#1065 - Clinical Study / Free Papers

Analysis Of Anterior-Posterior Standing Radiographs Of The Lower Extremity Using An Artificial Intelligence Based Software For Estimation Of Measurements And Assessment Of Knee Alignment.

Orthopaedics / Knee & Lower Leg / Epidemiology, Prevention & Diagnosis

Sebastian Simon[1], Gilbert Schwarz[2], Alexander Aichmair[3], Bernhard JH Frank[1], Matthew D DiFranco [4], Allan Hummer[4], Martin Dominkus[3], Jochen G Hofstätter[1]

1. Michael Ogon Laboratory for Orthopaedic Research, Orthopaedic Hospital Speising, Vienna, Austria
2. Department of Orthopedics and Trauma-Surgery, Medical University, Vienna, Austria
3. 2nd Department, Orthopaedic Hospital Speising, Vienna, Austria
4. Image Biopsy Lab GmbH, Vienna, Austria

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Background
Artificial Intelligence (AI) has been implemented for automated measurements in many medical areas, including orthopedic radiographic assessment. LAMA is the first fully automated AI software tool for the assessment of standing long leg views.

Objectives
The aim of this study was to compare the performance of a fully automated AI software tool to expert readers regarding angle and length measurements on standing long leg radiographs.

Study Design & Methods
From our institutional image database 285 native AP standing lower extremity radiographs from adult males and females without surgical implants were selected. The following diagnostic angles and lengths were determined: joint line convergence angle (JLCA), hip-knee-ankle (HKA) angle, anatomical-mechanical angle (AMA), mechanical lateral proximal femur angle (mLPFA), mechanical lateral distal femur angle (mLDFA), mechanical medial proximal tibia angle (mMPTA), mechanical lateral distal tibia angle (mLDTA), mechanical axis deviation (MAD), leg length, femur length and tibia length.Each image was analyzed using the fully automated software tool IB Lab LAMA (IB Lab GmbH, Vienna, Austria) and were compared to the readings of two independent orthopedic surgeons using mediCAD v6.0 (Hectec GmbH, Germany). Mean and standard deviation of paired differences was used to compare LAMA to mean reader performance and to assess inter-reader variability.

Results
The paired mean difference for angels between automated AI measurements and the mean reader were: JLCA, -0.04° ± 2.59°; HKA, 0.16° ± 0.54°; AMA, 0.12° ± 0.55°; mLPFA, 1.39° ± 2.6°; mLDFA, 0.31° ± 2.14°; mMPTA, 0.12° ± 1.61°; mLDTA, -0.49° ± 1.67°. The paired mean difference for lengths were: MAD, 2.06mm ± 1.86mm; leg length, 0.35cm ± 0.57cm; femur length, 0.23cm ± 0.35cm; tibia length, 0.14cm ± 0.27cm. Post-hoc assessment revealed that LAMA and mediCAD both use different, but

consistent, knee center landmarks when measuring the MAD, resulting in a fixed bias of approximately 2 mm varus (i.e., medial).

The paired mean difference for angels between the readers were: JLCA, -0.31° ± 1.43°; HKA, 0.02° ± 0.22°; AMA, 0.01° ± 0.24°; mLPFA, 0.64° ± 1.55°; mLDFA, -0.03° ± 0.64°; mMPTA, -0.36° ± 1.35°; mLDTA, 0.49° ± 1.56°. The paired mean difference between the readers for lengths were: MAD, 0.01mm ± 0.87mm; leg length, -0.09cm ± 0.32cm; femur length, 0.01cm ± 0.2cm; tibia length, -0.12cm ± 0.21.

Conclusions

LAMA is a reliable, reproducible fully automated software tool using AI technology to measure angles and calibrated distances on standing long leg radiographs