

Integrating Monson's Spherical Theory with Advanced Digital Techniques: A Case Report on Occlusal Plane Determination and Digital Wax-Up for Patients Devoid of Posterior Support

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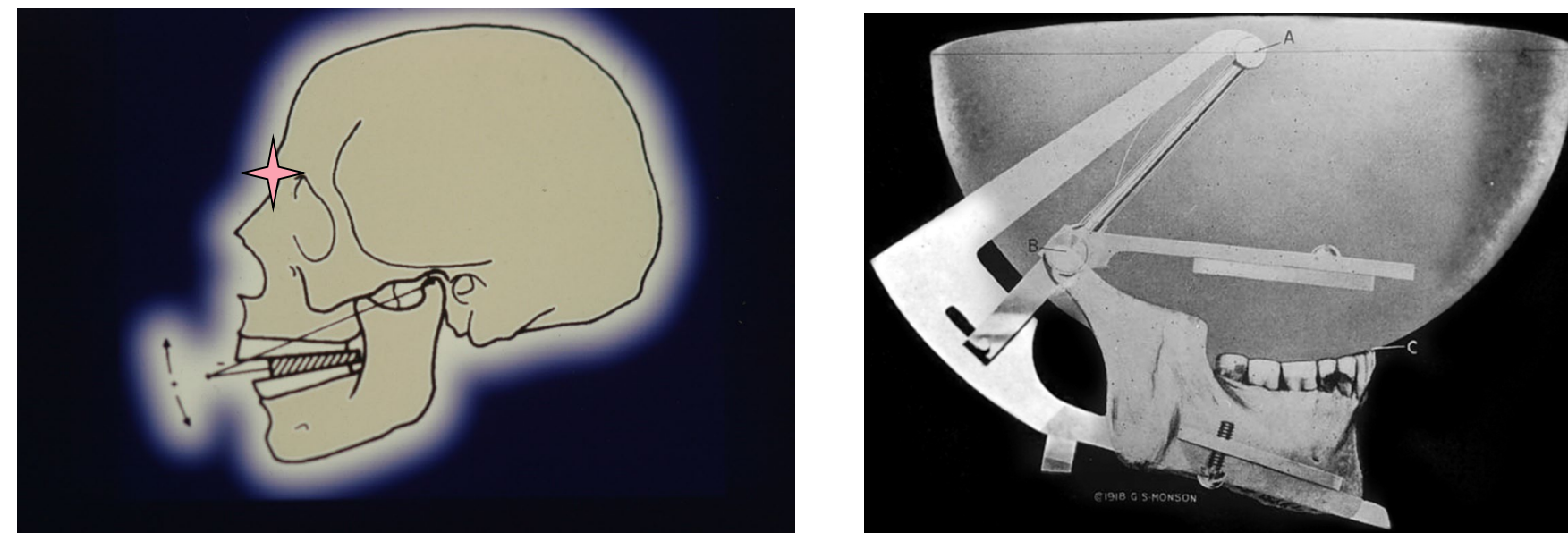


Introduction

For a patient lacking posterior support who requires complex oral rehabilitation, determining the plane of occlusion is a crucial step in diagnosis and treatment planning. Typically, an occlusal wax rim is crafted and employed to assess esthetics and establish the plane of occlusion using the FOX Plane.

Monson's curve, introduced in 1920, describes an ideal occlusal curve where every cusp and incisal edge either touches or conforms to a segment of an 8-inch diameter sphere's surface, centered around the glabella region. While contemporary methods have progressed from two-dimensional and three-dimensional mechanical scribes like the Broadrick Occlusal Plane Analyzer to sophisticated three-dimensional electronic pantography and axiography systems like the Axioquick Recorder® and Cadiax®, Monson's theory remains pertinent in the initial determination of the occlusal plane, particularly for patients without posterior support.

As digital technology advances in the realm of oral rehabilitation, this study incorporates the Monson Spherical Theory alongside these digital innovations. By leveraging CBCT, it's now possible to determine the occlusal plane and ease the process of digital wax-up. This research highlights the evolution from conventional wax rim techniques to cutting-edge digital approaches, underlining their promising applications in prosthodontics.



Patient Presentation

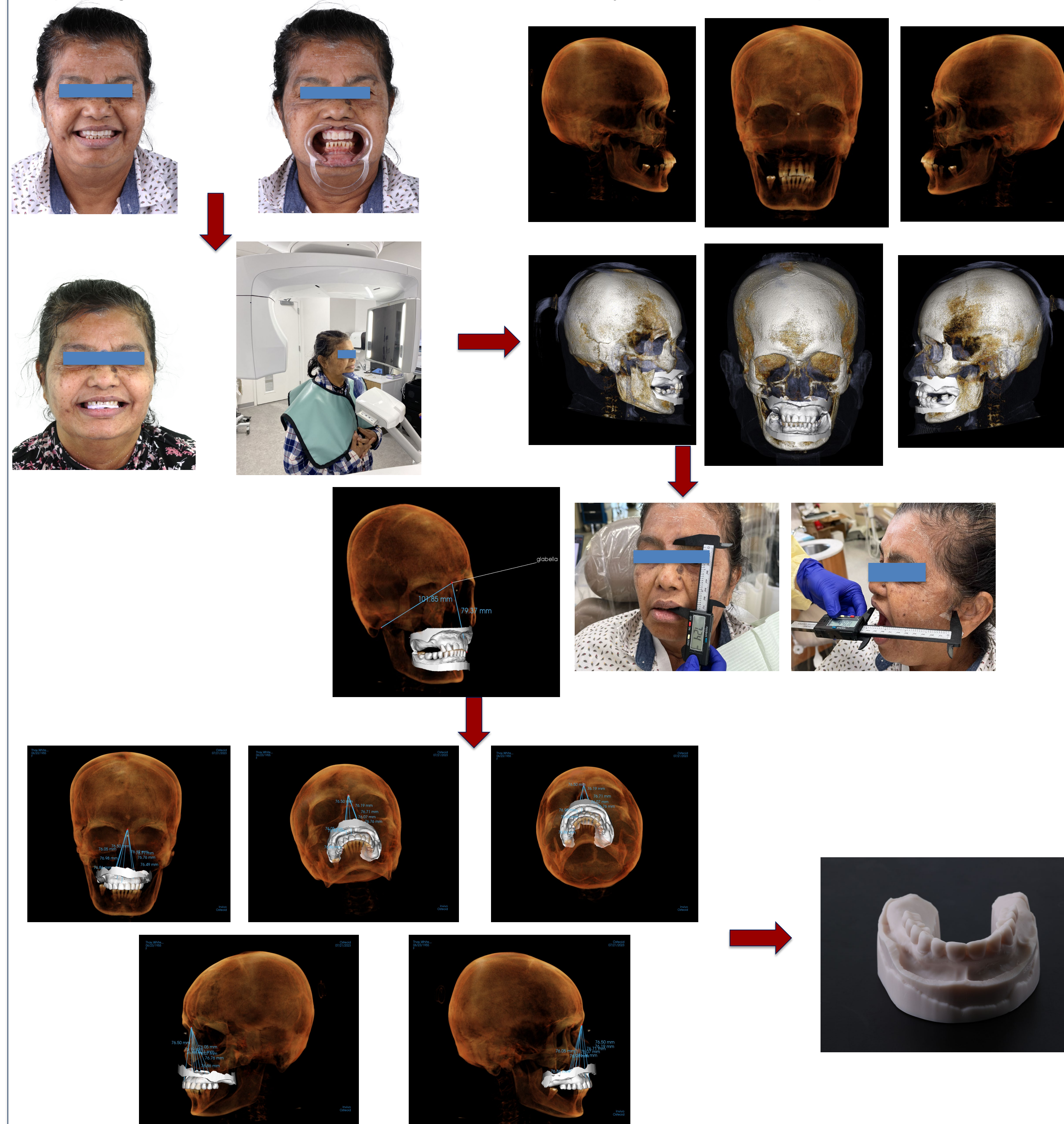
A 65-year-old patient presented to PG Prosthodontics Clinic seeking a full mouth rehabilitation. She presented with notable attrition and significant loss of tooth structure. A closer examination revealed the absence of posterior support, which is critical for maintaining optimal occlusal balance and overall oral functionality. This loss of posterior teeth significantly impacted her facial aesthetics and ability to chew food effectively.

Her primary aim was to restore her dental function, improve aesthetics, and achieve a comfortable bite. One of our first significant challenges in her rehabilitation process is determining the appropriate occlusal plane. Establishing the right occlusal plane is crucial as it dictates the orientation and position of the teeth in relation to the temporomandibular joint and the masticatory muscles. Getting this right is paramount to ensuring that the patient's rehabilitation is successful, lasting, and comfortable.



Case Report/Technique

The design of the maxillary anterior dentition was meticulously crafted with a primary focus on achieving optimal esthetics and phonetics. This design was further validated through a chairside mockup, ensuring that it aligned with the patient's expectations and requirements. A cranial CBCT was procured, with a radiographic marker positioned on the patient's glabella. Utilizing Invivo 7.0, the model of the maxillary arch was superimposed onto the CBCT. The orientation of the maxillary occlusal plane was determined using Monson's spherical theory with the lingual cusps of the maxillary teeth calibrated equidistant from a reference line extending from the glabella to the maxillary central incisor. This design was subsequently actualized through 3D printing. Vacuum matrix was made and filled with bis-acryl for clinical mock-up.



Discussion and Conclusion

Newly developed techniques for determining the occlusion plane for full mouth digital mock-up were successfully executed using Monson's Spherical Theory in conjunction with CBCT. The design was clinically validated using the Fox plane method to ensure precise determination of the maxillary occlusal plane.

Utilizing this innovative approach simplifies the process for clinicians to determine the occlusal plane. Given that CBCT scans are typically performed in the majority of full-mouth rehabilitation cases, especially those lacking posterior support, combined with the ability to identify ideal incisal edge positions rooted in phonetics and aesthetics, clinicians can already make an initial assessment of the occlusal plane's position. This capability presents substantial advantages in managing full-mouth rehabilitation cases.



Clinical Implication

By integrating digital and conventional techniques to precisely determine occlusal planes, practices can streamline planning and execution for full mouth rehabilitations. This approach leverages existing CBCT data and functional assessments to reduce chair time, appointments and revisions. The resulting improvements in efficiency, predictability and patient experience present advantages for complex cases and practice capabilities while cementing benefits for both clinicians and patients.

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