A Novel Idea: AI Guided Autonomous Nanobot for Non-Invasive Artery Blockage Detection & Plaque Removal

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Arterial plaque can cause cardiovascular disease, often requiring invasive interventions such as stent placement or angioplasty, which carry risks of restenosis and vessel injury. This study was aimed to build and code an AI-guided autonomous nanobot could accurately detect and remove arterial plaque in a simulated vascular environment. DICOM (Digital Imaging and Communications in Medicine) images of human coronary arteries were converted to JPEG datasets and processed using Python to extract plaque-specific features. A convolutional neural network was trained on 1,200 annotated images to identify plaque locations. A Unity-based 3D simulation was developed to model nanobot navigation in vessels with varying diameters and flow rates, integrating magnetic guidance, enzymatic release modules, and collision-avoidance algorithms. Nanobot dimensions (1.8–2 μm), biocompatible polymer composition, and enzymatic delivery rates were optimized based on prior microfluidics literature. In simulations, the nanobot successfully navigated 95% of vascular paths without wall collisions and removed 85% of simulated plaque using enzymatic delivery, while mechanical scraping strategies removed 78%. Enzymatic clearance time averaged 12.3 seconds per target region, with minimal disruption to simulated flow dynamics. These results demonstrate that AI-guided nanobots can combine precise computational detection with feasible micro-scale design and targeted plaque removal. The approach establishes a foundation for non-invasive cardiovascular interventions and suggests potential applications for early-stage plaque management and future in vitro or in vivo validation.

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