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Introduction

This article’s readership focus is lab technicians, my colleagues. I often get questions about cases involving 28 teeth because they are complicated and involved. Technicians know in principle how to construct a full mouth case. But they will often question their knowledge because that type of case does not come around very often and technicians are full of doubt about how to fulfill the assignment.

I will focus on the lab side of procedures for a case of this magnitude, creating a blueprint which we can all hopefully follow in order to create simple, predictable understanding of occlusion.

Case Study

Post-operatively, the final lab porcelain work, with a protrusion view (Fig. 1) is shown. This design is attractive and artistically pleasing because the anterior teeth - the centrals, laterals and canines have an individual look with proper incisal silhouette and good angulation. It also measures the three dimensional appearance and properly sized teeth, all the way from the gingival to the incisal, mesial and distal.

This is an architectural concept, a building from the ground up. The author’s first step was to record case measurement, which was 11 mm in size, after both the incisal and vertical dimensions were taken into consideration. This meant that the size of the centrals was decided with canine rise considered on the lateral incisal length. After finishing with the restorations, he double-checked the protrusion, canine rise and lateral excursion.

A mirrored image of the restorations for teeth numbers 22-27 allowed the author to see the amount of translucency (Fig. 2) he had previously applied. The color harmony of the maxillary anterior teeth is again shown in this mirrored image (Fig. 3). The models were checked on the semi-adjustable articulator with a facebow (Fig. 4). Pre-op models indicate the incisal length and size of the teeth (Fig. 5) before preparation. The author then checked the original cast on the
model (Fig. 6). The finished restorations were tried on the model (Fig. 7) and the side protrusion view demonstrated a three dimensional aspect of the harmony of color. The characteristic of the facial shape is not flat and there are no sharp corners to be seen (Fig. 9). The lingual anatomy can be distinguished in this mirrored view (Fig. 10).

In order to create precise copings, a full mouth wax-up was first blueprinted based on the patient's impressions (Fig. 11). This step cannot be overestimated in terms of predictability for the technician as he works on his final crowns. Technicians often don't want to follow this step, but without it, we cannot be completely confident about the final outcome of the case.

The author's cutback technique was engaged for teeth numbers 7, 9 and 11 because the wax-up offered a blueprint to decide on proper contouring (Fig. 12). The author could press, build up the porcelain and know the exact size of the
Fig. 11: Full mouth wax-up
Fig. 12: Cut back technique on teeth numbers 7, 9, and 11
Fig. 13: Maxillary quadrant view
Fig. 14: After cutting back, facial aspect of maxillary
Fig. 15: Occlusal maxillary view after cut-back
Fig. 16: Mandibular full contour view
Fig. 17: Mandibular quadrant view
Fig. 18: Side view cut back technique
restorations by using this as his guide. The maxillary quadrant view demonstrates his cutback technique (Fig. 13) for pre-molar and molar contour. By comparing adjacent teeth, he was able to bring about proper marginal ridge and cusp frame design when he formulated his final restorations.

After cutting back, the illustrated maxillary facial view is clear (Fig. 14) with the occlusal view to follow (Fig. 15). Proper design for the mandibular full contour demonstration (Fig. 16) and the left side mandibular (Fig. 17) follow each other. Side view cutback techniques (Fig. 18) are next. A normal sprue/press technique was conducted using GC MultiVest (Fig. 19). After the sprue/press, approximately ten GC PC ingots were utilized for pressing the twenty-eight teeth (Fig. 20). The GC PC ingots and copings (Fig. 21) were checked, then cut and placed on the model (Fig. 22). A mirrored image of the lingual mandibular copings demonstrates the frame contour (Fig. 23).
GC Initial Low Fusing porcelain is the product of choice for the author (Fig. 24). He started the build-up of the lower anterior teeth with dentin base A1 and CLF (Fig. 25). Firing at 770°C (Fig. 26) left the copings with a bumpy appearance. The upper and lower maxillary copings in the bisque bake stage were checked during the build-up (Fig. 27). Next, an occlusion view of the mandibular, prepared for the incisal table (Fig. 28) with markings. For facial surface texture preparation, the author drew lines on the model (Fig. 29). The pre-op model demonstrates the patient’s irregular teeth (Fig. 30). The finished mandibular restorations were tried on the model (Fig. 31). Build-up of the dentin was begun with A1 base and CLF (Fig. 32). The copings were cut on the model (Fig. 33). After firing, the lingual morphology was created with lines drawn for grinding (Fig. 34). The author was then able to create texture, lobe and interproximal contact (Fig. 35). After glazing, the crowns were placed on the model (Fig. 36).

The right mandibular quadrant was tried on the model, bisque bake stage (Fig. 37). Pre-operatively, a look at the previous shape (Fig. 38) proves that it was both under and over-contoured. Dentin build-up color was A1 (Figs. 39, 40 and 41). Clear Florescence and
Fig. 31: Finished mandibular restorations
Fig. 32: Build-up was begun using dentin and CLF
Fig. 33: The copings were cut
Fig. 34: Lingual morphology was created with lines drawn for grinding
Fig. 35: Texture, lobe and interproximal contacts were created
Fig. 36: After glazing
Fig. 37: Right mandibular quadrant
Fig. 38: Pre-op, previous shape contour
Figs. 39, 40, 41: A1 Dentin build-up
enamel color were built up using a brush technique to create tooth morphology (first tooth in the quadrant (Fig. 42), second tooth in the quadrant, (Fig. 43), third tooth in the quadrant and fourth tooth in the quadrant, (Fig. 44). Figures 45 and 46 demonstrate the same level of build-up all the way across the teeth in order to create a perfect Curve of Spee on the buccal area. After the bisque bake stage, the Curve of Wilson was created (Fig. 47).

The marginal ridge and cusp contacts were drawn and checked on the model (Fig. 48). Interproximal contact was checked on the finished restorations with the same cusp height and Curve of Wilson (Fig. 49). The mandibular left side occlusion view (Fig. 50) and pre-op model (Fig. 51) proves again that the patient’s teeth were over and under contoured, with the same steps followed as in the above figures for the right mandibular quadrant (Figs. 52-56). The exact duplication of the right side occlusion is obvious (Figs. 57, 58) through the author’s markings. The maxillary left side Renfert die
spacer (Fig. 59) on top of the gold model allows for a better model diagnosis. The quadrant copings were placed on the model (Fig. 60). A layering of dentin was applied (Fig. 61) then the GC CLF (Fig. 62) after which the enamel was brushed on (Fig. 63). These applications were based on the mandibular blueprint already in place through the same layering procedures and techniques. The bisque bake stage (Fig. 64) was again checked on the model and the specific contour markings drawn
Fig. 60: Copings on the model
Fig. 61: Dentin build-up application
Fig. 62: CLF application
Fig. 63: Enamel application same as the opposite quadrant
Fig. 64: Bisque Bake stage
Fig. 65: Contour begun
Fig. 66: Finished product
Fig. 67: Model diagnosis
Fig. 68: Maxillary right side

(Fig. 65). A quadrant view of this finish line is next (Fig. 66).

Again, the author duplicated exactly the Renfert die spacing material on top of the gold model to allow for a better model diagnosis (Fig. 67), this time for the maxillary right side copings (Fig. 68). The same procedure as in the above figures is followed (Figs. 69, 70). Incisal height and length were checked on the model (Fig. 71) with an occlusal view of the finished build-up next (Fig. 72). The GC Initial Porcelain was mixed (Fig. 73) with a brush in order to create perfect cusp ridges (Fig. 74) and finish the restorations (Fig. 75). Again, marginal ridge and cusp lines
Figs. 69, 70, 71: Dentin, CLF application
Fig. 72: Enamel application
Fig. 73: GC Initial A0 Porcelain
Fig. 74: Author created ridges
Fig. 75: Finished restorations – Maxillary right side
Fig. 76: Technician morphology markings
Fig. 77: Finished restorations with technician lingual morphology

were drawn for contact (Fig. 76) and checked on the model after finishing (Fig. 77).

The mid-central line, when checked for the four maxillary and mandibular anterior teeth on the model, can be compared to a baby’s mouth as their teeth begin to appear (Fig. 78). Next, the author added the laterals and lower canines (Figs. 79, 80). The canine centric stop follows in the double-check process (Fig. 81) and then the pre-molars, sequentially (Fig. 82). A centric occlusion view (Fig. 83) gives way to the finished presentation (Fig. 84).

A canine rise (Figs. 85, 86) demonstration leads to the occlusion view contact point diagramming (Figs. 87, 88) with a view of the maxillary cusp. Previously, the Renfert gold die
Fig. 78: Mid-line can be compared to a baby's mouth
Figs. 79, 80: Laterals, lower canines, beginning steps
Fig. 81: Canines, centric touching
Fig. 82: Pre-molars
Fig. 83: Occlusion view, centric
Fig. 84: All finished restorations on the cast model
Figs. 85, 86: Canine rise, right and left sides
Fig. 87: Occlusion view contact point
Fig. 88: Maxillary cusp view
Fig. 89: Model diagnosis
Fig. 90: Contact points drawn on the model in red (centric)
Fig. 91: Patient models, pre-op
Fig. 92: Post-op
Figs. 93, 94: Posterior contact measured
Fig. 95: Anterior contact measured
Fig. 96: Prep between crowns
Fig. 97: Check build-up
Fig. 98: Curve of Spee
Fig. 99: Prep between crowns
Fig. 100: Pre-op
Fig. 101: Without anterior crowns in place, see posterior stop
Figs. 102, 103: Protrusion view
Figs. 104-106: A hole in the model allows for lingual view check for sides to be the same
Fig. 107: Maxillary centric stop
Fig. 108: Mandibular centric stop
Figs. 109, 110: Study model, restorations, A0 ingot, GC porcelain sample
Fig. 111: Side view, pre-op
Fig. 112: Side view, finished
Fig. 113: Opposite side, pre-op
Fig. 114: Occlusion check
Figs. 115-123: Mirrored images
Figs. 124-125: Surface texture
Figs. 126-127: Final color check
Spacing was used on the model to diagnose the model (Fig. 89).

Occlusal contact points were drawn in the centric stop areas in red (Fig. 90). Pre-op model work (Fig. 91) and after restoration creation (Fig. 92) show the line and pattern the author followed, after which he lined up and checked the posterior teeth contacts on the model (Figs. 93-95).

Preparation between crowns (Fig. 96) on the model is checked for proper porcelain build-up (Fig. 97). For Curve of Spee demonstration (Fig. 98), the posterior teeth were placed and examined. Again, preparation between the teeth was performed (Fig. 99). Gold die spacer application (Fig. 100) accentuates the pre-operative appearance of the patient. Without the anterior teeth on the model, the reader can see the posterior stop (Fig. 101). A protrusion view (Fig. 102) of the anterior teeth leads to the full protrusion view (Fig. 103). Lingually, a hole cut through the back of the model (Figs. 104-106) makes sure that both sides are exactly the same for the patient’s bite.

In figure 107 the centric stop is noted on the maxillary crowns with a red marker and again on the mandibular (Fig. 108). The study models, with mandibular restorations, ingot and porcelain (Fig. 109) as well as for the maxillary restorations (Fig. 110) are the materials used in the creation of this patient’s reconstruction. Pre-operatively, the patient’s maxillary left-side view (Fig. 111) is juxtapositioned next to the finished restorations (Fig. 112) and again for the right side (Figs. 113, 114) for an occlusion check. The mirrored images (Figs. 115-123) demonstrate the final color harmony. A texture check (Figs. 124-125) gives way to the final color check (Figs. 126, 127).