Digitizing the Facebow: A Clinician/Technician Communication Tool

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Communication between the clinician and the technician has been an ongoing problem in dentistry. To improve the issue, a dental software application has been developed—the Virtual Facebow App. It is an alternative to the traditional analog facebow, used to orient the maxillary cast in mounting. Comparison data of the two methods indicated that the digitized virtual facebow provided increased efficiency in mounting, increased accuracy in occlusion, and lower cost. Occlusal accuracy, lab time, and total time were statistically significant ($P < .05$).

The virtual facebow provides a novel alternative for cast mounting and another tool for clinician-technician communication.


Materials and Methods

Patients with recently restored dental implants were recruited to participate in the study at the Schulich Dental Clinic. These patients were selected as the occlusion on the implant was exact. The patient was seated and impressions were taken of both arches using Counterfeit (Clinician’s Choice) impression material. Quick Bite (Clinician’s Choice) was used to establish the maxillomandibular relationship in maximum intercuspation. These procedures were completed by independent clinicians. Clinician A took a timed analog facebow (AF) and recorded the maxillomandibular relationship with wax. Clinician B employed the virtual facebow (VF) and timed the process. Fig 1 depicts the clinical steps required with the VF.

Two separate sets of models were poured in Microstone (Whip Mix), one for each clinician. Clinician A used the AF and wax bite, and Clinician B used the VF and record of occlusion to mount the models on a semiadjustable articulator (Whip Mix). Both processes were timed. The clinicians also recorded the number of occluding teeth on the mounted models using 8-µm shim stock. A percentage of the total number of occluding teeth in the patient’s original occlusion was then calculated.

Results

Various factors from both facebow methods were analyzed to determine the more efficient method. Time, occlusal contact replication, and cost were compared for the two methods.

Time Comparison

The AF and VF were timed with regard to clinical, lab, and total time (Fig 2). To compare the times, $t$ tests were conducted at $P < .05$. Results indicated an overall time efficiency for the VF.

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A t test was performed at $P < .05$, and statistical significance was found (Fig 3). On average, the VF successfully replicated 89.47% of the patient’s original occlusion, compared to 46.14% with the AF.

Cost Comparison

The comparison of equipment and materials costs used in both methods suggested that the VF is more cost effective than the AF (Table 1).

Fig 1  Virtual facebow method. (a, b) Patient positioning. (c) Face and dentition capture with reference grid and gyroscope. (d) Skull-face overlay for anatomic reinforcement and reference. (e, f) Occlusal contact checklist. (g) Positioning of maxillary cast. (h) Cast and face overlay. (i) Cast, face, and skull overlay.
Discussion

Based on the limited pilot study, the VF seems to provide an efficient, accurate, and cost-effective alternative to the AF. Alignment of the maxillary cast was not assessed as the VF had technology that offered extremely accurate spatial positioning. The AF can prove uncomfortable for the patient, as the ear canal projections, bite fork, and nose bridge can apply pressure and pain. It can be frustrating for the clinician due to the subjective positioning and multiple adjustments.4,5,6 The VF provided a simple and straightforward approach without comfort issues. Although arbitrary mounting may suffice, the VF provides patient information that may prove valuable for the laboratory.

Conclusions

The VF provides a novel approach for clinical data acquisition and a process for the mounting of diagnostic casts. The VF embraces mobile technology to offer an accessible alternative to assist with diagnoses and treatment planning. The efficiency, accuracy, cost, and comfort of the VF provides the clinician an alternative tool for records and essential technician communication.

Acknowledgments

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Table 1 Cost Comparison of Both Facebow Methods

<table>
<thead>
<tr>
<th></th>
<th>Traditional ($)</th>
<th>Virtual ($)</th>
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<tbody>
<tr>
<td>Facebow and articulator</td>
<td>947</td>
<td>349</td>
</tr>
<tr>
<td>PVS impression material</td>
<td>55</td>
<td>10</td>
</tr>
<tr>
<td>Bite registration wax</td>
<td>4</td>
<td>8</td>
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<tr>
<td>Stands</td>
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<td>3</td>
</tr>
<tr>
<td>Level</td>
<td>3</td>
<td>Simple hinge articulator</td>
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<tr>
<td>Total</td>
<td>1,006</td>
<td>Total 385</td>
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</tbody>
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References