

Perbedaan distribusi tekanan pada tindakan intrusi molar pertama rahang atas menggunakan penjangkar miniscrew dengan berbagai ketinggian dan sudut pemasangan (simulasi 3D finite element analysis) = A Comparison of stress distribution of upper first molar intrusion using miniscrew anchorage with various heights and angles Of placement (A 3D finite elemen analysis)

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Abstrak

ABSTRAK Tindakan intrusi molar pertama rahang atas menggunakan penjangkar *miniscrew* yang diletakkan di sisi bukal dan palatal sering digunakan dan memiliki tingkat keberhasilan yang cukup tinggi. Penelitian ini dilakukan untuk mengetahui perbedaan distribusi tekanan pada tindakan intrusi molar pertama rahang atas menggunakan *miniscrew* yang diletakkan dengan ketinggian 3 mm, 5 mm, dan 7 mm dari *cementoenamel junction*, serta sudut 45° dan 90° dari sumbu gigi. Model tiga dimensi struktur kraniomaksila dibuat dari hasil pemindaian tengkorak kering. Terdapat empat *Region of Interest* (ROI) yang ditentukan yaitu akar molar pertama rahang atas, alveolar molar pertama rahang atas, *miniscrew*, dan alveolar *miniscrew*. Terdapat perbedaan bermakna ($p < 0,05$) distribusi tekanan pada tindakan intrusi molar pertama rahang atas, baik pada kelompok ketinggian maupun sudut pemasangan *miniscrew*, di semua ROI. Gambaran tekanan pada molar pertama rahang atas dan alveolarnya terkonsentrasi di daerah akar palatal dan trifurkasi. Gambaran tekanan pada alveolar *miniscrew* menunjukkan perbedaan distribusi spektrum warna pada kelompok sudut pemasangan. Tindakan intrusi molar pertama rahang atas dipengaruhi oleh ketinggian dan sudut pemasangan *miniscrew*.

ABSTRACT

Miniscrew-assisted upper first molar intrusion had been developed recently with high rate of success. The placement of two miniscrews, buccally and palatally, is usually done to deliver such force. This research was conducted to analyse the difference of stress distribution of upper first molar intrusion using two miniscrews, placed at 3 mm, 5 mm, and 7 mm from cementoenamel junction, and 45° and 90° from the tooth axis. A three-dimensional solid model of craniomaxillary structure was rendered and the region of interests (ROI) were defined at the first molar roots, its alveolar, miniscrews, and the bone surrounding the miniscrews. Statistical analysis showed that there were significant differences ($p < .05$) of Von Mises mean values in the ROIs between all groups of height and angle of placement. Visual analysis showed that the stress distribution in first molar roots were concentrated at the trifurcation and palatal root apex area, while in the bone surrounding the miniscrews, the highest stress distribution was located diversely among separate angles of placement groups. The stress distribution of upper first molar intrusion using miniscrews anchorage was affected by heights and angles of miniscrews placement.