6

Articulators and articulation theories

VITA shade, VITA made.

In order to produce complete dentures, it is necessary to have a device which simulates the opening and closing movements of the mouth, the lateral and protrusion movements as well as the retrusion movements. A device which carries out such movements is described as a chewing simulator or an articulator.

6.1 Classification of articulators according to their design

6.1.1 Arcon articulators

An arcon articulator is a mechanical device which imitates the natural temporomandibular joint.

The condylar casings are situated – similarly to the TMJ – on the upper part of the articulator, and the condyles are attached firmly to the lower part of the articulator. The advantage of this type of articulator is the unidirectional movement, as with natural chewing apparatus.

Examples: Denar, Mark II, New Simplex, Panadent, Protar, Quick-Perfekt, SAM, Stuart etc.

6.1.2 Non-arcon articulators

In contrast to the arcon articulator, the condylar casings are situated on the lower part of the articulator and the condyles on the upper part. All movement sequences are made in the opposite direction to the natural temporomandibular joint.

Examples: Atomic, Atraumatik, Candulor Articulator, Dentatus, Condylator, Mastikator, Rational.

6.2 Classification of articulators according to the type of movement that can be made

6.2.1 Average value articulators

These articulators correspond to Bonwill's triangle, and the inclination of the condylar path is taken to be a fixed value. Masticatory movements can therefore only be carried out on an average value basis.

Average value inclination of condylar path: 34°
Average value Bennett angle: 15°

6.2.2 Semi-adjustable articulators

These allow different values to be set such as the inclination of the condylar path, the Bennett angle and in some articulators, the intercondylar distance.

6.2.3 Fully adjustable articulators

These articulators reproduce individual values obtained using an extraoral or an intraoral registration procedure.

The aim of articulation theory is to interpret the existing anatomical conditions of the edentulous patient with the physical and mechanical conditions of the dynamic chewing system in such a way that feasible solutions for the practical fabrication of complete dentures can be developed.

Literature on the subject offers various examples with explanation's as well as practical working instructions.

6.3 The various movements of the mandible are defined as follows

6.3.1 Protrusion
Symmetrical anterior movement of the lower jaw out of the position of maximum intercuspation towards anterior.

6.3.2 Laterotrusion (working movement)
The mandible moves sideways (laterally) out of the position of maximum intercuspation.

6.3.3 Laterotrusion side (working side)
Moves away from the centre during lateral movements.

6.3.4 Mediotrusion (balancing movement)
The mandible moves out of the position of maximum intercuspation towards the centre.

6.3.5 Mediotrusion side (balancing side)
The side of the mandible which is moved towards the centre during lateral movements.

6.3.6 Retrusion
The mandible is moved backwards and downwards (posteriorly and down) out of maximum intercuspation.

6.3.7 Retraction
Movement of the mandible out of the protrusion position back into maximum intercuspation.

6.3.8 Laterotraction (lateral retraction)
Movement of the mandible out of laterotrusion into maximum intercuspation.

6.3.9 Bennett angle
The Bennett angle is formed by the condylar path of the mediotrusion side (Fig. 1, from M1 to M2) and a line parallel to the median plane during lateral movement. It varies between 10° and 20°. Average value 15°.

6.3.9.1 Bennett movement
The lateral and spatial shifting of the laterotrusion condyle in an outward direction. During lateral movement: Fig. 1, from L1 to L2.

The mediotrusion condyle accordingly moves more towards the centre. The lateral movement of the working condyle normally varies between 0.6 mm and 1.5 mm (Lundeen et al. 1978, Wirth 1996).

Diagrams show that the working condyle is not only moved in the lateral direction; its movement can also include a superiorly, inferiorly, anteriorly or posteriorly directed component.

The condyle can here carry out movements in the following directions:

superior = sideways (laterally) and upwards (laterosurtrusion)
inferior = sideways (laterally) and downwards (laterodetrusion)
anterior = sideways (laterally) and forwards (lateroprotrusion)
posterior = sideways (laterally) and backwards (lateroretrusion).

In the absence of further information from the dentist, the average value for dentulous patients is taken to be 15° and for edentulous patients 20°.

The size of the movement has an influence on the Bennett angle.

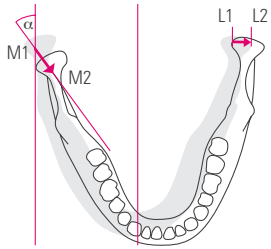

Fig. 1

6.4 The Bonwill triangle

The Bonwill triangle is represented by an equilateral triangle that runs from the mandibular central incisal point to the centre of the right and left condyles (Fig. 2).

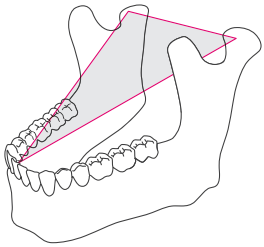

Fig. 2

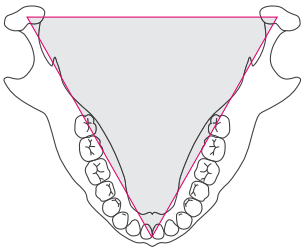

Fig. 3: Boundary of the Bonwill triangle.

The intercondylar distance is consequently equal to the distance from the condyle to the centre of the lower central incisors (incisal point). The length of one side of the triangle is approximately 10.5 cm (Fig. 3).

Mounting the models in the articulator

Preparation: Locating grooves are made in the base of maxillary and mandibular models with a plaster cutter, so they can be remounted after the dentures are completed. There are many different systems which available for this purpose.

The ideal is to use a Split Cast, which enables even the most minor deviations to be recognised after completion of the denture, and to rectify or correct these accordingly.

If a face bow is not used for mounting, the model pairs can be placed according to average values in the Bonwill triangle.

This requires an elastic band and an incisal pin (Fig. 4).

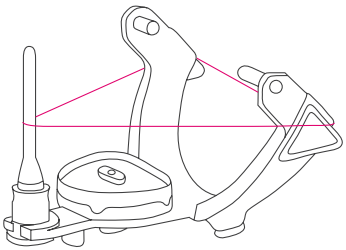

Fig. 4: An elastic band is used to form the boundary of the Bonwill triangle. This corresponds to the occlusal plane.

Notes