**Prosthodontics**

**Dental articulator**

*Definition:*

It is a mechanical instrument that represents the TMJ and jaw members to which the maxillary and mandibular casts are attached to simulate some or all mandibular movements.

*The design based on:*

1. Theories of occlusion
   - Bonwill, Conical, Spherical
2. Types of record used for their adjustment.
3. Capability of adjustment of an articulator

*Functions:*

1. Allow most of the prosthetic work to be done in the absence of the patient.
2. Maintain jaw relation record during setting up of teeth.
3. Denture remounting after processing for correction of occlusal disharmony.

*Requirements of an articulator:*

1. It should hold the casts in the correct horizontal and vertical relationships
2. The casts should be easily removable and re-attachable
3. It should provide a positive anterior vertical stop (incisal pin)
4-It should accept face-bow transfer record

5-It should open and close in a hinge movement

6-It should be made of non-corrosive and rigid materials

7-It should not be bulky or heavy

8-There should be adequate space between the upper and lower members

9-The movable parts should move freely without any friction

*Types of articulators:*

1- *Non-adjustable condylar path articulators*

*a- simple hinge articulators (class I)*

it consists of an upper and lower members held apart at a certain distance by the screw which act at the back. The screw can increase or decrease the distance between the two members, and permits only a hinge like movement.

*Possible movements:*

Opening and closing movements only
**Records required:**
1-OVD
2-Centric relation record

**Disadvantage:**
Not represent the TMJ and the dynamic mandibular movements

**B. Mean value or Fixed condylar path articulators (Class II)**
The two members are joined by 2 joints that represent the TMJ. The horizontal condylar path is fixed at certain angle that ranges from 30-40 which is the average of the most patients. The incisal guide table is also fixed at a certain angle from horizontal. On the fixed condylar path articulators, the upper members are movable (the condyle) and the lower members are stationary.

![Image of fixed condylar path articulators](image.png)

**Possible movements**
1-opening and closing
2-protrusive movement at a fixed condylar path angle.
Records required
1-OVD
2-Centric relation record
3-Face-bow record
(In some designs of these articulators, the upper cast can be mounted by a face bow transfer)

When an articulator doesn’t accept face-bow record, the mounting is made according to (Bonwill triangle)
Bonwill found that in the mandible the inter-condylar distance as well as the distance from each condyle to the contact point of the lower central incisors was 4 inches (equilateral triangle). An anterior pointer is attached to the incisal pin of the articulator to locate the tip (midline) of the occlusion rim labially and thus to orients cast in relation on the Bonwill triangle.

Disadvantages:
1-Most of these articulators do not accept face-bow record
2-The condylar path moves to a fixed angle and it is successful in patients whose condylar angle approximates that of the articulator.
3-No lateral movements.
2- *Adjustable condylar path articulators (class III and IV)*

These types of articulators differ from fixed condylar path articulators in that they have adjustable condylar and incisal guidance. They can be adjusted so that the movements of its jaw members closely resemble all movements of the mandible for each individual patient.

*A-Semi adjustable condylar path articulators (class III)*

*Design:*

In these articulators (e.g. *Hanau’s articulator*) the horizontal condylar path is adjusted by the protrusive record obtained from the patient.

The lateral condylar path inclination is adjusted according to the *Hanau’s formula:* 

\[ L = H/8 + 12 \]

(L=lateral condylar path, H= the horizontal condylar path).

Some semi adjustable articulators are non-arcon, while others are arcon. The term arcon (articulator+condyle) is commonly used to indicate an instrument that has its condyles on the lower member and the condylar guides on the upper member.

The non-arcon or condylar articulator having the condylar guides (fossa assemblies) attached to the lower member.

<table>
<thead>
<tr>
<th>Arcon</th>
<th>Non-Arcon</th>
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[Image of Arcon and Non-Arcon articulators]
**Possible movements:**

1-Opening and closing

2-Protrusive movement according to the horizontal condylar path angle determined from the patient.

3-Lateral movement to the angle estimated from the Hanau formula.

4-Some types have Bennett movement (immediate side shift).

(lateral movement of the mandible toward the working side as the non-working condyle moves forward).

**Records required:**

1-A maxillary face bow record to mount the upper cast.

2-centric occluding relation record (vertical dimension and centric relation) to mount the lower cast.

3-protrusive record to adjust the horizontal condylar path inclination of the articulator.
Disadvantages:

1-the lateral condylar path angle is determined from the formula.

2-most of these articulators have no Bennett movement.

B. Fully adjustable articulators (Class IV)

They differ from the adjustable articulators in that the lateral condylar path inclinations are adjusted according to records taken from the patient.

Possible movements:

The same movement for the semi-adjustable articulators in addition they have Bennett movement.
**Records required:**

1- A maxillary face bow record to mount the upper cast

2- Centric occluding relation record to mount the lower cast.

3- Protrusive record to adjust the horizontal condylar path inclination.

4- Right lateral record to adjust the left lateral condylar path inclination.

5- Left lateral record to adjust the right lateral condylar path inclination.

**Disadvantages:**

Multiple records are required with the possibility of errors. The semi-adjustable articulators are usually enough for complete denture construction.