, a transparent cement was used for the preparation.[16] With this method, an optimal esthetic result and long-term stability can be achieved (Figs 26 and 27).

Discussion

Often, simply placing a restoration of a lighter color is sufficient to achieve a good esthetic result, but sometimes the thinness of the soft tissue will reveal the treated tooth. It is therefore necessary to treat both the enamel and the soft tissue to obtain an optimal result (Figs 24 and 25). Despite the fact that this technique makes the treatment more complex, it is essential in the esthetic zone.

The effort and work that this treatment entails usually results in a very satisfied patient in the short term; however, after a few years, the contralateral central incisor will change its color, position, and shape, which will result in a less-integrated restoration. Thus, in this case, the contralateral tooth was treated with the same type of restoration, to ensure that both teeth will behave in the same way and thus result in a better long-term esthetic integration.

Conclusion

The treatment of a single tooth in the esthetic zone is one of the most demanding clinical challenges. When a treatment involves only a change of tooth color, it usually means that the tooth has a good prognosis, but that the patient would like to treat it for esthetic reasons in order to improve it visually. This leads to a treatment decision that results in the patient paying a biological price – despite the choice of the most conservative treatment possible – in order to achieve the desired result of a tooth that blends perfectly into the smile.

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