

# A randomized controlled study comparing fenestrated and non-fenestrated peripheral cannulas for contrast-enhanced computed tomography

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## ABSTRACT

**Introduction:** Achieving high-quality computed tomography (CT) images necessitates optimal contrast flow, which requires a large-bore intravenous cannula (18-gauge or 20-gauge). However, a proportion of patients present with fragile and small veins that are unsuitable for accommodating such cannulas. The effectiveness and safety of utilizing small-gauge cannulas for contrast infusion remain uncertain. Our study aimed to compare the image quality, first-time insertion success rate, and safety profile between small and large-gauge cannulas. **Methods:** We conducted a non-inferiority randomized study at the University Malaya Medical Center between September 2019 and March 2021, involving outpatients scheduled for arterial phase CT studies. Participants were randomly assigned to one of 4 cannulation groups: interventional (fenestrated 20-gauge, fenestrated 22-gauge, and non-fenestrated 20-gauge) and an active comparator (non-fenestrated 18-gauge). Image quality was assessed by measuring aortic attenuation (HU) with a non-inferiority margin set at 50 HU. The safety profile encompassed extravasation, cannula integrity break, and maximum infusion pressure. **Results:** Comparative analysis of the 4 groups showed no significant differences in CT image quality ( $p=0.15$ , eta-squared 0.02). The forest plot revealed that all 3 interventional cannulas were non-inferior to the active comparator, with the fenestrated 20-gauge cannula demonstrating superiority. The first-time insertion success rate was comparable. No adverse events were reported throughout the study. **Conclusion:** Our findings demonstrated that image quality, first-time insertion success rate, and safety profile were comparable across all tested cannulas. Notably, image quality was superior with the fenestrated 20-gauge cannula. Consequently, a smaller-bore fenestrated cannula presents a viable alternative for patients with challenging venous access who require a contrast-enhanced CT study.