

The International Congress on Health Studies

ARTIFICIAL INTELLIGENCE-ASSISTED CEPHALOMETRIC ANALYSIS VERSUS MANUAL TRACING IN DISTAL OCCLUSION TREATMENT: A COMPARATIVE CLINICAL STUDY USING WEBCEPH AND CEPHX PLATFORMS

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Background: Traditional manual cephalometric analysis remains the gold standard in orthodontic diagnosis despite being time-consuming and operator-dependent. Artificial intelligence (AI) platforms offer automated solutions that may enhance accuracy and efficiency in orthodontic treatment planning.

Objective: To compare the accuracy, reliability, and clinical efficiency of AI-assisted cephalometric analysis using WebCeph and CephX platforms versus conventional manual tracing methods in patients with distal occlusion (Class II malocclusion).

Methods: A prospective comparative study was conducted with 20 patients (mean age 14.2 ± 2.3 years) diagnosed with Class II malocclusion. Lateral cephalometric radiographs were analyzed using three methods: manual tracing, WebCeph automated analysis, and CephX automated analysis. Seventeen cephalometric parameters were measured, including angular (SNA, SNB, ANB, GoGn-SN, U1-SN, L1-MP) and linear measurements. Statistical analysis included paired t-tests, intraclass correlation coefficients (ICC), and Bland-Altman plots.

Results: AI-assisted platforms demonstrated high correlation with manual measurements ($ICC > 0.85$ for most parameters). WebCeph showed superior performance in angular measurements (mean difference $< 1.2^\circ$), while CephX excelled in linear measurements (mean difference $< 0.8\text{mm}$). Analysis time was significantly reduced: manual (45.2 ± 8.1 minutes), WebCeph (3.4 ± 0.6 minutes), CephX (2.8 ± 0.5 minutes). Both AI platforms showed excellent intra-examiner reliability ($ICC > 0.90$).

Conclusions: AI-assisted cephalometric analysis platforms provide clinically acceptable accuracy with significant time savings compared to manual methods. These technologies can enhance orthodontic workflow efficiency while maintaining diagnostic precision in distal occlusion treatment planning.

Keywords: Artificial Intelligence, Cephalometrics, Orthodontics, Class II Malocclusion, Digital Diagnosis, Webceph, Cephx