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Association of Anterior Communicating Artery Aneurysm with Triplicate A2 Segment of the Anterior Cerebral Artery

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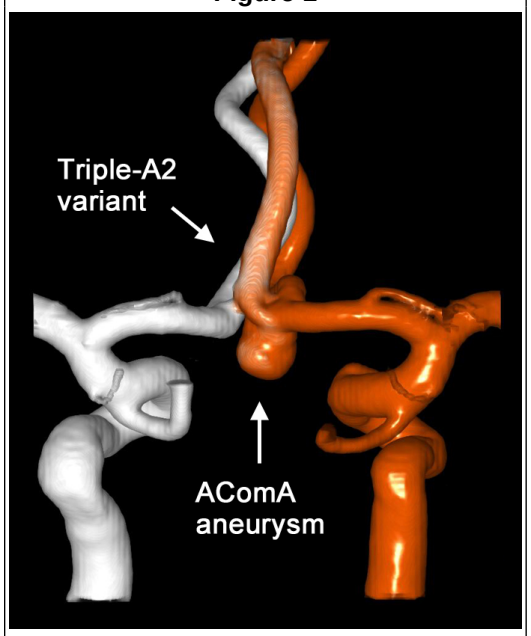
Introduction

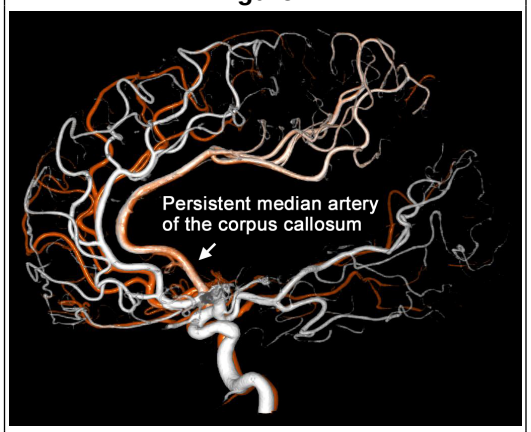
Triplicate A2 segment of the anterior cerebral artery (ACA) is a rare anatomical variant (Figure 1) with a reported prevalanece in large series of approximately 1-3%. The third A2 segment is thought to result mainly from persistence of the embryonic median artery of the corpus callosum (Figure 2). A recent report noted a higher prevalence of the triple-A2 variant among patients with aneurysmal subarachnoid hemorrhage. We sought to determine if the triple-A2 variant is specifically associated with anterior communicating artery (AComA) aneurysms.

Figure 1



Triplicate A2 segment in association with an anterior communicating artery aneurysm

Figure 2



Persistent median artery of the corpus callosum giving rise to an additional A2 segment

Methods

we performed a PubMed literature search for large-scale imaging studies of the Circle of Willis or anterior circulation variants. Large-scale was defined as greater than 100 subjects. Where pathologies were stated, those subjects were excluded from the total count.

We reviewed two-dimensional digital-subtraction angiography (2D-DSA) and three-dimensional rotational angiography (3D-RA) images of 55 patients with AComA aneurysms treated between 2009 and 2014 at our institution. The criteria to obtain definitive accounting of all A2 segments were presence of adequate cross-filling across the AComA or ability to fuse 3D-RA images of left and right internal carotid artery injections. Patients whose imaging did not meet the above criteria were excluded from further analysis.

Results

Our literature search yielded 4 large scale imaging studies that quantified the number of individuals bearing the triple-A2 variant (Table 1). Combining these numbers (44/2440) yields a more accurate estimate of the prevalence of the triple-A2 variant in the normal population (1.80%).

Table 1

Study first author	Study year	Imaging modality	Individuals studied	Triple-A2 variants
Krzyżewski et. al.	2015	CTA	411	4 (1.0%)
Popovic et. al.	2011	MRA	1000	13 (1.3%)
Uchino et. al.	2006	MRA	879*	25* (2.8%)
Krabbe-Hartkamp et. al.	1998	MRA	150	2 (1.3%)

* After excluding individuals with pathologic findings. Original numbers reported are 891 and 27.

Large-scale imaging studies that quantify the prevalence of the triple-A2 variant

Among our AComA aneurysm patients, we were able to obtain a definitive count of all A2 segments in 36 patients. A total of 7 patients had the triple-A2 variant. The prevalence of the triple-A2 variant in our cohort of AComA aneurysm patients is 19.4% (Table 2).

Table 2

AComA aneurysm treatment	Number of patients	Number with triple-A2 variant
Open surgery	16	5
Endovascular	20	2
Total	36	7 (19.4%)

Prevalance of the triple-A2 variant among our AComA aneurysm patients

Conclusions

Compared to normal population, patients with AComA aneurysm have a significantly higher likelihood of having triplicate A2 segment of the ACA (binomial P<0.0001). Knowledge of this variation is of critical importance in planning and executing endovascular and open surgical treatment of AComA aneurysms.

References

Ferré J-C, et al. Anatomical variations of the anterior cerebral arterial circle visualized by multidetector computed tomography angiography: Comparison with 3D rotational angiography. J Neuroradiol 2013;40:112–20.
Krzyzewski RM, et al. Anatomical variations of the anterior communicating artery complex: gender relationship. Surg Radiol Anat 2015;37:81–6.
Popovic S, et al. Anatomic Variations Of The Anterior Portion Of The Circle Of Willis: An MR Angiography Study. Curr Top Neurol Psychiatry Relat Discip 2011;19:8–13.
Uchino A, et al. Anterior cerebral artery variations detected by MR angiography. Neuroradiology 2006;48:647–52.
Krabbe-Hartkamp MJ, et al. Circle of Willis: morphologic variation on three-dimensional time-of-flight MR angiograms. Radiology 1998;207:103–11.

Learning Objectives

1) Describe the triple-A2 variant, its main developmental origin, and its prevalence in the normal population, 2) Understand the association of the triple-A2 variant with anterior communicating artery aneurysms, and 3) Discuss the importance of knowledge of this variant for treatment of anterior communicating artery aneurysms.