# COMPARISON BETWEEN COMPUTED TOMOGRAPHY ANGIOGRAPHY AND DIGITAL SUBTRACTION ANGIOGRAPHY IN EVALUATION OF INTRACRANIAL ARTERIOVENOUS MALFORMATION

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## INTRODUCTION

- Arteriovenous malformation (AVM) is defined as a fast-flow vascular anomaly that shunts blood from arteries directly to veins without any intervening capillary bed.
- Intracranial AVM is the most common etiology of intracranial hemorrhage in the younger population, predisposing them to long-term morbidity and mortality.
- The origin of AVM remains unclear and is still under investigation.
- The most-quoted standard grading system used in ascertaining the outcome and management of intracranial AVM is the one described by Speltzer and Martin (S-M), which is based on size of AVM, its venous drainage and eloquence of brain adjacent to the malformation.
- The current gold standard for diagnosis and follow-up of cerebral AVMs is digital subtraction angiography (DSA). It characterizes angio-architectural features of AVM conclusively and gives hemodynamic information which is an integral part of planning treatment.
- However, the downside of DSA is that it's invasive, expensive, time consuming and exposes the patient and personnel to significant amount of radiation.

## AIM OF THE WORK

The aim of the work was to do a comparison between CTA and DSA in evaluation of intracranial AVM.

## PATIENTS AND METHODS

-This study was conducted on 30 patients with intracranial AVMs at Smouha University Hospital. They were all referred to the facility for DSA after they had presented with various manifestations of intracranial AVM and after having done a CTA.

**The studied patients were subjected to the following:**

•Clinical data and laboratory work-up.
•Brain CTA studies were obtained on a multi-detector CT.
•Multi-planar and volume rendered reconstructions were done and displayed in maximum intensity projection (MIP) and three-dimensional (3-D) images.
•The CTA data was read and reported by a panel of two expert neuroradiologists.
•DSA imaging was performed on a uniplane system using Seldinger technique.
•The data of DSA studies were read and reported by a panel of two expert neurosurgeons who were blinded to the results of CTA.
•For each patient, a standardised scoring sheet was filled out for each diagnostic study.

## RESULTS

•Twenty (66.7%) presented with intracranial hemorrhage, five (16.7%) with convulsions, three (10%) with chronic headache and two (6.7%) with fluctuating/progressive neurological deficits.
•The overall CTA sensitivity in detection of AVMs was 93.3%. The CTA sensitivities in detection of unruptured and ruptured AVMs were 100% and 90% respectively.
•The two false negative cases on CTA shared the similarity of harboring AVMs <3 cm in the setting of intracranial hemorrhage.
•With the exception of the two AVMs which were not detected on CTA, all the others had the same results for the S-M grading parameters on both imaging modalities.
•One (3.4%) out of the 29 anterior circulation feeders was missed on CTA, whereas four (19%) out of 21 posterior circulation feeders were missed/misinterpreted on CTA.
• Two cases (6.7%) had transdural blood supply which were detected on DSA only.
•Eight (26.7%) patients had aneurysms associated with AVM, six (20%) of which were detected on CTA.
•Two (6.7%) patients had venous aneurysms of the draining vein, of which one (3.3%) was detected on CTA.
•Only one (3.3%) patient had venous stenosis of the draining vein which was appreciated on DSA only.

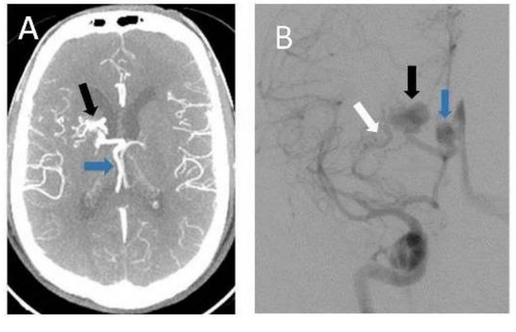


**Figure 1: (A)** Axial CTA MIP image shows an AVM nidus (black arrow) in the right head of caudate and the draining vein, right internal cerebral vein (blue arrow). The AVM measured 1.7cm.
**(B)** Right frontal internal carotid artery (ICA) angiogram shows the right lateral lenticulostriate artery (white arrow) supplying the nidus (black arrow) and the right internal cerebral vein (blue arrow) draining the AVM.

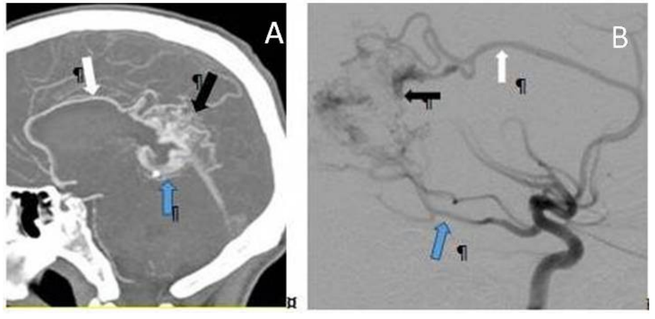


**Figure 2: (A)** Sagittal CTA MIP image shows the left pericallosal artery (white arrow) supplying the nidus (black arrow) located in the left parietal lobe. Vein of Galen (blue arrow) drained the nidus which measured 4.1cm.
**(B)** Oblique left ICA angiogram shows the nidus (black arrow) and the two feeders; branch of left pericallosal artery (white arrow) and posterior choroidal artery arising from left PCA (blue arrow).

## CONCLUSION

•Computed tomography angiography can be used as an initial imaging modality in the detection and evaluation of patients suspected of harboring AVMs.
•Digital subtraction angiography remains the gold standard in detection and characterization of intracranial AVMs.