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Management of a Failing Implant Using Guided Bone Regeneration and Esthetic Crown Lengthening in the Esthetic Zone; A Case Report

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Management of a Failing Implant Using Guided Bone Regeneration and Esthetic Crown Lengthening in the Esthetic Zone; A Case Report

Cover Page Footnote

Omar Al-Daoudi, DDS, DU, CES

Management of a Failing Implant Using Guided Bone Regeneration and Esthetic Crown Lengthening in the Esthetic Zone: A Case Report

By Bassam M. Kinaia, DDS, MS, DICOI; Miranda Kinaia, BS; Roksolana Gala, DDS; Ashleigh Turows, DDS; and Anthony L. Neely, DDS, MDent Sc, PhD

Today, the number of dental implants placed is on the rise, approaching 3 million in the United States, with an increase of 500,000 implants annually.¹ Similarly, the incidence of peri-implant diseases is on the rise, varying from 2.7% to 47.1%.^{2,3} Even initially healthy implants may show signs of peri-implant diseases after 10 years of function.⁴ Studies have shown a variety of protocols effective in managing peri-implant diseases, ranging from peri-implant mucositis to peri-implantitis to failing implants.^{5,6}

Abstract

Introduction: The current paper shows the successful management of a failed implant and asymmetrical gingival display in the esthetic zone. The case is managed using a combination of bone and soft tissue grafting to build the failed site. This is followed by esthetic crown lengthening to obtain a symmetrical esthetic smile.

Case Presentation: A 34-year old female patient presented with peri-implantitis in the esthetic zone. The case was treated with a combination of implant removal, reconstruction of the hard and soft tissues, and esthetic crown lengthening. After 12 months, healthy soft tissues with bilateral gingival symmetry were observed. The clinical crown dimensions were proportional with a pleasing smile line. The patient was pleased with the esthetic outcome and continued periodontal maintenance every three months and annual periodontal examination.

Conclusion: The current case report highlights management of failing implants in the esthetic zone using guided bone/tissue regeneration and esthetic crown lengthening with complete maxillary rehabilitation. Diagnosis of the uneven gingival display and failed implant were critical to develop an appropriately sequenced treatment plan. This allowed management of the failing implant with an esthetic outcome. Therefore, correct diagnosis addressing all functional as well as esthetic factors during treatment planning are critical for a successful outcome.

Key Words: bone graft, dental implant, membrane, implant survival, success, fixed denture.

When an implant fails, it is necessary to treat the failing site via reconstruction to correct bony and soft tissue anatomy for future replacement. When dealing with implant failures in the esthetic zone, there are several anatomical and surgical factors that should be taken into consideration. Anatomically, these include horizontal or vertical bone and soft tissue deficiencies, smile line, gingival symmetry, and clinical crown shape and contour.⁷ Surgically, these include past trauma to the surgical site, incorrect implant positioning, previous infection in the surgical site, inadequate healing time, or early loading leading to loss of osteointegration.⁸ Assessing these factors is critically important for implants in the esthetic zone due to high esthetic demands. Therefore, correct diagnosis and appropriate treatment planning are critical for a successful outcome. The current case report highlights management of a failing implant in the esthetic zone using guided bone/tissue regeneration and esthetic crown lengthening with complete maxillary rehabilitation.

Methods

Clinical presentations: A 34-year-old female with an unremarkable medical history presented with a history of extractions and immediate implant placement in sites #7 and #8. The clinical examination revealed deep probing depths (PD) of 2-8 mm, with bleeding on probing (BOP) and provisional crowns around implants #7, 8 (Figure 1). The patient exhibited a medium smile line with uneven gingival margins bilaterally (Figure 2).⁹ The patient experienced dull pain with deeper PD and bone loss approaching the sixth and seventh threads of implants #7 and #8 (Figure 3). Treatment options were discussed, and the patient consented to implant removal of #7, with guided bone regeneration and soft tissue grafting followed by esthetic crown lengthening and full maxillary reconstruction.

Surgical procedure: The patient received 600 mg ibuprofen (Amneal Pharmaceuticals, Paterson, NJ, USA) one hour prior to the procedure, pre-rinsed with 15 mL of 0.12% chlorhexidine gluconate (Peridex, 3M ESPE Dental

Products, St. Paul, Minn., USA) for one minute, and local anesthesia was administered with 4% articaine HCl (Septodont, Lancaster, Pa., USA) with 1:100,000 epinephrine. Provisional crowns were removed and implants #7 and #8 were tested for osseointegration (Figure 4). Implant #7 exhibited low resonance frequency, with a dull sound-to-percussion test and was removed using reverse torque (Figure 5). Sulcular incisions were made with a vertical release incision of #6, then facial full thickness flap reflection facially. A partial thickness flap was then reflected palatally (Figure 6). A pedicle connective tissue graft (CTG) was dissected and rotated facially to allow coverage of the grafted implant extraction socket¹⁰ (Figure 7, see Page 46). Implant surface #8 was treated for two minutes with doxycycline slurry (Doxycycline hyclate capsules, West-Ward Pharmaceutical Corp., N.J., USA), and socket #7 was degranulated, then particulate freeze-dried cancellous bone allograft was added for sites #7-8 (Puros, Zimmer Dental, Carlsbad, Calif., USA)(Figure 8, see Page 46). The pedicle connective tissue graft was then used to cover the grafted area and flaps were repositioned using resorbable sutures (Vicryl, Johnson & Johnson, Langhorne, Pa., USA) to obtain primary closure (Figure 9, see Page 46).

The patient received provisional crowns on #7 and #8 and allowed the area to heal (Figure 10, see Page 46). Mock wax-ups for crowns #4-13 were performed to plan symmetrical clinical crown dimensions (Figure 11, see Page 46). The patient approved the wax-up and a surgical stent was made (Figure 12, see Page 46). Esthetic crown lengthening (ECL) was performed to reduce the gummy smile and create a harmonious gingival symmetry bilaterally.¹¹ Internal bevel gingivectomy was performed on #4-13 with osseous reduction on the

(Continued on Page 46)

Figures 1-6



Figure 1 — Pre-operative clinical view showing deep probing depth around implants #7 and #8.

Figure 2 — Pre-operative clinical view showing medium smile line with uneven gingival margins.

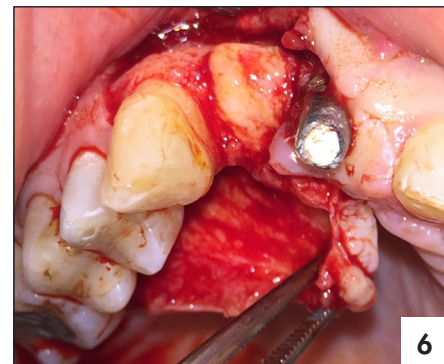
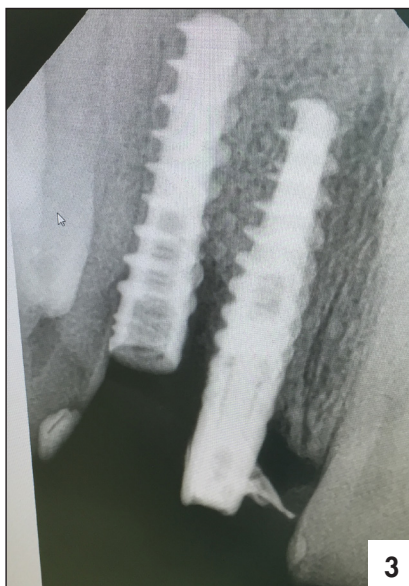


Figure 3 — Pre-operative radiograph showing peri-implant bone loss #7 and #8.

Figure 4 — Pre-operative clinical view showing implants #7 and #8 after provisional crowns removal.

Figure 5 — Clinical view demonstrating implant removal #7 using reverse torque.

Figure 6 — Clinical view showing facial full thickness and palatal partial thickness flap reflection.

teeth but no bony reduction around the implant region (Figure 13). The flaps were repositioned using resorbable sutures maintaining bilateral symmetry (Figure 14).

Post-surgical instructions were

given, and the patient resumed gentle brushing after four weeks. The patient received new provisional crowns on #4-13 to develop the emergence profile (Figure 15). The area was allowed to heal for three months,

then final impressions were taken (Figure 16). Full ceramic crowns were made from #4-13 with a pontic in the #7 position (Figure 17). Final restorations were delivered (Figure 18), maintaining a bilaterally symmetrical smile (Figure 19).

Figures 7-12

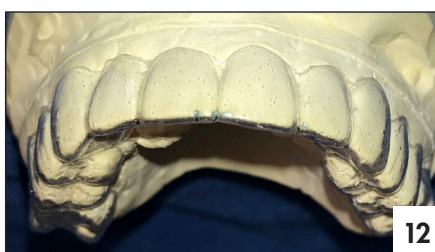
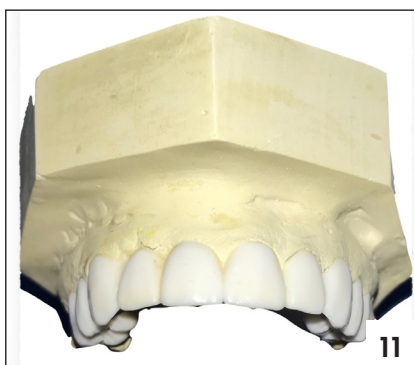
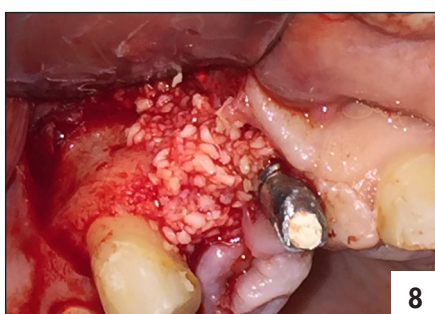
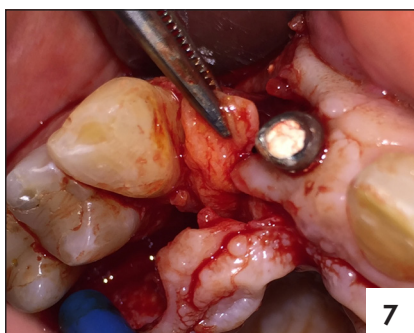


Figure 7 — Clinical view showing facial rotation of pedicle connective tissue graft to cover implant extraction socket.

Figure 8 — Clinical view showing socket particulate freeze-dried cancellous bone allograft placement #7-8.

Figure 9 — Primary closure using resorbable sutures.

Figure 10 — Post-operative clinical view displaying delivery of provisional crowns #7, 8.

Figure 11 — Mock wax-up of crowns #4-13.

Figure 12 — Duplicate study model with surgical stent for esthetic crown lengthening.

Results

Follow-ups at three, six, and 12 months showed proper healing. The clinical appearance showed healthy soft tissues with correct bilateral gingival symmetry (Figure 20). The pink esthetic score (PES) and white esthetic score (WES) improved from 8.7 pre-operatively to 19.2 post-final restorations (Tables 1 and 2, see Page 48). The clinical crown dimensions were bilaterally proportional with a pleasing smile line (Figure 21). The patient was pleased with the esthetic outcome and continued periodontal maintenance every three months and annual periodontal examination.

Discussion

Despite excellent implant survival, implant failure is a reality.^{12,13} Many treatment modalities have been used to address peri-implant disease, including non-surgical and surgical approaches.^{14,15} When an implant fails, it is critical to use the appropriate protocol to reconstruct the site.^{5,6} Implant removal consequences can be grave, as they relate to establishing acceptable function and esthetics.¹⁶ The current case report highlights removal of a failed implant using guided bone regeneration with a pedicle CTG to reconstruct the bony and soft tissue foundation.

Achieving an esthetic symmetrical smile around teeth and implants can be challenging.¹¹ Careful analysis of the soft tissue position and bony foundation relative to the smile line is important. The patient in this case showed uneven gingival display with excessive gingival display (EGD) on the left side compared to the right side. EGD combined with uneven free

gingival margin position gives the appearance of short clinical crowns with a unaesthetic smile.¹⁷ ECL is a predictable procedure to establish a natural smile with harmonious proportion between the teeth and the gingiva, maximizing the long-term success of the restorations.¹⁸ ECL is generally performed using gingivectomy with or without osseous reduction. It is important to understand the biologic width around teeth vs. implants when performing ECL. The mean biological width around implants is 3.80 mm compared to 3.17 mm around teeth.¹⁹ Given the longer biologic width around dental implants, special management in soft tissue reduction is needed to minimize potential recession around dental implants. Therefore, when performing ECL around teeth and implants it is recommended to perform gingivectomy only around implants, compared to gingivectomy combined with osseous reduction around teeth.¹¹

Not all failed implant sites can be replaced with a new implant, and a fixed partial denture (FPD) can be a reliable alternative.²⁰ The current case was managed using provisional restorations followed by full coverage crowns with implant FPD #7-8 to establish a correct soft tissue profile. It is important to have 8 to 12 weeks of soft tissue healing before proceeding with final impressions and restorations.^{21,22} Therefore, final impressions were taken at three months, and final restorations were delivered. This allowed complete tissue healing for the teeth and the implant, resulting in a symmetrical esthetic smile. The soft tissue results remained stable at 12-month follow-ups.

Conclusion

Management of failed implant site poses a challenge to clinicians surgically and restoratively. This suggests that the dental team must diagnose,
(Continued on Page 48)

Figures 13-21



Figure 13 — Clinical view demonstrating internal bevel gingivectomy #4-13.

Figure 14 — Esthetic crown lengthening with repositioned flap using resorbable sutures.

Figure 15 — Post-operative clinical view showing delivery of provisionals #4-13.

Figure 16 — Final impression #4-13.

Figure 17 — Study model with full ceramic crowns #4-13 and pontic #7.

Figure 18 — Smile view showing delivery of permanent full ceramic crowns #4-13.

Figure 19 — Right and left smile view showing bilateral gingival symmetry. Post-operative clinical view demonstrating maintained bilateral symmetrical smile.

Figure 20 — Post-operative clinical view showing healthy periodontal tissues with correct gingival symmetry.

Figure 21 — Post-operative showing proportional clinical crown dimensions bilaterally proportional with pleasing smile line.

Table 1 — Summary Evaluation of the Preoperative Pink Esthetic Scores (PES) and White Esthetic Scores (WES).

Site	Mesial Papilla	Distal Papilla	Curvature of facial mucosa	Level of Facial Mucosa	Root convexity, Soft tissue color and texture	TOTAL PES	Tooth form	Tooth volume/Outline	Color (Hue/Value)	Surface Texture	Translucency and Characterization	TOTAL WES	TOTAL PES + WES
4	2	2	1	2	1	8	1	1	1	1	0	4	12
5	2	2	1	2	1	8	1	1	1	1	0	4	12
6	0	2	1	1	1	5	1	1	0	0	0	2	7
7—Pontic	0	0	0	0	0	0	0	0	0	1	0	1	1
8—Implant	1	0	1	1	0	3	1	1	0	1	0	3	6
9	2	1	1	1	0	5	1	1	0	0	0	2	7
10	2	2	1	1	1	7	1	1	0	0	0	2	9
11	2	2	1	1	1	7	1	1	0	0	0	2	9
12	2	2	1	2	1	8	1	1	1	1	0	4	12
13	2	2	1	2	1	8	1	1	1	1	0	4	12
Mean	1.5	1.5	0.9	1.3	0.7	5.9	0.9	0.9	0.4	0.6	0	2.8	8.7

Table 2 — Summary Evaluation of the Final Pink Esthetic Scores (PES) and White Esthetic Scores (WES) Demonstrating Improvement. Final Scores Compared to the Preoperative Scores for the Maxillary anterior Teeth.

Site	Mesial Papilla	Distal Papilla	Curvature of facial mucosa	Level of Facial Mucosa	Root convexity, Soft tissue color and texture	TOTAL PES	Tooth form	Tooth volume/Outline	Color (Hue/Value)	Surface Texture	Translucency and Characterization	TOTAL WES	TOTAL PES + WES
4	2	2	2	2	2	10	2	2	2	2	2	10	20
5	2	2	2	2	2	10	2	2	2	2	2	10	20
6	1	2	2	2	2	9	2	2	2	2	2	10	19
7—Pontic	1	1	2	2	2	8	2	2	2	2	2	10	18
8—Implant	2	1	2	2	1	8	1	1	2	2	2	8	16
9	2	2	2	2	1	9	2	2	2	2	2	10	19
10	2	2	2	2	2	10	2	2	2	2	2	10	20
11	2	2	2	2	2	10	2	2	2	2	2	10	20
12	2	2	2	2	2	10	2	2	2	2	2	10	20
13	2	2	2	2	2	10	2	2	2	2	2	10	20
Mean	1.8	1.8	2	2	1.8	9.4	1.9	1.9	2	2	2	9.8	19.2

plan, and sequence treatment correctly to obtain a predictable esthetic outcome. In this case, the diagnosis of the failed implant and uneven gingival display were critical to present an appropriately sequenced treatment plan. This allowed appropriate management of the failing implant, resulting in an esthetic outcome. ●

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