Accreditation Clinical Case Report, Case Type #1: Six or More Indirect Restorations

INTRODUCTION

The development of IPS d.Sign porcelain by Ivoclar Vivadent (Amherst, NY) has added another restorative material that enables the cosmetic/restorative dentist to achieve excellent esthetic results with minimal tooth reduction. The fluorapatite-leucite glass ceramic used with this feldspathic technique provides a highly esthetic and durable restoration that is well-matched for younger patients. Combined with current dental adhesive technology, lost occlusal function and oral esthetics can be restored and the patient's smile returned to its natural beauty.

Evaluation of the gingival architecture indicated that only slight supraeruption of the maxillary central incisors had accompanied the wear of the teeth.

HISTORY

The patient was a healthy, active college student whose mother was a former dental hygienist. The patient's dental history included full-mouth orthodontics from age 13 to age 15 and regular six-month preventive maintenance under the care of her pediatric dentist. There were no dental restorations present. She presented for her initial visit with severely worn upper anterior teeth; this finding was a surprise to the patient and her mother (Fig 1).

Upon conferring with the orthodontist who had completed her care, we discovered that the patient's second molar teeth had not been bracketed during treatment. The orthodontist related that the second molar teeth had not erupted adequately to affix either a band or a bracket. Consequently, the second molar teeth were allowed to erupt into position without orthodontic guidance. I referred the patient to a periodontist, Dr. J. Daulton Keith of Charleston, South Carolina, who is also an expert on occlusal disorders, for evaluation of her occlusion. Dr. Keith concurred that the patient had significant occlusal interferences in the second molar areas, both right and left.

RESULTS OF CLINICAL EXAMINATION

A healthy periodontium was present. Examination of the occlusion revealed that the patient was positioning her mandible 2 mm forward from the hinge axis position with occlusal interferences on the second molar teeth. At maximum intercuspal position she exhibited Class I occlusion right and left, as well
Figure 1: The restoration of the patient’s severely worn maxillary anterior teeth to their proper length and width made her look more attractive and mature.

Figure 2: The incisal edge position of the anterior segment was too apical, leading to a flat incisal plane. The final restorations were shaped and contoured to accurately follow the patient’s smile line.

as a normal curve of Spee and Wilson, with the exception of rotated second molar teeth.

Evaluation of the gingival architecture indicated that only slight supraperuption of the maxillary central incisors had accompanied the wear of the teeth. Using the cusp tips of the buccal corridor teeth and extrapolating forward left the impression that the incisal edge position of the anterior segment was significantly too apical, leading to a flat incisal plane (Fig 2).

As the gingival architecture was basically correct, additional tooth length would be acquired by lengthening the incisal edges of the maxillary anterior teeth.

Observation of her speech pattern revealed that she did not move significantly forward when enunciating “S” sounds. I therefore believed that we could successfully lengthen the teeth without encroaching upon speech function.

The widths of her central incisors were found to be 8.2 mm each, and the heights were 7.9 mm. The basic color of her teeth was A-1, with yellow and white mottling.

Diagnosis and Treatment Plan

Due to bruxing, the severe wear on the anterior teeth and the second molar interferences resulted in occlusal dysfunction. The wear and mottled enamel resulted in an esthetically displeasing smile. We therefore embarked on a course to
correct both the esthetic and functional problems.

The anterior dentition violated esthetic principals in the following ways. The maxillary anterior teeth appeared to be too short. The central incisors failed to dominate because the central incisors were too short and the lateral incisors were relatively too wide. The axial inclination of the laterals, cuspids, and first premolars was reversed (distally inclined).4 Finally, the general appearance of the teeth was heavily mottled, which was displeasing to the patient and her mother.

Central incisor dominance would be achieved by increasing their length. Decreasing the width of the lateral incisors would also enhance central incisor dominance and more closely approximate a golden proportion relationship. Additionally, narrowing the laterals would help to relieve the axial inclination dilemma. Continuing the veneer process into the first premolar area would eliminate the mottled appearance of the most visible teeth and aid in the development of anterior and posterior harmony (Fig 3).5

In our diagnostic wax-up we decided to add 2.5 mm of length to the centrals, which created a 78% width-to-height ratio (Fig 4). We then added 2.0 mm of length to the laterals and 1.0 mm to the cuspids. We were further able to achieve a well-balanced esthetic proportion by reducing the width of the laterals and increasing the width of the cuspids.

The goals of the treatment plan were to restore anterior guidance, eliminate all occlusal interferences to centric relation (CR), and create a pleasing esthetic result. We chose to utilize eight maxillary anterior por-
celain veneers with internal characterizations restoring esthetic appearance and function (Fig 5).

As the gingival architecture was basically correct, additional tooth length would be acquired by lengthening the incisal edges of the maxillary anterior teeth. Occlusal equilibration to eliminate all interferences to CR would be completed by Dr. Keith prior to initiation of the restorative procedures. A maxillary flat-plane occlusal appliance was to be fitted and worn nightly following the insertion of the final restorations.

**Armamentarium**
- Pumice and 2% chlorhexidine slurry
- Morley anterior prep and contouring kit (Brasseler; Savannah, GA)
- ET diamond kit (Brasseler)
- Brasseler diamond burs 6844-014, 6844-016, 6850-018, 6850-014
- Impregum impression material (3M ESPE; Seefeld, Germany)
- Luxatemp temporary material shade A-1 (DMG Hamburg; Hamburg, Germany)
- Tubilcrid red (Global Dental; North Bellmore, NY)
- Optibond (Kerr Corp.; Orange, CA)
- Insure cement and try-in pastes (Cosmedent; Chicago, IL)
- Ultraetch 35% (Ultradent; South Jordan, UT)
- Optilux 400 curing light (Demetron; Orange, CA)
- FlexiStrips and FlexiDiscs (Cosmedent)
- Bard Parker #12 scalpel (Becton-Dickinson; Hancock, NY)
- Porcelize Diamond polish (Cosmedent)
- Pic-N-Stic (Pulpdent; Watertown, MA)
- Dialite porcelain polishers (Brasseler)
- Monobond-s silane coupler (Ivoclar-Vivadent; Liechtenstein, Germany)
- Deox (Ultradent)
- Consepsis (Ultradent)
- Vita B-1 (Vitapan; Bad Säckingen, Germany)
- H6-7 scaler (Miltex; York, PA)
- Glide floss (Gore; Flagstaff, AZ)

*It was decided to use the cut-back technique with internal characterizations and subtle incisal translucency for all the restorations.*

**Preparation**
The teeth were anesthetized and tooth preparation was initiated using a 6850-018 diamond bur (Brasseler). Three depth cuts (0.8 mm) were made by embedding the bur tip to one-half of its diameter, beginning in the gingival margin area and continuing to the incisal edge. The preparation was then uniformly reduced to the base of the depth cuts, providing for a 0.8-mm reduction. The middle and incisal thirds were then further reduced approximately 0.2 mm to a depth of 1 mm. Additional preparation refinement was accomplished in the incisal third by
beveling to a depth of 1.2 mm, allowing the technician freedom for incisal effects and characterizations. I then extended the preparation into the interproximal areas using a 6850-014 diamond bur (Brasseler). The contact was broken slightly. The gingival-proximal area extended lingually at the crest of the papilla to provide adequate porcelain to eliminate black triangles. Chamfered margins were prepped to the tissue height and an Impregum impression was taken, blowing the impression material into the sulcus.

The teeth were scrubbed with Consepis and dried. A Luxatemp provisional, shade A-1, was fabricated by taking an impression of the diagnostic wax-up, filling the impression with Luxatemp and placing the impression in the mouth. Excess material was removed and the temporary trimmed for hygiene access. The temporary was then refined to accommodate for speech and function. Finally, it was shaped and contoured to accurately follow the patient’s smile line (the superior border of her lower lip), creating a pleasing result within the context of her overall facial appearance.

**LABORATORY INSTRUCTIONS**

The laboratory was instructed to shade the middle and incisal thirds of the central and lateral incisors using Vita B-1 (Vitapan) and fade to B-1.5 at the gingival. The cuspid and premolar teeth were to be Vita B-1.5 fading to B-1.75 at the gingival. It was decided to use the cut-back technique with internal characterizations and subtle incisal translucency for all the restorations (Figs 6 & 7). Surface texture, length, width, and basic form were communicated via stone models of the refined temporary. Our laboratory technician was able to be present at the preparation appointment to assist in shade selection.

**INSERTION**

The restorations were carefully inspected. After anesthesia, the temporary was removed and the restorations were checked for fit and accuracy. Using Insure try-in pastes, the yellow-red light shade was selected. Each veneer was individually placed to assess marginal fit. The veneers were then placed on the teeth two at a time to check the strength of the proximal contact. The contacts were adjusted to proper intensity to ensure the complete seating of the restoration during the cementation process. The restorations were rinsed of the try-in paste and the bonding surfaces were then acidified with Ultraetch to enhance the silane application. After rinsing, the restorations were dried and a layer of Monobond-S was applied to the bonding surfaces. The restorations were dried again and a layer of Optibond 2FL adhesive was placed. The restorations were then loaded with Insure luting resin and protected from light.

The teeth were isolated segmentally with a rubber dam and the preparations scrubbed with Consepis and then rinsed. The preparations were then etched with Ultraetch for 15 seconds and rinsed with water. Maintaining a moistened surface, Optibond primer was applied to each tooth for 20 seconds and lightly dried for 20 seconds. Optibond 2FL adhesive was applied to the preparations.

The centrals were seated first, excess resin removed and checked for seat. The central incisor restorations were tacked to place using a 4 mm tip on the curing light. The remaining restorations were then placed in two steps, the right side first, then the left, using the same cementation technique. To avoid an oxygen-inhibited layer, Devex gel was then applied at all the veneer margins and a 40-second cure to the facial and a 40-second cure to the lingual surfaces was completed using a 12 mm tip on the curing light.

Excess cement was carefully removed using a Bard-Parker #12 scalpel, an H6-7 hand-scaper, and 12 fluted carbide finishing burs. The occlusion was adjusted using articulating paper and finishing diamonds. The adjusted porcelain surfaces were polished using the Brasseler Dialite Polishing Kit. The patient was then fitted with a maxillary flat-plane occlusal appliance for nighttime wear.

**SUMMARY AND CONCLUSIONS**

We were able to restore proper length to the patient’s anterior teeth with porcelain veneer restorations solving her esthetic and functional dilemma. We implemented nighttime use of a flat-plane bite appliance to preserve and protect her teeth and restorations.

It is interesting to note that neither the patient nor her mother had realized that her front teeth were so severely worn until we examined them with the intraoral video camera. The return of proper length to her front teeth made the patient look significantly more mature. Her new smile greatly increased her self-confidence and had a positive im-
Figure 6: Increasing the length of the central incisors and narrowing the laterals enhanced central dominance to a closer golden proportion relationship.

Figure 7: The internal characterizations and subtle shading and translucency of the final restorations contrast vividly with the mottling in evidence before treatment.

References
Lab Technician’s Comments for John F. Rink, Jr., D.D.S.

COMMUNICATION

Communication is the key to success in all large esthetic cases. The following steps in this case were performed with greater accuracy due to the early establishment of clear communication channels that provided the lab with all the pertinent information, resulting in a successful result for the lab, doctor, and most importantly, the patient.

The lab was supplied with pretreatment casts, the diagnostic wax-up, stone casts of the provisionals, facebow, bite registration, bite-stick for alignment and mid-line position, and a series of photographs.

The provisional cast was mounted and used to create incisal edge matrix to aid in final incisal edge positioning.

FABRICATION

The restorations were fabricated using d.SIGN porcelain on refractory dies. A variety of powders were used to create a depth of color at the gingival and to create a smooth transition to the incisal and subtle interior characterization. This was achieved with three progressive layered firings to achieve the desired effect. Final contouring was done to meet the presented parameters and surface texture matching the surrounding dentition. After glaze, the units were devested and seated to a master stone solid model to verify contacts and ensure gingival relationships.

A final polishing with rubber wheels, pumice, and diamond paste created the final surface texture.

MATERIAL SELECTION

The use of d.SIGN for these restorations allowed for less overall tooth reduction on a relatively young patient, as well as the ability to achieve a higher level of internal characterization with a minimal thickness. Also, with the lengthening and restoration of cuspid guidance required, d.SIGN provided a less abrasive surface for the opposing teeth.