

Occlusal Splint Guides for Presurgical Orthodontic Treatment

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Three-dimensional model simulation is an integral part of conventional orthognathic surgical treatment.¹⁻⁵ In some cases it can be performed on a simple hinge articulator, while in others a facebow and semiadjustable articulator are required.⁶⁻⁸ Even with proper presurgical planning,^{9,10} however, orthodontic preparation can be imprecise, and the tooth positions may interfere with surgical movement of the jaws.

This article describes an experimental protocol designed to optimize presurgical orthodontic treatment.

Presurgical Treatment Planning

The following steps are traditionally involved in presurgical orthodontic planning when a semiadjustable articulator is used¹⁰ (Fig. 1):

1. To obtain a facebow record of the plaster casts for mounting on the semiadjustable articulator, take a cusp-tip impression of the maxillary teeth, using two thicknesses of softened wax on a bite

fork. Place the facebow assembly on the articulator, and position the maxillary cast on the bite fork. Mount the maxillary cast on the upper part of the articulator with plaster. Using a wax bite registration taken in centric relation, place the mandibular cast on the lower part of the articulator (Fig. 2).

2. Trace the lateral, anteroposterior, and panoramic radiographs (Fig. 3). Plan the linear and rotational skeletal movements in all three planes of space using a Visualized Treatment Objective (VTO) tracing¹¹⁻¹⁵ (Fig. 4). In addition, construct regional VTOs to predict the required tooth movements, taking facial and dental esthetics into consideration.

3. Perform model surgery on the articulator, based on the cephalometric and esthetic planning (Fig. 5). Measure the surgical movements in the horizontal, frontal, and midsagittal planes; when they coincide with the planned cephalometric measurements, apply thermoplastic glue over the model slices to stabilize the casts in their final position. Send the casts to the laboratory for preparation of



Fig. 1 16-year-old female patient before surgical-orthodontic treatment.

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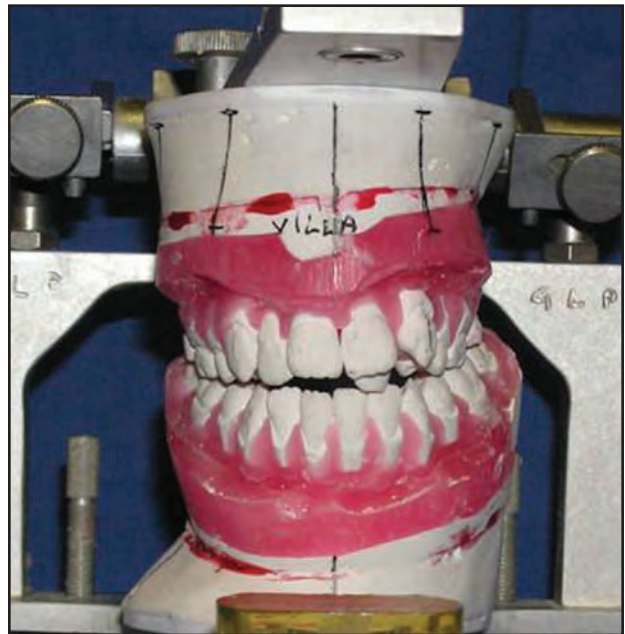
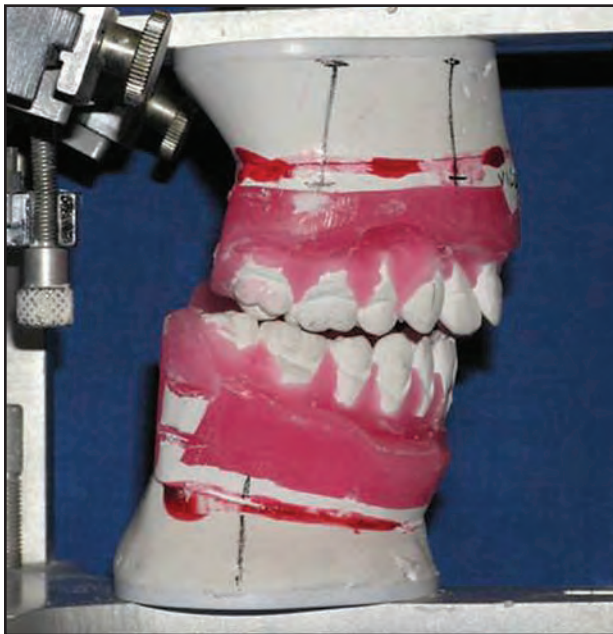


Fig. 2 Models mounted on articulator.

the presurgical diagnostic setup¹⁶ (Fig. 6).

We have added the following two steps to help the clinician visualize the results of the presurgical treatment plan and thus optimize orthodontic preparation for surgery:

4. Reproduce the original skeletal discrepancies on the articulator to show the final desired tooth positions before surgery, based on the measurements made in model surgery (Fig. 7). The thermoplastic glue will allow disassembly and repositioning of the casts.

5. Fabricate upper and lower occlusal splints by tightly forming 1mm-thick thermoplastic material (Biocryl*) over the teeth on each cast in a pressure-thermoforming machine (Biostar*) (Fig. 8). Use a bur to cut the acrylic away from the buccal surfaces of the teeth, leaving only short buccal

extensions. Remove the upper and lower splints from the casts, and glue them together with resin in the presurgical setup relationship (Fig. 9). The same procedure can be followed if there are brackets on the patient's teeth, with the splint trimmed at the bracket locations as required.

Obviously, the splints will not fit properly at the beginning of presurgical orthodontic treatment. At each appointment, the orthodontist places the splints in the patient's mouth to verify that tooth movements are progressing as planned; bracket positions can then be adjusted if necessary. When the splints fit well, the presurgical orthodontic preparation is complete. A new set of records is

*Great Lakes Orthodontics, Ltd., 200 Cooper Ave., P.O. Box 5111, Tonawanda, NY 14151; www.greatlakesortho.com. Biostar is a registered trademark.



Fig. 5 Model surgery on articulator.



Fig. 6 Presurgical diagnostic setup, showing desired treatment results.



Fig. 7 Original skeletal discrepancies reproduced on articulator, showing desired presurgical tooth positions.



Fig. 8 Upper and lower occlusal splints positioned on presurgical setup.



Fig. 9 Occlusal splints attached to guide presurgical orthodontic treatment.

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Fig. 10 Simulation of treatment stages on articulator. A. Before treatment. B. After presurgical orthodontic treatment. C. Expected final result.