



A Starter's Guide to Preclinical Teeth Arrangement: Simplified Clinometer

N Venugopal Rao, A Sudheer, C Sathya Nageswar Rao, K Srinivas Reddy

ABSTRACT

Arrangement of artificial teeth in a bilaterally symmetrical fashion with proper inclinations of teeth had been a challenging task for beginners. A variety of tools and guiding equipment have been developed to help students to learn teeth arrangement. Unfortunately, those tools were either costly or unsuitable for use with mean value articulators. This article attempts to introduce a simplified clinometer which can be attached to mean value articulator and can be used as a guide to arrange teeth in a bilaterally symmetrical manner by the undergraduates in both clinical and preclinical set-up.

Clinical significance: Training of the future dentists in sound esthetic principles in a preclinical environment, using this device, will increase the final clinical efficacy of their work.

Aim: The aim of this article is to provide a simple but effective device to undergraduate students to help them learn teeth arrangement easily and systematically.

Keywords: Behavior shaping, Complete denture, Psychology, Patient care.

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INTRODUCTION

The psychological importance of a pleasing dental appearance is often discussed in regards to denture success.¹⁻⁵ Many studies have inferred that patients wearing removable dentures considered appearance to be the most important property of the prosthesis and that there was an almost exclusive preference for the esthetic denture over a denture with better comfort or function.^{6,7} In an ideal esthetic setting of denture teeth, the maxillary midline should coincide with the midline of the face. The verticality of the midline appears to be much more critical than the mediolateral position. As long as the midline is

perpendicular to the occlusal plane and hence the interpupillary plane, the smile can appear balanced. The dental midline when not collinear with the facial midline should be at least parallel to it. Otherwise a visual tension is created. The same applies to the lack of balance of direction. Lombardi stated that an esthetic denture has its midline placed in a stable position and the visual weights and directions on either side are in a state of equilibrium.⁸

Meager interest has gone through the development of aids for proportionate arrangement of teeth in articulators. Golden proportion is one such parameter for esthetics.⁹ Several guides have been developed for reproduction of golden proportion in prosthesis fabrication, examples being Golden Ruler, Golden section Divider and Grids, Waxing guides, etc. Dr Behrend type clinometer developed for the Artex system of articulators is an adjustable Perspex[®] shield furnished with several vertical lines and two horizontal lines, for transferring physiognomic esthetic parameters. Once adjusted to the facebow, the horizontal lines can be aligned to match the eyes and the line of the anterior teeth, using the rotary control. The tooth position as determined is represented as an angle, and can be transferred to the articulator in the laboratory to recreate the position of the anterior teeth.¹⁰ Though adequate the Behrend type clinometer is not a cost-effective solution and also needs a semiadjustable articulator system for its utilization. But no such device is available to use with the mean value articulator, which is still the most commonly used type for preclinical and clinical work.

Considering the above, a starter's guide to preclinical teeth arrangement in the form of a simplified clinometer is designed and its usage is presented in this article. This simplified clinometer can be made to fit any mean value articulator with adequate accuracy and can be used as a guide to arrange teeth in a bilaterally symmetrical manner both in

clinical and preclinical set-up. This can also serve as an aid in fixed partial prosthodontic procedures.

MATERIALS AND METHODS

Ideal occlusal rims were constructed on ideal casts used by the undergraduates and mounted on a mean value articulator. In order to fabricate the simplified clinometer to fit to the mean value articulator, the incisal rod of the articulator had to be replicated in exact size and shape to maintain the established vertical height of the occlusal rims. The incisal rod was replicated by using putty elastomer (Zhermack Elite HD+). The impression was filled with self-cure resin (DPI-RR cold cure) by sprinkle on method. Once the resin has cured completely, it was removed, trimmed and polished (Fig. 1). The resin rod was then cut into two pieces near the central hole (which accommodates the incisal pin) such that the total length of the two pieces is less than the length of the original incisal rod. Two notches were made at the cut ends of the rod in a rectangular fashion. A glass plate was cut into a shape (Fig. 2) such that it fills into the gap created by cutting the resin rod and restores the original height. Once satisfied with the dimensional accuracy, the glass plate was taken out and divided into sections using an adherent tape. It was divided into an upper and a lower half in a horizontal plane. It was divided vertically on either side of the midline into nine parts. The vertical lines were spaced uniformly with 5 mm between each line. Care was taken to coincide the junction of horizontal and vertical midlines to the previous incisal pin-hole. Then the glass plate was fixed to the notched areas of the resin incisal rod using cyanoacrylate. The entire assembly was fixed to the upper member of mean value articulator on which ideal casts with ideal occlusal rims were mounted prior to the removal of metallic incisal rod (Fig. 3). Simplified clinometer was thus ready to be used. Teeth arrangement was started with the

simplified clinometer in position (Fig. 4). Care was taken while teeth arrangement to make sure that the vertical lines on either side of the midline acted as reference guidelines for coinciding the inclinations of teeth on either side. The horizontal line acted as reference guide for occlusal plane. Teeth arrangement was completed by placing teeth on the right side first and then on left side. Maxillary teeth arrangement was finished first and then mandibular teeth were arranged as usual. Care was taken to incorporate all the principles of teeth arrangement that are taught to undergraduates. The ideal trial dentures were ready for evaluation (Fig. 5).

DISCUSSION

The first and foremost purpose of the design is to prepare a device that can help undergraduate dental students to visualize teeth arrangement that they do, in a bilaterally symmetrical fashion from a frontal view. Clinometer is a device used to assess the inclinations of teeth and arrange teeth in a bilaterally symmetrical fashion. The Hanau Behrand Clinometer permits the dentist to record correct anterior tooth alignments, and transmit these then to the laboratory, thus controlling tooth alignment in fabricating the prosthesis. It can also be used to plan and control orthodontic treatment and orthognathic surgery. It enables the facial harmony of eyes, lips, incisor planes, and long axis of the nose to be precisely recorded. A smaller screen laboratory clinometer is attached to the articulator, and this is set by the technician, using information recorded on the patient. The disadvantage with this clinometer being its high cost and inability to be modified to fit to mean value articulator, it cannot be used by undergraduate students. Hence, the need to invent a new type of clinometer that is cost-effective, can be fit to a mean value articulator that is most commonly used by undergraduates and can be easily



Fig. 1: Replica of incisal rod made with self-cure acrylic

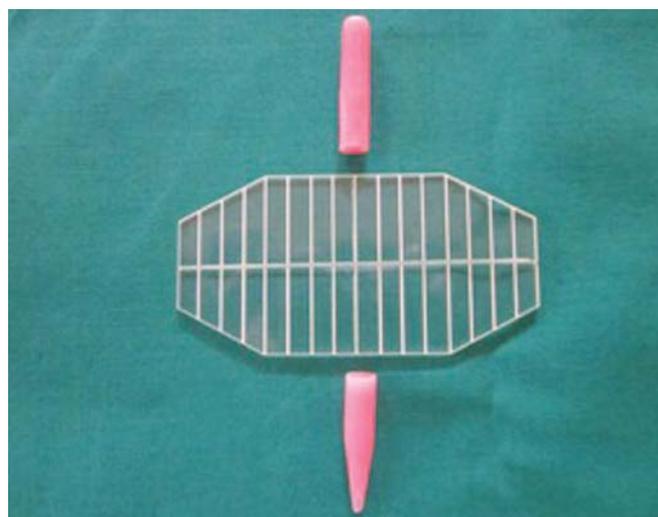


Fig. 2: Pants of simplified clinometer ready to be assembled

used by them. Simplified clinometer is an effective answer to this problem. Several modifications are done to the original clinometer of Behrend. The changes done are as follows:

1. Design is simplified to be fit to a mean value articulator.
2. Incisal rod of the articulator is itself modified to act as clinometer, removing the need to incorporate additional components to fix the clinometer to articulator.
3. Since, the purpose of this device is to teach undergraduates the art of teeth arrangement in a esthetic manner on a mean value articulator, clinical clinometer component is completely eliminated leaving only laboratory clinometer to be used.
4. A glass plate is used thus making the visibility of teeth on the other side even clearer.



Fig. 3: Simplified clinometer attached to mean value articulator



Fig. 4: Completed maxillary teeth arrangement using the instrument



Fig. 5: Frontal view of simplified clinometer with the completed teeth arrangement

5. Once, the occlusal plane is established in the patient with the anterior plane parallel to intercanthal line and jaw relation established, the occlusal rims are mounted in such a way that the mid line of maxillary occlusal rim coincides with the central vertical line of clinometer and the horizontal line coincides with the occlusal plane. Thus, it is very easy for students to adapt this device.

Teeth arrangement done using this device was found to be a simple exercise. The vertical lines of simplified clinometer act as guidelines for arrangement of teeth in a bilaterally symmetrical fashion. They act as guidelines for inclinations of anterior teeth and in maintaining the proportionate decrease in size of teeth as we go posteriorly. Overall, this device has been found to be very easy to use by the undergraduates as has been found by allowing them to use this during preclinical teeth arrangement.

CONCLUSION

A mean value articulator has been modified to attach a simplified clinometer in place of vertical supporting rod. Simplified clinometer has been used successfully for arranging teeth in an ideal preclinical setting. The completed teeth arrangement was found to be esthetically ideal from frontal view and bilaterally symmetrical. Thus, in a future clinical perspective, it would not only be a very useful tool in the hands of budding dental students for arranging teeth in a bilaterally symmetrical manner, thereby inculcating a sense of esthetics in the minds of undergraduates but also helps in educating patients about possible treatment outcome prior to the start of treatment.

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