THE JOURNAL OF PROSTHETIC DENTISTRY

TIPS FROM OUR READERS

Registration of jaw movements using a custom attachment for a mandibular sensor

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The accurate recording and reproduction of jaw movements are essential for dentists to make diagnoses and personalize treatments.[1,2] Different digital methods of tracking jaw movements have gradually replaced traditional mechanical articulators and physical occlusal registrations because of their convenience, accuracy, and ability to preserve data.[3,4]

The digital jaw movement analysis system (JMA) uses head-mounted cameras to monitor a sensor fixed to the mandibular teeth and is typically connected to the labial surface of the mandibular dentition via a metal attachment.[4,5] However, the standard metal attachment must often be shaped to conform to the patient's mandibular arch, a process that can be both time-consuming and cumbersome. Furthermore, the standard metal attachment may interfere with mandibular movement when a patient has a pronounced vertical overlap or short clinical crowns, leading to inaccurate recording.[6]

When clinical examination of a patient with a deep vertical overlap reveals limited retention space for the JMA sensor attachment (Fig. 1A), a custom mandibular metal attachment for the JMA sensor is needed to provide adequate rigidity, facilitate accurate placement, and avoid occlusal interferences.

PROCEDURE

1. Scan the maxillary and mandibular arches and the intercuspal position using an intraoral scanner (TRIOS 3; 3Shape A/S). Export the data as standard tessellation language (STL) format files. Transfer the intraoral scanner data into a dental software program (exocad dental CAD; exocad GmbH) to design the custom attachment. Simulate jaw movements to determine the optimal points for attachment fixation without occlusal interference.
2. Draw an open curve for the major bar of the mandibular attachment to align with the gingival margin of the mandibular teeth, setting a 3-mm width and 2-mm thickness. Place retention wings on the labial or buccal sides of the mandibular lateral incisors, first premolars, and second molars. Incorporate Ø1-mm holes in the wings to enhance the retention of the device after bonding. Design 4 nail-like protrusions from the major bar to match the maxillary cusps for precise positioning. Set the thickness of nail processes to 1 mm to facilitate removal after fixation of the attachment (Fig. 1B, C).
3. Shape the connection part to match the standard sensor holder for a stable connection between them. Simulate virtual jaw movements to ensure that no interference exists on the custom mandibular attachment (Fig. 1D).
4. Print the custom attachment with a 3D printer (Concept laserM2; Concept Laser) using cobalt-chromium alloy (Audental) (Fig. 1E) to ensure rigidity during recording. Verify the fit on the 3D printed cast (Fig. 1F).

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
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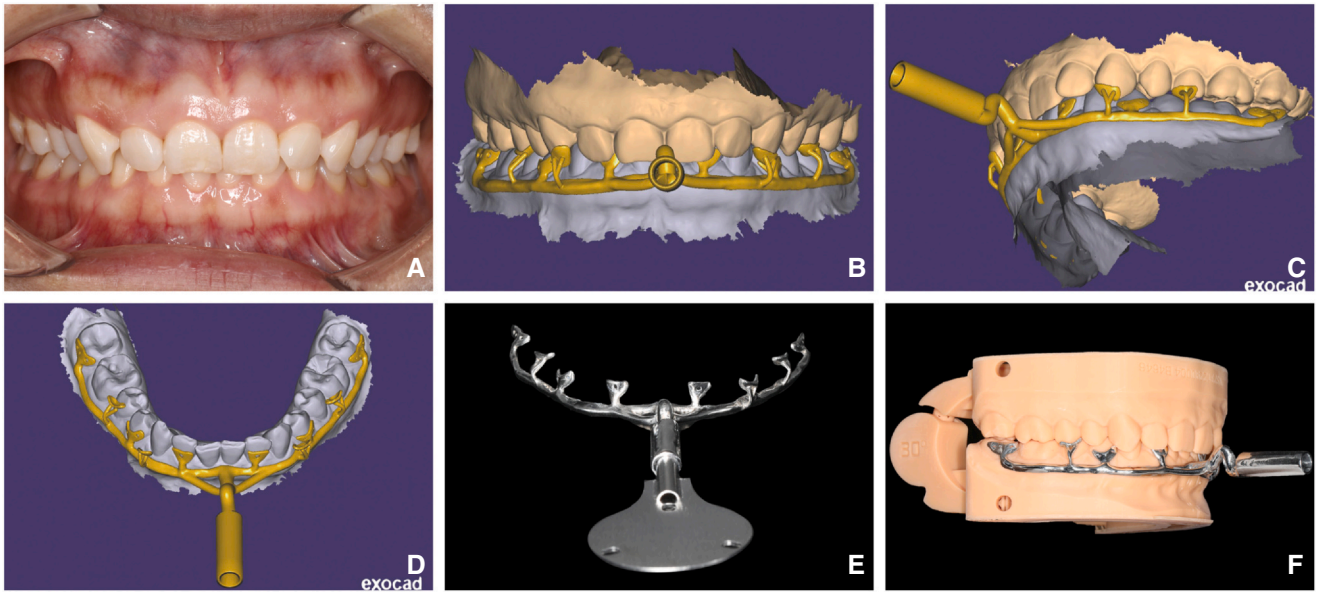

Figure 1. A, Patient with deep vertical overlap with limited retention space for standard sensor attachment. B, Custom mandibular attachment design. C, Nail-like protrusions matching maxillary cusps. D, No interference with occlusion. E, Custom metal attachment printed. F, Fit of custom metal attachment verified on printed cast.

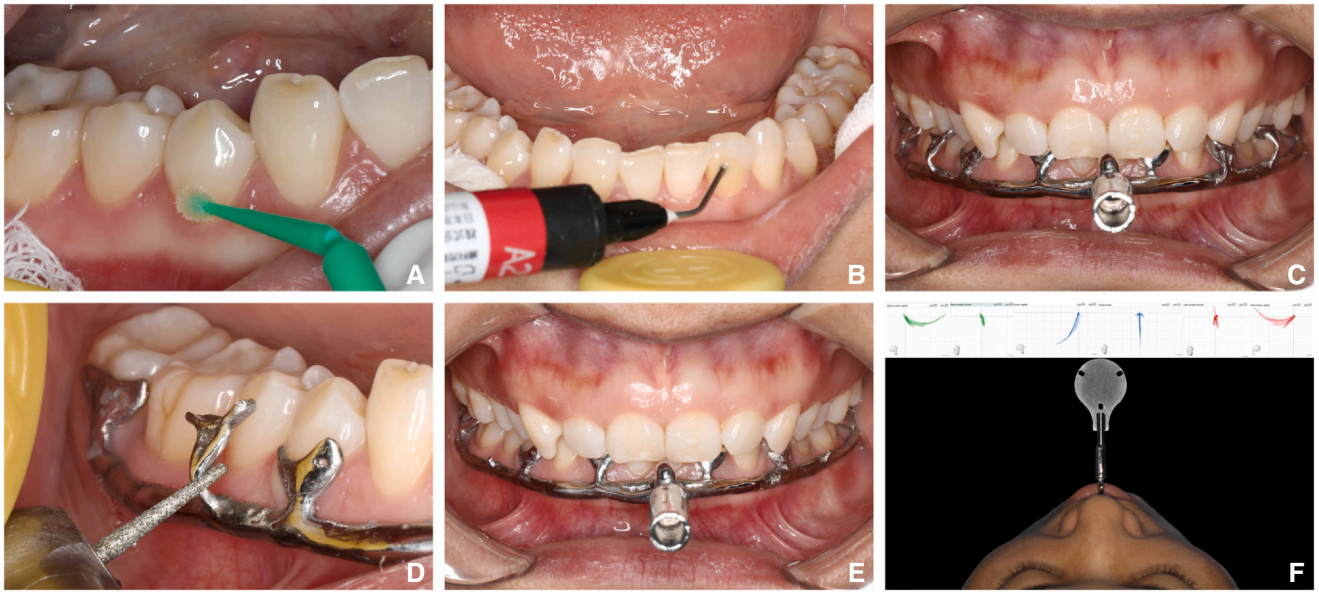

Figure 2. A, B, Application of adhesive and fluid resin to labial or buccal sides of multiple teeth. C, Seating of attachment guided by nail-like protrusions and fixation with light-polymerized resin. D, E, Removal of protrusions using high-speed diamond rotary instrument. F, Connection of standard sensor holder to custom attachment and recording of mandibular movements.

5. With the facebow positioned horizontally, apply dental adhesive (Single Bond Universal; 3M ESPE) on the dried tooth surfaces (Fig. 2A) and then seat the metal attachment accurately under the guide of the nail-like protrusions. Bond the retention wings using light-polymerized flowable resin (Beautifil Flow Plus; Shofu) (Fig. 2B, C). Avoid etching tooth surfaces for easy removal of the bonding resin after recording.
6. Remove the nail-like protrusions and excess bonding resin using high-speed diamond rotary instruments (MANI) (Fig. 2D, E).
7. Connect the sensor holder securely and record the mandibular movements by following the manufacturer's guidelines (Fig. 2F). Remove the attachment by detaching the bonding wings from the teeth with pliers (Bracket Removing Plier; Hu-Friedy) and

remove the residual resin by scraping with a sharp curette (Sickle Scaler; Hu-Friedy).

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https://doi.org/10.1016/j.prosdent.2024.04.012