Does a fenestrated IV catheter improve CT image quality?

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Purpose:

• To compare image quality of routine contrast enhanced CT abdomen/pelvis studies using a fenestrated versus a standard peripheral IV catheter

• The fenestrated catheter has been previously shown to perform similarly to an end hold catheter in CTA studies but has not been evaluated for its effect on contrast bio-distribution, image quality and mean pressure during injection at lower injection rates used in routine CT abdomen/pelvis studies
Fenestrated catheter with side holes in addition to end hole

Standard, non-fenestrated catheter with single end hole

Fenestrated catheter with side holes in addition to end hole
Materials/Methods Used:

• Institutional Review Board approval was obtained
• For this prospective, randomized, double-blinded study,
  • 61 adult outpatients undergoing a contrast enhanced CT abdomen/pelvis were randomized into 2 groups scanned on a 64 MDCT
  • 20 or 22-gauge catheters were placed in the forearm based on the safest cannulation possible
  • Rate of injection, injection pressure, complications, and number of attempts required for catheter insertion, and other parameters were recorded
• Groups were similar in
  • Age
  • Sex
  • Abdominal circumference
  • Image noise
  • Contrast infusion rate
  • Catheter size selected
  • Contrast amount and type
Quality Scoring and Statistical Analysis

• Image quality (IQ) score
  • Biodistribution of contrast as evidenced by appropriate subjective opacification of the portal vein, IVC, renal parenchyma, liver, spleen, and pancreas
  • Graded by 3 radiologists on a scale of 1 to 10

• Average IQ score from three raters between the two catheter types
  • Compared with a two-sample t-test

• Peak contrast infusion pressure were compared
  • By a Wilcoxon rank sum test

• The intra-class correlation coefficient (ICC) for consistency measured the interrater reliability of IQ scores
Results:

- No significant difference in IQ scores was seen between the two catheters (p=0.4487)
- The ICC among raters was 0.48 (95% confidence interval 0.20-0.67) indicative of fair agreement
- Peak injection pressure was significantly lower (13 psi) in the fenestrated catheter group (p=0.0112)
Conclusions:

• By our randomized design, we compared a novel fenestrated peripheral IV catheter to a standard end hole catheter in routine CT abdomen/pelvis studies at standard injection rates (2.8 cc/sec)

• Image noise was similar between the 2 arms of the study and was less likely to affect differences in image quality

• No clinically significant difference in image quality between the two groups was seen and there was fair agreement among the raters

• There was a significant decrease in pressure with the fenestrated catheter at lower injection rates