Conservative dentistry achieved through a multi-disciplinary approach

Combining orthodontics and CAD/CAM technology to achieve conservatism for a rehabilitation case

By Dr. Thomas Colina, DMD

C omplex treatment needs can necessitate oral rehabilitation of patients. Often these patients will require a multi-disciplinary approach to correct problems. When patients have significant concerns, such as severe malocclusions or destruction of dental tissue, oral rehabilitation can entail extensive treatment that may involve reconstructions.

To return the patient to optimal function, regain normal form and address possible concerns such as esthetics, an integrated approach that involves various disciplines needs to be taken. The challenge posed to a particular treatment plan may involve the treatment of many teeth and possibly the need to prepare a significant number of teeth and corresponding dental tissue. Another challenge in reconstruction cases is the cost associated with the restoration of numerous teeth. Cost may be a factor for patients. There are often many options and approaches that can lead to the same successful treatment outcome. The variety of options can be at different ends of the spectrum. Diagnostic tools, including tomograms and the use of CAD/CAM systems, are useful in achieving complex treatment goals. This paper presents a treatment option that is an alternative to the reconstruction approach through the innovative application of multiple disciplines and current technology.

Case presentation

A 31-year-old male patient presented with the chief complaint of his upper front teeth restorations breaking off a few months after being placed. He has had the front teeth restored numerous times with the same outcome. A comprehensive examination and records revealed the following findings.

Medical history and functional concerns

There is a history of arthritis in the family. The patient experiences transient pain from his back, neck and shoulders. He has noted he clenches and grinds his teeth day and night. He was involved in a motor vehicle accident and sustained head trauma 12 years before his presentation to our office. Along with routine examination protocols, the temporomandibular joint (TMJ) was examined using a TMJ health questionnaire, range of motion examination, muscle palpation and TMJ imaging. TMJ findings and symptoms were: normal maximum opening to 33 mm; no limitation in excursion; at opening, there is a 2 mm deviation to the left. There is a posterior slide from centric relation to maximum intercuspation. The patient noted cracking noises from the TMJ at opening and closing, and there has been occasional locking of the TMJ through the years. He has slight hearing loss and tinnitus.

As a routine for patients exhibiting TMJ dysfunction, a TMJ tomogram series was taken. Tomographic series was achieved by use of a CranexTome (Soredex, Tuusula, Finland). The CranexTome has a unique spiral tomography for cross-sectional images. Interpretation of hard tissue imaging study would include the evaluation of condylar and temporal component morphology and integrity of the bony articular surfaces. The TMJ is assessed for signs of remodeling, degenerative joint disease or morphological variations affecting the TMJ, jaw and skull.

Condylar position in maximum intercuspation is evaluated. The diagnostic tools are used not only for initial assessment to attain a working and definitive diagnosis, but during and after treatment to assess attainment of the treatment objectives. The corrected lateral TMJ view taken at maximum intercuspation reveals a posteriorly displaced condyle and morphological bending of the condyles (Fig. 1). The joint vibration analysis (JVA Bioresearch International, Milwaukee, Wis.) is used to assess TMJ health for patients and yielded normal vibrations of the TMJ.

Skeletal pattern

Based on a cephalometric analysis, the patient presented with a Class I skeletal pattern with a slight retrognathic mandible.

Occlusion

A visual examination and cast analysis revealed a Class II dental pattern with a deep overbite and tight overjet, fractured upper incisor restorations, slight crowding of the upper and lower arches, and severe worn dentition (especially the anterior teeth). The upper incisors were retroclined, and the upper and lower incisors had severe wear (Fig. 2).

There was generalized moderate wear on the posterior teeth. The patient presented with a posterior shift of 2 mm from centric relation to maximum intercuspation.

Treatment options

The following treatment options were presented to the patient:

• Reconstruction of the arches to achieve an ideal occlusion. This first option would entail splint therapy and eventual reconstruction to achieve a stabilized occlusion. This approach will provide a stable occlusion and would entail restoration of numerous teeth — both anterior and posterior — to support the anticipated changes in vertical dimension.

• Orthodontic treatment to achieve the best possible occlusion and orthodontic alignment. This approach provides for the patient an option to conserve dental structure, minimize the need for maintenance of the restorations and allow cost for the treatment to be more manageable. The disadvantage is the time required to achieve orthodontic and orthodontic correction.

Treatment plan details

Straight wire appliance treatment (SWA) was proposed to attain ideal inter- and intra-arch alignment augmented by a mandibular repositioning mechanics by way of posterior build-ups and elastics or a fixed orthotic or use of a Twin Force Appliance. This phase of treatment was anticipated to last 20 months. After the orthodontic treatment, restoration of the six anterior or maxillary teeth with porcelain restorations would follow. The lower incisors will be evaluated for the need of restorations. The need for an upper brassing appliance would also be evaluated after the completion of the restorations.

Discussion of the treatment

The first phase of the treatment was the provision of orthodontic therapy using GAC Innovation C Self Ligating Bracket System. The Innovation C bracket system has a highly translucent porcelain structure and a rhodium coated clip, which provide superb esthetics as well as a high-torque component for the incisors of 17 degrees for the upper central and 10 degrees for the upper lateral incisors. One of the main goals for the treatment was the correction of the maxillary incisor torque. The retroclined upper incisors had contributed significantly to the severe wear of the anterior teeth and had resulted in an intercuspal position that produced a posteriorly displaced condyle. The correction of the incisor torque brought about a natural repositioning of the mandible, which was a treatment goal for the patient. The JVA, which has been proven effective in discriminating joint vibrations to assess TMJ2 conditions, was utilized to evaluate the TMJ during and after treatment. Anterior repositioning of the mandible has been described in the literature as a viable approach in the treatment of Class II malocclusions and TMJ dysfunction.
Woodside) and McNamara describe a functional approach to the correction of the Class II malocclusion. Anterior repositioning therapy has had a history of more than 50 years. Gelb5 referred to his repositioning appliance in 1979 and described the Gelb 4/7 position, which is currently accepted in the literature and recognized by many practitioners treating TMJ dysfunction to correlate with the physiologic position of the condyle in the fossa (Fig. 3). Several functional appliance designs and their efficacy of improving TMJ dysfunction through mandibular repositioning have been described in later literature.6 Sim- mons9 further describes the alleviation of symptoms after mandibular repositioning. As noted, there was a natural anterior repositioning of the mandible upon removal of the centric interference in this patient, and appliance therapy was unnecessary. Posterior resin build-ups with Class II elastic forces were adequate to provide an occlusion with anterior guidance and delivery of restorations. The system uses a laser capture to acquire a digital impres- sion. The information is condensed, aided by computer, to an intuitive format that allows the restorative dentist to modify the design and send the design to a precise au- tomated milling unit that uses robotic tech- nology. The system essentially automates many of the more mechanical and labor in- tensive procedures, such as waxing, invest- ment, burnout, casting, and/or pressing in- volved in conventional fabrication of den- tal restorations.6

Lithium disilicate (IPS e.max) has the su- perior flexural strength of 360 MPa to 400 MPa, as compared to the strength of ceramic for PFM crowns, which has the strength of 80 MPa to 100 MPa; veneered zirconia, which has a flexural strength of 100 MPa; and leucite glass, which has the strength of approximately 150 MPa to 160 MPa. Lithium disilicate is a highly esthetic, high-strength material that can be conventionally cemented or adhe-

Summary
Reconstructive treatment usually entails significant correction of malocclusion and the maxillomandibular relationship. Many patients requiring reconstruction commonly present with varying functional con- cerns, including TMJ dysfunction and asso-


References
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Fig. 4 Debracket photos.

Fig. 5 Veneer post insert photos.

Fig. 6 Veneer post insert photos.

Fig. 7 E4D veneer design for teeth #42, #41, #41, and #12. Conservative design achieved, made possible with post-orthodontic idealized occlusion. Fig. 8. Reflective frontal closure.