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Implants in Your Laboratory

The Treatment Plan

By Leon Hermanides



Figure 1: This patient was treated with a zirconia abutment and crown on her maxillary left central, note the excess tissue at the cervical which was later plasted to normal contours. Photo Credit: Dr. J. Campo

One of the fastest growing treatment modalities in dentistry today is implant therapy¹. With biologic (osseointegration) success rates reported at 92 percent to 98 percent^{2, 3, 4}, more dental practitioners are gaining the knowledge and experience to successfully integrate implants into their practice. Any treatment plan for the replacement of missing teeth should include an implant site and cost evaluation before the destruction of natural teeth is considered for fixed partial denture abutments.

Laboratories at all levels can complement and advance the services they provide for their clients by successfully integrating implant restorations. A thorough understanding of patients' anatomical limitations during treatment planning is essential, as is recommending and implementing the appropriate impression/transfer techniques, abutment design and restoration design. The modern dental laboratory, armed with this knowledge, is able to provide implant restorations in a financially, technically and esthetically predictable manner, delivering the highest standard of patient care.

This article focuses on treatment planning from the laboratory perspective in order to deliver successful implant restorations and evaluate the risks for creating excellent esthetic results. Our success is judged by our clients and their patients, essentially how our restorations integrate in their smiles and how long they last.

Understanding Anatomical Limitations

As previously noted, the integration of implants in bone and the biologic determiners for clinical success have become highly predictable, and we can therefore spend more time and effort to create optimal esthetic integration with a patient's smile. In order to improve the

Peri-Implant Esthetics



Reference: Kois JC. *Compend Contin Educ Dent* 2001; Vol 22 (3) 199-206

Figure 2.

Five diagnostic keys for peri-implant esthetics demonstrating key risk factors for favorable esthetic success. Reprinted with permission Dr. J. Kois.

predictability of any treatment outcome it is critical to understand whether the patient's anatomy, bone and soft tissue, is favorable for esthetic integration. Dr. John Kois has noted that the patient's presenting situation has a greater role to play in the final treatment outcome and optimum esthetic result than most of the currently accepted additional management strategies⁵.

Although favorably altering a patient's anatomy is beyond our control in the laboratory; it is important to realize how it may affect our final results and how patients evaluate our restorations. In his book *Esthetics in Dentistry*¹⁴, Dr. Goldstein noted that treatment compromises due to clinical limitations may be viewed by patients as esthetic failure, usually when the patient is not aware of the limitations of a treatment. He states: The patient needs to understand the compromise before the treatment begins¹⁴. Therefore, if we are to accept responsibility for the esthetic outcome of implant restorations created in our laboratories it is crucial to know where and when we have the ability to make a significant impact on the final result.

To understand this it is important to have a working knowledge of significant research driven predictors for

esthetic integration. Ultimately esthetics is evaluated by the color, shape and position of the restored tooth and the gingival architecture that surrounds it¹⁰. There has been consistent reporting in the dental literature that patients' and dental specialists' criteria for evaluating components of an esthetic smile differ¹⁰. For example, in their study evaluating perceptions of papilla length LaVacca et al. noted that patients perceived smiles as attractive regardless of papilla length as long as there was symmetry in the gingival display¹⁰.

Our Patient

If we take this knowledge and apply it in a clinical environment can

we predict a favorable result before the treatment is initiated, in the diagnosis and treatment planning phase? For this patient presenting for implant therapy, was this a less risky case to manage in the dental laboratory according to the chart in **Figure 2** to evaluate risk factors?

The male patient in this example experienced a traumatic injury during an ice hockey game resulting in irreparable damage to his upper right central incisor, crown fracture of his right lateral incisor and a root fracture to the right side cuspid. The cuspid and central are determined to have a hopeless prognosis and are recommended for extraction and implant placement.

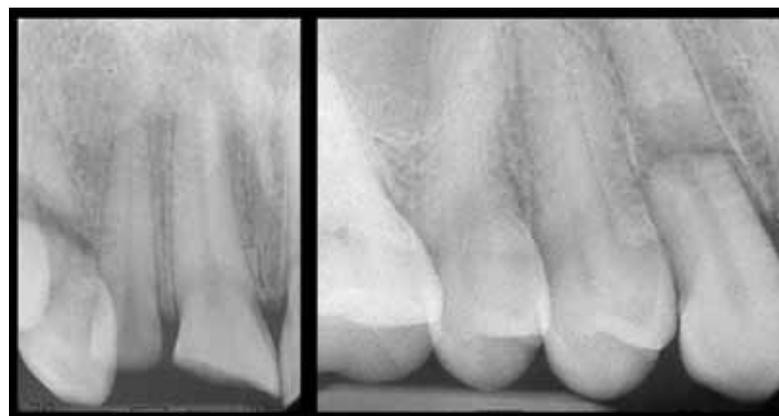


Figure 3.

Radiograph showing root fracture of the cuspid and damage to the central and lateral. These radiographs were taken at initial presentation approximately 24 hours after the injury. Photo credit: Dr. J. Files



Figures 4A and 4B.

Facial and occlusal view of patient as he presented approximately 24 hours after the injury. Photo credit: Dr J. Files



Treatment was initiated with the lateral incisor being endodontically treated and provisionally restored and a specialist referral was generated for the extractions and implant placements. The restoring dentist's office then lost contact with the patient who had been awaiting information on insurance reimbursement. The patient returned to the restoring dentist's office after extraction of the central incisor and cuspid, the sites had been grafted and left to heal.

Implants were placed by the surgeon approximately three months later in the central and cuspid sites and during healing the patient refused provisional restorations. This prevented the clinical team from managing the soft tissue at the sites with anything more than stock healing abutments. The patient went for six months without front teeth on the upper right side.

Looking back at the patient's pre-operative study model (Figure 5), the gingival margin of the upper right central is coronal to the upper left central — a more favorable position for implant placement and healing. Additionally in his favor, the teeth are evenly aligned in the dental arch. The gingival scallop of the maxillary anterior teeth is normal to flat meaning that the interdental papilla is less than 50 percent of the length of the tooth. The patient's normal to thick periodontal biotype indicated a more favorable esthetic result would be possible with an abundance of soft tissue remaining at the healed implant sites and a lower risk of gingival recession. The tooth form is square to ovoid and with the teeth proximal to the implants remaining intact the tissue volume will be supported by the proximal crest of bone on the adjacent natural teeth.

As we can see, all the diagnostic categories fell into the green zone for this patient and although he was uncooperative with conventional

Figure 5.

The patient had a model from before the trauma which proves extremely important in evaluating the risk for esthetic compromises in the final implant restorations for this patient.



Figures 6A and 6B.

After extracting the central and cuspid, the sites were left to heal for three months. With the implants placed, stock healing abutments were placed before the implants were restored. Photo credit: Dr J. Files



provisional strategies the final outcome of the treatment was an esthetic success. The patient was very happy and did not return for minor soft tissue surgery to correct the gingival levels of the right central incisor to create more symmetry between the centrals.

During the diagnostic and treatment planning phase key risk factors for creating an unfavorable esthetic result should be identified and evaluated. The chart in Figure 2 from the article by Dr. Kois⁵ shows an increased esthetic risk associated with each of five diagnostic keys and is an essential tool for any treatment planning discussion with a client/dentist. The article communicates the role that each of these major anatomical risk factors plays in determining the predictability of the esthetics for anterior implant restorations.

Treatment Planning

Management of the boney architecture is not possible in our laboratories as these are patient-based, anatomical factors. The question is how can we provide predictable esthetics without favorable anatomy? We are continually at risk of not achieving optimum esthetics if we do not understand the impact of the patients' presenting anatomy and provide intelligent guidance on how to improve the result.

To help guide implant placement during surgery, surgical templates demonstrate to the surgeon three important areas of the final tooth position. They are the incisal edge position, facial surface and the CEJ of the restored tooth/teeth. These key determinators can be finalized in the laboratory with a diagnostic wax-up. This opportunity to communicate the design of the final restoration before the implant is placed can prove vital in successfully integrating the restoration in the patient's smile. Additionally, a wax-up can provide an opportunity to build value for a



Figures 7A and 7B.

Atlantis custom abutments were ordered and PFM crowns on a high noble alloy were prescribed.



Figures 8A and 8B.

(Below left and right) The final PFM crowns seated, note the apical position of the gingival margin of the right central incisor. Photo credit: Dr J. Files



Figures 9A and 9B.

(Below left and right) The laboratory created a wax-up to identify the final tooth position, proportion and esthetic planes which can be used to plan final implant placement.



Figure 10.

The interproximal height of bone as a prognostic guide to esthetic tooth replacement according to Salama, Salama, Garber and Adar. Reprinted with permission.

Class	Restorative Environment	Proximity Limitations	Vertical Soft Tissue Limitations
1	Tooth-Tooth	1mm	5mm
2	Tooth-Pontic	N/A	6.5mm
3	Pontic-Pontic	N/A	6mm
4	Tooth-Implant	1.5mm	4.5mm
5	Implant-Pontic	N/A	5.5mm
6	Implant-Implant	3mm	3.5mm

laboratory and its services with clients and their specialists.

As a visual reference the diagnostic wax-up can also enhance the value of other diagnostic tools such as emerging imaging technologies. This aids in identifying the final tooth position, remaining bone density, ridge form and dimension or other factors determined in the treatment plan.

In their article published in 1998, and subsequent updates Salama, Salama, Garber and Adar¹¹ (also available online at www.dentalxp.com) have created the table shown in **Figure 10**, to help determine the predictable fill in of interproximal soft tissue in different restorative situations.

What the authors have established are guidelines for treatment planning that provide reference measurements for creating a favorable esthetic outcome. These measurements are from the most coronal interproximal crest of bone to the most coronal peak of soft tissue (the interproximal papilla). If a patient's anatomy does not allow us to stay within these guidelines, our risk for not achieving optimum esthetics increases substantially, regardless of the technical proficiency or skill of the technician/doctor team.

To optimize the esthetic result of our restorative dentistry there needs to be symmetry in the supporting structures to satisfy patients' perceptions of an attractive smile. If the only way for us to control papillae height in the laboratory is through interproximal contact point placement¹³ and the addition of gingival colored ceramic, we are going to have to rely on a dialogue with our clients. A conversation about the risks that the anatomy presents to achieving optimal esthetics requires a level of knowledge beyond what is available in current technical laboratory education programs.

Recommendations

In order to fully understand the clinical implications impacting our esthetic outcomes, an advanced knowledge base is required. There are clinical programs around the country that present this information to dentists; however, gaining this level of understanding at laboratory meetings will prove elusive. Attending programs at established and respected institutes such as the Kois Center, Pankey Institute, The Misch Institute and the Seattle Study Club will provide any technician the opportunity to acquire this knowledge and to study alongside current clients or meet new dentists. This will help build trust and relationships with these dentists and allow for valuable laboratory input during treatment planning. **JDT**

References

1. Dental Implant Prosthetics. Misch, CE Mosby 2005 pg 1-3
2. A retrospective evaluation of 1,387 single-tooth implants: a 6-year follow-up. Levin, L; Sadet, P; Grossmann, Y. Journal Perio. 2006 Dec ;77(12):2080-3.
3. A retrospective study of 1925 consecutively placed immediate implants from 1988 to 2004. Wagenburg, B; Froum, SJ. Int J Oral Maxillofac Implants. 2006 Jan-Feb;21(1):71-80.
4. The effect of smoking on achieving Osseointegration of surface-modified implants: A clinical report. Kumar, A; Jaffin, RA; Berman C. Int J Oral Maxillo Fac Implants 2002;17:816-819
5. Predictable Single Tooth Peri-Implant Esthetics: Five Diagnostic Keys. Kois, JC. Compendium March 2001;22(3):199-206
6. Accuracy of Replacing Three Tapered Transfer Copings in Two Elastomeric Impression Materials. Liou, AD, Nicholls, JI, Yuodelis, RA, Brudvik, JS. Int Journ Prosth 1993;6:377-383
7. The Accuracy of Three Implant Impression Techniques: A Three Dimensional Analysis. Phillips KM, Nicholls JI, Ma T, Rubenstein J. Int J Oral Maxillofac Implants 1994;9:533-540

8. Tolerance Measurements of Various Implant Components. Ma T, Nicholls JI, Rubenstein JE. Int J Maxillofac Implants 1997;12:371-375
9. The economics of restorative dentistry. Spear F. Dent Econ. 1998 Feb;88(2):42, 44, 46
10. Interdental Papilla Length and the Perception of Esthetics. LaVacca MI, Tarnow D, Cisneros GJ. PPD 2005;17(6):405-412
11. The Interproximal Height of Bone: A Guidepost to Esthetic Strategies and Soft Tissue Contours in Anterior Tooth Replacement. Salama H, Salama MA, Garber DA, Adar P PPD 1998 10(9):1131-41
12. Evaluation of the accuracy of three techniques used for multiple implant impressions. Vigolo P, Majzoub Z, Cordioli G JPD 2003; 89(2):186-192
13. The effect of the distance from the contact point to the crest of bone on the presence or absence of the interproximal dental papilla.
14. Tarnow DP, Magner AW, Fletcher P. J Periodontol. 1992 Dec;63(12):995-6.
15. Esthetics in Dentistry. Goldstein RE Philadelphia: JB Lippincott Co.; 1976

About the Author

Hermanides graduated from college in South Africa with a national higher diploma in dental technology, the equivalent of a bachelor's degree in the U.S. He has worked in South Africa, London and Seattle laboratories specializing in all stages of advanced reconstructions and anterior esthetics. Hermanides is a mentor of Dr. John Kois' Kois Center programs and a member of study clubs around the Puget Sound area, additionally he currently serves on the board of directors of the Washington State Dental Laboratory Association as vice president.



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