

Diode Laser-Assisted Gingivo-osseous Recontouring to Enhance Aesthetic Dental Restorations

By Dr. Clarence Tam

Predictability in aesthetic dentistry starts with the consideration of the smile in relation to the face. The face is a dynamic, expressive medium that modifies the display of teeth, granting the individual either desirable or undesirable characteristics. Tjan and Miller identified that 20% of individuals feature low lip dynamics, 69% medium dynamics and 11% high lip dynamics¹. A consideration should always record the maximal smile, otherwise known as the Duchenne smile, an individual effort that exposes as much upper gingival display as possible. The lip position of a Duchenne smile is approximately 6mm – 10mm from the repose position of the lip. If lip dynamics are significant, asymmetries in pink aesthetics or gingival elements may be modified to enhance the proportion of the teeth to gain better bilateral symmetry in global smile design.

Generally, it is accepted that the distance of the bony crest from the free gingival margin is 3mm on the facial aspect and 3mm – 4mm at the proximobuccal line angles for 85% of the individuals who feature a normal crest, according to Kois². A high crest situation exists in 2% of the individuals and is when the midfacial bony crest is less than 3mm from the free gingival margin. A low crest situation exists in 13% of individuals, and is characterised by a crestal height in the midfacial that is greater than 3mm, and greater than 3mm – 4mm at the proximobuccal line angles. Therefore, it is imperative that any modification of the gingival levels be preceded by a customised site evaluation of crestal proximity via bone sounding, driving any open or closed flap modifications as required to maintain the accepted distances, and avoid restorative marginal position inflammation.



Fig.1: Pre-operative Situation; teeth 12, 22



Fig.2: Pre-operative situation: 1:1 ratio retracted



Fig.3: Button technique for shade selection



Fig.4: Ultradent Gemini dual wavelength diode laser



Fig.5: Gemini laser cradle detail

Anterior teeth feature an 87% incidence of having a facial bony cortex measuring 1mm or less in buccolingual thickness with cone beam CT scans often overestimating bony cortical thickness of facial bone. This



Fig.6: Split dam isolation, facial resin removed tooth 22



Fig.7: Laser diode gingivectomy to planned level



Fig.8: Sounding to bone. Need to re-establish biologic width



Fig.9: Closed flap transsulcular osseous recontouring using the Kois Wedelstaedt chisel

is the basis of possibility for site specific transsulcular modification of osseous contour if a full flap is not necessary to access multiple adjacent teeth.

Case #1: Gingival asymmetry

A 14-year-old female with recently finished orthodontics was referred for improvement of aesthetics of composite bonding on teeth 12 and 22. A diagnostic wax-up was generated as the referring dentist required certain proportions relative to primary anatomy to be confirmed before starting. Due to gingival asymmetry negatively impacting on resultant tooth display of the lateral incisors, the decision was made to modify the gingival contour of tooth 22 (diode, 810nm, 980nm, 1.0W SuperPulsed)

(Gemini, Ultradent, UT), with pre-operative bone sounding being the basis for whether osseous recontouring was necessary. In this case, transsulcular osseous recontouring using a Wedelstaedt chisel (Kois) (Brasseler) was utilised to re-establish biologic width on the day of the restorations. It is important to note that the gingival and osseous recontouring surgery is normally done first with a three-month period for complete healing prior to any restorative enhancement of the teeth. But this patient suffered from limited time constraints, thus, necessitating



Fig. 10: Removal of old composite on peg lateral tooth 22



Fig. 11: Guided placement of lingual shelf using Harmonize A1 Enamel



Fig. 12: Sculpting of dentin layer using Harmonize XL2 Dentin

a concomitant procedure. Intraoperatively, the bulk of the old composite was removed except for areas where it could not easily be distinguished from tooth structure. After defining finish lines, the teeth were isolated with metal strips and micro air abraded (27-micron aluminium oxide) before a total etch approach. A silane coupling agent was utilised (GC G-MultiPrimer) before bonding (GC G-Premio Bond) to maximise the chemical link to silica particles in the old composite. A layered approach was utilised (four separate layers) using shades

XL1 Enamel, A1 Enamel, XL2 Dentin, Trans Clear (Harmonize, Kerr Dental).



Fig. 13: Final enamel volume placed and primary anatomy completed. Planning of secondary anatomy



Fig. 14: Finishing and polishing completed for tooth 22



Fig. 15: Immediate post-operative view of corrected aesthetics on 12 and 22



Fig. 16: 1 week reassessment of aesthetics; retracted 1:1 view



Fig. 17: 1 week reassessment: 1:2 unretracted frontal view

Case #2: Missing lateral incisors with mesialised canines

A 32-year-old female had congenitally missing maxillary lateral incisors, mesialised canines and first premolars. Improvement in tooth proportions was desired and planned using a Digital Smile Design-type software (Smile Designer Pro, Toronto). The digital design specified modifications in both soft and hard tissue dimensions to achieve a more harmonious and natural smile. The

gingival zenith of tooth 24 posing as tooth 23 was to be moved apically, and after site-specific bone sounding determined to be possible using a transsulcular approach with a Kois Wedelstaedt chisel (Brasseler). Modification of the soft tissue was completed using the Ultradent Gemini diode laser (810nm, 980nm) on 1.2W Superpulsed mode before osseous recontouring completed. The restorations were layered to completion using shades XL1 Enamel, XL2 Dentin, Trans Clear, white tint (Kerr Kolor) (Harmonize, Kerr Dental).



Fig. 1: Pre-operative view of 14-24. Note the prominence and dominance of the mesialised 13, 23.



Fig. 2: Retracted 1:1 ratio view of the maxillary anterior sextant



Fig. 3: Digital Smile Design Workup (Smile Designer Pro, Toronto)



Fig. 4: Putty matrix generated from diagnostic wax-up tried on preoperative model



Fig. 5: Ultradent Gemini dual wavelength diode laser



Fig. 6: Adaptation of putty matrix derived from diagnostic wax-up



Fig. 7: Isolation with split rubber dam to allow access for gingivo-osseous procedures



Fig. 8: Pre-operative view tooth 24 posing as tooth 23



Fig. 9: Post-gingivectomy and closed flap transsulcular osseous recontouring to planned level



Fig. 10: Finalised preparations treated with caries detector dye to rule out active lesions



Fig. 11: Improved pre-operative pink/gingival symmetry prior to modifying white aesthetics

Laser wavelength therapeutics

The Ultradent Gemini diode laser (810nm and 980nm) was used to adjust the gingival margins prior to a transsulcular osseous recontouring approach using the Kois Wedelstaedt chisel (Brasseler USA), re-establishing the 3mm biologic width midfacially and 4mm at the proximofacial line angles. The Gemini uses different wavelengths for different therapeutic actions — 980nm is attracted to the water content more, resulting in more efficient coagulation and cutting. It has been used in pain relief and inflammation reduction protocols.



Fig. 12: Intraoperative frontal view. Lingual shelves completed on 13, 23 posing as 12, 22



Fig. 13: Close-up view of proximal axial contour development using a vertically-oriented Garrison Slick Band (purple)



Fig. 14: Final Enamel Volume placed, primary and secondary anatomy placement



Fig. 15: Immediate post-operative view of corrected aesthetics. The canines look more like lateral incisors



Fig. 16: Post-operative 1:2 unretracted frontal view showing improved proportionality of teeth in the smile



Fig. 17: Post-operative view showing harmonious integration and proportions of smile

The 810nm requires carbonisation of the tip to account for its lesser absorption (10 times less than 980nm), but is an efficient “cutter”. **DA**

References

1. Tjan AHL, Miller GD (1984) Some aesthetic factors in a smile. *J Prosthet Dent* 51:24-28.
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About the author



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