Comparison of Catheter and CT Angiogram for Arterial Distensibility at the Site of Carotid Stenosis During Catheter Angiography.

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Authors:
A Abayazeed¹, J Lozano¹, S Vedantham², A Puri¹, A Wakhloo¹, D Takhtani¹

Institutions:
¹University of Massachusetts Memorial Healthcare, Worcester, MA, ²University of Massachusetts Medical School, Worcester, MA

Purpose:
During catheter angiogram (CA) there is momentary increase in intravascular volume and pressure that can potentially cause vascular distention particularly at the stenotic site, whereas on CT angiogram (CTA) this is unlikely due to intravenous administration.

Materials and Methods:
CA and CTA of the carotid artery from 29 patients were included. For CA, two orthogonal views were obtained with 8 cc hand injection of Isovue 250 at approximately 5 cc/s. CA images were auto calibrated for magnification. CTA were performed with 80 cc of Isovue 350 at 120 kVp, 0.9 mm slice thickness, 0.5 pitch, 22 cm FOV and 512x512 matrix resulting in 0.43 mm voxels. Sagittal 0.45 mm MPRs mirroring the plane of the CA were generated (VOXAR-3D). On both CA and CTA, the narrowest diameter at stenosis and the distal lumen diameter were measured. Mural plaque calcium content was graded on axial CTAs. Grade 1 is <1 mm thick calcification regardless of circumferential involvement. Grade 2 is 1 mm≤thick<1.9 mm and ≤180 degree. Grade 3 is 1 mm≤thick<1.9 mm and >180 degree or 2 mm≤thick<2.9 mm regardless of circumferential involvement. Grade 4 is calcification thickness >3 mm regardless of circumferential involvement. The CA and CTA measurements were evaluated on a PACS workstation (IDX-IMAGECAST). Two independent neuroradiology fellows performed the measurements. Appropriate parametric and nonparametric tests were chosen after testing for normality. All statistical analyses were performed either using SAS or GraphPad Prism. Effects associated with p<0.05 were considered statistically significant.
Results:
Accounting for repeated measurements, the likelihood that the lumen diameter from CA will be larger than CTA was higher at stenosis than distal to it (OR: 5.57, 2.4-12.9, p<0.001), but the difference in lumen diameters between CA and CTA at stenosis was similar to CTA voxel size; 0.24(±0.13) mm and 0.64(±0.09) mm in sagittal and axial CTA, respectively. Hence, there is insufficient evidence that intra-arterial hand-injection during CA leads to vessel dilation. Percentage stenosis using the NASCET criteria differed between the 3 measurements, with post hoc analysis showing significant difference between CA and axial CTA (p<0.0001), but not between CA and sagittal CTA (p>0.99). The difference in lumen diameter measured at stenosis site between CA and axial CTA did not depend on calcium grading (p=0.484).

Conclusions:
There is insufficient evidence to suggest that intra-arterial hand-injection contributes to vessel distension and possible underestimation of percent stenosis during CA. Calcium grading scale does not affect the lumen diameter measurement on CTA suggesting minimal or no effect of beam hardening. Importantly, sagittal CTA should be used for measuring stenosis whenever possible as it does not differ from CA.

Categories:
ADULT BRAIN, Extra-cranial Vascular
Box-plot of percent stenosis (A), lumen diameter at stenosis (B) and lumen diameter distal to stenosis (C) from CA (Angio), sagittal CTA and axial CTA. The 3 estimates statistically differed (p<0.001, Friedman’s test). Post hoc Dunn’s test indicates that axial CTA differed from CA, but sagittal CTA did not differ from CA. (D) Difference in lumen diameter at stenosis between CA and axial CTA did not depend on calcium grade (p=0.484).

(https://ww4.aievolution.com/asn1501/files/content/abstracts/abs_2200/ASNRplot.jpg)