

A Clinical Evaluation of Deep Learning-Based Detection of Intertrochanteric Femoral Fractures in X-ray Images

Abstract

Intertrochanteric femoral fractures are a serious condition common among the elderly because they are associated with high morbidity and mortality. Precise identification is crucial for prompt treatment, but it can be quite difficult when interpreting X-rays individually due to anatomical complexity and variability. In this study, deep learning models are used to optimize the binary classification of intertrochanteric femoral fractures within X-ray images. An X-ray dataset of about 1,000 images from hospital PACS was used, including both fracture and non-fracture cases. A convolutional neural network (CNN), comprising ResNet50, ResNet101, InceptionV3, and a custom CNN, was fine-tuned using preprocessing and augmentation to manage clinical variability. The models' performance was evaluated based on accuracy, precision, and sensitivity, with ResNet101 achieving the highest results (accuracy: 0.8000, precision: 0.8179). Statistical validation was conducted using confidence intervals (90%, 95%, and 99%) CI for fracture and non-fracture detection. The improved diagnostic accuracy has significant clinical implications, enabling faster diagnoses and better outcomes in time-sensitive environments. This study demonstrates the promising potential of deep learning in addressing diagnostic challenges in the identification of intertrochanteric femoral fractures, supporting its integration into clinical practice.

Keywords: intertrochanteric femoral fractures; deep learning; x-ray imaging; fracture detection; statistical analysis