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## The use of tooth thickness in predicting intermaxillary tooth-size discrepancies

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### ABSTRACT

Intermaxillary tooth-size discrepancies can be assessed using a diagnostic setup or predicted using a mathematical formula, such as the Bolton analysis. However, variations in tooth thickness may produce inaccuracies in the Bolton analysis ratio. To date, no method for incorporating tooth thickness into discrepancy prediction has been proposed. The purpose of this study was to design and test a new method of predicting anterior tooth-size discrepancy that takes into account tooth thickness and width. Forty-four positioner setup models were set to ideal overbite (2.5 mm) and occlusion (Class I canine relationship). Interproximal gaps between the maxillary or mandibular central incisors were allowed in order to optimize tip and torque. The mesiodistal width of all anterior teeth and the labiolingual thickness of the maxillary incisors were measured on these idealized setups to the nearest 0.1 mm. Actual intermaxillary anterior ratios were then calculated. A new method of prediction was developed by assuming a linear relationship between tooth thickness and ideal intermaxillary ratio. Errors in Bolton's method were compared with the new method. The results showed wide variations in mesiodistal tooth widths, tooth thicknesses, and intermaxillary anterior ratios in orthodontically treated patients. The correlation coefficient between the intermaxillary ratio and tooth thickness was  $r = 0.68$  when tooth thickness was  $< 2.75$  mm, and  $r = 0.28$  when tooth thickness was  $\geq 2.75$  mm. The mean absolute errors in predicting the actual intermaxillary ideal ratio was  $1.29 \pm 0.81$  for Bolton's ratio and  $0.84 \pm 0.46$  for the new prediction formula. These new formulas were better than Bolton's ratio in predicting tooth-size discrepancies ( $p = 0.003$ ). Tooth thickness combined with mesiodistal width may be useful in predicting intermaxillary tooth-size discrepancies.

**Commentary** by Dennis M. Killiany

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