

Accurate arch-discrepancy measurements

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One of the most important but arbitrary procedures of orthodontic diagnosis is the measurement of tooth-to-arch-length discrepancies. Several techniques have been suggested for determining the actual tooth-to-arch-length discrepancy,¹⁻⁴ but all of these techniques are of dubious value because they involve a high degree of personal judgment and cannot display a high degree of reproducibility.

In 1972 Brader⁵ published his findings concerning the ideal arch form and found that natural, untreated, superior arches conformed to a formula of $PR=C$. These superior arches were found to be trifocal ellipses and could be used as guides for the arch development in treatment of malocclusions. It has been suggested that these ideal arch forms of Brader could be adapted for the construction of accurate, indirect arch wires.⁶ Further adaptation of these arch forms permits an accurate measurement of the tooth-to-arch-length discrepancy (Fig. 1).

Armamentarium

A Boley gauge is used to measure arch width, in millimeters, in the lower second molar region on the diagnostic models. This will permit selection of the ideal arch form guide that will be used to determine the actual tooth-to-arch-length discrepancy. The fine dividers are used to measure the individual teeth and place the measurements on the paper arch form of choice. A clear plastic arch form guide is used as an overlay to determine the actual arch-length discrepancy (Fig. 1).

Technique

The patient's lower second molars are used to determine the intra-arch width in millimeters (Fig. 2). If the second molars are absent, the first molars can be measured and 4 mm. added to arrive at the correct arch width. This molar width, in millimeters, will conform to the correct, ideal, numbered arch form on

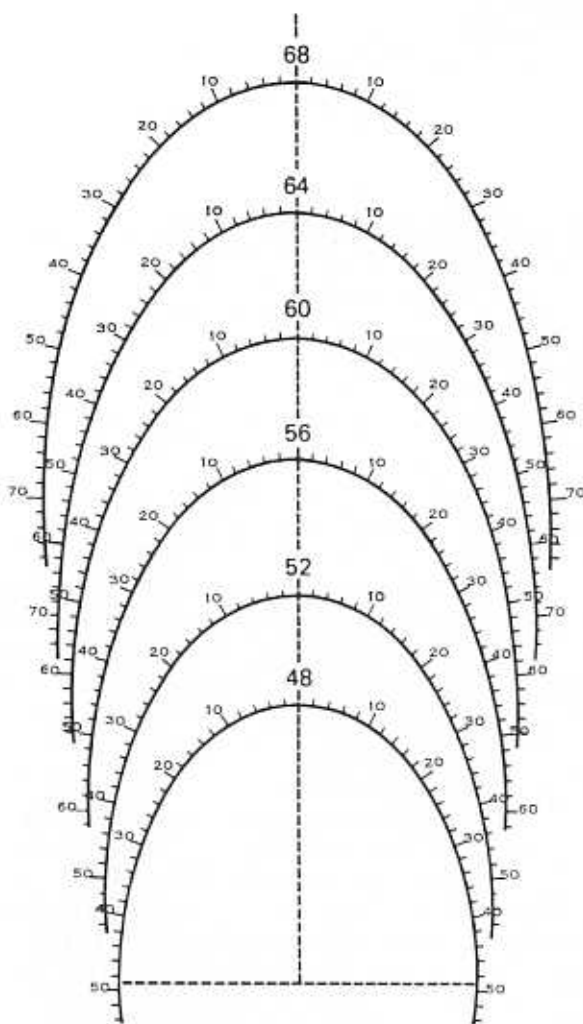


Fig. 1. Illustration of the clear plastic overlay with millimeter markings that is used to determine arch length and form.

the plastic guide (Fig. 1). If, for example, the molar width is 60 mm., then a No. 60 arch form will be used to determine the arch-length discrepancy (Fig. 4). If the measurement lies between two numbered arch forms, the orthodontist must choose the more accurate of the two.

Ordinarily, the maxillary arch form is one size larger than that selected for the lower arch. The fine calipers are used to measure the mesiodistal width of each individual lower anterior tooth (Fig. 3). The width of each of these teeth is scratched, in sequence, from the midline distally, on the paper arch form (Figs. 1 and 4). One may measure all of the teeth in the arch but, again, experience has shown that it is more practical to measure only six anterior teeth.

The clear plastic overlay is then positioned over the diagnostic model so that

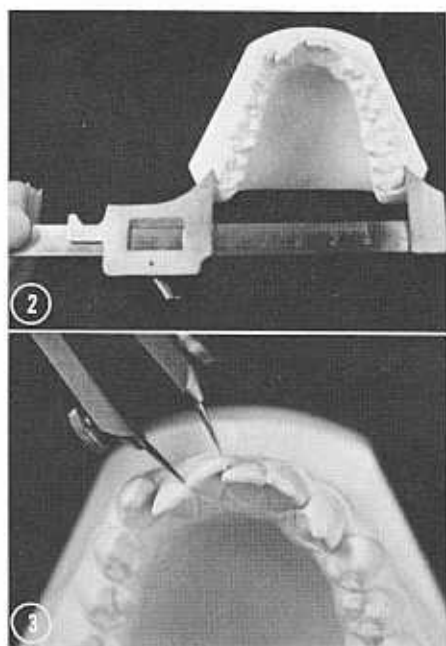


Fig. 2. Measurement of mandibular second molar width to determine appropriate arch form size.

Fig. 3. Measurement of mesiodistal widths of mandibular anterior teeth.

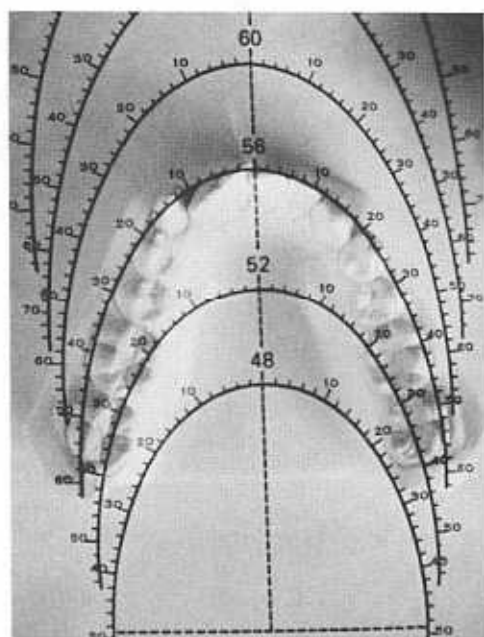


Fig. 4. Clear plastic overlay superimposed on lower arch.

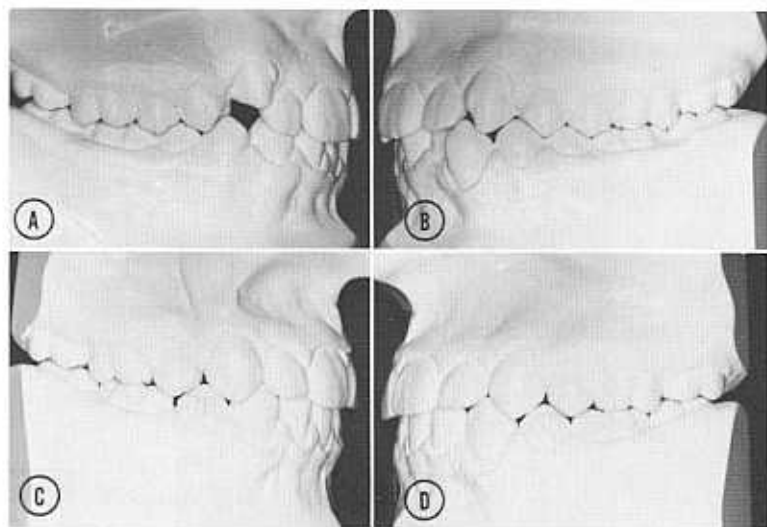


Fig. 5. A, Pretreatment models, right lateral view. B, Left lateral view. C, Posttreatment models, right lateral view. D, Left lateral view.

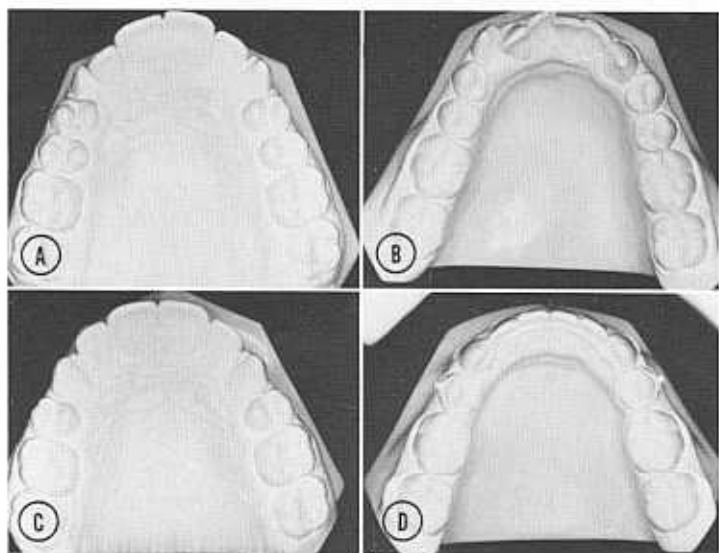


Fig. 6. A, Pretreatment maxillary model, occlusal view. B, Pretreatment mandibular model, occlusal view. C, Posttreatment maxillary model, occlusal view. D, Posttreatment mandibular model, occlusal view.

the selected arch form is centered and lying on the facial surfaces of the lower incisors (Fig. 4). When there is a great deal of crowding in the anterior section, some thought as to where exactly to place the overlay is required. Close inspection will usually reveal the true basal bone arch form, and the overlay can be made to conform to the best-oriented tooth or teeth within that bony structure.

Obviously, if one or more teeth are positioned quite a bit labially or lingually,

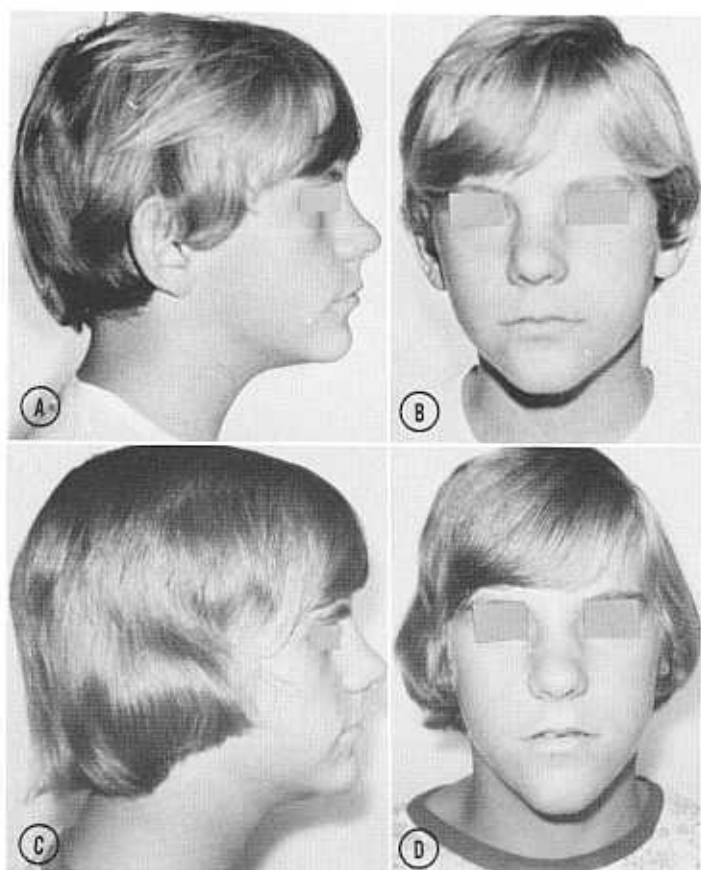


Fig. 7. A, Pretreatment profile at age 12 years 2 months. B, Pretreatment full-face view at 12 years 2 months. C, Posttreatment profile at age 14. D, Posttreatment full-face view at age 14.

the overlay would not be aligned with the facial surfaces of these grossly misplaced teeth.

A reading is made through the clear overlay, and the mesial surface of the first lower premolar on each side is determined in millimeters as the arch limit. This millimeter measurement is then transferred to the paper arch form, and the difference between the amount of arch length needed and that which is actually present is determined.

One of the most common current methods of arch-discrepancy measurement is personal assessment (or "eyeballing" it), but one has only to compare that with this new technique of assessment to point out the degree of error that is possible by "eyeballing." General principles are shown in the treated case depicted in Figs. 5 to 8.

Accurate measurement of the tooth-to-arch-length discrepancy must be the cornerstone of any orthodontic diagnosis. Unfortunately, this important feature has been left to conjecture and tradition far too long. It is hoped that this simple but effective technique can encourage more accuracy in this assessment.

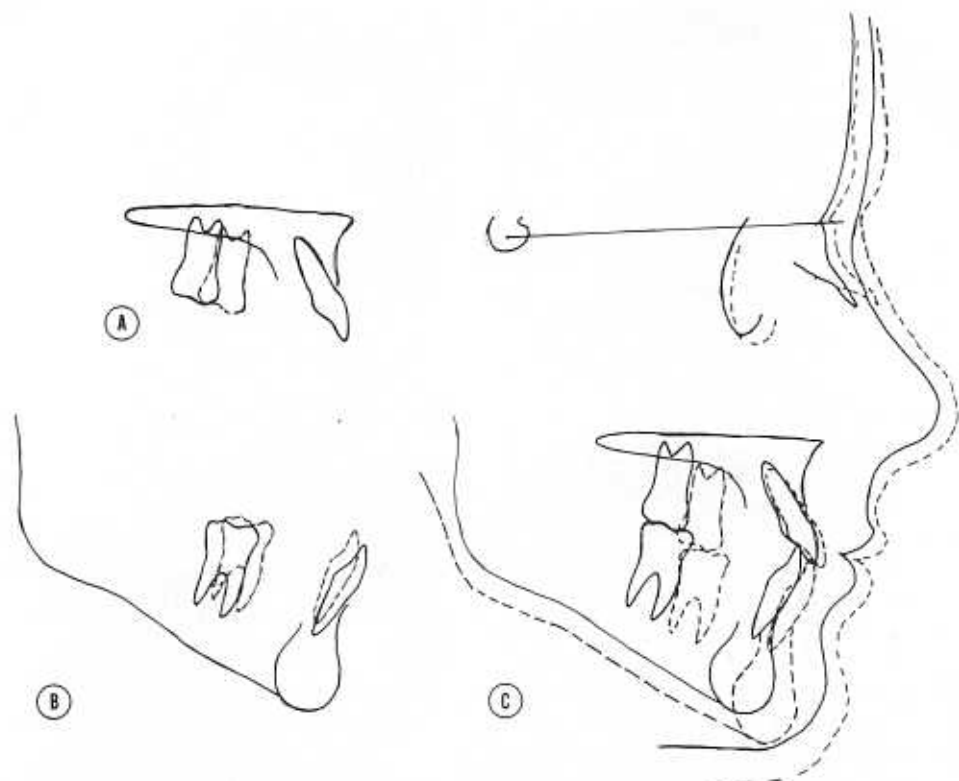


Fig. 8. Cephalometric tracings. A, Superimposed on maxilla. B, Superimposed on mandible. C, Superimposed on SN.

Summary

A new technique for accurately measuring tooth-to-arch-length discrepancies according to the ideal arch form is discussed. The armamentarium for making these measurements is explained, and the technique is demonstrated. Clearly, this is an important part of orthodontic diagnosis, and there is a need for greater accuracy than that which techniques of the past have made possible.

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