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THE EDITOR'S CORNER

Adventures in the Occlusal Plane

One of the most difficult cases I have ever tackled involved a finicky middle-age woman with a unilateral buccal crossbite. Other than the Brodie bite on her left side, almost everything else about her occlusion and facial appearance were within acceptable limits. Her upper centrals were a bit upright, giving her smile a division 2 appearance; nevertheless, the buccal interdigitation on her unaffected side was good, and her overall esthetics were, at least to my eye, attractive. The patient was relatively pleased with her appearance, but her general dentist had worried her about the buccal crossbite. Even though the crossbite had not yet caused any pathosis, the dentist was concerned that the compromised mastication on the affected side might eventually lead to temporomandibular dysfunction.

My treatment options were limited. The patient absolutely refused to consider surgery. Since the frontal radiograph indicated that the buccal crossbite was caused by buccolingual tipping of the dentition rather than an underlying skeletal asymmetry, I felt that a non-surgical approach was feasible. In the end, however, that course of treatment would try every ounce of my doctorly patience and strain our doctor/patient relationship to near the breaking point. Had we simply aligned the teeth and then proceeded to surgery, the entire treatment would have taken 20-24 months. While the case did finish out rather nicely, if I do say so myself, I am almost embarrassed to report that the total treatment time was actually more than four and a half years.

Treatment was certainly prolonged by the patient's inability to accept virtually any means of disclusion that would have allowed me to jump the bite buccally, but we finally got the crossbite straightened out in about 28 months. The next stage proved still more problematic. Even with proper interdigitation, the canted occlusal plane was extraordinarily difficult to correct without overeruption of the unaffected side, which would have opened the bite. In surgical-orthodontic treatment, the buccolingual tipping and vertical repositioning could

have been handled in one fell swoop, but without the surgical option, I had to rely on an ever-changing combination of bite blocks for intrusion on the Brodie side and up-and-down elastics on the contralateral side. Today, with the availability of miniscrews that are relatively comfortable and cannot be seen in conversation, I probably could have convinced the patient to give them a try. But this case occurred before the era of skeletal anchorage.

Management of the occlusal plane is part and parcel of any orthodontic graduate training program, and the ability to control this plane is one of the hallmarks of the conscientious specialist. According to Vaden, Dale, and Klontz, "The occlusal plane angle expresses a dentoskeletal relationship of the occlusal plane to the Frankfort horizontal plane. . . . In most orthodontic corrections the original value should be maintained or decreased. An increase in the occlusal plane angle during treatment indicates a loss of control."[1] Actually, I never *lost* control of the case mentioned above; it just took me an inordinately long time to gain control in the first place. In this patient, as in many others, the occlusal plane was clearly the factor that would determine my success or failure. That conclusion is substantiated by an extensive analysis of successful and unsuccessful cases conducted by the late Jim Gramling of Jonesboro, Arkansas.[2] The "probability index" devised by Gramling to predict treatment success included elements such as FMA, ANB, FMIA, SNB, and, of course, the occlusal plane.

In our treatment planning, we generally visualize the occlusal plane from the side, as in a lateral cephalogram. While the sagittal occlusal plane angle is undoubtedly an essential measurement of treatment progress, it is just as important to control the occlusal plane in the transverse dimension. Causes of a canted occlusal plane can range from major developmental or growth disturbances, such as those seen in hemifacial microsomia, to lesser problems, such as ankylosed deciduous teeth. In my patient, some developmental disruption had resulted in buccal tipping of the upper left posterior teeth and lingual tipping of the opposing lower teeth. Inevitably, the premolars and molars on that side supraerupted in both arches, producing the Brodie bite and subsequent cant of the occlusal plane.

It can be even more difficult to control a canted occlusal plane in the anterior segments than to control it posteriorly. A cant of the anterior dentition, or the "incisal plane" as described by Drs. DeLuke, Uribe, and Nanda in this issue of JCO, is every bit as detrimental to the overall occlusion as a posterior cant is—and far more obvious to the patient looking in the mirror. In such a case, orthognathic surgery may have a dubious prognosis, and it will be more difficult to employ the combinations of bite blocks and up-and-down elastics that finally allowed me to achieve success with my patient. Although skeletal anchorage can be an effective option, there are other ways of achieving appropriate control of the incisal plane.

Drs. DeLuke, Uribe, and Nanda present a unique approach, utilizing segmental mechanics and an off-center, cantilevered force system to establish a rotational moment around a center of rotation in the frontal plane, between the roots of the central incisors. These vectors produce a differential intrusion and extrusion of the incisor segment, which is shown to correct a canted incisal plane in two similar cases. Given the incredible array of techniques available to us nowadays, I am always impressed when a new variation on an old theme produces such remarkable results. In a time when surgery or miniscrews can make virtually any malocclusion correctable, it is refreshing to see that an understanding and application of the fundamental principles of orthodontic biomechanics can still make a tremendous difference. RGK

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