



PREVALENCE OF LOCATION OF INTRACRANIAL SACCULAR ANEURYSM ON CT CEREBRAL ANGIOGRAPHY.

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KEYWORDS :

INTRODUCTION:

Most intracranial aneurysms are saccular aneurysms¹ and occur at predictable sites around the circle of Willis, however unusual types of aneurysms are occasionally encountered including dissecting, fusiform, serpentine, blood blister type, traumatic, mycotic, atheromatous and giant aneurysms, all of which may manifest with hemorrhage, thromboembolic events or mass effect¹⁰. Blood blister – like aneurysms are variants of berry aneurysms, which usually involves paraclinoid carotid artery, have very thin walls and are very small appearing as small protrusions from the artery. They are difficult to treat because they are very small and their thin wall causes them to easily rerupture. Multiple aneurysms can be seen in some patients. Most of them are small and asymptomatic.

Risk factors:

Increasing age, Hypertension, Smoking, Alcohol abuse, Estrogen deficiency, Hypercholesterolemia and Carotid artery stenosis^{11,12}. Females are more prone to aneurysm rupture, with SAH 1.6 times more common in women.

Etiology:

Saccular aneurysms occur when there is collagen deficiency in the internal elastic lamina and breakdown of the tunica media. An outpouching, consisting of only tunica intima and adventitia, protrudes through the defect in the internal elastic lamina and tunica media to produce the aneurysmal sac^{13,14}.

Clinical presentation:

Characteristic symptoms include: "the worst headache of my life," nausea and vomiting, loss of consciousness, neck stiffness, and seizures^{15,16}.

The clinical manifestations of unruptured aneurysms, however, are much more subtle. Only 10–15% of intracranial aneurysms are symptomatic^{17,18} with the majority being identified incidentally during evaluation for other conditions.

Location¹⁰:

a) Anterior circulation:

- ACoA.
- ICA-PCoA Junction.
- MCA bifurcation.

b) Posterior circulation:

- Basilar artery bifurcation.
- PICA.

Size⁹:

Aneurysm size is traditionally reported as being

- Small - < 15mm

- Large aneurysm – 15 – 25mm.
- Giant aneurysm – 25 – 50mm.
- Supergiant aneurysm - > 50 mm.
- Subcategories: Small < 5mm and medium sized 5-15 mm.

The most serious presentation of intracranial aneurysms is subarachnoid hemorrhage.

Treatment:

Dissecting aneurysms are treated with parent artery occlusion, either surgically or transarterially⁵, stents, particularly flow-diverting ones, may represent a significant advancement⁶. Mycotic aneurysms treated with antibiotic administration in conjunction with surgical or endovascular elimination, depending on the patients's clinical status and the aneurysm geometry and location. Giant and fusiform aneurysms are best treated by endovascular or surgical interruption, which is usually tolerated because the slow flow in the involved segment allows the gradual development of effective collaterals^{6,7}.

AIMS & OBJECTIVE:

To determine the prevalence of Intracranial Saccular Aneurysms on CT cerebral angiography based on their location.

MATERIALS & METHODS:

- **Source of data:** We conducted a retrospective study in which we selected 44 consecutive cases with Intracranial Saccular Aneurysms presented to the department of Radio-diagnosis, referred for sudden onset of severe headache, who underwent plain CT brain followed by CT cerebral angiography.
- The patients were categorized based on the location of the aneurysm.
- **Study period:** From June 2015 to October 2017.
- **Sample size:** 44.
- **Equipment:** GE Bright Speed Elite 16 Slice CT Scanner.

CT scan protocol:

- Scans were performed in the axial axis, starting from the vertex upto the C3 vertebral body, first in plain followed by contrast angiographic phase.
- For enhancement of intracranial arteries, 100 mL of contrast medium (Ultravist 300mg) was injected intravenously at a flow rate of 4 mL/sec by using a power injector. A bolus tracking method was used routinely to achieve optimal synchronization of contrast medium flow and scanning. Once the injection is started, the bolus tracking software measures attenuation values within one internal carotid artery (ICA), and the spiral scan is automatically started as soon as a threshold of 100 HU is exceeded.

- MDCT angiography has the ability to detect most intracranial aneurysms 3mm or larger and allows evaluation of osseous anatomy, reconstructed multiplanar reformatted images and 3D rendering of vessels.

Scanning parameters:

- Slice thickness: 0.625mm.
- Pitch: 0.562:1 kVp: 120 mAs: 350.
- Rotation Time: 0.6sec.
- Matrix: 512/512.

RESULTS & OBSERVATIONS:

Total number of cases included in our study are 44 cases.

Table 1: Gender distribution of saccular aneurysms

GENDER	NUMBER	PERCENTAGE	RATIO
MALE	19	43.2	1 : 1.3
FEMALE	25	56.8	
TOTAL	40	100	

Table 2: Age distribution of saccular aneurysms.

AGE (years)	NUMBER	
	MALE	FEMALE
50 – 60	6	12
60 – 70	9	7
70 – 80	4	6

Table 3: Prevalence of location of saccular aneurysms.

ANTERIOR CIRCULATION ANEURYSMS 41(93.2%)			POSTERIOR CIRCULATION ANEURYSMS 3(6.8%)
ACOM	ICA-PCOM	MCA BIFURCATION	BASILAR ARTERY ANEURYSMS
14(31.8%)	10(22.7%)	17(38.6%)	3(6.8%)

Table 4: Location of unruptured aneurysms.

Location	Unruptured aneurysms
ICA	0(0%)
ACoA	1(16%)
MCA	4(66%)
Basilar artery bifurcation	1(16%)

REPRESENTATIVE CASES: MCA BIFURCATION ANEURYSM:

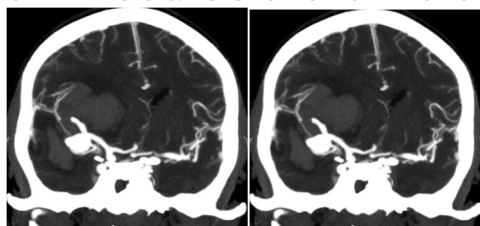


Fig 1: CT cerebral angiographic image showing Right MCA bifurcation saccular aneurysm which is ruptured causing adjacent intraparenchymal hemorrhage in temporo-parietal region and SAH in right sylvian fissure, in adjacent sulcal & cistern spaces. Significant mid line shift noted to left.

ICA PCOM ANEURYSM:

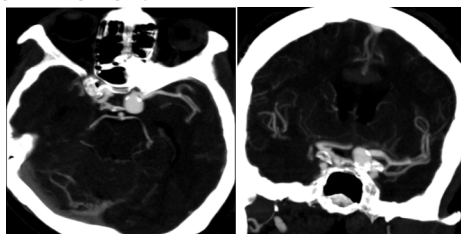


Fig 2: CT cerebral angiographic image showing left ICA-PCoM

aneurysm. Peripheral calcifications noted within aneurysm. (Note: Basilar artery bifurcation aneurysm is also present in this patient in axial section, pericallosal cistern hemorrhage is also present.

ACOM ANEURYSM:

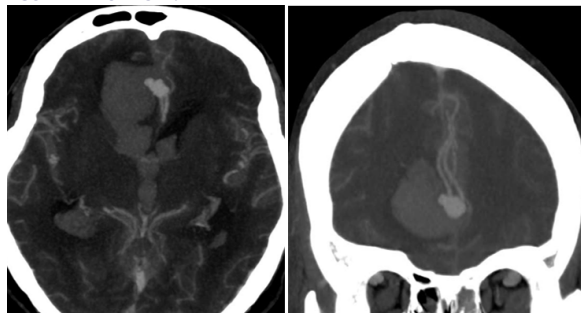


Fig 3: CT cerebral angiographic image showing ACoM saccular aneurysm which is ruptured leading to SAH at interhemispheric fissure, adjacent sulcal spaces & with intraventricular extension (into bilateral lateral ventricles, 3rd & 4th ventricles). Right frontal lobe intraparenchymal hemorrhage also noted.

BASILAR ARTERY ANEURYSM:

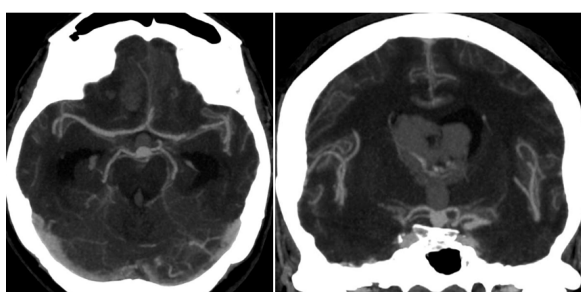


Fig 4: CT cerebral angiographic image showing basilar artery bifurcation saccular aneurysm which is ruptured with associated SAH at prepontine cistern, adjacent sulcal spaces & with extension into bilateral lateral, 3rd & 4th ventricles.

DISCUSSION:

- CT cerebral angiography is commonly available screening procedure used for diagnosing intracranial saccular aneurysm.
- We observed a Peak incidence in the 5th decade of life.
- In our study Female preponderance is noted with M:F ratio of 1:1.3 which are correlating with the studies done by **Rinkel GJ et al¹⁹**, **Alexander Keedy et al²⁰** and **Ivamoto H et al²¹**
- In our study 41 patients presented with anterior circulation aneurysm & 3 patients presented with posterior circulation aneurysm, Correlating with the studies done by **Robert J singer et al²²**.
- We observed, MCA bifurcation (38.6 %) is the most common site of Saccular aneurysm, followed by ACoM (31.8 %), ICA-PCoM junction (22.7 %) & basilar artery bifurcation (6.8 %) aneurysms. These findings are correlating with the study done by **soonchanpark et al²³**
- Saccular aneurysm rupture is most common cause of SAH that diffusely fills supra sellar, central basal cisterns & extends peripherally to cerebral convexities **Osborn³**.
- In our study most of them are ruptured aneurysms causing SAH and few incidentally detected unruptured aneurysms seen along with the ruptured aneurysms.
- Most common location of unruptured intracranial aneurysms in our study at MCA bifurcation (66%) followed by basilar artery bifurcation (16%) and ACoA aneurysms (16%).
- These findings are in correlation with the studies done by **Wiebers DO et al¹⁸** and **Lindsey N. Williams et al²⁴**

CONCLUSION

- Knowledge of common locations of intracranial aneurysms is essential for accurate diagnosis.
- CT cerebral angiography is an important modality for imaging patients with intracranial aneurysms which detects aneurysms quickly, reliably, safely and guides the prompt proper therapy.
- Clipping has proven its long-term effectiveness over several decades, where as endovascular coiling is relatively new technique.
- Patients harboring unruptured intracranial aneurysms often remain asymptomatic. There are effective surgical and endovascular interventions to prevent rupture, but these procedures carry a risk of adverse complications.

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