

Esthetic Risk Assessment in Implant Dentistry

An interdisciplinary team approach to esthetic implant treatment planning is key to a successful esthetic outcome.

By Robert Levine, DDS | William Martin, DMD, MS

The addition of dental implants as a viable and predictable treatment option has had life-changing benefits for many patients. The improvements psychologically, medically, and socially are the results of clinicians' ability to replace missing teeth with permanent root substitutes, avoiding conventional fixed or removable restorations. The interdisciplinary team approach to patient care is especially important when the treatment involves the esthetic zone. The implant reconstruction requires comprehensive preoperative diagnosis and planning, followed by precise surgical and restorative procedures

that maximize implant positioning and restoration to mimic the missing dental unit(s).¹⁻³

Treatment with dental implants in the anterior maxilla is an advanced or complex procedure based on the International Team for Implantology's (ITI) Straightforward, Advanced, Complex (SAC) Classification of Implant Dentistry.⁴ The SAC Classification System has both restorative and surgical categories that use a normative classification system, which can be influenced by modifying factors based on individual clinical situations. One area that can influence this classification—both from a surgical and restorative perspective—is found in the ITI's "Esthetic Risk Assessment (ERA) analysis" (Table 1).⁵

ERA is a pretreatment assessment tool that uses clinical precursors to determine the risk of achieving an esthetic result based on known surgical and restorative approaches in given clinical situations. Esthetic risk factors should be addressed directly with the patient *before* the initiation of treatment to avoid any posttreatment misunderstandings that may result from unmet high expectations. The clinician can best avoid potential posttreatment complications and an unhappy patient by gathering information chairside with patients during their consultation visit and sharing it with them using aids such as the ERA form.^{2,4,5} This is an excellent communication tool that can be used in all esthetic cases to help both the clinician and the patient achieve their esthetic goals. The more high-risk categories the



FIG. 1



FIG. 2



FIG. 3



FIG. 4

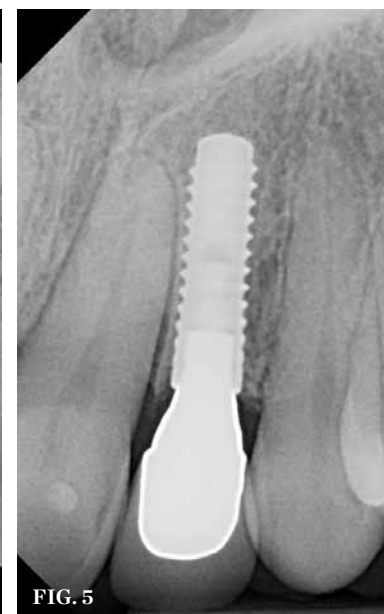


FIG. 5

PATIENT 1 (1.) A 22-year-old woman presented halfway through orthodontic therapy. Note the mid-line deficiency, severe ridge defect in site No. 7, and asymmetrical spaces of edentulous sites Nos. 7 and 10; tooth No. 6 had been impacted and surgically removed years before and No. 5 had shifted into its position. **(2.)** The completed case at 1 year. Note the gingival symmetry created with the use of an anatomically correct surgical template fabricated through crown-down planning after ridge reconstruction of site No. 7 was successfully completed. Screw-retained provisionals were used as a "blueprint" to aid in creating soft-tissue maturation and proper emergence profile prior to final impressions being made. In addition, composite bonding and enamel reshaping of the mesial of tooth No. 5 created the illusion of tooth No. 6. **(3.)** Final smile at 1 year. **(4. AND 5.)** Completed case at 1 year. (Straumann Narrow Connection 3.3-mm X 12-mm bone-level implants with CAD/CAM, zirconium abutments, and cement-retained zirconia/lithium-disilicate crowns.



ROBERT LEVINE, DDS
Private Practice at the
Pennsylvania Center for
Dental Implants &
Periodontics
Philadelphia, Pennsylvania

Clinical Professor of
Periodontology and
Implantology
Kornberg School of Dentistry
at Temple University
Philadelphia, Pennsylvania



**WILLIAM MARTIN,
DMD, MS**
Associate Professor and
Director of the Center
for Implant Dentistry
University of Florida,
College of Dentistry
Gainesville, Florida

patient falls into, the more conservative the surgical and restorative approach should be.⁶ This will help avoid any potential esthetic disasters later.

The following case examples highlight the use of the ERA in treatment planning patients who want to replace failing and missing teeth in the esthetic zone.

Patient 1: Low-to-Moderate ERA

A 22-year-old healthy woman represented nearly halfway through 2 years of full-banded orthodontic therapy to

correct a 4-mm midline discrepancy (to the patient's left side), with the result being a space too small for implant placement in site No. 10 and a space too large in site No. 7 (Figure 1). Included as part of the team's treatment of orthodontic patients in preparation for dental implants were periodic office visits to the periodontist/implant surgeon's office to re-evaluate the inter-root spaces and need for additional space adjustments based on periapical radiographs and clinical assessments for proper implant placement. A cone-beam computed

tomography (CBCT) scan was taken of the maxillary jaw to evaluate bone availability for both implant sites at an initial visit to help in determining the sequencing of surgical treatment. While a large horizontal-ridge defect requiring bone reconstruction was noted for site No. 7, adequate ridge width for a 3.3-mm width implant was noted for site No. 10. The authors' surgical and prosthetic goals were to place 12-mm x 3.3-mm narrow-connection bone-level implants (Straumann®, www.straumann.us).⁷

A tentative team treatment plan was reviewed with the patient from the outset of orthodontic therapy, so she was educated as to what the overall time and surgical/prosthetic treatment costs would be once orthodontics was completed. Evaluation of the patient's esthetic risk factors was reviewed with her (Table 2) at the CBCT visit, and the following restorative-driven treatment plan was developed, discussed, and finalized with her orthodontist and restorative dentist, and included the following steps.

TABLE 1

Esthetic Risk Analysis for Implant Dentistry*

ESTHETIC RISK FACTOR	LOW RISK	MODERATE RISK	HIGH RISK
Medical Status	Healthy, cooperative patient with an intact immune system		Reduced immune system
Smoking Habit	Non-smoker	Light smoker (< 10 cigs/day)	Heavy smoker (> 10 cigs/day)
Patient's Esthetic Expectations	Low	Medium	High
Lip Line	Low	Medium	High
Gingival Biotype	Low scalloped, thick	Medium scalloped, medium thick	High scalloped, thin
Shape of Tooth Crowns	Rectangular		Triangular
Infection at Implant Site	None	Chronic	Acute
Bone Level at Adjacent Teeth	< 5 mm to contact point	5.5 mm to 6.5 mm to contact point	> 7 mm to contact point
Restorative Status of Neighboring Teeth	Virgin		Restored
Width of Edentulous Span	1 tooth (> 7 mm)	1 tooth (< 7 mm)	2 teeth or more
Soft-Tissue Anatomy	Intact soft tissue		Soft-tissue defects
Bone Anatomy of Alveolar Crest	Alveolar crest without bone deficiency	Horizontal bone deficiency	Vertical bone deficiency

*Adapted from the ITI's SAC Classification in Implant Dentistry. Chen S, Dawson A, eds. Esthetic Modifiers. In: *The SAC Classification in Implant Dentistry*. 2009; Berlin: Quintessence Publishing Co., Ltd: 15.

TABLE 2

ERA Table for Patient 1: Moderate Esthetic Risk*

ESTHETIC RISK FACTOR	LOW RISK	MODERATE RISK	HIGH RISK
Medical Status	Healthy, cooperative patient with an intact immune system		Reduced immune system
Smoking Habit	Non-smoker	Light smoker (< 10 cigs/day)	Heavy smoker (> 10 cigs/day)
Patient's Esthetic Expectations	Low	Medium	High
Lip Line	Low	Medium	High
Gingival Biotype	Low scalloped, thick	Medium scalloped, medium thick	High scalloped, thin
Shape of Tooth Crowns	Rectangular		Triangular
Infection at Implant Site	None	Chronic	Acute
Bone Level at Adjacent Teeth	< 5 mm to contact point	5.5 mm to 6.5 mm to contact point	> 7 mm to contact point
Restorative Status of Neighboring Teeth	Virgin		Restored
Width of Edentulous Span	1 tooth (> 7 mm)	1 tooth (< 7 mm)	2 teeth or more
Soft-Tissue Anatomy	Intact soft tissue		Soft-tissue defects
Bone Anatomy of Alveolar Crest	Alveolar crest without bone deficiency	Horizontal bone deficiency	Vertical bone deficiency

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1. Orthodontic space assessment appointments with the periodontist to aid in final apical root positions of the adjacent teeth (Nos. 5, 8, 9, and 11) and symmetry of edentulous spaces for implant placement. Smoking cessation was discussed throughout treatment.
2. Orthodontic completion with placement of retainers.
3. An anatomically correct surgical template was fabricated for sites Nos. 7 and 10.^{2,4}
4. Horizontal-ridge reconstruction using the principles of membrane-assisted guided-bone regeneration (GBR) on site No. 7 using a 7-mm tenting screw (Lorenz Surgical, Inc., www.lorenzsurgical.com), freeze-dried bone allograft (Exactech, www.exac.com), and a resorbable collagen membrane (Geistlich BioGide®, www.bio-gide.com) with implant placement in site No. 10, with vertical bone scalloping being determined with the aid of the surgical guide.⁸
5. Implant placement of tooth No. 7 at 6 to 7 months post-GBR with bone scalloping as needed based on the anatomically correct surgical guide template.
6. Screw-retained provisionals for soft-tissue development of final emergence profiles placed by the restorative dentist 6 weeks after implant placement, with the provisional intended to act as the blueprint for the final crowns to be fabricated. Once the proper soft tissues were developed, custom impression copings would be fabricated, capturing the subgingival transition zone (peri-implant tissue from the implant head to the mucosal margin).
7. Completion of final CAD/CAM

zirconium abutments and crowns for site Nos. 7 and 10 with a mesial composite restoration placed on No. 5 (in the No. 6 position) to create more of a canine profile with delivery of a nightguard appliance (Figure 2 through Figure 5).

8. Periodontal maintenance with her restorative dentist twice per year, with yearly digital radiographs and clinical examination of implant sites with the periodontist to evaluate bone level maintenance.

Patient 2: Moderate to High ERA

A male patient presented for an implant consultation with missing teeth Nos. 8 through 10, which he reported had been fractured at the “gum line” 4 months earlier as a result of an accident (Figure 6 and Figure 7). He also reported that the roots of the teeth had

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been extracted and grafts placed by his dentist in his hometown soon thereafter. A clinical and radiographic examination (with a radiographic template) was performed to allow the implant



FIG. 6



FIG. 7



FIG. 8



FIG. 9

PATIENT 2 (6.) The full smile revealing a low-to-medium lip line. **(7.)** Retracted anterior view highlighting the soft-tissue architecture. **(8.)** Pretreatment panoramic radiograph with the template in place. **(9.)** The final restorations; a screw-retained zirconia abutment and zirconia veneer restorations initially cemented then converted for screw retention. Retrievable screw-retained restorations minimize the possibility of retained cement and eventual tissue complications.

TABLE 3

ERA Table for Patient 2: High Esthetic Risk*

ESTHETIC RISK FACTOR	LOW RISK	MODERATE RISK	HIGH RISK
Medical Status	Healthy, cooperative patient with an intact immune system		Reduced immune system
Smoking Habit	Non-smoker	Light smoker (< 10 cigs/day)	Heavy smoker (> 10 cigs/day)
Patient's Esthetic Expectations	Low	Medium	High
Lip Line	Low	Medium	High
Gingival Biotype	Low scalloped, thick	Medium scalloped, medium thick	High scalloped, thin
Shape of Tooth Crowns	Rectangular		Triangular
Infection at Implant Site	None	Chronic	Acute
Bone Level at Adjacent Teeth	< 5 mm to contact point	5.5 mm to 6.5 mm to contact point	> 7 mm to contact point
Restorative Status of Neighboring Teeth	Virgin		Restored
Width of Edentulous Span	1 tooth (> 7 mm)	1 tooth (< 7 mm)	2 teeth or more
Soft-Tissue Anatomy	Intact soft tissue		Soft-tissue defects
Bone Anatomy of Alveolar Crest	Alveolar crest without bone deficiency	Horizontal bone deficiency	Vertical bone deficiency

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team to discuss the available treatment options. The panoramic radiograph revealed retained root tips in site Nos. 8 to 10 (with periapical radiolucencies), which appeared to be covered by a grafting material (Figure 8). The patient was informed that the root tips needed to be removed along with the graft material prior to the initiation of definitive implant therapy. During the treatment planning discussions, the patient informed the authors of his desire for individual fixed implant-supported restorations. He was educated on the pros and cons of this approach with regard to implants in site Nos. 9 and 10, which could negatively affect the inter-implant crest height, papilla, and esthetic outcome.⁹⁻¹² He elected to have implants placed in the central sites and have a cantilevered restoration in site No. 10. Placing implants in sites Nos. 8 and 9 would help maintain the symmetry of the restorations while maximizing available tissue from the nasopalatine area for papilla formation.

During the pretreatment process, an ERA analysis revealed a high risk of failure to achieve an ideal esthetic result (Table 3). Clinical factors that greatly influenced this rating were:

- High esthetic demands.
- Acute infection of the remaining roots in site Nos. 8 through 10.
- An extended edentulous area coupled with a horizontal-ridge deficiency.

The patient was made aware of the esthetic risk and elected to proceed with the following treatment plan:

1. Removal of the grafting material and extraction of the root tips.
2. After 8 weeks, placement of bone-level dental implants (Straumann) in site Nos. 8 and 9 with simultaneous hard-tissue allograft augmentation (Exactech), allowing for submerged healing.
3. Second-stage implant uncovering 12 weeks later with simultaneous connective tissue grafting.
4. Placement of screw-retained provisional restorations 4 weeks later to initiate shaping of the transition zone (peri-implant tissue from the implant head to the mucosal margin).
5. Final impression to capture the implants and tissue shape with a customized impression coping procedure 4 to 6 weeks after implant loading (Figure 9).¹³⁻¹⁷

6. Restoration with all-ceramic, screw-retained restorations using zirconia abutments (Ivoclar Vivadent, www.ivoclarvivadent.com) and zirconia veneer restorations (Etkon, division of Straumann) (Figure 10 through Figure 12).

Conclusion

The comprehensive treatment of implant therapies using the team approach concept works to benefit patients. As the medical model has shown, members' knowledge of their respective areas contributes to the overall success of the rehabilitation, which becomes even more important in cases involving the esthetic zone.^{2,3,17} The routine use of the ERA analysis helps in careful surgical and restorative interdisciplinary diagnosis and planning. This results in a functional and esthetic outcome as well as a satisfied patient.

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FIG. 10



FIG. 11

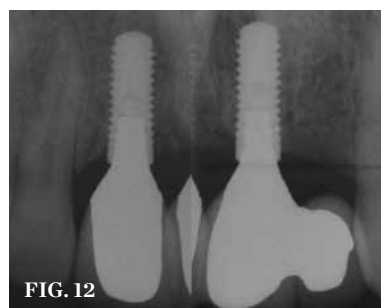


FIG. 12

PATIENT 2 (10.) The final smile at 1 year. **(11.)** The retracted anterior at 1 year. **(12.)** Periapical radiographs at 1 year.