

BIOESTHETICS: “B

*An Interdisciplinary Approach
to Improve Function and
Appearance*

by KENLEY HUNT, D.D.S., WITH
JOHN HAUPT, M.D.T.



Dr. Hunt, in addition to being a member of the ADA, state and local dental societies, is an Accredited Member of the American Academy of Cosmetic Dentistry. A 1970 graduate of Fairleigh Dickinson University, he has been practicing general dentistry in Southern California for over 20 years. His philosophy of “total health and well being” began in 1987 with the guidance of Dr. Robert Lee at the Lee Institute of Oral Bioesthetics and Function in Grand Terrace, CA. For more than 12 years, he has combined bioesthetics and cosmetic dentistry for the benefit of his patients. Dr. Hunt lectures on this subject to dental and plastic surgery groups.

Mr. John Haupt of Haupt Dental Laboratory in Brea, CA. is a Fellow of the American Academy of Cosmetic Dentistry. Along with Dr. Hunt, Mr. Haupt has received the same advanced training, and lectures nationally and internationally.

Dr. Hunt and Mr. Haupt are visiting professors at the Graduate School of Aesthetic Dentistry at U.C.L.A. For further information on bioesthetics, please feel free to contact them.

ioesthetics is the study or theory of the beauty of living things in their natural form and function”. — R.L. Lee¹ In dentistry, it is important not only to transform esthetic problems but also oral functional difficulties into beautiful, natural-looking smiles.^{2,3,4}

This article presents one patient through diagnosis and treatment. Applying the principles of bioesthetics, an interdisciplinary approach was undertaken which resulted in a successful functionally correct rejuvenation which was most gratifying to the patient.^{5,6}

SUBJECTIVE AND OBJECTIVE FINDINGS

The patient was a 25 year-old woman who was being treated orthodontically, and referred to this author for a restorative evaluation. She was unhappy with the appearance of her short anterior teeth. Radiographically, the tomograms, cephalometric, panorex, and full-mouth periodontal series as well as periodontal probing revealed no pathology. The incisal enamel and dentin on all of the maxillary and mandibular anterior teeth, however, were severely worn which is pathological. The patient did not have proper anterior coupling and exhibited ipsilateral and contralateral interferences (Figure 1).

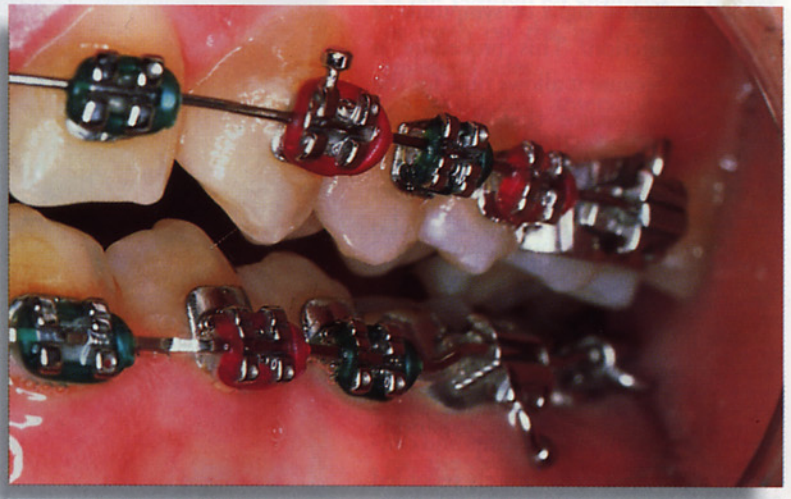


Figure 1: Note the contralateral interference on the first and second molars as well as the worn incisal edge on the lateral and cuspid.

PRELIMINARY ORTHODONTIC AND RESTORATIVE DIAGNOSIS

A preliminary centric relation record was made using a retruded anterior compound index and an anatomical face-bow registration. The casts with

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orthodontic bands were mounted in pretreatment centric relation position on a Panadent articulator. The casts were preliminary evaluated and utilized for the fabrication of a M.A.G.O. (Maxillary Anterior Guided Orthotic) splint. The patient was fitted with a M.A.G.O. splint, which she wore for two weeks with no reported discomfort (Figure 2). This TMJ stabilization/splint was worn 24 hours a day, except for brushing, until condyle position stability (centric relation) was achieved with no clinical signs or symptoms of TMJ dysfunction. This procedure is necessary because it allows time for the condyles to assume that their most superior, anterior medial position be in intimate contact with the thinnest part of the biconcavity of the disk. It also allows time for the entire TMJ complex to attain better functional health and allows posterior avoidance patterns of the occlusion to wane. The procedure ensures that the diagnostic measurements of condylar movements and centric relation will be accurately recorded and provides training in anterior-guided chewing cycles.⁷

MID-TREATMENT ORTHODONTIC AND RESTORATIVE DIAGNOSIS

After a stable centric relation position was established with the M.A.G.O., a new centric relation record was made

and the diagnostic casts were mounted. 1.0 mm Bennett analogs were used on the articulator. For the average patient, the right and left lateral movements are 1.0 mm.⁸ A protrusive interocclusal record was made to set the proper angulation of the condylar motion analogs.

One of the goals of bioesthetics is to achieve proper anterior guidance using



Figure 2: M.A.G.O. splint in the mouth shows posterior separation.



Figure 3: The posterior dentition occlusal scheme is being developed by deepening the marginal ridge and fossa while preserving the cusps.

mandibular anterior teeth necessary to achieve bioesthetic appearance and function. Upon consultation with the orthodontist, it was determined that some further posterior tooth movement would facilitate development of the posterior occlusion. This orthodontic treatment was completed over the next three months.

FINAL ORTHODONTIC AND RESTORATIVE DIAGNOSIS

Another centric relation record was made using a retruded anterior compound index and an anatomical face-bow registration. The casts were mounted in pretreatment centric relation position on a Panadent articulator before orthodontic debanding.

The patient was again fitted with a M.A.G.O. splint, which was worn for two weeks with no reported discomfort (Figure 5). The procedures were followed as above with a new centric record, models mounted and a coronaplasty completed on the mounted models. At this point it was agreed to remove the orthodontic bands and an orthodontic retainer was inserted in the mouth.

FINAL RESTORATIVE TREATMENT

Figure 3 shows the actual coronaplasty being performed in the mouth was a close replica of what was previously diagnosed on the centric relation mounted casts. Coronaplasty with the TMJ being stabilized by a M.A.G.O. splint becomes a predictable procedure.

Utilizing the bi-manual manipulation technique (Dawson)¹¹, coronaplasty was performed to establish centric relation occlusion. Protrusive and lateral excursions were not adjusted at this time because the anterior guidance had not yet been established. If

eccentric adjustment had been done at this point, using the severely worn anterior teeth would have resulted in severe loss of good posterior tooth forms (flattened) which would overload the dentognathic system over time (Figures 4 & 5).



Figure 6: The incisal edges were lengthened 2.5 mm to provide proper incisive function, lip support, and youthful smile.



Figure 7: Compare Figure 7 and Figure 5 and note how protrusive guidance totally eliminated posterior interferences and allowed for lengthening of the cuspids.

natural, unworn anterior crown forms. This anterior guidance will allow for more natural (sharp) posterior crown forms without eccentric occlusal interferences. Successful treatment for this patient would also result in a reduction of wear on the posterior teeth.

The first step in the diagnosis was to determine if the occlusion could be

treated with coronaplasty. By verifying coincident of maximum intercuspal position with centric relation position, we could insure (TMJ) harmony with intercuspal position.

The goals to be accomplished by coronaplasty were:

- 1) All teeth in the mouth to contact evenly at pressure with maximum intercuspation in stable centric relation;
- 2) All eccentric tooth contacts to the anterior teeth with the most vertical occlusion possible within the limits of anterior, genetic-like tooth forms (in this case artificial).
- 3) Preserve or recreate the best possible natural-like tooth forms for the posterior teeth.⁷

A determination was required as to whether or not the anterior teeth could be brought into contact in centric relation without radical posterior tooth reduction.⁷ This procedure was performed on the mounted casts, and, in fact, we were not able to close the anterior open bite without radical reduction of the posterior teeth. Restorative procedures would be required to restore biological occlusion (developing the anterior coupling and posterior intercuspal position in centric relation), and achieve esthetic harmony.

The next step was to evaluate the protrusive edge-to-edge position and note the amount of posterior clearance followed by an evaluation of the lateral jaw position for clearance of posterior teeth on the ipsilateral and contralateral sides.

On the cast, anterior maxillary and mandibular teeth were restored to average, unworn lengths with normal overlap (anterior guidance) in wax. Because the incisive position was not attainable utilizing the worn dentition, the chosen treatment was to restore the anterior teeth in conjunction with coronaplasty.^{9,10} Based on the favorable results of the coronaplasty on the models, the decision was made to proceed with patient treatment. The diagnostic casts wax up was later used to design laminates for the maxillary and



Figure 4: The cuspid incisal edge has worn to the distal creating ipsilateral interferences.



Figure 5: The central incisors are worn thus preventing posterior interferences on the second molar and cuspid. Note the reverse curve; the central incisors are shorter than the cuspids on the horizontal plane.

Following coronoplasty, the anterior teeth were prepared for porcelain veneers. A face-bow and a centric relation interocclusal record were made and working casts mounted. The laminates were fabricated, utilizing the foil technique, on the articulator in centric relation. Some further occlusal coronoplasty was needed on the working casts to develop the final bioes-

thetic occlusion. The mandibular central incisors are placed first followed by the maxillary central incisors. This facilitates the development of the anterior occlusion (Figure 6). Final coronoplasty was done in the mouth at the time of restoration placement. This procedure was essentially identical to the laboratory casts.

DENTAL COMPLEX

The occlusal scheme was accomplished by: A) Proper axial inclination of the anterior teeth, B) Ideal incisor vertical overlap 3 mm to 4 mm, and horizontal overlap 2 mm to 3 mm, and C) Canine overlap of 4 mm vertical and 1 mm horizontal. This bioesthetic anterior guidance in conjunction with the recorded condyle movements guide the mandibular teeth to centric relation without posterior interferences.^{9,10}

The porcelain laminates were constructed to biological esthetics. As a general guide, both the maxillary central incisors, cuspids, and the mandibular cuspids should be approximately 12 mm; in this case they were 11 mm. The mandibular central and lateral incisors should be 10 mm; in this case they were 9 mm (Figure 7). The length of the maxillary laterals were shortened in conjunction with the mandibular cuspids to guide in protrusive movement and esthetics.^{1,12} (Figure 7)

Figure 8 shows canine guidance developed by lengthening the maxillary and mandibular cuspids and canting the maxillary cuspids to the mesial.

The need for an interdisciplinary approach was exemplified in this case. Various types of porcelain wear differently — strength and esthetics does not always go hand-in-hand. There are many options available but we chose a fairly new porcelain from Ceramco called Finesse. Finesse is a low-fusion opalescent material with a significant lower abrasive index than other porcelains on the market. The challenge we had to overcome laid in the fact that Finesse has three times the amount of Leucites as standard porcelains and, therefore, cannot be etched properly to create a mechanical bond to the luting agent. We felt strongly about using a



Figure 8: Compare Figure 8 and Figure 4 and note how the posterior interferences have been eliminated by cuspid guidance while preserving the cusp heights.



Figure 9: Note the aged appearance of the worn cuspid and the maxillary central incisors canted towards the lingual.

low-abrasive porcelain and experimented with different high-fusing "coping-core" porcelains as the first layer of the veneer. Then we fused the low-fusion Finesse as the functional buildup. The strongest and most stable core material we found was the "Edge Porcelain Margin" kit. A very thin first layer of translucent porcelain, 2/10 mm, was baked onto the swaged platinum foil. The dentin and incisal were baked progressively, and finally the veneers were overlaid with the appropriate opalescent enamels.

DENTAL FACIAL COMPLEX

The width of the smile was determined as stated above using the Golden Rule, negative lateral space, and the size of the mouth.^{4,13} The posterior plane of occlusion rises toward the Frankfort Plane with the maxillary buccal cusp tips rising as we moved posteriorly. By reestablishing the original length of the anterior teeth, the esthetic appearance was facilitated. (Figures 9 & 10)



Figure 10: Note the individuality, sculpturing and youthful appearance of each central, lateral and cuspid.

The maxillary cuspid incisal line was made to parallel the horizon when the patient's head was perfectly erect.¹ The anterior esthetic line was achieved with the Panadent Bio-Esthetic Plane Level* mounted on the anatomical face-bow.

Applying the above criteria, while remaining open to the advice of the orthodontist, laboratory technician, and restorative dentist, enables the team to reach the bioesthetic goals of natural form and function.

CONCLUSION

Today, successful functional and esthetic dentistry consists of mastering a thorough understanding of natural, unworn tooth morphology, tooth position, and gingival contour, and how these relationships influence the dentofacial and facial complex.^{1,3,4 & 13} By incorporating bioesthetic principles into the teeth, smile, and face, there is a tremendous impact on the physical appearance and also the psychological well being of our patients.^{5,6,&14}

DEDICATION

It is with great respect and fondness that I began this article with a quote from Dr. Robert Lee, as I have many articles in the past. Dr. Lee, my mentor, gave me inspiration to continue my dental career with new vision—Bioesthetic Dentistry. His teachings made a tremendous impact in the treatment of my patients, and his friendship influenced my personal life as well. There has been a void since his passing November 16, 1997 that I hope to fill by writing, teaching and befriending those who continue the pursuit of Bioesthetic Dentistry. *RL*

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*(Panadent Corporation, Grand Terrace, CA)