Dental Articulator – Hanau Wide Vue

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INTRODUCTION

Articulator is a mechanical device that represents the temporomandibular joints and the jaw members to which maxillary and mandibular casts may be attached to simulate some or all the mandibular movements. Articulators are instruments which attempt to reproduce the range of movement of the jaws. Maxillary and mandibular casts are attached to the articulators so as to functional and parafunctional contact relation between the teeth can be studied. It has often been said “patient’s mouth is the best articulator”. The primary function of articulator is to act as a patient[1].

The success of fixed or removable restoration directly depends on the articulator selected as well as the skill and care with which it is handled.

USES OF ARTICULATOR

1. To mount diagnostic casts.
2. To study the occlusion of a patient.
3. As an aid in planning treatment procedures.
4. To hold the opposing casts in a predetermined fixed relationship.
5. As an aid in the fabrication of dental restorations and lost dental parts.
6. In the arrangement of artificial teeth for complete dentures, removable partial dentures and waxing in field partial dentures.

REQUIREMENTS OF ARTICULATORS

Articulators have different adjustments, and some have more than others. To make any classification easy to visualize, and to avoid confusion because of these sophisticated adjustments, the requirements of an acceptable articulator must be defined.

In prosthetic dentistry the necessity of registering the following records is generally accepted:

1. Face-bow record

2. Centric jaw relation record

3. Protrusive record

4. Lateral records

5. Intercondylar distance record

ADVANTAGES OF ARTICULATORS

1. Properly mounted cast allows the operator to visualize the patient's occlusion, especially from the lingual view.

2. Patient cooperation is not a factor when using an articulator once the appropriate interocclusal record is obtained from the patients.

3. The refinement of complete denture occlusion in the mouth is extremely difficult because of shifting denture bases and resiliency of the supporting tissues. This difficulty is eliminated when articulators are used.

4. Reduced chair time, patient's appointment time. 5. The patient's saliva, tongue and cheek are not factoring when using an articulator[2].

CLASSIFICATION

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· Class I

· Class II

o Subdivision A

o Subdivision B

o Subdivision C

· Class III

o Subdivision A

o Subdivision B

· Class IV.

o Subdivision A

o Subdivision B

a) Class I

A Simple holding instrument capable of accepting a single static registration. Vertical motion is possible, but only for convenience.

Example- the Verticulator (Jelenko), the Corelator (Denar Corp)

b) Class II:

An instrument that permits horizontal as well as vertical motion but do not orient the motion to temporomandibular joints via facebow transfer.

Class II A

Eccentric motion permitted is based on average or arbitrary values.

Example- Gysi simplex articulator

Class II B

Eccentric motion permitted is based on theories of arbitrary motion.

Example- Monsons maxillomandibular articulator

Class II C Eccentric motion permitted is based on engraved records obtained from the patient.

Example- The gnathic relator

c) Class III:

Instruments that simulate condylar pathways by using averages or mechanical equivalents for all or part of the motion. These instruments allow for orientation of the cast via face bow transfer.

Class III A

Instruments that accept static protrusive registrations and use equivalents for the rest of the motion.

Example- Dentatus, Hanau non arcon H2 articulator

Class III B

Instruments that accept static protrusive registrations and some lateral interocclusal records and use equivalents for the rest of the motion.

Example- Hanau Teledyne, whip mix articulator

d) Class IV:

Instruments that will accept three dimensional dynamic registrations. These instruments allow for orientation of the casts via facebow transfer

Class IV A

The condylar pathways are formed by registration engraved by the patient.

Example- Denar Combi articulator, TMJS tereographic instrument

Class IV B

Instruments that have condylar pathways that can be selectively angled and customized.

Example- Stuart Articulator, Denar D5 articulator3.

TYPES OF VIRTUAL ARTICULATORS

Basically, there are two types of virtual articulators namely; completely adjustable virtual articulators and mathematically simulated virtual articulators.

A. Completely adjustable virtual articulators This type of virtual articulators uses an electronic jaw registration system called as jaw motion analyser (JMA) to replicate or record exact movements of the patient's mandible. Jaw motion analyser (Zebris, Germany) is an ultrasonic measurement system used to record and implement various mandibular movements.
B. Mathematically simulated virtual articulators It is a fully adjustable 3-dimensional articulator capable of reproducing the movements of a mechanical articulator. It is more versatile than a mechanical dental articulator. Basically, it functions as a mechanical average value articulator.

   Examples: Szentpetery's virtual articulator and Stratos 200

HANAU Wide-Vue

The HANAU Wide-Vue, Articulators are classified as semi-adjustable. They are of Arcon principle, wherein the Condylar Guidances are associated with the Upper Articulator Member, as the patient's glenoid fossa is a portion of the cranium, The Condyle of the Articulator is a part of the Lower Member and functions as the condyle of the patient's mandible. Articulator movements may be directly related to the anatomical function of the patient.

CONDYLAR GUIDANCE:

The Condylar Guidance are the control centres of the Articulator and they adjustably assimilate the multiple function of the glenoid fossa. The Condylar Track may be adjustably inclined on the horizontal transverse axis from a "zero" to a plus 60 degree or to a minus 20 degree. These inclinations are termed the protrusive inclination and simulate the patient's superior wall of the fossa. The Condylar Track may also be adjusted on the vertical axis from a "zero" sagittal to 30˚. This angle is termed the progressive Bennett angle and corresponds to the medial wall of the patient's fossa.

Condylar guidance adjustments in both sagittal and horizontal planes and the lateral condylar angle calculated by the formula L= H/8 + 12, H = Horizontal condylar angle, L= lateral condylar angle.

CLOSED CONDYLAR TRACK

The Condylar Guidance Track rotates in an enclosed housing which stops the Condylar Element, preventing the accidental disengagement of the Upper Member.

CENTRIC LOCK

Engagement of a Centric Lock depresses a Centric Pin, causing it to arrest the Condylar Element at the centric position. When locked, the Upper Member isrestricted to an opening and closing movement only. Releasing the Centric Lock two full turns will disengage the Centric Pin and return the Element's freedom ofmovement in the Condylar Track.

CONDYLAR SHAFTS

The Condylar Shafts adjustably slide in the “wings” of the Lower Member. They have been factory fixed by Setscrews when their brass shoulders rest against the flatted sides of the Condylar Elements at the “zero” centric position. A resilient Bumper will protectively stop the Upper Member and rest against the “Wing” of the Lower Member when fully opening the Articulator.

DUAL-END INCISAL PIN

Coinciding with these Condylar Shaft adjustments is an alignment of the chisel edge of the Incisal Pin with the central table of the Incisal Guide. The Incisal Pin serves as the forward control of the Articulator. It cooperatively maintains a vertical stop and provides a stylus contact for the excursive movements of the Articulator against the various inclined guiding surfaces of the Incisal Guide. A mid-line groove is cut in the Incisal Pin about one inch from the spherical tip. Five additional lines calibrated in milli meters extend on either side thereof. These lines are used for recording or altering the vertical dimension. The Incisal Pin is inserted into, and the wider mid-line of these metric grooves is aligned with, the top edge of the Upper Member. It is secured by the Thumbscrew bearing against the flatted side on the Pin. This adjustment places the chisel end at 90 degrees to and in contact with the central table of the Incisal Guide and provides a parallelism of the Upper Member to the Lower Member.

Two annular grooves, appear on the Incisal Pin at 37 and 54 mm below the Frankfort Horizontal Plane. These grooves form arbitrary vertical landmarks for alignment of the incisal edge of the maxillary centrals when making a Facebow transfer. The 37 mm line is based in part on the Bonwill Triangle and results in a generally horizontal appearing plane of occlusion. The 54 mm line forms an average landmark for alignment of the incisal edge of the upper centrals when making a Facebow transfer. This reference line is based on the research study by Frank R. Lauciello, D.D.S., and Marc Appelbaum, D.D.S., “Anatomic Comparison to Arbitrary Reference Notch on Hanau Articulators,” Journal of Prosthetic Dentistry, December 1978, Volume 40, Number 6, Pages 676-681. The Incisal Pin extends beyond the top of the Upper Member and provides a third point of stability when inverting the Articulator for mandibular cast mounting. The spherical tip of this Incisal Pin serves as the DualEnd and is useful for fabricating customized acrylic anterior guide tables.

ADJUSTABLE INCISAL GUIDE

The Adjustable Incisal Guide provides an independent adjustment of anterior guidance. It cooperates with the Incisal Pin and Condylar Guidances to present a stable, three-dimensional programmed guide pattern for the mounted casts.

The Incisal Guide rotates antero-posteriorly from a horizontal "zero" degree to a 60-degree positive inclination of protrusion which is then secured by the small Locknut. The central guiding table is 5.56 mm wide and forms the inclined surface for the protrusive guidance of the Incisal Pin. Separately adjustable Lateral Wings elevate by a Thumbscrew from a "zero" horizontal to a 45-degree incline and are fi xed by a Thumbnut. The calibrations are very small and serve only as a reference.

An anterior slot, in the Lower Member, allows repositioning of the Incisal Guide. Adjust and lock the Guide at a "zero" horizontal and slightly loosen the Platform Lock screw. Slide the Platform antero posteriorly to align the chisel end of the Incisal Pin with the "zero" indicating line on the Lateral Wings. This adjustment will place the Incisal Pin contact on the rotational centre of the Guide, thereby maintaining the vertical dimension when adjusting the inclination for protrusion. Loosening the Platform Lock screw one turn will allow the Incisal Guide Assembly to be withdrawn from or returned to the anterior slot without any disassembly of parts

RESILIENT BUMPER

Stop the upper member and rest against the wings of the lower member, when fully opening the articulator.

ADJUSTABLE PROTRUSIVE-RETRUSIVE

This micrometre adjustment permits the Condylar Element to be protruded 6 mm from centric or to be retruded 3 mm from centric.

ORBITALE INDICATOR

This "crescent" represents the patient's infraorbitale notch and is the anterior reference landmark of the Frankfort Horizontal Plane. When used with an Orbitale Pointer on a Face bow it provides an anatomical vertical orientation for the upper arch, obviating the use of any average reference lines on the Incisal Pin[3,4].

Shape and angulation of the articular eminence Limitation: the upper wall of the "mandibular cavity" of the SAA is straight and rigid, whereas this structure in the TMJ is curved. That is to say, only the initial and final positions of mandibular movement are recorded. Therefore, the actual paths of the condyles are not accurately recorded on the SAA. Consequently, carving of the occlusal surface of posterior teeth increases the risk of occurrence of undesirable contacts during mandibular movements. Compensation: customization of the anterior guidance while the provisional crowns are worn and its transfer to the incisal table on the articulator reduces the possibility of contacts between the posterior teeth during excursive mandibular movements. This customization guides the establishment of cusp height and fossa depth[5,6].

FACTORS CONTRIBUTE TO INACCURACY OF CAST ARTICULATION

Errors could happen while registering occlusal relationship. An example of a possible source of error is the difference in the patient's mandibular position when supine and upright. According to Helcio et al., the mandible tends to be positioned more posteriorly when the patient is lying down and the mouth has been actively closed into the relaxed position of centric occlusion. Another example is inherent in the nature of mandibular hinge axis and the consequences of its application in treatment planning.

To simulate the mandibular functional movement on the dental articulator, the degree of correlation between the patient and mounted casts depends on many factors, including biologic considerations and the properties of the materials used during the process of transferring maxilla mandibular records[8,9].

Literature has reported some factors that are possibly the source of incorrect maxillary cast alignment. According to Ferrario et al.

(1) Individual variation in the anatomic reference landmarks and measurements,

(2) Improper adjustment of the face-bow to the patient or the instrument to the articulator during the transfer procedure, and

(3) Setting the Frankfurt plane horizontally on the upper member of the articulator.

Conclusion

Evolution of articulators through the years has given an insight of the researchers trying to develop a mechanical device that simulates the jaw members and its movements. The purpose of using an articulator is to develop a prosthesis that will be harmonious in the oral cavity.

Various articulators have been developed and are being improved upon as and when the functions of the jaws are understood better. Accordingly, in the present day, the availability of articulator ranges from simple hinge type to fully adjustable articulators and virtual articulators[10,11].

Selection of articulators depends upon the clinical situation. In complete denture prosthesis, semiadjustable articulators suffice the requirements to develop a good denture. Fully adjustable articulators are used for fixed prosthesis. It is difficult to manage fully the adjustable articulators in complete denture patients because the clutches used to obtain the hinge axis and condylar movements are more cumbersome to be used in edentulous patients which in turn do not provide accurate records.

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