Interdisciplinary Approach to Establishing Ideal Occlusion to Achieve Esthetic and Functional Excellence: The Restorative Orthodontic Surgical Triad in Esthetic Dentistry

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With the rapid advances in dental materials and technology, the demands and expectations for esthetic dentistry are increasingly high. As providers of dental care in our various specialties, it is our obligation to present our patients with total treatment approaches to maximize dental health and esthetics.

The team approach of surgical-orthodontic treatment of skeletal deformities in severe skeletal malocclusions is well documented in the orthodontic and surgical specialties in our literature and our national and regional meetings. It is of vital interest to our patients to integrate and coordinate treatment and not to limit the treatment to an isolated specialty. Severe skeletal and dental malocclusions are multifactorial and include consideration of facial esthetics, function, and ideal dental occlusion. In many of our routine dental malocclusions, orthodontic treatment alone may be limiting in obtaining ideal facial and esthetic dental occlusions. The initial correction of a class II maloclusion to an ideal class I occlusion does not terminate our obligation to the patient. We must inform our patients of their total dental needs, not just our limited specialty. We must evaluate the face, smile, lip line, buccal corridor of the smile, black triangles, and spacing, providing esthetic anterior tooth shape and correct mesial-distal space in agenesis cases for implants treatment. One-sided approaches to multifaceted problems often produce compromised results.

Agenesis of one or more teeth constitutes one of the most common developmental anomalies in man. Familial tooth agenesis is transmitted as an autosomal dominant, recessive, or x-linked condition. Reported incidences of agenesis vary from 1.6 to 9.6%, excluding third molars, which occur in 20% of the population. Most common missing permanent teeth are second premolars (3.4%) and maxillary lateral incisors (2.2%).

There has always been an ongoing controversy in orthodontic and restorative dentistry in the treatment of agenesis cases, especially of the lateral incisors. Restorative dentists were opposed to mesial movement of the maxillary cuspid into the lateral incisor space since it precluded the potential for developing cuspid rise and cuspid-protected occlusion because it places the cuspid in direct opposition to the mandibular lateral incisor. D'Amico, Stuart and Stallard, and Thomas advocated cuspid-protected occlusion in all dentitions. Wheeler emphasized esthetics and function of the canines by stating, "Because of their position in the arches and the length and angulation of the roots, all canines act as important underlying structures of the face, assuring sufficient prominence at the 'corners' of the mouth to bring out character, strength, and beauty."

An article justifying the mesial movement of canines into lateral incisor space by Nordquist and McNell provided many orthodontists with the rationale for space clo-
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Figure 1. Ideal occlusion displaying normal gingival architecture and topography of alveolar bone.

sure. They stated that no difference existed in adequacy of occlusal function between group function and cuspid rise and no relation with periodontal status existed between the two groups. They also stated that treatment should be designed to eliminate prostheses that contributed to elevation of plaque and irritation. Orthodontic proponents such as Carlson, Strang and Thompson, Tuverson, McNeill and Joondeph, and Zachrisson were advocates of mesial movement of canines into lateral incisor position.

From an esthetic viewpoint, in observing the natural anatomy of the maxillary lateral incisor and the maxillary canine, the marked prominence of the canine roots at the corner of the mouth is quite obvious. The natural topography of labial root prominence of the central incisor, the labial concavity of the lateral incisor root, and the labial prominence of the canine root are normal findings. The next natural observation is the gingival scalloping height contours of the natural dentition. The gingival tissue is higher on the central incisors (cervico incisal length of crown 10.5), drops down on the lateral incisors (cervico incisal length of crown 9.0), is higher again for the canines (cervico incisal length of crown 10.0 mm), and drops down on the first premolar (cervico incisal length of crown 8.5 mm). These heights of contour are critical in the esthetic smile of our patients (Fig. 1).

Placing the dentition into ideal occlusion in agenesis cases, especially with lateral incisors, is critical in obtaining an ideal esthetic result. Obviously, in many of these cases, the canines erupt into the lateral incisor position; thus, extensive distalization of the buccal dentition to create the mesial distal space to create an esthetic lateral incisor position is required. The second molars must be distalized into a class I position; the first molars, the second premolars, the first premolars, and, finally, the maxillary canines must be distalized into a class I occlusion to provide the mesial distal space to achieve ideal restorative dentistry. Obviously, it is much easier to move the canines mesially, but esthetic results are compromised.

When examining esthetic requirements, the clinician should be aware of the morphology of the interdental papilla, the scallop of the gingival contours, the location of the proximal contacts, assess tooth morphology, and finally, tooth size problems. It is important to be aware of worn incisal edges and line up the gingival tissues, not the incisal edges. Elimination of triangulation problems in the adult patient may be caused by divergent root angulations or tooth shape and incisal contact problems. The decision to reshape or add tooth structure should be evaluated with the width to length ratios of the Golden proportions;[6,7] with a ratio of over 60%, contacts may be contoured, if less, then additional tooth structure should be added to maintain esthetic proportionality. The length for the central incisors should be divided into the width to obtain the proper percentage, with the ideal width being 75 to 80% of the length. The longer teeth in this range appear more feminine, and the shorter teeth in this range appear more masculine.

Awareness of the smile line and lip shape must be evaluated. Does the patient show all of his or her gingival and tooth structure with a curved up lip shape, half of the crown or incisal edge with a straight lip shape, or show no tooth structure when smiling with a reverse lip shape? Obviously, the approach to treatment will be different for these different types. Does the patient have a normal lip length, excessive lip length, or short lip length? The position of the lip attachment at the nasal-labial junction has a profound effect on the esthetics of the profile. We must all have an understanding of facial proportions and facial esthetics to provide our patients with a comprehensive treatment plan. We must all look at the harmony and balance of the face.

The common, one-sided orthodontic approach of moving canines mesial to eliminate restorative procedures may be comparable to the restorative dentist who eliminates crowding with abnormal size restorations. Adult patients presenting with malocclusions and anterior crowding who request esthetic solutions without proper orthodontic treatment will have compromised results.

The avoidance of establishing a stable occlusion, proper alignment, and proper axial inclination of the teeth leads to compromised esthetic and periodontal results. For example, adding labial lingual thickness to laminates or crowns to eliminate anterior crowding is only an illusion to esthetics and periodontal health and proper gingival architecture.

Case 1
A female patient presented with a class II, division I malocclusion with a 90% overbite, a severe mid-line discrepancy, and mandibular crowding. The patient presented with a crossbite of the maxillary right canine, peg-shaped maxillary right lateral incisor, and agenesis of the maxillary
left lateral incisor. The maxillary arch was v-shaped and the anterior gingival contours were distorted.

The treatment consisted of the distalization of the maxillary left buccal segments. The second molars were distalized into a class I position: the first molars, second premolars, first premolars, and, finally, the maxillary left canine were brought into their ideal position in the dental arch. Proper mesial distal space was created for the future placement of a Branemark implant in the ideal position in the dental arch.

The right buccal dentition was also distalized into a class I occlusion; the maxillary right canine was moved out of crossbite and positioned ideally into the dental arch. This movement created the ideal mesial-distal space to restore the maxillary right lateral incisor with composite resin to its ideal mesial-distal dimension. The maxillary midline was corrected and bite opening was achieved (Fig. 2).

The patient was presented with a maxillary Hawley appliance with a pontic for the missing left lateral incisor. The right lateral incisor was restored with composite resin material. The implant was placed for the left lateral incisor and during the healing and osseous integration the Hawley appliance was worn. Figure 2D shows the final restorations, occlusion, and gingival architecture.

Case 2
A female patient presented with a class II, division II malocclusion with 100% overbite, severe midline discrepancy, and mandibular crowding. The patient presented with an ectopic right canine in the palate. Her original dentist had performed cosmetic dentistry by bonding her four incisors and added an additional cusp to the palatal right canine to bring it out from crossbite (Fig. 3B).

Before the start of orthodontic treatment, the composite material was removed from all incisors and the right canine. Edgewise orthodontic brackets were bonded to the natural tooth structure. The maxillary dentition of the right and left buccal segments were distalized into a class I occlusion. The roots of the maxillary central incisors were torqued lingually into medullary bone to achieve proper axial inclinations. The central incisors were intruded and bite opening was achieved. The midline discrepancies were corrected.

Figure 2. A, Frontal view of female patient displaying deep bite, mid-line discrepancy, missing left lateral incisor, peg-shaped right lateral, and crossbite of left canine. Note the abnormal gingival architecture. B, Left buccal view displaying agenesis of left lateral incisor and mesially positioned canine. C, Left buccal view displaying ideal canine position and final restoration of lateral incisor implant. D, Front view displaying normal overbite, correct midlines, normal gingival architecture, composite bonded peg-shaped right lateral incisor, and left lateral implant restoration.
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Figure 3. A, Frontal view of female patient displaying 100% overbite, composite bonding of four incisors, and right canine. Note the abnormal gingival architecture. B, Buccal view of the class II, division II malocclusion, the上班 teeth central incisors, and the ectopic palatal canine, which has a composite bonded extra cusp. C, Frontal view after orthodontics and bonded porcelain veneers. Note the normal gingival architecture.

An ideal class I occlusion was achieved. After a period of retention, the patient returned to the referring dentist and bonded porcelain veneers were placed. Note the gingival architecture at the start of treatment and the final results after orthodontic and restorative procedures.

In conclusion, we must have a basic understanding of facial proportions and facial esthetics to provide our patients with a comprehensive treatment plan. We must have an understanding of harmony and balance of the face.

References