

The Brown

PerioDontaLetter



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From Our Office to Yours...

Achieving anterior esthetics with dental implants presents a formidable challenge. This challenge can be overcome with a well-designed interdisciplinary treatment plan and sequence of treatment.

The treatment plan must consider patient medical and dental risk factors, as well as patient expectations. It should also include a periodontal examination, smile analysis, evaluation of gingival biotype, appropriate radiographs, including three-dimensional imaging and occlusal considerations.

This issue of The PerioDontaLetter addresses the most important factors to be evaluated to ensure optimal esthetics with anterior, implant-supported restorations.

We hope you find this information helpful.

As always, we welcome your comments and questions.

Achieving Anterior Esthetics With Dental Implants

Implant therapy in the anterior maxilla is an advanced and complex procedure which requires comprehensive preoperative planning and precise surgical execution based on a restoratively-driven approach.

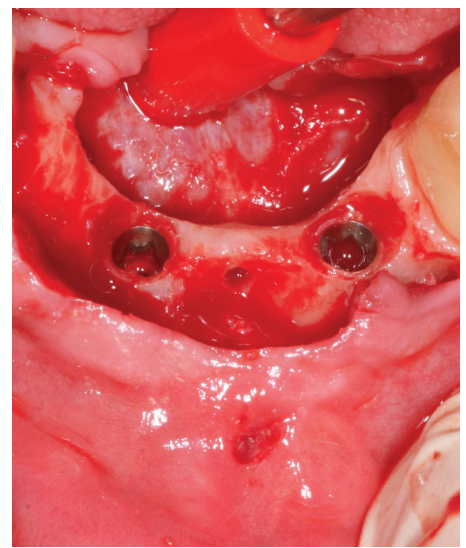
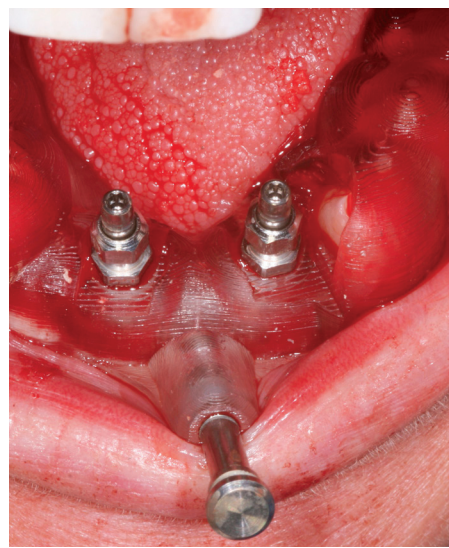
The primary objective in maximizing esthetics is to create a restoration which

mimics the natural dentition and associated gingival architecture.

Surgical considerations include timing of extraction, decisions about immediate vs. delayed implant placement, use of positioning guides, and an evaluation of the quality, quantity and volume of available bone and soft tissue.



Figure 1. Five years after the left central incisor was replaced with an implant, it is almost impossible to determine which tooth is the restored implant. The tooth was extracted, and the implant was immediately placed and loaded with a provisional restoration to shape the peri-implant tissue.



Figures 2, 3 and 4. Guided surgery, using a drilling and implant placement guide designed and fabricated from CBCT scans, allowed the precise, pre-planned placement of these implants to facilitate an ideal esthetic result.

Restorative considerations include choices of transitional or provisional restorations, abutment selection and cemented vs. screw-retained prostheses, as well as the proper cement selection and technique. These choices facilitate the management and shaping of soft and hard tissue.

A predictable treatment plan must also consider:

Patient Risk Factors and Expectations. Achieving a successful result requires a clear understanding of risk factors, medical status, demonstrated plaque control, and most importantly, ensuring that the patient has realistic esthetic expectations.

The Periodontal Condition of Adjacent Teeth and the Level of Adjacent Bone. The importance of the periodontal condition of the teeth to be extracted, and those adjacent to the proposed restoration, cannot be overstated. Interproximal horizontal bone loss from pre-existing periodontitis is a significant negative factor in creating the shape and position of the ideal interproximal papilla. Usually the height of the papilla is determined by the level of bone on the adjacent natural tooth. Bone and soft tissue deficiencies will have a marked effect on achieving a natural-looking result.

A Patient Smile Analysis. This must include the height and shape of the teeth adjacent to the proposed implants and the height and width of the smile line. In an average smile, 75 to 100 per cent of the maxillary incisors and the interproximal gingiva are displayed (about 70% of the adult population). A high smile line poses the greatest challenge when planning for implant-supported restorations in the esthetic zone because the restoration and gingival tissues can be completely displayed. The low smile line is a less critical situation because the implant restoration interface will be hidden behind the upper lip.

Position of the Teeth. The tooth needs to be evaluated in three planes of space before it is extracted: apicocoronal, faciolingual and mesiodistal. The relative position of the teeth markedly influences the thickness of the remaining bone with respect to proposed extractions. If possible, a flapless extraction technique will minimize the amount of associated bone loss.

Surgical Plan for Implant Placement. The surgical plan must include decisions regarding immediate vs. delayed implant placement. While studies have shown comparable results,

if there is adequate bone volume for implant stabilization in the ideal position, immediate implant placement may present less risk in achieving optimal esthetics.

If the extraction socket and facial bone wall has been damaged by acute infection, trauma or periodontitis, it is advisable to consider a delayed approach with hard tissue grafting and soft tissue augmentation.

If bone or soft tissue regeneration is required it is necessary to delay implant placement for the most predictable results. A three- to four-month healing period is often necessary for maturation of the bone augmentation site reconstruction.

Three-Dimensional imaging. Three-Dimensional imaging (CBCT) has become the standard for decision making regarding optimal implant placement and timing. It also facilitates a truly restorative-driven treatment plan.

The benefits to be derived from CBCT analysis include:

- Accurate choice of implant size and length
- Assessment of bone quality, quantity and volume
- Presence and identification of bony pathology

Restorative Positioning Guide (Surgical Guide)

A restorative positioning guide or surgical template derived from a three-dimensional radiographic analysis permits ideal positioning of implants, which in turn contributes to maximizing esthetic outcomes. This guide allows the periodontist to place the dental implant in the proper mesiodistal and palatal position. The surgical guide establishes the ideal anterior facial gingival position of the planned implant. This allows the surgeon to place the implant platform 2-3 mm apical to the ideal gingival margin position of the restored crown to allow space for the appropriate abutment.

Orthodontic Considerations. Orthodontic considerations include forced eruption to maximize gingival and bone levels. Additionally, orthodontic treatment may be employed to control mesio-distal tooth position. When root parallelism is essential in achieving ideal implant position, controlled tooth movement can often facilitate the process.

Interdisciplinary Responsibilities. The comprehensive treatment planning and placement of implants in the esthetic zone using the team approach concept benefits patients. As the medical model has shown, each doctor's expert knowledge of their respective areas contribute to the overall predictability of the esthetic outcome.

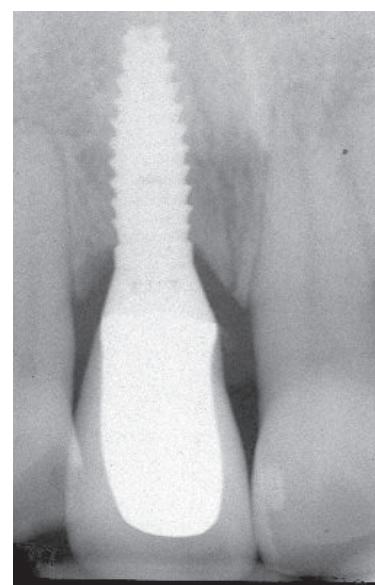
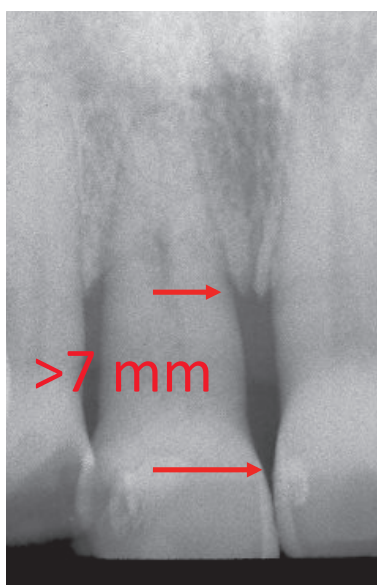
Provisional Restoration Considerations

The advantages of provisional restorations are:

Screw-retained provisional restorations offer flexibility in maintaining or modifying tissue contour and preservation of hard tissue.

Provisional restorations shape and "train" the peri-implant tissues to help the laboratory fabricate an anatomically appropriate and esthetic soft tissue model.

Screw-retained restorations have been shown to be preferable to cemented insofar as they eliminate the possibility of subgingival cement, perhaps one of the most prevalent cause of peri-implantitis.



Figures 5, 6 and 7. Periodontal disease causing interproximal bone loss can contribute to the clinician's inability to recreate lost papilla, and result in black triangles.



Bone Issues

To Bone Graft or Not to Bone Graft.

Socket grafting at the time of extraction has been proven to preserve the original alveolar architecture by limiting the post-extraction resorption process.

Many studies indicate that a greater amount of socket resorption can be expected without a graft. Initial socket grafting can often prevent the need for a secondary bone reconstruction procedure.

Ridge Preservation. About 3 to 4 mm of resorption (or 40 to 60%) can occur during the first six months after extraction in the absence of bone graft intervention.

The ideal solution to successful ridge preservation is the flapless, atraumatic removal of the hopeless tooth, leaving much of the bony architecture, including thin buccal cortical plate, intact.

After the extraction socket is curetted, a decision is made regarding the grafting material, choosing from an absorbable

collagen matrix, autogenous bone, demineralized freeze-dried bone allograft, combinations of bone graft materials and the use of growth factors.

Ridge Redevelopment. A variety of techniques, regenerative materials and barriers have been successfully used to reconstruct deficient ridges.

Most often ridge augmentation is a preliminary phase prior to placement of dental implants.

Reconstruction of the deficient soft tissue may also be beneficial to regenerate the ridge to facilitate the placement of pontics in fixed prosthodontics.

Lateral ridge augmentation methods include particulate bone grafts and monocortical block grafts in combination with various barrier materials.

Adequate time for bone graft incorporation and maturation, along with graft stability and complete tension-free flap closure, are essential to all bone graft procedures

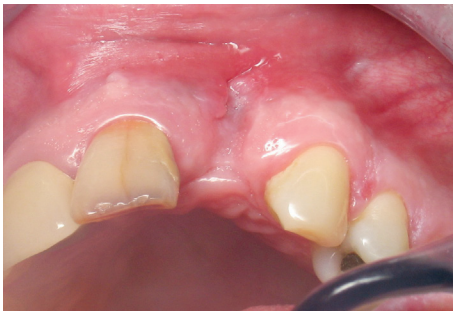


Figure 8. Traumatic tooth removal without bone grafting can result in a very compromised alveolar ridge deformity.



Figure 9. Inappropriate presurgical treatment planning and case design can lead to an extremely compromised esthetic result.

Tissue Issues

Gingival biotype. Two different periodontal biotypes have been described in the literature: the thin scalloped periodontium, and the thick flat periodontium. The presence of a thick biotype favors achieving an esthetic outcome. This morphology is less susceptible to recession, and offers more tissue volume for prosthetic manipulation.

Tooth shape is also correlated with soft tissue morphology and esthetics. Triangular teeth are associated with a thin, scalloped periodontium, with the contact area in the coronal third often resulting in a long, thin papilla. A square anatomic crown is associated with a thick, flat periodontium. The contact area, located in the middle third of the crown, supports a short, wide papilla. Thin scalloped gingiva is much more prone to loss of volume resulting in black triangles.

The Modified Pink Esthetic Score (PES) described by Belser et al provides an esthetic rating to the appearance of the soft tissue in anterior implant restorations. The use of this evaluation is a more objective appraisal of the short and long-term esthetic results of various surgical and prosthetic implant procedures. This is a simple checklist to use in our practices.

The analysis identifies five distinct soft tissue parameters:

1. The presence or absence of mesial papillae
2. The presence or absence of distal papillae
3. Curvature of the facial gingival margin of the implant restoration compared to the adjacent teeth
4. The height of the implant restoration at the mid-facial aspect compared to the adjacent teeth, and
5. Root convexity and soft tissue color at the facial aspect.

Each of these parameters was rated 0, 1 or 2 with the maximum possible score of 10, indicating the most esthetic result. A 6 was rated as clinically acceptable.

Prosthetic Considerations

Abutment Selection. An ideal abutment fits passively, has correct emergence profile, and mimics the morphology of the peri-implant tissues. Customized abutments are generally superior to stock abutments in achieving these objectives.

Abutment design. The abutment design should facilitate tooth alignment and the desired cervical and emergence

contours. Scalloped abutments help control the subgingival depth of crown margins to 1 mm, which in turn facilitates cement removal and maintenance of gingival health.

Cement Issues. Excess cement left around the implant collar and threads during the restoration phase of implant therapy is a primary cause of peri-implantitis. The clinical manifestations of cement-induced periimplantitis may not become evident for two to five years. It is absolutely essential that the clinician control cement flow to minimize excess cement when placing a cement-retained restoration, and that residual cement be removed. Various techniques for placing the proper amount of cement in the implant crown have been described in the current literature.

When choosing a cement, it is preferable to choose one that is radiopaque, permitting visualization of excess cement in a radiograph.

Conclusion

Dental implant therapy in the esthetic zone is one of the most demanding and complex treatments due to the necessity to obtain an optimum esthetic result.

Careful surgical and restorative interdisciplinary diagnosis, treatment planning, and treatment sequencing is essential to a functional and esthetic outcome, as well as a satisfied patient.

