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Internally Weighted Mandibular Denture Technique: A Fully Digital Workflow

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Objectives

This case report presents a fully digitized alternative to the conventional weighted denture approach¹. The digital workflow offers clinicians, patients, and technicians a time-efficient, reproducible process with fewer processing errors and improved precision of fit compared to the analogue method.

Patient History

- Patient's Age: 84 Y/O Female
- Chief Complaint: "I would like to have a stable lower denture. My temporary one rocks."
- Medical History & Medication: Hip replacement, radiotherapy, and chemotherapy (2004), osteoporosis, hypertension, colostomy, and type II diabetes mellitus. Patient is taking oral bisphosphonates, alprazolam, lisinopril-hydrochlorothiazide, and duloxetine.
- Dental History: The patient had #22,23,26, and 27 extracted. Patient's previous mandibular partial denture was converted into a complete interim denture.



Fig. 1.1
Primary Mandibular Cast
Occlusal View

Fig. 1.2
Primary Mandibular Cast
Frontal View

Fig. 1.3
Primary Mandibular Cast
Lingual View



Fig. 2.0 Pre-operative Mandibular arch.

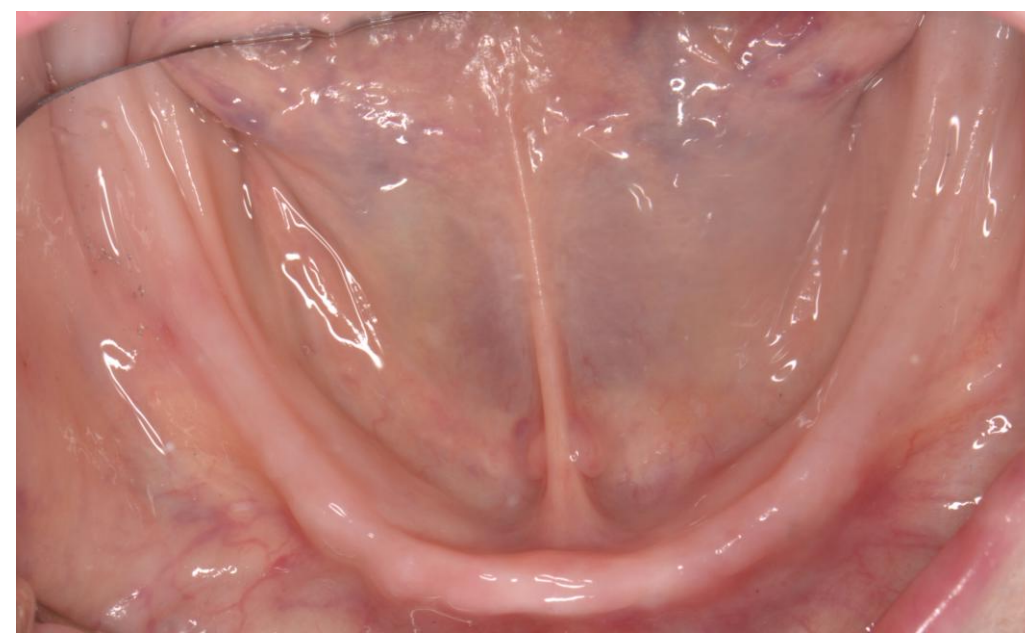


Fig. 2.1 Pre-operative Mandibular arch.

Intraoral Findings

- Lips, tongue, and pharyngeal tissues: No signs of pathology observed.
- Palatal throat form: Class II (House classification).
- Mandibular arch form: U-shaped, with firm and keratinized denture-bearing area.
- Retro-mylohyoid space: Class I (Niel's lateral throat form).
- Buccal shelf: Adequate to provide denture support.
- Salivary flow: Average and adequate.

Diagnosis

The patient exhibited complete edentulism. The ACP classification system for complete edentulism was classified as Class II with class I maxillo-mandibular relationship

Treatment Option Selected

A mandibular-weighted denture was presented based on the diagnostic information and patient desires. Risks, alternatives, and benefits of treatment were explained, and informed consent was obtained before treatment.

1. Presentation of treatment goals and objectives to the patient.
2. Oral hygiene instructions included denture care, cleaning, and care of soft tissues.
3. Fabrication of a mandibular complete denture.
4. Post-insertion instructions and care was provided to the patient.
5. The patient was placed on a routine recall schedule.

Treatment Procedure

- A final impression was made with a custom tray material using modeling compound, soft reline (COE-Soft, GC International AG, Lucerne, Switzerland), and vinyl polysiloxane (VPS) impression (Aquasil Ultra XLV; Dentsply Sirona)



Fig. 3.1 Custom Tray for
Definitive Impression



Fig. 3.2 Definitive Impression



Fig. 3.3 Definitive Cast



Fig. 3.4 Mandibular try-in setup

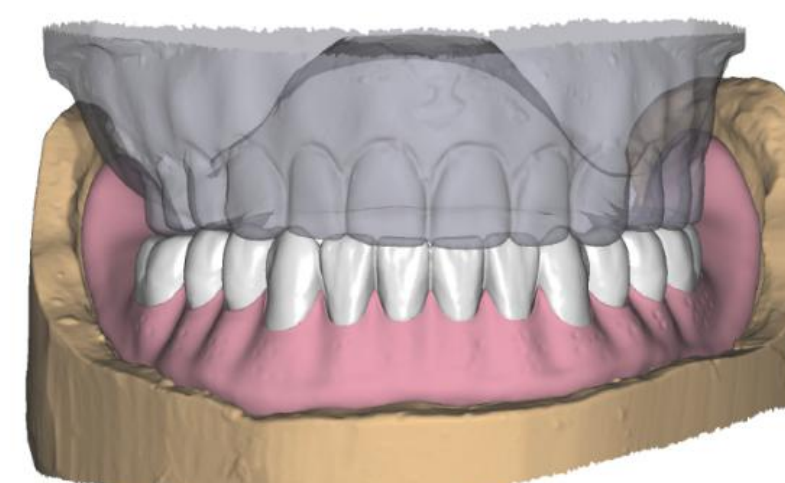


Fig. 3.5 Mandibular Digital Setup

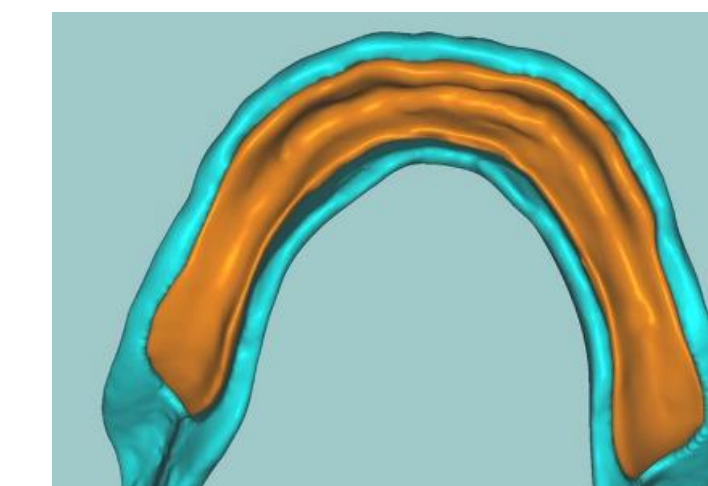


Fig. 3.6 Weighted #1 with metal.

- OVD was established using wax rims and trial dentures (Fig. 3.4).
- Dentures and rims were scanned (Medit i710), and a digital design was created in Exocad (Fig. 3.5).
- A 1.5 mm acrylic relief was added to the ridge, and a total thickness of 2.5 mm (1.0 mm metal, 1.5 mm acrylic) was incorporated in the design (Fig. 3.6).
- The metal framework was designed in the partial denture module, and its volume was converted to weight; the model and framework were exported as STL ("Weighted #1") (Figs. 4.1–4.3).
- A second STL ("Weighted #2") file was created to fully adapt into the intaglio surface (Fig. 4.2).
- Both STL files were merged: blue = denture base, pink = intaglio-adapted base, yellow = metal base, white = denture teeth (Fig. 4.1).

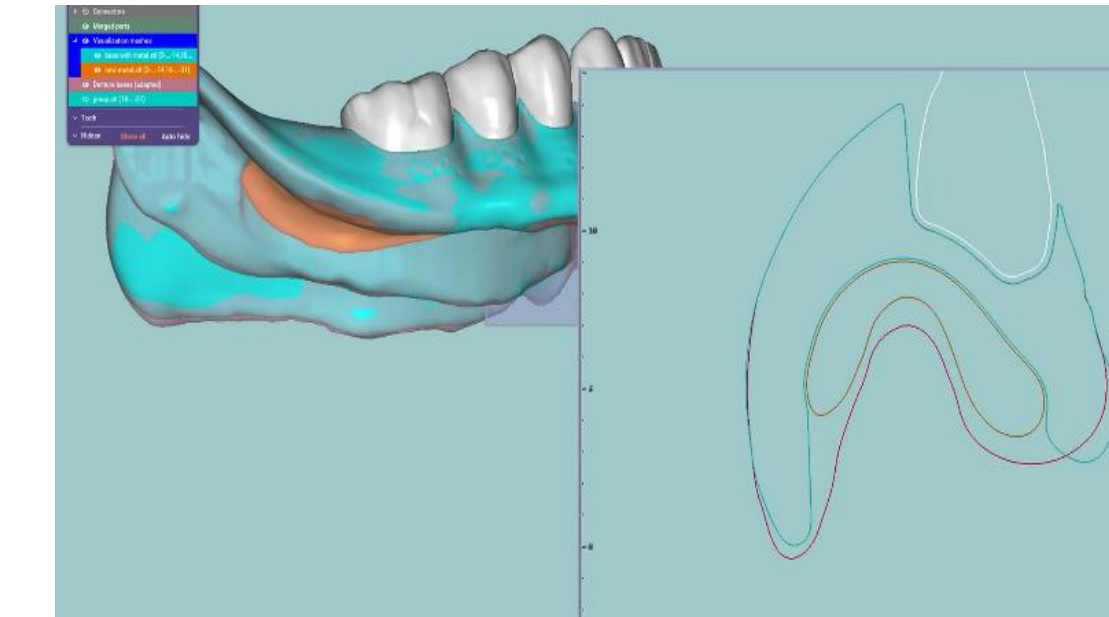


Fig. 4.1 Merged STL files (#1
and #2)

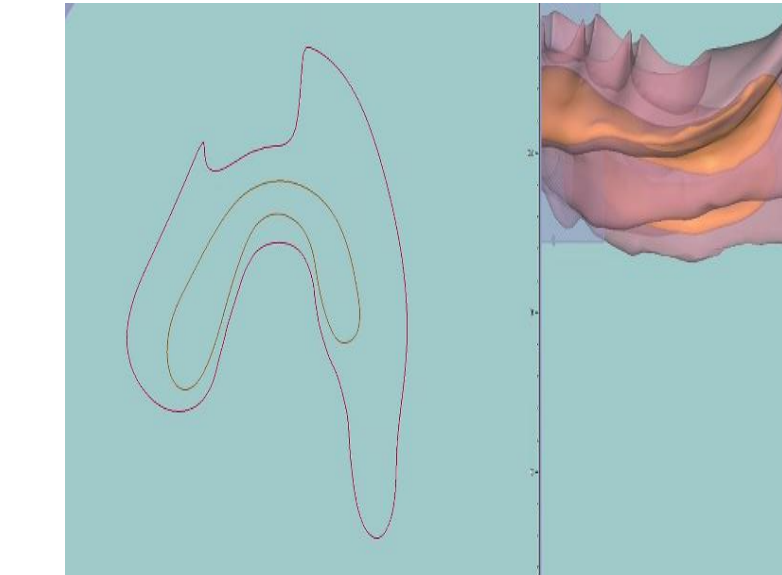


Fig. 4.2 Weighted #2 denture
design

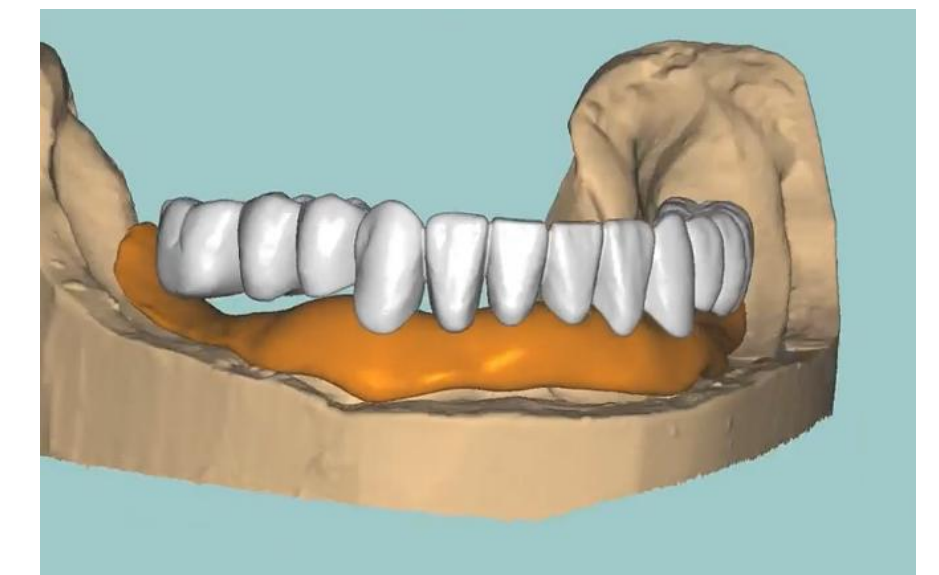


Fig. 4.3 Space relief for metal

- The metal was laser printed using SLM (NCL-M150, Nanjing Chamlion Laser Technology Co., Ltd).
- The first mill was completed using "weighted #1" STL file with a PMMA disc (Ivotion Dent Multi Disc, Ivoclar, Vivadent) (Fig. 5.1).
- After positioning the metal on the milled inner surface, PMMA resin was poured and polymerized at 55 °C for 5 minutes (Fig. 5.2).
- A second milling using "weighted #2" STL file was performed, resulting in the definitive denture with integrated metal (Fig. 5.3).
- The final denture weighed 36 grams, including 19 grams for the metal.



Fig. 5.1 Milled weighted #1 file with metal



Fig. 5.2 PMMA on top of metal.



Fig. 5.3 Final mill, metal inside the denture.

Tissue adaptation and the denture flanges were evaluated. Contacts were adjusted as needed to achieve bilateral occlusal contacts during lateral movement.



Fig.6.1 Frontal profile frontal -
Before



Fig.6.2 Frontal profile frontal - After



Fig.7 Final Mandibular
Prosthesis

Conclusions

Overall, this clinical case report demonstrates that a CAD-CAM fabricated weighted mandibular denture can provide clinicians, dental laboratories, and patients with a faster and more efficient fabrication process. The digital workflow enhances accuracy and reproducibility while reducing the risk of processing errors². Additionally, applying PMMA resin to the intaglio surface before final milling has been shown to improve shear bond strength compared to conventional heat-polymerized dentures³.

References

1. Kim, H., Brewer, J. D., & Monaco, E. (2009). Internally weighted mandibular denture fabrication using a processed denture base. *The Journal of prosthetic dentistry*, 102(2), 123–125. [https://doi.org/10.1016/S0022-3913\(09\)60121-9](https://doi.org/10.1016/S0022-3913(09)60121-9)
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3. Bhumpattarachai, S., Kan, J. Y. K., Goodacre, C. J., Oyoyo, U. E., & Vimontkittipong, U. (2025). Bond strength comparison of chemically activated hard reline materials on CAD-CAM milled and conventional heat-polymerized PMMA denture bases. *The Journal of prosthetic dentistry*, 133(3), 889.e1–889.e9.