A healthy, 45-year-old woman requested that her general dentist whiten her two front teeth. Internal bleaching was performed on the teeth at sites 11 and 12 (FDI tooth-numbering system). An internal barrier was not placed, and tooth 11 developed external root resorption. The patient was referred to an oral surgeon to extract the tooth and place an implant. Tooth 12 was salvageable, but the surgeon recommended extraction of both teeth. Implants were immediately placed in the sockets. The implant at site 12 failed and was removed, resulting in a severe ridge defect. Multiple hard and soft tissue surgeries were unsuccessful and the defect worsened, resulting in a Class III ridge defect. The patient was referred to a prosthodontist for consultation, and he recommended referral to a periodontist to reconstruct the badly damaged ridge prior to prosthetic restoration. The periodontist successfully reconstructed the damaged ridge, and a restoration was placed on the implant at site 11 with a cantilevered pontic for site 12. This case elucidates the difficulty in reconstructing a damaged ridge and returning it to its preextraction contour when two adjacent teeth are extracted.


When adjacent teeth are extracted in the maxillary anterior region in a patient with a very high smile line, it presents a challenging course of treatment to augment the ridge to its previous contour. Mimicking the soft tissue levels of the contralateral side is extremely difficult.

Severely deformed edentulous ridges (Seibert Class III) involving two or more adjacent teeth in the maxillary anterior region are difficult to restore esthetically with a fixed dental prosthesis (FDP), especially when the patient has a very high smile line. Reconstructing these ridges to their preextraction contours is a daunting task. The challenge is to rebuild the height of the papilla between the missing adjacent teeth. In a patient with a very high smile line, mimicking the height of the papillae to the contralateral teeth is difficult.

There are surgical and restorative techniques that can be employed to make it possible to place an esthetic FDP. The defect can be restored with various soft tissue grafting techniques or with a combination of hard and soft tissue grafting. Pink porcelain can be used to improve any remaining defect; however, this is more challenging in a patient with a very high smile line. The patient was referred to a prosthodontist and periodontist for consultation regarding the treatment possibilities.
Materials and Methods

A healthy, 45-year-old woman requested that her general dentist whiten her two front teeth. Internal bleaching was performed on the teeth at sites 11 and 12 (FDI tooth-numbering system). Unfortunately, an internal barrier was not placed, and tooth 11 developed external root resorption. The patient was referred to an oral surgeon to extract the tooth and place an implant. The surgeon recommended removal of tooth 12, too, as “it would be lost in the future anyway.” Implants were immediately placed in the sockets. The implant at site 12 failed and was removed, leaving a significant vertical and labial deformity in the ridge. The surgeon attempted multiple hard and soft tissue surgeries but was unsuccessful in reconstructing the ridge defect (Fig 1). The patient was referred to a prosthodontist for consultation, and he recommended referral to a periodontist to reconstruct the badly damaged ridge prior to prosthetic restoration.

Treatment Planning

Three treatment possibilities were discussed to ameliorate this complex esthetic dilemma and deliver an esthetic FDP.

For the first option, the deformed ridge at tooth site 12 could be bone grafted, and a new implant could be placed, which would require multiple surgeries. The prosthodontist felt that it would be difficult to achieve an acceptable result with adjacent implants in the esthetic zone. The height of the papilla between sites 11 and 12 would be shorter than the contralateral side and would be noticeable due to the very high smile line. For the second treatment option, the ridge contour at site 12 could be augmented with soft tissue, and a restoration could be placed on the implant at site 11 with a cantilevered site 12 implant. This would improve the height of the papilla between the implants. The third treatment option was to augment the ridge, bury the implant at site 11, and place a tooth-borne FDP from sites 13 to 21. This would require preparation of two additional virgin teeth, extending the length of the FDP. The patient preferred to use the implant at site 11 if it was integrated.

The clinicians felt that the second option would require less treatment and would be more predictable. It would give the best opportunity for esthetic gingival levels on the maxillary anterior teeth and a taller papilla between sites 11 and 12.

Treatment

The patient was wearing a temporary removable prosthesis (Fig 2). A new removable temporary appliance (Essix) was fabricated that would allow room for significant soft tissue augmentation. The planned reconstruction required two surgeries. A full-thickness flap was reflected and continued apically with a split-thickness dissection (Fig 3).
Osseointegration of the implant (site 11) was verified, and the bony defect at site 12 was significant. A connective tissue graft (CTG) was harvested from the left palate and placed over the ridge crest. A pediculated CTG was harvested from the right palate and “flipped” over the CTG, then secured with resorbable sutures (Fig 4). The labial flap was released further, and primary closure was accomplished with 6-0 nylon sutures (Fig 5). The graft was evaluated at 4 months, and considerable augmentation was accomplished. The ridge still had a slight vertical defect in the area where optimum papilla height was necessary (Fig 6).

A second surgery was needed to improve this vertical deficiency. A split-thickness flap was reflected, and CTGs were harvested from the left and right palate and layered over the labial and coronal aspects of the ridge (Fig 7). Complete closure was accomplished (Fig 8). The ridge was evaluated at 6 months and was almost completely reconstructed (Fig 9). The patient was referred back to the prosthodontist to begin restorative treatment.

The restorative plan was to first develop the soft tissue contours with a provisional FDP, then capture those contours in the final impression and duplicate them in the final ceramometal prosthesis. The prosthodontist did a punch-uncovering of the healing abutment at site 11, and an implant-level impression was taken for a laboratory-fabricated provisional restoration.

The provisional was fabricated on a temporary titanium abutment (Dentsply Sirona) that was modified and opaqued (Monopaque, Ivoclar Vivadent). It was then layered
with polymethyl methacrylate provisional material (Vita VM CC, Vita Zahnfabrik). The initial provisional had a narrow subgingival emergence profile to start the process of gradually displacing the tissue facially and laterally (Fig 10). At the initial seating appointment for the provisional, the CTG over the implant at site 11 was so dense and the facial dimension so thick that it was not possible to displace it with the provisional contours alone. It was necessary to use some judicious electrosurgery to sculpt the sulcus of the implant emergence profile and to create a shallow ovate pontic form for site 12 (Fig 11). The screw-retained provisional was seated by incrementally tightening the abutment screw, then allowing the soft tissue to slowly stretch until blanching ceased. This was repeated until the provisional was fully seated (Fig 12).

The patient returned at three subsequent appointments approximately 4 to 6 weeks apart to gradually add contour to the emergence profile of the provisional implant retainer and the pontic until the soft tissue was as close of a match as possible to the contralateral side. From the initial provisional seating, a period of about 6 months was passed to give the soft tissue an opportunity to mature around the provisional. There was a slight difference in papilla height and fullness when compared to the contralateral papilla (Fig 13). A final impression was made using a custom impression coping technique to capture the emergence profile of the implant unit and the ovate pontic form of the ridge.35–38
The final screw-retained prosthesis was fabricated by casting ceramic alloy (Foundation, Jensen Dental) to a manufactured cast-to-abutment (Dentsply Sirona). Porcelain (Vita VM 13, Vita Zahnfabrik) was hand-layered to match the contours of the provisional and shade of the adjacent teeth. A try-in was done to evaluate shade and contours. At this point, the patient noticed that when smiling, there was a slight shadow in papilla between sites 11 and 12. Despite the excellent soft tissue volume created by the periodontist, it was not possible to match the height and volume of the sharp interdental papilla peak on the contralateral side. This slight lack of volume in the incisal tip of the papilla created a shadow in this area, as the lip blocked the light coming from above. One option was to lengthen the contact between the restoration and the pontic at sites 11 and 12, respectively, to minimize the size of the gingival embrasure; however, that would change the shape of the teeth in this area, creating disharmony with the natural contralateral side.

Instead, a slight amount of gingival-colored porcelain was added to fill in the papilla area but with intaglio contours that would allow for good hygiene with dental floss. The patient approved the final restoration, which was seated and torqued to 25 Ncm. The access hole was sealed with a small cotton pellet and composite resin (Filtek Supreme, 3M ESPE). Follow-ups were conducted at 1 month, 18 months, and 9 years. There were no detectable changes in tissue volume or bone levels around the implant or the edentulous ridge during this 9-year period (Fig 14).

Discussion

This case illustrates the importance of avoiding loss of adjacent teeth in the maxillary anterior esthetic zone, especially in a patient with a very high smile line whose tissue heights can be compared to a contralateral side. Originally, the patient had teeth 11 and 12 with good periodontal support (Fig 15). The teeth were treated with an internal bleach; however, an appropriate barrier was not placed, and tooth 11 developed external root resorption. Tooth 12 was salvageable, but the surgeon recommended extraction of both teeth. The implant at site 12 failed and was removed,
resulting in a severe ridge defect. Multiple hard and soft tissue surgeries were unsuccessful and the defect worsened, resulting in a Class III ridge defect. This created a difficult esthetic dilemma with adjacent missing teeth in the esthetic zone. For such a case, the present authors knew that the best gingival framework and tallest papillae height would be achieved with a single implant and cantilevered pontic as opposed to two adjacent implants.\(^\text{22}\) Achieving a good esthetic result was difficult; this goal is more easily attained when two maxillary central incisors are missing, as the slightly shorter papilla is in the midline and is not as noticeable because there is no contralateral site for comparison,\(^\text{40}\) unlike the situation in the present case. The successful result in the present case was due to ample reconstruction of the deformed ridge and diligent soft tissue management during the prosthetic phase of treatment.\(^\text{21}\)

**Conclusions**

This case demonstrates the benefits of interdisciplinary treatment of a Seibert Class III defect in the maxillary esthetic zone and highlights the importance of avoiding loss of adjacent teeth in the esthetic zone, especially in a patient with a very high smile line. Reconstruction of the tissue volume and papillae height that were present when the patient had teeth is extremely difficult.

**Acknowledgments**

The authors declare no conflicts of interest.

**References**


