lowest in the 0° group (0.052±0.003mm) and the highest in the 90-degree group (0.128±0.007mm). After 56 days of storage under high-humidity conditions(SP2), the RMS value of the 90° group increased by 32.5%, significantly higher than that of SP1 group (P<0.01).

**Conclusions:** This in vitro study conclusively demonstrates that ambient humidity exceeding 90% induces statistically significant dimensional deviations in 3D-printed surgical guides, establishing precise humidity control during storage of surgical guides as a factors in maintaining implant surgical accuracy.

*Key Words:* 3D-printed, surgical guides, accuracy, humidity.

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## CA5029

### Deep Learning-Assisted CBCT Precisely Locating MB2 Validated By Microscope

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**Aim or purpose:** Based on the gold standard of Micro-Root-Canal Treatment(MRCT), this study established a CBCT imaging deep learning training dataset for the maxillary molars MB2 canal.

**Materials and methods:** With clinical cases screening from 2021 to 2023, hereinto, total 78 cases (maxillary first/second molars accounting for 68/10, respectively) that MB2 were detected through CBCT and were successfully negotiated via microscope eventually, was included. CBCT images of the treated tooth were collected, and MB2 canal contours were manually annotated in their cross-sections, having 1,962 images labeled. They were randomly grouped into a training group (62 cases, 1,412 images), a validation group (8 cases, 305 images), and a test group (8 cases, 245 images), subsequently, the training was conducted in the YOLO11 artificial intelligence model.

**Results:** The precision (B) of the MB2 canal segmentation model was 0.883, and the recall (B) was 0.920. The mAP 50(B) value was 0.961.

**Conclusions:** This study integrates preoperative CBCT three-dimensional imaging data with intraoperative microscopic validation results establishing a MB2 canal detection deep learning training system via multimodal fusion pathway. It efficiently solved the clinical challenge that the canal specificity identification was insufficient in the existed single-imaging methods. The intelligent analytical model developed in this study can accurately recognize MB2 canal anatomical features in maxillary molar CBCT images, providing reliable decision support for clinicians in preoperative root canal treatment planning.

*Key Words:* Deep Learning, CBCT, MB2.

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## CA4895

### Comparison Of Occlusalforce In Post-Orthodontic And Non-Orthodontic Subjects

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**Aim or purpose:** Balanced occlusal force distribution is a critical factor for restorative, prosthetic or orthodontic treatment. It has been postulated that orthodontic treatment may lead to occlusal discrepancy in the arch due to change in occlusal relationship. This study was conducted to compare the occlusal force parameters between natural dentition and post-orthodontic treatment group.

**Materials and methods:** The sample comprised of 50 Thai subjects divided into 2 groups, with 25 subjects each in non-orthodontic and post-orthodontic groups (mean age 24.8 years). T-Scan III computerized occlusal analysis was used to record a multi-bite closure for each subject. Bilaterally force distribution, force in anterior and posterior quadrants and individual force percentage on every tooth in the arch were recorded in both groups.

**Results:** The results showed initial tooth contacts in both groups on second molars and central incisors. Significant difference was found between anterior and posterior occlusal force but no significant difference was observed bilateral force distribution. Statistically significant difference was observed in the quadrants between both groups with 22.46% anterior and 77.57% posterior force among non-orthodontic group and 10.58% anterior and 89.42% posterior force in post orthodontic group(P<0.01).

**Conclusions:** A significant occlusal force discrepancy was found in the post-orthodontic subjects, with higher force percentages observed posteriorly and much less percentage force anteriorly, when compared to the natural dentition subjects. Therefor, T-Scan digital occlusal analysis may be recommended for occlusal loading evaluation as part of orthodontic case finishing.

*Key Words:* Occlusal Force parameters,T-scan digital occlusal analysis.

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## CA4673

### Artificial Intelligence In Intact Tooth Model Creating And Strength Testing

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**Aim or purpose:** Artificial intelligence (AI) is becoming an increasingly common, widely used tool for intact tooth 3D modeling from CBCT scans. Also, AI could be used for biomechanics testing, with high value of accurate.

**Materials and methods:** CBCT of the patient was made. After exporting the DICOM format of CBCT in 3D Slicer the upper left central incisor was isolated as volumetric finite element model from the maxilla and then its mesh was corrected and refined in 3D Slicer and Meshmixer. The next step was to convert the exported ASCII code from Meshmixer into appropriate ASCII code for SOFiSTiK with the help of artificial intelligence. The 3D intact tooth model was made with all biological tissue properties. With that, the volumetric model was ready and subjected to strength testing with SOFiSTiK.

**Results:** The fracture resistance testing was conducted in SOFiSTiK. The results have shown that the intact tooth has a high value of strength, around 1350 N. This value is near to value of in vitro testing with Universal Testing Machine.

**Conclusions:** Today, in vitro fracture resistance studies have been totally replaced with artificial intelligence algorithms studies. This way of testing the fracture strength could save money and time with value of accurate as in vitro testing.

*Key Words:* finite element model, finite element analysis, artificial intelligence, intact tooth, strength testing.

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## CA4656

## 3D Reconstruction Of Maxillary Central Incisors Using Deep Learning Algorithms

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**Aim or purpose:** This study aims to develop a deep learning-based three-dimensional point cloud reconstruction network that utilizes the morphological features of the ipsilateral maxillary lateral incisor, canine, and premolars to predict and reconstruct the anatomical morphology of the maxillary central incisor, providing insights for personalized anterior tooth aesthetic restoration.

**Materials and methods:** Exocad 3.2 was used to segment crowns of teeth #11-14. After standardizing coordinate systems in MATLAB 2019a, 182 cases were randomly selected as the training set and 10 as the test set. A dual-network architecture (morphology and pose estimation) was trained to reconstruct maxillary central incisor point clouds. Reconstructed outputs were meshed, aligned with original crowns for evaluation, and applied to incisal third defect models of tooth #11 to compare restoration outcomes among the proposed algorithm, mirroring technique, and standard database method.

**Results:** The test set achieved a Chamfer Distance of 0.405, Earth Mover's Distance of 0.152, and root mean square error of 0.128 ± 0.030 mm. For incisal defect restoration, the proposed algorithm (0.128 ± 0.030 mm) demonstrated comparable accuracy to mirroring (0.130 ± 0.021 mm, $p = 0.865$) but significantly outperformed the database method (0.233 ± 0.038 mm, $p < 0.001$).

**Conclusions:** The proposed 3D point cloud reconstruction algorithm enables high-precision maxillary central incisor restoration based on adjacent tooth morphology, offering a reliable technical solution for personalized anterior dental rehabilitation.

*Key Words:* Deep Learning;Dental Crown Design;Maxillary Central Incisor.

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## CA3859

## Automated Recognition Of Dentists' Poor Postures Using Artificial Intelligence

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**Aim or purpose:** This study aimed to create and test an artificial intelligence (AI)-based system for the automated evaluation of dentists' clinical sitting postures.

**Materials and methods:** The dentists' sitting postures were compiled into a dataset. A training-validation set comprised 80% of the dataset, while a test set made up 20%. Segmenting video frames, extracting keypoints, calculating geometric angles, and training and validating classification models were the main algorithmic components. Performance measurements utilized included accuracy, F1-score, recall, confusion matrix, and Kappa coefficient. The model's performance was assessed using a 5-fold cross-validation.

**Results:** The model exhibited outstanding performance on the test set, with an accuracy of 98.2%, an F1-score of 0.974, a sensitivity of 0.983, a specificity of 0.995, and an Area Under the Receiver Operating Characteristic Curve (AUC-ROC) of 0.999. It accurately identified typical poor postures, such as forward head tilt, lateral tilt, and shoulder asymmetry. It surpassed the conventional threshold-based classification method ($P < 0.01$).

**Conclusions:** This research has created and tested an AI-based automated clinical posture evaluation system. The technology facilitates quantitative assessment of dentists' bad sitting postures, and has the potential to offer a dependable instrument for early prevention and management of occupational musculoskeletal problems.

*Key Words:* Artificial Intelligence, Poor Postures, Postural Evaluation, Musculoskeletal Disorders.

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