

SPEEDY AND EXACT DETERMINING OF THE VERTICAL DIMENSION AND CENTRIC RELATION OF EDENTULOUS JAWS

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The vertical dimension of the bite and the centric relation between edentulous jaws are of great importance in treatment. Many methods of determining the vertical dimension of the bite and the centric relation of the jaws have been described in the literature. Thus, for instance, M. G. Swenson (4) has described ten methods of determining the vertical dimension and as many methods for the centric relation. The existence of so many methods shows that not a single one of them is decidedly superior to the others. Every forthcoming contribution, therefore, is a improvement in the treatment of edentulous jaws.

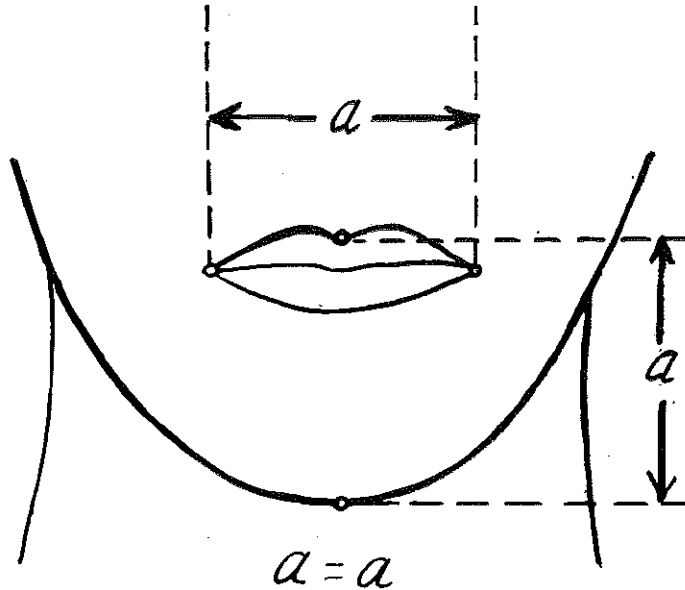
We have used two methods of determining the vertical dimension of the bite and the centric relation of the jaws, which are easy to handle and produce good results. After the necessary practical tests, they were introduced as basic methods of work in teaching the students.

Vertical Dimension of the Bite. During one of our experiments (1) with the device of Willis, we established that the distances between the bipupillary line, the parting line of the lips and the base of the nose, the lower ridge of the chin, are not always equal. The measurements taken on 200 persons with normally developed teeth rows and faces gave differences ranging from 8 to 10 mm.

During another of our anthropometric studies (2), we established that the length of the mouth line equals the distance between the tubercle (Fig. 1). We measured 400 persons (200 men and 200 women) between the age of 21 and 38 with normally developed and well preserved teeth rows with precision up to 0.1 mm. In the mouth region all measurements were taken on the border between the red of the lips and the skin. The difference between the two measurements does not exceed 0.05 mm on the average (Table 1).

Measurements	Sex	Mouth Line	Tubercle Line
Minimal	Women	40.00	40.00
	Men	42.85	42.80
Maximal	Women	55.60	55.60
	Men	58.90	58.85
Average	Women	46.20	46.15
	Men	51.30	51.27

It is difficult to accept the closeness of results in Table 1. This is probably due to an optical illusion. It is even difficult to assume that the two distances are equal on the flat design in Fig. 1.

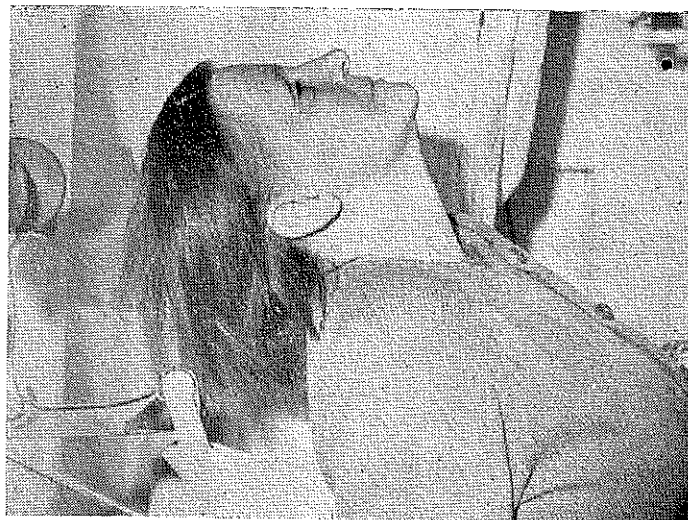


The vertical dimension of the bite is determined in the following order. The vertical dimension of the upper base plate is determined first

in relation to the length of the upper lip and the desired visibility of the edges of the upper incisors. Then the outside surface of the bite rim is formed, while the upper lip is in a normal position. Then the length of the mouth line is measured with a compass and superimposed between the tubercle of the mouth and the lower ridge of the chin, after closing both jaws. If they do not coincide, the vertical dimension of the lower bite rim is reduced or extended accordingly.

The described method of determining the vertical dimension of the bite gives extremely accurate results. It cannot be applied to people with visible deformities and scars in the lower part of the face, to persons who have a deep bite, grave changes in the jaw bones due to rickets and other reasons.

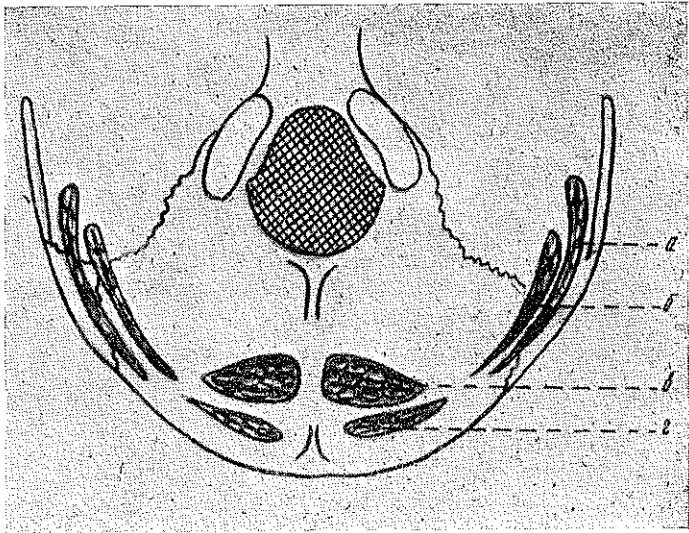
Determining the Centric Relation. For the exact and speedy determining of the centric relation between edentulous jaws we use a functional - reflex method (3). We request the patient consciously to turn his head to the back and downwards (Fig. 2), the mandible is then



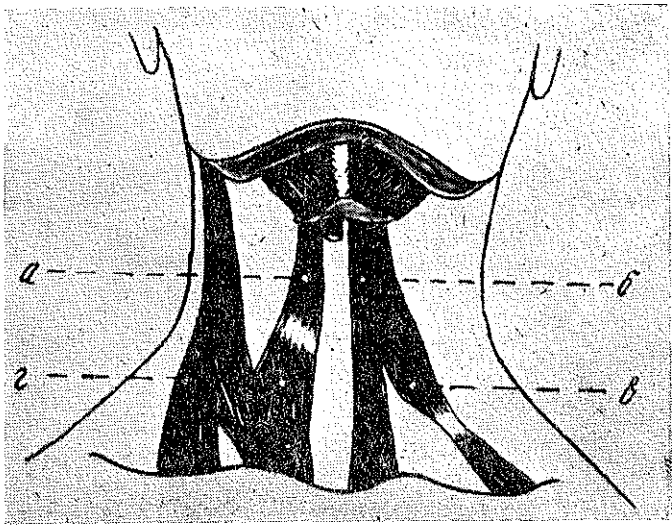
pulled to the back and upward by a reflex motion in a correct central relation to the maxilla. If the patient swallows simultaneously or pulls the tip of his tongue upwards and to the back, the functional tests correct and determine the relation between the two jaws with greater precision.

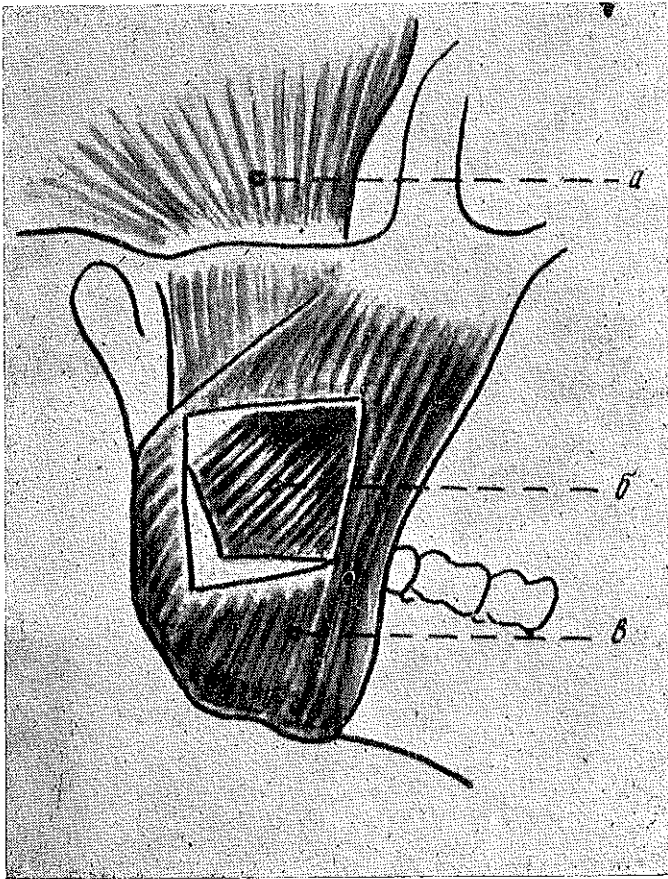
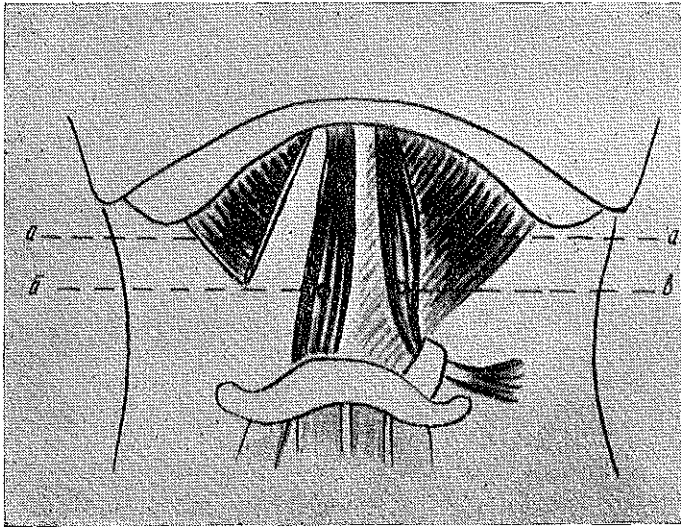
The functional - reflex determining of the centric relation between edentulous jaws is done in the following order. The base plates are

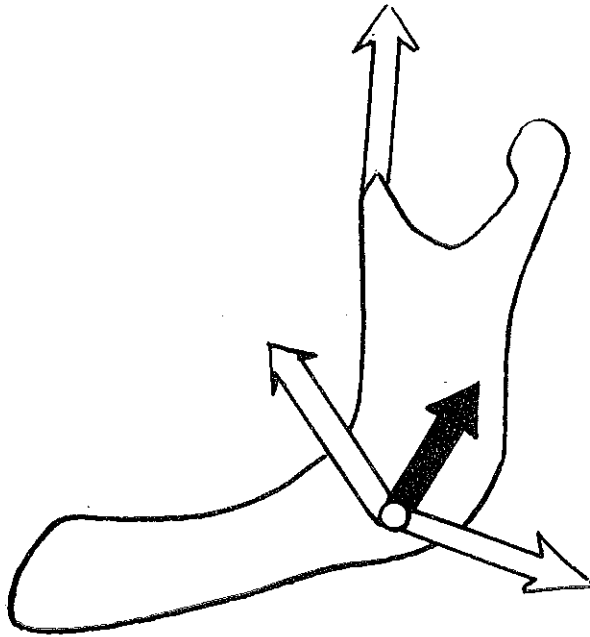
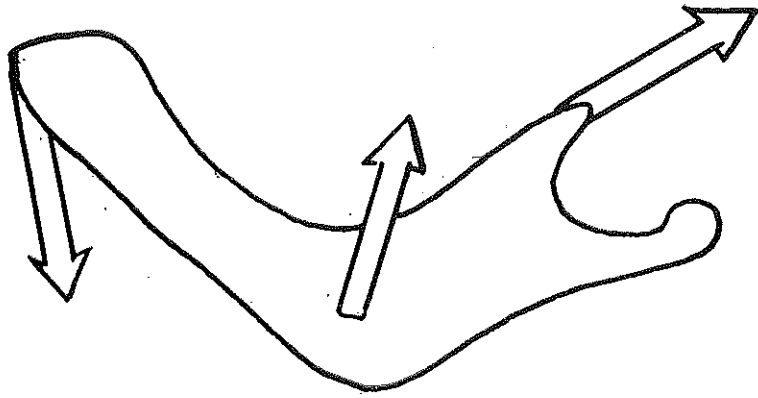
adjusted in the mouth and the bite vertical dimension is determined. Then the head support is detached. The patient leans on the dental chair and without changing the position of his body, bends his head to the back and downwards (Fig. 2). At the same time he is asked to swallow his saliva and to press his jaws tightly together. Only the rims of the bite plates have to be fixed together and the centric relation is determined.

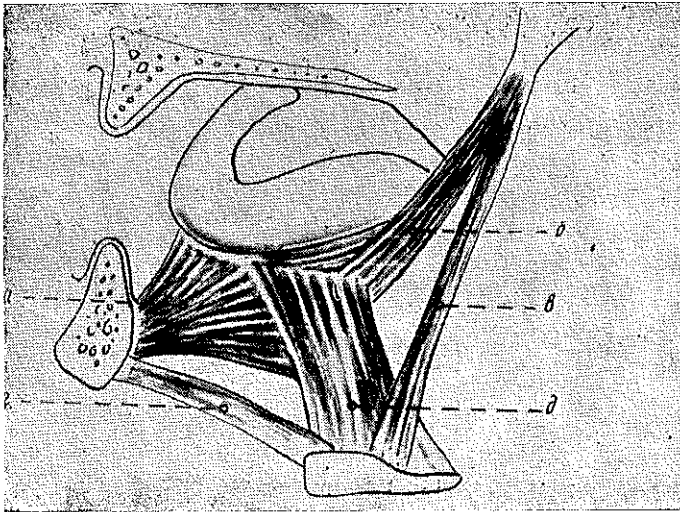
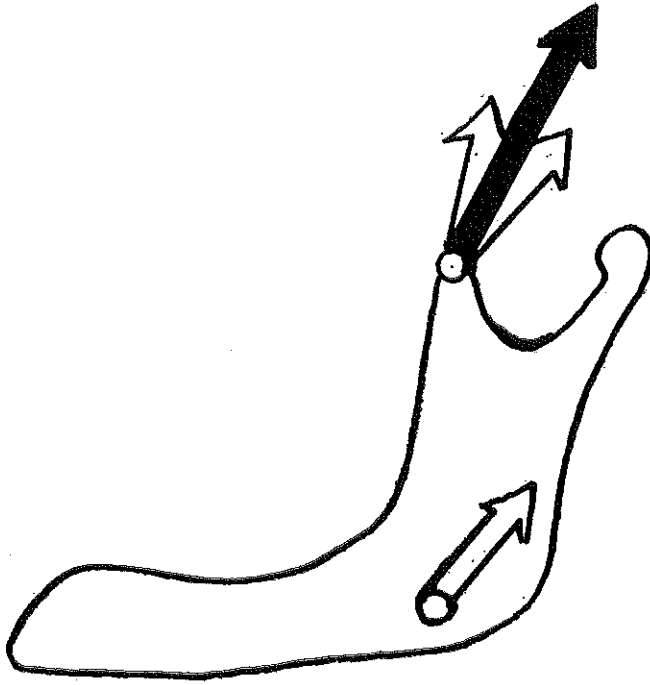


The functional - reflex determining of the centric relation of edentulous jaws is done in a fraction of a minute. Its description and the showing of its locomotor reflex mechanisms require more time.









The conscious movement with which the patient pulls his head backwards is achieved with the help of a group of muscles, among which the most important are: MM. **trapezius**, **splenius capitis**, **semi-spinalis et sternocleidomastoideus** (Fig. 3). The disturbed balance of

the head and the neck causes a reflex shortening of the subhyoidal and suprahyoidal muscles. The shortened subhyoidal muscles MM. **sternohyoideus, sternothyroideus, thyrohyoideus** et **omohyoideus** (Fig. 4) pull the hyoidal bone downwards. The suprahyoidal muscles MM. **digastricus (v. anterior), mylohyoideus** et **geniohyoideus** (Fig. 5), fixed to the hyoidal bone, and M. **platyzma** pull the mandible downwards and cause the reflex shortening of the mastication muscles. The shortened mastication muscles MM. **massater, temporalis et pterygoideus medialis** (Fig. 6) pull the mandibular bone in three main directions in conjunction with the suprahyoidal muscles (Fig. 7). The resultant of the muscles which are active in the region under the chin and the mandibular angle (Fig. 8), added to the action of M. **temporalis** gives a total end result (Fig. 9), in which the locomotor reflexes of all mandibular muscles are summed up. This sufficiently powerful total resultant neutralizes the counteraction of M. **pterygoideus lateralis**, pulling the mandible to the back and upwards in centric relation to the maxilla.

The end result is improved if a functional locomotor test, such as, for instance, the pulling of the tip of the tongue to the back and upwards (or deglutition) is added to the backward movement of the head. The pulling of the tongue and fixing it backwards is effected by M. **styloglossus et hyoglossus** (Fig. 10). In that case M. **genioglossus** finds support in the fixed root of the tongue and by shortening helps the closing of the mandible in centric relation to the maxilla.

Conclusion. The described methods of anthropometric determining of the vertical dimension of the bite and the functional-reflex determining the relation between edentulous jaws are easy to handle and do not require special instruments. They can be used by any stomatologist after several trials with the first patients.

TEXT TO FIGURES

FIG. 1 — Facial measurements (scheme)

- a. **Commissura labiorum dextra**
- b. **Commissura labiorum sinistra**
- c. **Gnathion**
- d. **Tuberculum labii superioris**

FIG. 2 — Patient's position with head pulled to the back and downwards

FIG. 3 — Muscles pulling head backwards :
a. **M. semispinalis capitis**

- b. **M. sternocleidomastoideus**
- c. **M. splenius capitis**
- d. **Trapezius**

FIG. 4 — Subhyoidal muscles

- a. **M. thyreoideoideus**
- b. **M. sternohyoideus**
- c. **M. omohyoideus**
- d. **M. sternothyreoideus**

FIG. 5 — Suprahyoidal muscles

- a. **M. mylohyoideus**
- b. **M. geniohyoideus**
- c. **M. digastrius (v. anterior)**

FIG. 6 — Muscles closing the mandible

- a. **M. temporalis**
- b. **M. pterygoideus medialis**
- c. **M. masseter**

FIG. 7 — General direction of shortening the mandibular muscles

FIG. 8 — Resultant of the muscles of the chin and mandibular angle

FIG. 9 — Total resultant of all mandibular muscles

FIG. 10 — Muscles which take part in moving the tongue to the back
and downwards

- a. **M. genioglossus**
- b. **M. styloglossus**
- c. **M. stylohyoideus**
- d. **M. geniohyoideus**
- e. **M. hyoglossus**

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A method of determining the vertical dimension of the bite is described, based on the equality between the length of the mouth line and the distance between the tubercle of the upper lip and the base of the chin. This equality was established after measuring 400 persons with an average difference of 0.05 mm between the two values.

The functional reflex method of determining the centric relation between edentulous jaws is described. It consists of a conscious movement of pulling the head to the back and downwards, in which case the mandible moves to the back and upwards along a locomotor - reflex way. The role of the functional tests of deglutition and pulling the tongue to the back and upwards which improve the end result are also explained.

LITERATÜR

- 1 — **Boyanov, B.** : Arranging the Artificial Teeth on Whole Prosthesis, Medicina i Physcultura Publishing House, Sofia, 1958, p. 71
- 2 — **Boyanov, B., Y. Yordanov, K. Bernstein** : Anthropometric Determining of the Vertical Dimension of the Bite (original)
- 3 — **Boyanov, B.** : Functional - Reflex Method of Determining the Centric Occlusion (original)
- 4 — **Swenson, M. G.** : Complete Denture, E. H. Kimpton, London, Sec. Ed., 1948, p. 90