Manual segmentation of femoral arteries in PET/CT images: Internship with University of Pennsylvania

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Abstract

Peripheral arterial disease (PAD) is characterized by progressive atherosclerosis that can lead to reduced blood flow and long-term vascular damage. While CT imaging identifies structural calcium deposits within arteries, it does not fully capture early biological activity such as inflammation or active microcalcification. This project uses the CAMONA PET/CT dataset to evaluate femoral artery atherosclerosis by quantifying uptake of two molecular imaging tracers: ^{18}F-NaF, which reflects active microcalcification, and ^{18}F-FDG, which reflects inflammatory and metabolic activity. Bilateral regions of interest encompassing the common and superficial femoral arteries were defined on co-registered PET/CT scans, and tracer uptake was summarized using SUVmean. These molecular activity measures were compared with CT-based calcium scoring and available clinical data relevant to peripheral arterial disease. By analyzing the relationship between inflammatory activity, early calcium deposition, and established structural calcification, this study aims to better understand how active disease processes relate to overall arterial burden and clinical status. The findings may help clarify how molecular imaging can detect vascular disease progression beyond what is visible through structural imaging alone.

Index Terms

segmentation, medical images, radiology, artificial intelligence, machine learning, computer vision, CNN, convolutional neural network