AbstractID: 8138 Title: Digital Tomosynthesis of Hand Joints for Arthritis Assessment

The two principal forms of hand arthritis, rheumatoid and osteoarthritis, affect a significant number of individuals Radiography has been shown to be a useful tool to assess the condition of the disease. A hand radiograph, however, is a two dimensional projection of a three dimensional object. In this report we present the results of a study that applied digital tomosynthesis to hand radiography in order to extract three-dimensional outcome measures that should be more sensitive to arthritis progression.

The study was performed using simulated radiographs created using micro computed tomography (microCT) and a set of dry-bone hand skeletons. The matrix inversion tomosynthesis (MITS) algorithm was used to reconstruct the projectional images into tomographic slices. We examined the imaging geometry, MITS variables, and added noise by comparing the reconstructed images to a gold standard created using the microCT data. A parameter from image registration science, normalized mutual information, provided a quantifiable figure of merit.

We found good agreement between the MITS slices and the true planes. Both joint margins and trabecular structure were visible and showed more information than available with the standard projectional image.

We have demonstrated the potential of digital tomosynthesis for imaging of the hand to assess arthritic changes. We have also developed a methodology that can be used to optimized the technique and have studied the issues that will control the feasibility of clinical implementations.

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