

Perbedaan distribusi stress pada tindakan ekspansi rahang atas menggunakan rapid maxillary expander dan maxillary skeletal expander simulasi 3d finite element analysis = The differences of stress distribution of maxillary expansion using rapid maxillary expander and maxillary skeletal expander a 3d finite element analysis simulation

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Abstrak

Latar Belakang: Rapid Maxillary Expander RME yang sering digunakan dalam mengoreksi defisiensi maksila secara transversal memiliki beberapa keterbatasan, seperti usia dan efek samping yang secara klinis kurang menguntungkan. Maxillary Skeletal Expander MSE merupakan pengembangan RME yang dikombinasikan dengan miniscrew. Penelitian ini bertujuan untuk menganalisis perbedaan distribusi stress akibat penggunaan RME dan MSE di Region of Interest ROI kraniomaksila, yaitu molar satu M1, alveolar palatal di regio M1, sutura palatina, sutura zigomatik, miniscrew, dan palatum di sekitar lokasi insersi miniscrew. Metode: Tengkorak kering manusia dipindai dengan Cone ndash;Beam Computed Tomography untuk membuat model tiga dimensi 3D kraniomaksila. Analisis data dilakukan secara visual dan numerik. Hasil: Gambaran distribusi stress di kelompok RME berada di palatal mahkota M1, mesial alveolar palatal, dan korteks inferior sutura palatina. Gambaran distribusi stress di kelompok MSE berada di cusp distopalatal M1, palatal alveolar palatal, dan korteks inferior dan superior sutura palatina. Gambaran distribusi stress di sutura zigomatik pada kedua kelompok terkonsentrasi di sutura zigomatikotemporal, sedangkan pada miniscrew dan area sekelilingnya terkonsentrasi pada miniscrew anterior dan area palatal tulang di sekeliling miniscrew anterior. Kesimpulan: Terdapat perbedaan bermakna distribusi stress pada ROI M1, tulang alveolar palatal M1, sutura palatina, dan sutura zigomatik di antara kelompok model kraniomaksila 3D RME dan MSE.

.....Background Transversal maxillary deficiency corrected with Rapid Maxillary Expander RME may result with some unfavorable side effects and limitations. Maxillary Skeletal Expander MSE, combined with miniscrews, was developed to overcome these drawbacks. This research was conducted to analyze the differences of stress distribution of maxillary expansion using RME and MSE in the Region of Interests ROIs first molars M1, palatal alveolar bones of M1, palatine sutures, zygomatic sutures, miniscrews and their surrounding bones. Methods A dry skull was scanned using Cone Beam Computed Tomography, and rendered into a three dimensional 3D model of craniomaxillary structure. The data analysis was done visually and numerically. Result The stress distributions in RME group are located in palatal side of M1, mesial side of palatal alveolar of M1, and inferior cortex of palatine sutures. The stress distributions in MSE group are located in distopalatal cusp of M1, palatal side of palatal alveolar of M1, and inferior and superior cortex of palatine sutures. The stress distributions in zygomatic sutures on both groups are concentrated in zygomaticotemporal sutures, whereas in the miniscrews, the stress is concentrated on anterior miniscrews and palatal side of surrounding bones. Conclusion There are significant differences of stress distribution of maxillary expansion measured in the ROIs in craniomaxillary 3D model using RME and MSE.