e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(9); 733-737

Original Research Article

A Study Comparing Computed Tomography and Magnetic Resonance Angiography Results with DSA's Involvement in Intracerebral Vascular Anomalies: A Hospital-Based Prospective Study

Soumitra Halder[1], Purnendu Ranjit[2], Dona Saha[3], Debashis Dakshit[4]

[1]Assistant Professor, Department of Radiology, Jhargram Government Medical College and Hospital, West Bengal, India

[2]Senior Resident, Department of Pathology, Jhargram Government Medical College and Hospital, West Bengal, India

[3]Associate Professor, Department of Anatomy, Barasat Government Medical College and Hospital, West Bengal, India

[4]Professor and HOD, Department of Radiology, Medical College and Hospital, Kolkata, West Bengal, India

Received: 03-06-2025 / Revised: 14-07-2025 / Accepted: 24-08-2025

Corresponding author: Dr. Soumitra Halder

Conflict of interest: Nil

Abstract

Background: Digital subtraction angiography (DSA) has been the gold standard for diagnosing cerebral vascular malformations (CVMs) with arteriovenous shunting, including arteriovenous malformations (AVMs), arteriovenous fistulas (AVFs), and developmental venous abnormalities (DVAs). Although catheter technologies have advanced, there is still a 1% chance of invasive catheter angiograms.

Objectives: The objective of the study was to know the distribution of age and sex in patients of brain vascular lesion. To see the common location of different brain vascular lesions. To compare the diagnostic supremacy of CTA/MRA and DSA for the detection of intracranial vascular anomalies.

Methods: 50 patients, both male and female, with acute stroke syndrome or any other symptoms indicating an intracranial vascular lesion that were undergoing DSA testing at Medical College and Hospital in Kolkata were included in the study. They were examined using one or more index tests and a reference standard that was determined by CT or MR scanning or other parameters.

Results: The youngest patient was 14 years old and the oldest patient was 82 years old. Out of the total 50 patients 29 (58%) were males and 21 (42%) were females. The maximum number (14) of patients belonged to the age group 51-60 years. Second largest number of patients (12) belonged to the age group 41-50years, followed by10 patients in age group 31-40years. Males exceeded in number in all age groups except in the <30years, 51-60 and 71-80years age groups where the number of patients in both sexes are the same.

Conclusion: The Study reveal DSA is more superior to accurate angioarchitectural delineation of different intracerebral vascular malformation.

Keywords: Computed tomography angiography (CTA), Digital subtraction angiography (DSA), Magnetic resonance angiography (MRA), vascular malformation.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Digital subtraction angiography (DSA) has been the gold standard for diagnosing cerebral vascular malformations (CVMs) with arteriovenous shunting, including arteriovenous malformations (AVMs), arteriovenous fistulas (AVFs), and developmental venous abnormalities (DVAs). Although catheter technologies have advanced, there is still a 1% chance of invasive catheter angiograms. [1] Although the rate of problems may vary depending on the operator, a noninvasive imaging modality has always been essential for the diagnosis and monitoring of cerebral vascular disorders due to the invasive nature of catheter angiography. For the diagnostic and treatment follow-up of cerebral aneurysms, noninvasive imaging modalities such as computed tomography angiography (CTA) [2] and magnetic imaging angiography (MRA) [3, 4] have largely supplanted DSA. The lack of temporal resolution has been the main drawback of these noninvasive imaging methods in the case of CVMs. Even while MRA has improved significantly in recent years in terms

of temporal resolution [5–11], its availability and temporal resolution remain constrained. CTA has been lacked the temporal resolution for the diagnosis of CVMs. For the first time, temporal resolution imaging for CVMs is now possible thanks to the new 320-row CT scanner technology. [12, 13] The present study was aimed role of DSA in intracerebral vascular anomaly comparison with computed tomography angiography/magnetic resonance angiography Results: A Hospital-based Prospective Study.

The objective of the study was to know the distribution of age and sex in patients of brain vascular lesion. To see the common location of different brain vascular lesions. To compare the diagnostic supremacy of CTA/MRA and DSA for the detection of intracranial vascular anomalies

Materials and Methods

After receiving clearance from the Institutional Ethics Committee and gaining the appropriate informed consent from the patients involved, a cross-sectional observational and descriptive study was conducted. 50 patients, both male and female, with acute stroke syndrome or any other symptoms indicating an intracranial vascular lesion that were undergoing DSA testing at Medical College and Hospital in Kolkata were included in the study. They were examined using one or more index tests and a reference standard that was determined by CT or MR scanning or other parameters.

Inclusion Criteria: Patients were included irrespective of the severity of their disease as long as they were stable enough to undergo an index test and a reference standard.

Exclusion Criteria: Patients having a history of allergic manifestation to contrast or other drug and patients with implanted cardiac pacemaker or other such device were excluded from the study.

Statistical Analysis: The IBM SPSS Statistics for Windows software, version 25, was used for all statistical computations. Data collection was done using a pre-designed and pretested proforma to detail the clinical and epidemiological profile of the patient along with the findings of imaging studies.

Results

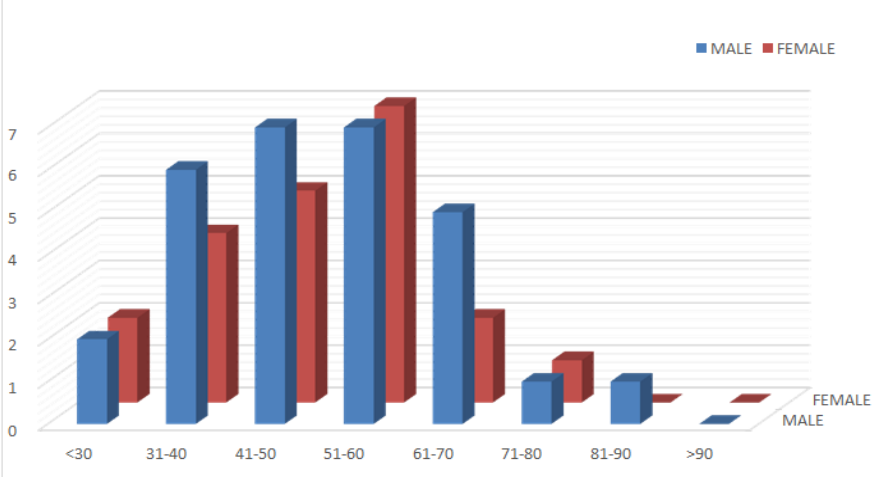

Figure 1: Age and sex distribution of the study population (n=50)

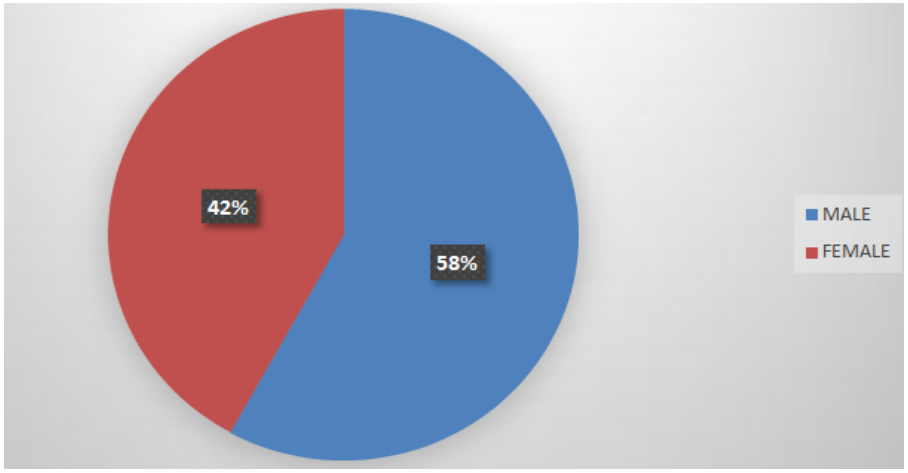

Figure 2: Showing percentage of male-female patient (n=50)

The youngest patient was 14 years old and the oldest patient was 82 years old.

Out of the total 50 patients 29 (58%) were males and 21 (42%) were females. The maximum number (14) of patients belonged to the age group 51-60 years. Second largest number of patients (12) belonged to the age group 41-50years, followed by10 patients in age group 31-40years.

Males exceeded in number in all age groups except in the <30years, 51-60 and 71-80years age groups where the number of patients in both sexes are the same, showing Figure 1 and 2.

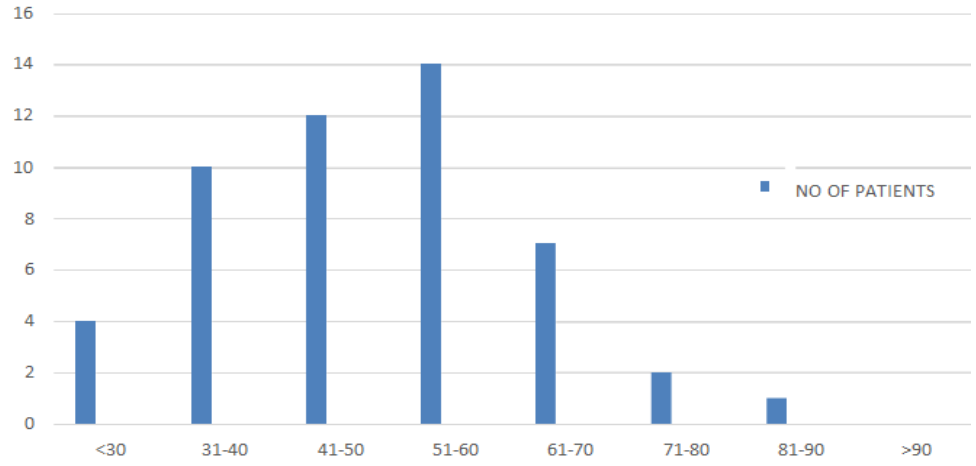

Figure 3: Different Age group.

Figure 3 showing total no of patients in different age group. Maximum no is involved in 51-60 yrs.

Table 1: Distribution of Different Brain Vascular malformation

Name	Male	Female	Total	Percentage
AVM	09	05	14	28
Dural AVF	03	03	06	12
Cavernoma	05	03	08	16
DVA	07	03	10	20
Sinus Pericranii	01	00	01	02
Carotid Cavernous Fistula	03	05	08	16
Moya Moya	01	02	03	06
Total	29	21	50	100

Table 1 showing AVM is the predominant lesion followed by DVA. Moya Moya and Sinus pericranii are the usually rare occurrence carrying 6 and 2% respectively. CCF and Moya Moya having the female predominant. AVM, DVA and Cavernoma shows mild male predominance. Dural AVF shows no gender variation.

Table 2: Angioarchitectural delineation of specific findings

	CTA	MRA	DSA
Intra nidal aneurysm (AVM)	0	2	5
Small feeding vessels (AVM)	0	3	10
Fistula site detection (d AVF & CCF)	0	1	9
Dural and small feeding arteries (d AVF& CCF)	1	4	10
Collaterals (Moya Moya)	2	2	3

Table 2 showing the Angioarchitectural delineation of specific findings, Intra nidal aneurysm (AVM) identify 2 MRA and 5 DSA cases.

Whereas small feeding vessels (AVM) could identify 3 MRA and 10 DSA cases.

Fistula site detection (d AVF & CCF) could identify 1 MRA and 9 DSA. Dural and small feeding arteries (d AVF& CCF) could identify 1 CTA, 4 MRA and 10 DSA. Collaterals (Moya Moya) could identify 2 CTA, 2 MRA and 3 DSA cases.

Discussion

A cross-sectional observational and descriptive study was conducted. 50 patients, both male and female, with acute stroke syndrome or any other symptoms indicating an intracranial vascular lesion

that were undergoing DSA testing at Medical College and Hospital in Kolkata were included in the study. They were examined using one or more index tests and a reference standard that was determined by CT or MR scanning or other parameters.

For the diagnosis of cerebrovascular disorders, non-invasive imaging techniques—in particular, CTA and MRA—are becoming more widely recognized as viable substitutes for DSA. [14] Fifty patients with a tentative diagnosis of vascular brain involvement from a tertiary hospital's medical and neurological wards participated in the current investigation.

Numerous clinical and morphological AVM variables at the time of first diagnosis may be significantly impacted by the patient's age, including correlations with known risk factors that may affect the risk of invasive AVM therapy as well as the natural history. [15] AVMs often appear in people in their third to fifth decade of life and afflict 0.01 to 0.50 percent of the population. [16]

The current study's conclusions are consistent with the available data. Males are more likely to develop AVM, which is consistent with the current study's findings. [17]

Infratentorial AVM hemorrhage patients may have a higher incidence of feeding artery aneurysms and a deep venous drainage component than supratentorial AVM hemorrhage patients, suggesting that the location of the lesion may be significant. [18]

While dural AVFs were primarily discovered in the transverse, sigmoid, and transverse sinus, the majority of the lesions in the current investigation were reported to be in the supratentorial brain. resolution While DSA offers a series of shots at various stages of the passage of contrast through the AVM, CT angiography is not precise enough to identify the precise location and size of the AVM nidus or distinguish between nidus obliterated or normal blood vessels, such as arteries that bring blood to the AVM or drainage veins, which can be left out by CT angiography. [19]

However, MRA is becoming more and more important for usage in cerebral vascular lesions and has emerged as a viable alternative for both diagnosis and follow-up because of the high levels of ionizing radiation in CTA tests and the increased risk of an allergic reaction to the CT contrast medium in patients. [20] The majority of the patients in this study are still unknown, although 19 individuals are clearly defined by CTA based on vascular architecture pattern. Selecting 35 individuals allows MRA to accurately represent the vascular anatomical involvement, which is superior to CTA.

Conclusions

The study shows AVM is the predominant lesion followed by DVA. Moya Moya and Sinus pericranii are the usually rare occurrence carrying 6 and 2% respectively. CCF and Moya Moya having the female predominant. AVM, DVA and Cavernoma shows mild male predominance. Dural AVF shows no gender variation.

Most of the lesions are located in supratentorial brain carrying 52% in this study. CTA is easily available .CTA, especially with 3D surface rendering, may be helpful in delineating the feeding arteries and draining veins of an AVM. But very small sized aneurysm or feeding arteries are not picked up by CTA. Digital subtraction angiography can be used for both diagnostic and interventional angiography. Its high spatial and temporal resolution have maintained DSA as a very important tool. The Study reveal DSA is more superior to accurate angioarchitectural delineation of different intracerebral vascular malformation.

References

1. Willinsky RA, Taylor SM, Ter Brugge K, et al. Neurologic complications of cerebral angiography: Prospective analysis of 2,899 procedures and review of the literature. Radiology 2003; 227: 522–528.
2. Dabirzadeh H, Moulton R and Lum C. Long-term durability of coiled cerebral aneurysms in which CTA was used as the sole imaging selection criteria for patients presenting with subarachnoid hemorrhage (SAH). Presented at the Annual Meeting of the Canadian Association of Radiologists, 23–26 April 2009, Montreal, Quebec, Canada.
3. Shankar JJ, Lum C, Parikh N, et al. Long-term prospective follow-up of intracranial aneurysms treated with endovascular coiling using contrast-enhanced MR angiography. AJNR Am J Neuroradiol 2010; 31: 1211–1215.
4. Agid R, Willinsky RA, Lee SK, et al. Characterization of aneurysm remnants after endovascular treatment: Contrast-enhanced MR angiography versus catheter digital subtraction angiography. AJNR Am J Neuroradiol 2008; 29: 1570–1574.
5. Farb RI, Agid R, Willinsky RA, et al. Cranial dural arteriovenous fistula: Diagnosis and classification with time-resolved MR angiography at 3T. AJNR Am J Neuroradiol 2009; 30: 1546–1551.
6. Petkova M, Gauvrit JY, Trystram D, et al. Three-dimensional dynamic time-resolved contrast-enhanced MRA using parallel imaging and a variable rate k-space sampling strategy in intracranial arteriovenous malformations. J Magn Reson Imaging 2009; 29: 7–12.

7. Saleh RS, Lohan DG, Villablanca JP, et al. Assessment of craniospinal arteriovenous malformations at 3T with highly temporally and highly spatially resolved contrast-enhanced MR angiography. AJNR Am J Neuroradiol 2008; 29: 1024–1031.
8. Hadizadeh DR, von Falkenhausen M, Gieseke J, et al. Cerebral arteriovenous malformation: Spetzler-Martin classification at subsecond-temporal-resolution four-dimensional MR angiography compared with that at DSA. Radiology 2008; 246: 205–213.
9. Cashen TA, Carr JC, Shin W, et al. Intracranial time-resolved contrast-enhanced MR angiography at 3T. AJNR Am J Neuroradiol 2006; 27: 822–829.
10. Gauvrit JY, Leclerc X, Oppenheim C, et al. Three-dimensional dynamic MR digital subtraction angiography using sensitivity encoding for the evaluation of intracranial arteriovenous malformations: A preliminary study. AJNR Am J Neuroradiol 2005; 26: 1525–1531.
11. Griffiths PD, Hoggard N, and Warren DJ, et al. Brain arteriovenous malformations: Assess ment with dynamic MR digital subtraction angiography. AJNR Am J Neuroradiol 2000; 21: 1892–1899.
12. Brouwer PA, Bosman T, van Walderveen MA, et al. Dynamic 320-section CT angiography in cranial arteriovenous shunting lesions. AJNR Am J Neuroradiol 2010; 31: 767–770.
13. Willems PW, Taeshineetanakul P, Schenk B, et al. The use of 4D-CTA in the diagnostic work-up of brain arteriovenous malformations. Neuroradiology 2012; 54: 123–131.
14. Shankar JJ, Lum C, Chakraborty S and Dos Santos M. Cerebral vascular malformations: Time-resolved CT angiography compared to DSA. Neuroradiol J. 2015; 28(3):310-315. https://doi.org/10.1177/1971400915589682
15. Stapf C, Khaw AV, Sciacca RR, Hofmeister C, Schumacher HC, Pile-Spellman J, et al. Effect of age on clinical and morphological characteristics in patients with brain arteriovenous malformation. Stroke. 2003; 34(11):2664-2669. https://doi.org/10.1161/01.STR.0000094824.03372.9B
16. Fleetwood IG and Steinberg GK. Arteriovenous malformations. Lancet. 2002; 359(9309):863-873. https://doi.org/10.1016/S0140-6736 (02)07946-1
17. Van Beijnum J, Bhattacharya JJ, Counsell CE, Papanastassiou V, Ritchie V, Roberts RC, et al. Patterns of brain arteriovenous malfo rmation treatment: prospective, population-based study. Stroke. 2008; 39(12):3216-3221. https://doi.org/10.1161/STROKEAHA.108.523662
18. Khaw AV, Mohr JP, Sciacca RR, Schumacher HC, Hartmann A, Pile-Spellman J, et al. Association of infratentorial brain arteriovenous malformations with hemorrhage at initial presentation. Stroke. 2004; 35(3):660-663. https://doi.org/10.1161/01.STR.0000117093.59726.F9
19. Merhemic Z, Lincender L, Guso E, Bicakcic E, Avdagic E and Thurnher MM. Computed tomography angiography in the diagnosis of arteriovenous malformations. J Health Sci. 2018; 8(1):73-77. https://doi.org/10.17532/jhsci.2017.521
20. Cheng YC, Chen HC, Wu CH, Wu YY, Sun MH, Chen WH, et al. Magnetic resonance angiography in the diagnosis of cerebral arteriovenous malformation and dural arteriovenous fistulas: Comparison of time-resolved magnetic resonance angiography and three dimensional time-of-flight magnetic resonance angiography. Iran J Radiol. 2016; 13(2):e19814. https://doi.org/10.5812/iranjradiol.19814