Comparison of Jaw Tracking Devices

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Introduction: The masticatory system has been analyzed for many years, but the methods used record statistic points or single positions of the mandible (e.g., protrusion, excursion, etc.). The masticatory system is, however, dynamic, and the main component lies in the mandible.(4) The study and treatment of the stomatognathic system is called “gnathology”. Transferring patient information to a properly selected articulator allows the dentist and technician to more accurately evaluate and design restorations that will later be delivered to the patient. Various devices have been developed to record and analysis the mandibular movement for more than a century.**(5)** There are methods using mechanical devices with graphical methods involving marking needles, recording styli and pantographs,**(5)** Photographic techniques **(4)** Roentgenographic methods**(5),** two systems of magnetometry, the mandibular Kinesiograph,**(6)** and the Sirognathograph. Optoelectronic tracking systems obtain mandibular movements using cameras to tracking the spatial position of light-emitting diodes. The aim of this presentation is to briefly introduce and compare two devices which are available at Boston University School of Dental Medicine.

CADIAX COMPACT2

Mechano-Electric

Advantage

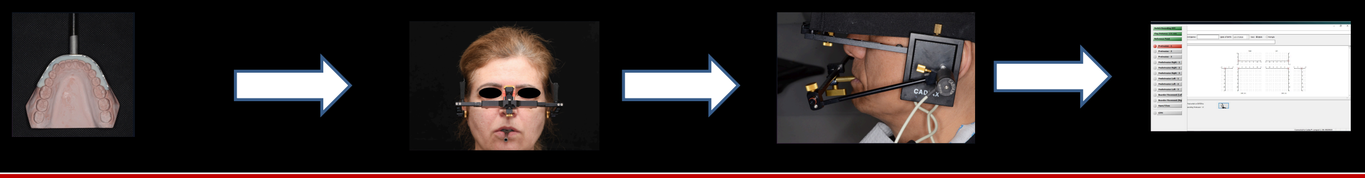
- Digital recording
- Acceptable accuracy
- Relatively light devices
- Fast
- Final result are the Articulators parameter

Disadvantage

- Might cause interferences in movement
- Technique sensitive
- Limited time movement(4.5s)
- Cost of the system
- Does not show movement

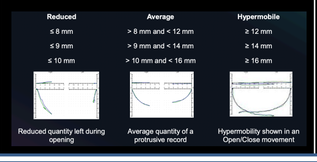
Work Flow

1- Attach Para-Occlusal track 2- Patient preparation 3- Apply Jaw Movement 4- Data Analysis

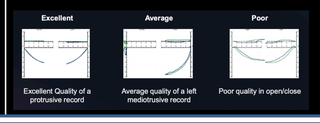


Screening Disfunction

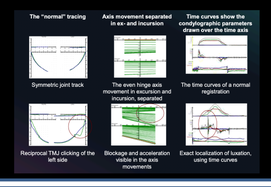
1- Quantity



2- Quality



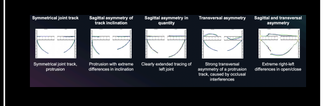
3-Timing and phenomena of speed



4- Characteristics



5- Symmetry



SICAT JMT+

Ultrasound

Advantage

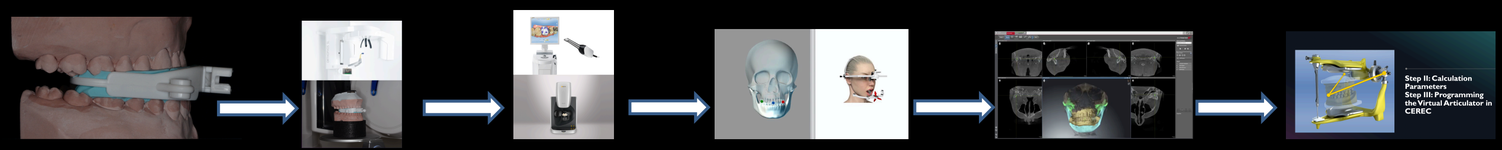
- Digital recording
- Acceptable accuracy
- Light Weight
- Wireless
- Show live movement

Disadvantage

- Long preparation process
- Technique sensitive
- Higher cost of the system
- CBCT exposure required
- Optical scan required
- Manual measurement needed to extract the numbers to set articulator

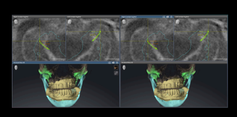
Work Flow

1- Attach fusion bite 2- CT scan 3- Optical scan 4- Jaw motion tracing 5- Data Analysis 6- Parameter calculation

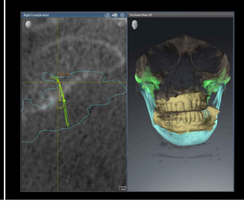


Programing Virtual Articulator

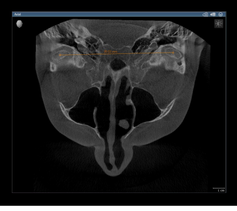
1- Sagittal Condylar Angle



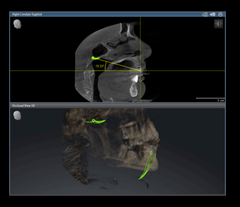
2- Lateral Movement (bennet angle)



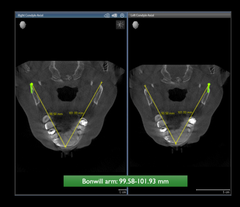
3- Intercondylar Distance



4- Balkwill Angle



5- Bonewill Arm



Discussion: Joshua et al in 2012 conducted a study to investigate the accuracy of an optoelectronic and mechano-electric pantograph. Result demonstrated that none of them record mandibular movement accurately; and there were differences in accuracy between the optoelectronic pantograph and mechano-electronic pantograph.(1)

In 2016 Shushu Et al conducted a study to introduce and preliminarily evaluate a new software application, SICAT Function, They concluded the SICAT Function software is a system capable of measuring and visualizing patient-specific jaw movement relative to the patient-specific anatomy of the jaw, also they mentioned further studies are needed to validate its accuracy and potential for future use. (2)

Conclusion:

The Mechano-electronic and optoelectronic recorders that register mandibular movement electronically have been more studied and developed in order to improve precision and efficiency.

The SICAT JMT and Cadiax 2 software are two popular systems capable of measuring and visualizing patient-specific jaw movement relative to the patient-specific anatomy of the jaw.(2) Both of them are light weight and require relatively little time, but their cost is high and Further studies are needed to validate their accuracy and their potential for future use.

Refrences

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