Implant Tribune

Aesthetic management of a single dental implant

Dr Michael Sonick details a case involving both form and function in the aesthetic zone

A medically and periodontally stable 57-year-old man presented with coronally fractured tooth #9, which had a history of endodontic treatment (Fig 1). The tooth was deemed restoratively hopeless.

Treatment Plan
1. Extraction of tooth #9 and socket preservation
2. Three-month healing period
3. Placement of implant #9 and connective tissue graft
4. Three-month healing period
5. Implant #9 exposure, placement of healing abutment and connective tissue graft
6. Three-month healing period
7. Final implant #9 crown restoration

Extraction and Socket Preservation of Tooth #9

After oral sedation with 0.25mg triazolam and local anesthetic induction using two per cent lidocaine with 1:100,000 epinephrine and 0.5 per cent bupivacaine with 1:200,000 epinephrine, a flap was raised over the labial ridge aspect into which the connective tissue graft was harvested from the palate. A punch-like envelope flap was raised over the labial ridge aspect into which the connective tissue graft was harvested from the palate. A punch-like envelope flap was raised over the labial ridge aspect into which the connective tissue graft was harvested from the palate. A punch-like envelope flap was raised over the labial ridge aspect into which the connective tissue graft was harvested from the palate.

In order to form an aesthetic soft tissue profile by expanding mucosal dimensions, a connective tissue graft was harvested from the palate and placed on the buccal aspect of the ridge overlying the implant. The graft was stabilised using 5-0 chromic suture (Fig 6). After periosteal release via lateral scalpel incisions, the flap was primarily closed with 4-0 ePTFE sutures in an interrupted and horizontal mattress fashion (Fig 7). The area was re-temporised with a resin-bonded fixed partial denture.

Implant Exposure with Connective Tissue Graft

The #9 site healed well and without incident after three months (Fig 8). After using a tissue punch technique to remove the mucosa immediately coronal to the fixture (Fig 9), a one-piece 4.1mm (platform) x 15mm (length) x 4mm (height) healing abutment (Certain® EP® Healing Abutment, Biomet 3i, Palm Beach Gardens, FL) was placed on the #9 implant. To further augment the buccal ridge dimension, another connective tissue graft was harvested from the palate. A punch-like envelope flap was raised over the labial ridge aspect into which the connective tissue graft was transplanted and fixed using 5-0 chromic gut suture (Fig 10). The healing abutment remained exposed. A periapical radiograph revealed sufficient bone height around the fixture (Fig 11). The resin-bonded fixed partial denture was replaced.

Final Prosthetics

Final restoration of the #9 implant was performed three months post-exposure (Fig 12). The marginal height and contour of the #9 implant crown matched that of adjacent tooth #8, and a periapical radiograph showed suitable peri-implant bone height (Fig 13). The patient was satisfied with the functional and esthetic result (Fig 14).

Post-Operative Instructions

After each surgical procedure, the patient was instructed to take ibuprofen 600mg every 4-6 hours, hydrocodone 7.5mg/acetaminophen 750 mg every 4-6 hours as needed for pain, and doxycycline 100 mg every day for 10 days. The patient was instructed not to brush at or near the surgical site but instead to rinse with 0.12 per cent chlorhexidine or warm saline twice daily. The patient was also directed not to chew in the affected area for at least two weeks. Suture removal occurred at 10-14 days post-surgery.
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**Tissue Management**

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The choice between cement and screw-retained implant-supported prosthesis may be a matter of clinicians’ preference or dictated by particular clinical situations. This case presentation illustrates a clinical situation and the guidelines that led to the ultimate prosthetic treatment decision based on implant angulations, interocclusal relationship and arch position. The clinical considerations are presented to aid the clinicians in determining the most appropriate method of retention for a screw-retained implant-supported fixed partial denture (FPD).

A screw-retained implant-supported fixed partial denture (FPD) has certain physical advantages. However, according to several studies they require precise positioning of the implant for optimal location of the screw access hole. Also, obtaining passivity of frameworks that are screw-retained is difficult due to dimensional discrepancies inherent in the fabrication process.

Anchorage of prosthetic fixed partial dentures to implants can be achieved in two ways: some clinicians cement-ally have screw access openings, which can compromise aesthetics, weaken the porcelain around the openings and at cusp tips, and establish unstable occlusal contacts. Cementation of implant restorations eliminates unesthetic screw access holes. Cemented restorations also have the potential to compensate for any minor dimensional discrepancies in the fit of restorations to abutments, which can contribute to lack of passivity. It has the potential to reduce stress to splinted implants, since Screw-retained implant-supported fixed partial denture (FPD)

Michael Nawrocki and Dov M Almog provide implant information and a case report

Screw-retained implant restorations have an advantage of predictable retention and retrievability, and the lack of potentially retained excessive sub-gingival cement

Screw-retained implant restorations have a potential of predictable retention and retrievability, and the lack of potentially retained excessive sub-gingival cement. On the other hand fewer disadvantages exist: obtaining passivity of screw-retained framework is difficult due to dimensional discrepancies inherent in the fabrication process. Screw-retained units gener-
the effects of minor misfit of the framework are not transferred directly to the implants, as is the case with prosthesis-retaining screws. In addition, the exposure of screw access holes in esthetic areas of the mouth can be avoided. On the other hand, any excess retained cement extruding from the prosthesis/abutment interface, especially when located sub-gingivally, can cause inflammation, infection, and periodontal complications.

As more and more dental practitioners are focusing on implant-supported fixed partial dentures (FPD) restoring dentists need to understand the restorative options they may have to deal with. Many dental practitioners and labs will persistently use a screw-retained implant-supported fixed partial denture system, thereby promoting the utmost choices of serviceability, cosmetic result and maintenance of an optimised bite possible.

At the same time, in recent years the utilisation of adjunctive Cone Beam CT and technologies and 3-D derived virtual planning software solutions altered the manner in which we pull together diagnostic data, plan and execute both simple and complex implant cases. As a result, more and more implant trajectories are consistent with the planned prosthetic trajectories. Yet, some cases are still driven by the residual bone trajectories and are left to the reconstructing dentists’ decision as far as the final restorative option. In other words, when the implant trajectories are inconsistent with the planned prosthetic trajectories, the screw-retained implant-supported fixed partial denture systems offer an opportunity to minimise any controversy between the surgeons, restorative dentists and laboratories, creating greater understanding, appreciation and professional camaraderie.

As more dental practitioners are focusing on implant-supported fixed partial dentures restoring dentists need to understand the restorative options they may have to deal with.

Case Report
Patient presented for implant supported FPD after having teeth #8, 9, 10 extracted with socket preservation.

A CBCT study was performed with the iCAT CBCT machine (Imaging Sciences International, Hatfield, Pa) and revealed reasonable alveolar dimensions, both vertical and horizontal. However, by utilising ImplantMaster™ software (iDent Imaging, Inc., Foster City, CA, 94404-1294), it was discovered that the residual bone trajectory (RBT) and the planned prosthetic trajectory (PPT) were in conflict, that is, projecting a compromised restorative trajectory lingually in implant site #9 and buccally in implant site #11 (Fig 1). Nevertheless, following a treatment planning conference, rather than considering bone grafting, a decision was made to proceed with these angulations and a 3-D reconstruction of a patient’s anatomy was attained and a virtual surgical guidance template was designed and computer manufactured with precise drilling holes’ distribution and trajectory for implants #9 and 11.

The palatal trajectory of the implant in tooth position #9, the patient’s deep bite which resulted in severely limited space for prosthetic components, dictated a screw-retained prosthodontic FPD construction solution for the case.

The extremely buccal angulation of the implant replacing tooth #11 resulted in a buccally located screw access opening, which compromised aesthetics, and potentially weakened the porcelain around the screw opening in the proposed screw-retained three units FPD. The aesthetic dilemma could be solved by either gold plating of the metal portion of the screw chamber, which can reduce the need for opaque composite material, or by metal cut back to hide the non-aesthetic metal. We chose to overcome this aesthetic and structural obstacle by using a separate telescopic crown design to cover the metal sub-

As more and more dental practitioners are focusing on implant-supported fixed partial dentures restoring dentists need to understand the restorative options they may have to deal with.
Figure 2a, 2b & 2c: Figure 2: The screw-retained restoration was made by CQC at DTI Dental Lab in Rochester, NY. Different views of final screw-retained restoration emphasize the extreme lingual trajectory of implant #9 (a) and extreme buccal trajectory of implant #11 (b). Note telescopic design crown on #11 (b & c).

Figure 3a & 3b: Figure 3: Intraoral views of the screw-retained restoration. Note the implants’ prosthetic platforms (a) emphasizing the actual trajectories of implants #9 & 11 in the patient’s maxillary ridge. Note telescopic design crown on #11 (b).

structure of the screw-retained implant in #11 location.

Conclusions
As more and more dental practitioners are focusing on implant-supported fixed restorations, restoring dentists need to understand the restorative options they may have to deal with. Dental practitioners and dental labs need to be prepared to use a screw-retained implant-supported fixed partial denture, and thereby promote the utmost choices of serviceability, cosmetic result and maintenance of optimized bite possible.

References

About the author
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Dov M. Almog, DMD, Prosthodontist, Chief of the Dental Service, VA New Jersey Health Care System (VANJHCS).
The patient, a 36-year-old female office worker, was initially referred for implant therapy (via one of my implant course delegates) for replacement of the missing upper right central incisor. The upper central incisor had been lost following accidental trauma when she was 17 years old; the resultant space had been initially restored with a removable denture, but more recently with an adhesive bridge.

The patient was strongly opposed to keeping her denture having tolerated it for almost 20 years; and afraid that the adhesive bridge would fall out, she now wanted a fixed solution. Understandably she did not want a conventional bridge as she was afraid of “cutting down” the adjacent healthy teeth. The rest of her dentition was largely unrestored.

At the time of the trauma, the patient had asked her dentist if she was able to have a dental implant, but was told that there was insufficient bone and that such treatment was impossible.

Intra orally, the patient had signs of widespread gingival recession, oral hygiene was excellent, with no deposits and BPE codes healthy in all sextants. The patient presented with a composite occlusal restoration (UL6, LL6) and an adhesive “Maryland” bridge restoring UR1 with retainer wings UR2 UL1. There was Class 1 occlusion with general overcrowding, no interferences and canine guidance.

Radiographic assessment of UR2, UL2, revealed absence of periapical pathology, non-convergence of roots in adjacent teeth with good bone height.

The missing upper right central incisor had healthy adjacent teeth and a healthy, bony site. The edentulous area had reduced volume with respect to soft and hard tissue.

Following a formal discussion of her treatment options and advantages / disadvantages of each, a treatment plan was formalised in a detailed written patient report and verbal and written consent to treatment was obtained.

**Treatment Plan**

1. Two stage implant surgery was planned: Under LA, full flap elevation, implant placement (16mm NP NobelReplace tapered groovy) with hard and possibly soft tissue augmentation either simultaneously or at second stage surgery.

2. Second stage surgery; uncovering of implant +/- soft tissue augmentation and attachment of under contoured modified healing abutment.

3. Fixture head impression for lab construction of ideal design screw retained composite prototype crown.

4. Fit prototype implant crown with negatively contoured subgingival emergence profile

5. Pick up impression using modified impression coping

6. Fit definitive under contoured zirconium abutment and all ceramic proceria crown

7. Maintenance of implant restoration and remaining dentition by GDP. Including continued hygiene support.

The treatment was carried out over a period of seven months.
months with visits.

Reflection

The patient had an optimal result at the end of treatment, which she was extremely delighted with. Her management throughout was planned and executed with the utmost detail to attempt to deliver the most comfortable experience possible considering the nature of the treatment involved. She was offered a denture, which she had endured for the past 20 years and refused; a conventional bridge, which would have been destructive to the adjacent virgin teeth; or an adhesive bridge which she preferred to her denture but did not instil her with confidence. The patient was determined to undergo implant therapy if possible, and she had sought advice as to the feasibility 10 years ago but was dissuaded. She was willing to undergo any necessary treatment to augment the site ready for optimal implant therapy and was consented for the potential treatment sequence which may even involve block bone grafting and repeated soft tissue procedures.

As it was, she responded extremely well to treatment and her treatment was more simplified than expected. The utilisation of a laboratory made prototype restoration was a good policy which greatly improved the final result, although the patient’s finances were limited and it was carried out free of charge. The under contoured adjustment of the standard healing abutment at the minimally invasive second stage procedure encouraged more soft tissue growth, which also helped the final result. The patient was very amenable to the philosophy employed and never complained about the extra visits involved. Her focus was trying to gain the best possible final outcome. Translation of all of the information worked so hard to achieve in the prototype was also communicated to the laboratory in as accurate a way as possible, which helped ensure the final result.

The use of a narrow platform implant (3.5mm diameter) helped to keep the hard and soft tissue dimensions to a maximum and therefore perhaps allow greater long-term aesthetic success, which is why these implants are often utilised in the aesthetic zone.

Lengthy discussion was also had regarding root coverage procedures on the other recessions, which the patient is now considering following the good result achieved with the adjacent UR 2.
Figure 10: Undercontoured healing abutment to encourage further soft tissue growth and mucosal thickening.

Figure 11: Undercontoured healing abutment shows excellent volume and quality of soft tissue.

Figure 12: Healed postoperative periapical radiograph at four months showing excellent bone levels above microthreads.

Figure 13: Undercontoured lab made prototype crown adjusted further chairside.

Figure 14: Prototype crown showing excellent central papilla formation.

Figure 15: Indexing idealised prototype crown to copy dimensions for impression coping.

Figure 16: Customised impression coping in situ to copy soft tissue architecture.

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A medically and peri-odontally stable 50-year old woman presented with failing #8 and #9 teeth that exhibit asymmetry, lack of interdental papilla and a history of failing root-canal therapy and apicoectomy (Fig 1).

Treatment Plan
1. Extraction of teeth #8 and #9, immediate implantation of #8 and #9 and immediate non-functional provisionalisation of #8 and #9
2. Three-month healing period
3. Gingivectomy to create mucosal symmetry
4. Six-month healing period, during which contour adjustments to interim restoration will be made to manipulate papillary regeneration
5. Placement of final single PFM crowns on implants #8 and #9

Treatment Plan Rationale
Implant rehabilitation for sites #8 and #9 boosts long-term prosthetic success, which diminishes future costs and permits more future restorability options. The patient is an ideal candidate for immediate implant placement and temporisation due to her thick biotype, which resists recession, as well as the inherent coronal positioning of the gingival drape around #8 and #9 compared to the adjacent teeth, which allows any minor recession post-treatment to remain within aesthetically-pleasing bounds.

Extraction of Teeth #8 and #9, Immediate Placement of Implants #8 and #9, and Immediate Non-Functional Provisionalisation of Implants #8 and #9

After oral sedation with 0.25mg triazolam and local anaesthetic induction using two percent lidocaine with 1:100,000 epinephrine and 0.5 per cent bupivacaine with 1:200,000 epinephrine, sulcular incisions were made circumferentially around teeth #8 and #9. To create room for extraction instructions, the crowns on teeth #8 and #9 were reduced (Fig 2a). Teeth #8 and #9 were extracted atraumatically using a piezosurgical insert and serrated universal maxillary forceps (Figs 2b-2c). Degranulation of the sockets was performed using a carbide finishing bur and Neumeyer bur. A surgical guide was used to prepare the implant osteotomies, and proper positioning was attained (Fig 3). After finalisation of the osteotomy sites, rough-surfaced, internal hex 4 mm (diameter) x 13 mm (length) implants were placed into the #8 and #9 sites (NanoTite® Tapered Certain® Implant, BIOMET 3i, Palm Beach Gardens, Fla.) (Fig 4). Healing abutments were placed on the implants to prevent soft tissue and bony collapse during the period that extraoral fabrication of the temporary prostheses occurred (Fig 5a). The orientation of the implants was ideal,
and the fixtures exited from the sockets at the cingulum positions (Fig 5a). Primary stability was achieved. Radiographic review of the implants revealed a peak of the implants was achieved. Radiographic review (Fig 5a). Primary stability was achieved. Radiographic review (Fig 5a).

4 mm-diameter dental implants. Note the preferred site for a crown is to be on a different occlusal plane. Attention is drawn to them.

3b. Following a sulcular incision piezosurgery is used toatraumatically remove the tooth.

3c. Initial osteotomy orientation confirmed by radiograph.

3d. SMH view: Tooth #3 and #4 appear to be on a different occlusal plane. Attention is drawn to them.

3e. Right lateral initial smile view.

3f. A temporary guide is used to ensure correct orientation during osteotomy preparation. A buccal view of the guide in place with orientation pins is shown.

3g. Temporary healing abutments in place. Gingiva around teeth 8 and 9 is evident. Patient also reveals gingival asymmetry, inflammation and excess gingiva around teeth #8 and #9.

Final restoration of Implants
Six months after gingivectomy and provisional contour modification, the implants were ready for final prostheses (Fig 11). Single final PFM crowns were placed on implants #8 and #9. Clinical analysis demonstrated resolution of inflammation, idealisation of the soft tissue drape and papillary regeneration (Fig 12). A radiograph taken following completion of provisionalisation demonstrated satisfactory positioning and seating (Fig 5).

Gingivectomy Over Implants
Healing of the implant sites proceeded without incident. At one week post-surgery, the buccal marginal tissue remained coronally-oriented and encroachment of the papilla into the unfilled interdental space began (Fig 6). Three months after initial surgery, further coronal displacement and papilla fill occurred (Fig 7). A radiograph taken following completion of provisionalisation demonstrated satisfactory positioning and seating (Fig 8).

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Thursday 14 April

PLENARY PROGRAMME FOR CLINICIANS AND TECHNICIANS

Professor Thomas Albrektsson, Sweden
Professor Maurice Avorn, USA
Dr Stephen L Wheeler, USA

DENTAL IMPLANT TEAM PROGRAMME - (Morning)

Combined Team Programme for Hygienists, Nurses, Practice Managers and Therapists

The team approach to implant dentistry: a blueprint for success

Miss Anita H Daniels, USA

DENTAL IMPLANT TEAM PROGRAMME - (Afternoon)

Hygienist/Therapist Programme

The role of the dental hygienist in implant treatment

Miss Helen Frost, UK

Practice Managers’ Programme

Ringing the changes: turn every patient enquiry into an appointment

Miss Amy Miller, UK

Friday 15 April

PLENARY PROGRAMME OPEN TO THE WHOLE TEAM

Professor Joseph Kan, USA
Professor Clark W Stanford, USA
Professor Torsten Jemt, Sweden

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About the author

Dr Michael Sonick is a full-time practicing periodontist and implant surgeon in Fairfield CT. A renowned educator, author, and clinical researcher, he is a Guest Lecturer for the International Dental Program at New York University School of Dentistry, a former Clinical Assistant Professor in the Department of Surgery at Yale University School of Medicine and University of Connecticut School of Dental Medicine, and a frequent lecturer on periodontics, dentistry and implant dentistry. Unique to this program is the three part continuum: dentists to observe live surgery participate during the Hands-On portion and attend lectures. Interested participants can contact Carole at 203 254-2006 or visit the website at www.sonickdmd.com.