Periodontal Considerations in the placement of Dental Implants

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Abstract

The creation of an esthetic implant restoration with gingival architecture that harmonizes with the adjacent dentition is a formidable challenge. The predictability of the peri-implant esthetic outcome may ultimately be determined by the patient's own presenting anatomy rather than the clinician's ability to manage state-of-the-art procedures. To more accurately predict the peri-implant esthetic outcome before removing a failing tooth, five diagnostic keys are discussed. These keys include relative tooth position, form of the periodontium, biotype of the periodontium, tooth shape and position of the osseous crest.

KEYWORDS: Dental Implants, Periodontal, Peri-implant

Introduction

The current expansion of the therapeutic spectrum in implantology, has led to a decided attitude of expectation among many patients. As a matter of fact, however, the therapeutic window of novel techniques is often rather narrow. The predictability of the peri-implant esthetic outcome may ultimately be determined by the patient's own presenting anatomy rather than the clinician's ability to manage state-of-the-art procedures.

The goal of modern implant therapy in aesthetic areas is no longer represented just by the successful osteointegration of the implant. The final result has to be an implant-supported restoration surrounded by a soft and hard tissue environment in harmony with the existing dentition.[1]

After the loss of an anterior tooth, the normal sequela of wound healing will create an unfavorable esthetic soft-tissue complex. The remaining facial mucosa often recedes apically and palatally.[1-4] Typically, this cervical recession results in a restoration that appears too long and may be compounded with the loss of the interdental papilla.[5,6] In addition, using a single-tooth replacement minimizes the restoration and surgical options necessary to the optimal management of the problem. Therefore, the creation of an esthetic implant restoration with gingival architecture that harmonizes with the adjacent dentition is a formidable challenge.

To more accurately predict the peri-implant esthetic outcome before removing a failing tooth, an understanding of five diagnostic keys is essential:
1. Relative tooth position.
2. Form of the periodontium.
3. Biotype of the periodontium.
4. Tooth shape.
5. Position of the osseous crest.

1. Tooth position

The tooth needs to be evaluated in three planes of space: apicocoronal, faciolingual and mesiodistal. The existing tooth position will significantly influence the presenting gingival architecture.

Apico-coronal

On assessment of the apico-coronal position of the tooth it may be more apical, more coronal or ideal and mimic the level of the adjacent gingival margin. Numerous authors have shown that following extraction and insertion of an ovate pontic there is likely to be up to 2 mm of gingival recession, and on extraction and placement of an implant immediately the migration of the gingival margin is likely to approximate 1 mm.[7,8] The implications this has from a practical perspective are that if there is a hopeless tooth positioned ideally or apically and this is extracted,

the gingival margin is likely to migrate apically.Restoratively, long clinical crowns, pink porcelain or visible metal margins will result, compromising the aesthetic outcome. These teeth can benefit from orthodontic extrusion prior to extraction which will serve to position the gingival level at a more harmonious level.

Facio-lingual

In this dimension the tooth position may present with different concerns.The tooth may be positioned too far facially; this often results in very thin or non existent labial bone. These teeth are not good candidates for orthodontic extrusion because of inadequate underlying bone. Extraction of these teeth results in significant vertical bone loss and collapse of the gingival architecture.

This type of situation would benefit from bone augmentation procedures prior to implant placement. A tooth positioned more lingually would benefit from the presence of an increased amount of facial bone. This situation is more favourable prior to extraction since the resultant discrepancy in the facial free gingival margin may be minimal.[9]

Mesio-distal

The proximity of the adjacent teeth necessary to provide proximal support and volume of interdental papillae should be evaluated. Ideally the mesiodistal tooth width should be equal to that of the contra lateral tooth so that an aesthetic outcome can be achieved. Excess or deficiencies in this dimension should be addressed through the use of orthodontics, enameloplasty or restorations. For patients with diastemas it is imperative that the decision to maintain or close the space be made prior to implant placement. If the patient refuses the above options to close the space and insists on closing the space with the implant restoration there is a likelihood that a black triangle may ensue. This results from inadequate support from the adjacent tooth to maintain the papilla. It is important that the clinician discusses this with the patient ahead of time so disappointment with the final outcome is avoided . [10,11,12]

2. Form of the Periodontium

The basic human periodontal forms have been previously described.[13-15] For discussion, three categories of gingival scallop will be included: high, normal and flat. Based on a clinical survey of 100 patients, the average or normal gingival scallop is positioned 4 mm to 5 mm more incisally than the FGM.[16] The same clinical survey found that visually, because a central incisor is approximately 10 mm from the facial FGM to the incisal edge, the interdental tissue will occupy about 50 percent of the exposed tooth length.[16]

Of importance is the relationship to the underlying osseous crest. In the healthy periodontium, the underlying bony crest is about 2 mm apical to the cementoenamel junction (CEJ) and follows the scallop of the CEJ. This scallop of the central incisors is 3.5 mm. Therefore, in the normal and high-scalloped gingival architecture, there is more tissue coronal to the bone interproximally than facially for this scallop. The greater this discrepancy, the higher the scallop and the higher the risk for gingival loss after extraction.

In contrast, the flatter gingival scallop tends to mimic the osseous scallop, creating less discrepancy and more predictable maintenance of the interproximal papilla. A highly scalloped gingival architecture that is the result of facial recession can be misleading. In this scenario, the interproximal papilla may be in the normal or flat position, relative to interproximal bone, but appear to have a highly scalloped form. This interdental papilla is also in a favorable position and not at risk of being lost after extraction.

3. Biotype of the Periodontium

The biotype of the gingiva is typically considered thick or thin. The thick or dense biotype may be fibrotic. Thicker tissue is usually more resistant to recession and results often include pocket formation after any apical migration of the junctional epithelium. The thin gingival biotype is often friable and results in increased risk of facial recession

and interproximal loss of gingival tissue after any surgical procedure .

Gingival recession is the most common complication of anterior single-tooth implants.[17] Thicker tissue is inherently more favorable and thin tissue provides more concerns. For thin tissue, minimally invasive or flapless surgery is more appealing because it minimizes compromises to the blood supply of underlying bone and decreases the risk of recession after implant management protocols.

4. Tooth Shape

Three basic tooth shapes — square, ovoid and triangular — influence peri-implant esthetics. The impact is both

coronal and apical to the FGM. Coronal to the FGM, the tooth shape will influence the volume and height of the gingival embrasure. Apical to the FGM, the tooth shape will influence the proximity of the roots and support of the gingival tissue both facially and interproximally. Coronal to the FGM, the square tooth shape is the most favorable because the proximal contact is longer and more tooth structure fills the interdental area . This creates less risk of "black holes." The triangular tooth shape creates the highest risk for black holes because the proximal contact point is more incisally positioned and would require more tissue height to fill the interproximal area .Therefore, even minimal amounts of tissue loss may create large black holes. These situations may require modification of the adjacent tooth shape with either direct composite or porcelain veneers after an implant-retained restoration.

Apical to the FGM, the tooth shape creates very different diagnostic concerns. Triangular tooth shapes allow for roots that are positioned farther apart, which provides potentially thicker interproximal bone . This may actually minimize loss of vertical bone height after extraction procedures and implant placement as a result of lateral resorption with lateral violation of biologic width.[12] The ovoid and square tooth shape with proximal contact may, therefore, be at a greater risk of more vertical bone loss because the osseous crest is thinner. This shape, however, provides more proximal support for the interdental gingival tissue.

The presenting tooth shape will influence the implant-retained restoration shape. The implant restoration will need to mimic its contralateral natural tooth coronal to the FGM; however, apical to the FGM, the implant restoration will not be an anatomic replica. An often-delicate balance must be developed that provides support of the gingival architecture yet does not provide excessive pressure. Although the implant position will dictate the emergence profile of the implant restoration, ideally, the facial contour should be slightly flatter than the contralateral natural tooth to minimize apical displacement of the FGM after insertion.[18,19,20]

The interproximal position of the fixture is below the osseous crest of the adjacent teeth. The interproximal emergence profile of the abutment should be straight and scalloped until it is coronal to the osseous crest. This distance occupies approximately 3 mm.

5. Position of the Osseous Crest

The osseous crest is a critical foundation for gingival levels. The position of this relationship is an important predictor for gingival levels after any intervention. Previous clinical data on 100 healthy patients developed quantitative data for three different biologic variations.[16] These variations — normal, high, and low — are based on the vertical distance of the osseous crest to the FGM. The greater the distance of the osseous crest to the FGM, the greater the risk of tissue loss after an invasive procedure. If the vertical distance of the total dentogingival complex on the midfacial aspect is 3 mm, a slight apical loss of tissue (up to 1 mm) is anticipated after extraction and immediate fixture placement. Greater or less than 3 mm of vertical distance indicates the change will be relative and range from negligible change to potentially >1 mm apical. Measuring the distance from the FGM to the osseous crest before extraction is an important and valuable diagnostic procedure. If the facial gingival levels are harmonious a variety of implant systems, surgical protocols and restorative options can provide similar therapeutic outcomes for this anatomical clinical situation.[20] In contrast, if the patient presented with unfavorable anatomical keys, the clinician would face much higher risk and a less predictable outcome for peri-implant esthetics, despite state-of-the-art procedures.

Using a proactive protocol that alters the periodontium toward less risk and more favorable assessment of the five diagnostic keys before implant placement will provide the most predictable peri-implant esthetic outcome. Reliance on "state-of-the-art procedures" provides different options; however, these results are not as predictable.

References

1. Abrams H, Kopczyk RA, Kaplan AL. Incidence of anterior ridge deformities in partially edentulous patients. J Prosthet Dent. 1987;57:191-194.
2. Abrams L. Augmentation of the deformed residual edentulous ridge for fixed prosthesis. Compend Contin Educ Dent. 1980;1:205-213.
3. Tarnow DP, Eskow RN. Considerations for single-unit esthetic implant restorations. Compend Contin Educ Dent. 1995;16:778-788.
4. Jansen CE, Weisgold A. Presurgical treatment planning for the anterior single-tooth implant restoration. Compend Contin Educ Dent. 1995;16:745-761.
5. Weisgold AS, Arnoux JP, Lu J. Single-tooth anterior implant: a word of caution. Part I. J Esthet Dent. 1997;9:225-233.
6. Garber D. The esthetic dental implant: letting restoration be the guide. J Am Dent Assoc. 1995;126:319-325.
7. Becker W, Ochsenbein C, Tibbets L, et al. Alveolar bone anatomic profiles as measured from dry skulls. Clinical ramifications. J Clin Periodontol. 1997;24:727-731.
8. Kois JC. Esthetic extraction site development: the biologic variables. Contemporary Esthetics and Restorative Practice. 1998;2:10-18.
9. Saadoun A, LeGall M, Touati B. Selection and ideal tridimensional implant position for soft tissue aesthetics. Pract Periodontics Aesthet Dent. 1999;11:1063-1072.
10. Salama H, Salama M, Garber D, et al. Developing optimal peri-implant papillae within the esthetic zone: guided soft tissue augmentation. J Esthet Dent. 1995;7:125-
129.

11. Salama H, Salama M. The role of orthodontic extrusive remodeling in the enhancement of soft and hard tissue profiles prior to implant placement: a systematic approach
to the management of extraction site defects. Int J Periodontics Restorative Dent. 1993;13:312-333.
12. Tarnow DP, Cho SC, Wallace SS. The effect of interimplant distance on the height of inter-implant bone crest. J Periodontol. 2000;71:546-549.
13. Weisgold AS. Contours of the full crown restoration. Alpha Omegan. 1977;70:77-89.
14. Olsson M, Lindhe J. Periodontal characteristics in individuals with varying forms of the upper central incisors. J ClinPeriodontol. 1991;18:78-82.
15. Sanavi F, Weisgold AS, Rose LF. Biologic width and its relation to periodontal biotypes. J Esthet Dent. 1998;10:157-163.
16. Kois JC. Altering gingival levels: the restorative connection part I: biologic variables. J Esthet Dent. 1994;6:3-9.
17. Goodacre CJ, Kan JY, Rungcharassaeng K. Clinical complications of osseointegrated implants. J Prosthet Dent. 1999;81:537-552.
18. Phillips K, Kois JC. Aesthetic peri-implant site development. The restorative connection. Dent Clin North Am. 1998;42:57-70.
19. Tarnow DP, Magner AW, Fletcher P. The effect of the distance from the contact point to the crest of bone on the presence or absence of the interproximal dental
papilla. J Periodontol. 1992;63:995-996.
20. Kan JY, Rungcharassaeng K, Umezu K, Kois JC. Dimensions of peri-implant mucosa: an evaluation of maxillary anterior single implants in humans. J Periodontol. 2003;74:557-562.