

Egyptian Prosthodontic Association (EPA Newsletter)

Advancements in Digital Facebow Transfer Methods to Virtual Articulators



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Introduction

The integration of digital technology in dentistry has revolutionized the way we approach prosthodontic treatments. One of the significant advancements is the digital facebow transfer method, which allows for precise transfer of maxillomandibular relationships to virtual articulators. This article explores the benefits, techniques, and implications of this innovative approach.

History of Conventional Facebow and Articulators

The facebow has been a fundamental tool in dentistry since the early 20th century, primarily used to record the spatial relationship of the maxilla to the temporomandibular joint (TMJ). Traditional facebows and semi adjustable articulators as shown in figure (1) are mechanical devices that require physical impressions and manual adjustments to align the dental casts on an articulator as shown in Figure (1).

Limitations of Conventional Facebows:

- **Human Error:** Manual adjustments can lead to inaccuracies in occlusal relationships.

- **Time-Consuming:** The process of taking records and adjusting the articulator can extend treatment times.
- **Inflexibility:** Conventional systems often lack the adaptability needed for complex cases, particularly when dealing with extensive tooth loss or misalignment and cannot compensate for periodontal ligament pressure which tends to make premature contacts as we deal with rigid casts.

Due to these limitations, the dental community has increasingly turned to digital facebow systems, which offer enhanced accuracy and efficiency.

Transition to Digital Facebow Systems

Digital facebow systems have emerged as a solution to the limitations of conventional methods. These systems utilize advanced imaging technology to capture maxillomandibular relationships with high precision, significantly improving the workflow in prosthodontics.



Figure (1): Conventional facebow and semi adjustable articulator



Figure (2): Dento-Facial analyzer a mechanical device used as alternative to conventional facebow it can be integrated with CAM software



Benefits of Digital Facebow Transfer:

- **Increased Accuracy:** Digital systems reduce human error and improve the precision of occlusal records.
- **Time Efficiency:** The digital process streamlines workflow, reducing the time spent on manual adjustments.
- **Enhanced Communication:** Digital files can be easily shared with dental laboratories, facilitating better collaboration and understanding of the treatment plan.

Digital Facebow Transfer: An Overview

1. Intraoral Scanning: Intraoral scanners have revolutionized the way clinicians capture dental impressions. Utilizing advanced optical technology, these scanners allow for the real-time capture of the patient's dental arch and occlusal relationships. The data collected is used to create a highly accurate virtual model of the patient's dentition, which

can be utilized for various applications, including the design of restorations, orthodontic treatment planning, and surgical guides. Studies have shown that intraoral scanning not only improves patient comfort by eliminating the need for traditional impression materials but also enhances the accuracy of the resulting models, leading to better-fitting restorations and improved clinical outcomes

2. Digital Facebow Devices: Digital facebow devices, such as the Artex® Kavo™ and Arcus Digma facebow, play a crucial role in recording the spatial relationship of the maxilla to the temporomandibular joint (TMJ). These devices utilize advanced technology to capture the maxillomandibular relationship digitally, allowing for seamless integration with CAD/CAM systems. This integration facilitates the transfer of data directly into the design software, streamlining the workflow and reducing the potential for errors associated with manual facebow transfers. Research indicates that digital facebow systems provide enhanced accuracy in occlusal records, which is essential for successful prosthodontic

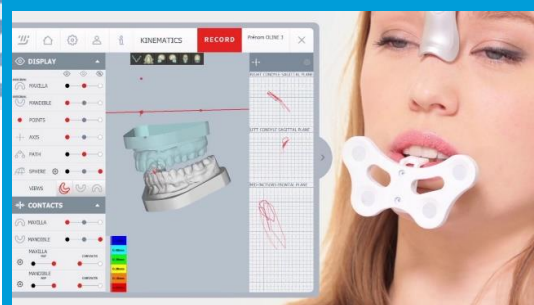


Figure (3): ModJaw jaw digital dynamic jaw tracking system



Figure (4): Integration between intraoral scanner, Facial scanners Ray Face with CAM software

for DSD and orientation of maxillary arch to virtual articulator



Figure (5): Arcus Digma digital facebow in which it takes facebow records of the upper bow in the maxilla digitally and also it tracks jaw movements and centric relation via ultrasound receive from the lower bow in the mandible



3. Dento-Facial Analyzers: Dento-facial analyzers, such as the Kinesiograph or the Dentofacial Analyzer by Kois as shown in figure (2), is an alternative to conventional facebow that provides comprehensive assessments of facial and dental relationships. These devices capture the spatial orientation of the dental arches in relation to the facial structures, allowing for a more holistic approach to treatment planning. They can be used in conjunction with digital facebow transfers to enhance accuracy and predictability in prosthodontic outcomes (1).

4. Modjaw: The Modjaw system is a digital tool that combines facial scanning with jaw tracking technology as shown in figure (3). It allows for the capture of dynamic jaw movements and facial features, providing a comprehensive view of the patient's occlusion and aesthetics. This data can be integrated into virtual articulators, enabling precise adjustments and simulations of occlusal relationships (1).

5. Facial Scans: Advanced facial scanning technologies, such as 3D facial scanners, (Ray Face) capture the patient's facial morphology in detail. This information can be used to create a virtual model that reflects the patient's unique anatomical features, enhancing the accuracy of restorations and improving aesthetic outcomes as shown in Figure (4). The integration of facial scans with digital facebow transfers allows for a more comprehensive understanding of the patient's occlusion and facial aesthetics (2).

6. Arcus Digma: The Arcus Digma is a digital facebow system that utilizes a combination of ultrasound waves transmitter from the upper fixed bow in maxilla and lower receivers in the mandible to track the jaw movements as well as centric relation this software captures the maxillomandibular relationship as shown in figure (5). It allows for quick and accurate recording of the occlusal plane and the relationship of the dental arches to the TMJ. The Arcus Digma system is known for its ease of use and the ability to integrate seamlessly with various CAD/CAM systems, making it a popular choice among dental professionals (3).

Clinical Implications

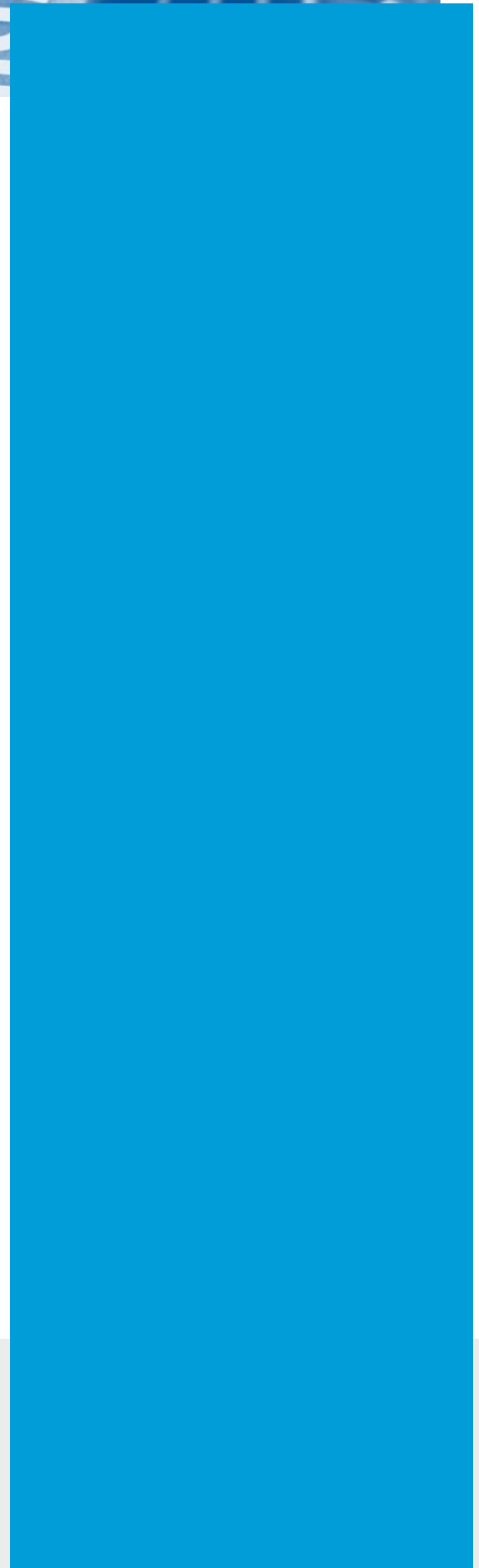
The transition to digital facebow transfer methods has significant clinical implications:

- **Improved Patient Outcomes:** Enhanced accuracy leads to better-fitting restorations and improved patient satisfaction.
- **Reduced Remakes:** The precision of digital transfers minimizes the likelihood of remakes due to occlusal discrepancies.
- **Streamlined Workflow:** Digital methods reduce the number of appointments needed, making the process more efficient for both clinicians and patients.



Conclusion

Digital facebow transfer methods represent a significant advancement in prosthodontics, enhancing accuracy, efficiency, and patient outcomes. The incorporation of dento-facial analyzers, Modjaw, Arcus Digma, and facial scans into the workflow further elevates the standard of care. As technology continues to evolve, embracing these innovations will be crucial for dental professionals aiming to provide the highest standard of care.



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