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Original Articles

## A Novel Method for the Assessment of Three-Dimensional Tooth Movement during Orthodontic Treatment

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### Abstract

**Objective:** To (1) evaluate the stability of palatal rugae as landmarks for superimposition of dental casts and (2) establish a three-dimensional superimposition method of maxillary dental casts for analyzing orthodontic tooth movement.

**Materials and Methods:** The sample consisted of dental casts obtained from 10 patients treated with extraction of bilateral maxillary first premolars and placement of three palatal miniscrews as anchorage for retraction of the anterior teeth. Dental casts were measured by means of laser surface scanning system, and three-dimensional images were reconstructed. Serial dental casts were superimposed on the three miniscrews as registration landmarks (miniscrew-superimposition method), and the displacement of each palatal ruga point during the closure of extraction spaces was measured. Displacement of the central incisors was measured by the miniscrew-superimposition method and the proposed superimposition technique (ruga-palate-superimposition method). Correlation analysis and paired *t*-tests were performed to determine whether a significant difference existed between the measurements of the two superimposition methods.

**Results:** The medial points of the third palatal rugae and the shape of the palatal vault were stable throughout the treatment. The displacement of the central incisors measured using the ruga-palate-superimposition method showed no significant difference with that measured using the miniscrew-superimposition method.

**Conclusion:** The maxillary dental casts can be reliably superimposed on the medial points of the third palatal rugae and the palatal vault as reference landmarks.

**Keywords:** [Palatal rugae](#), [Superimposition](#), [Miniscrew](#), [Stability](#), [Dental cast](#), [Landmark](#)

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