A Clinical and Radiological study of Intracranial Aneurysms in Alexandria University Hospitals

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Introduction

Intracranial aneurysms (IA) represent focal dilatation in a cerebral artery due to weakness in the intima layer.

Unruptured intracranial aneurysms (UIA) have a prevalence of 3.2% of general population, being more common above 30 years and a female to male ratio of 3:1. They are either discovered incidentally or may present with visual complain, headache, stroke or cranial nerve palsy. (1)

Rupture of IA leads to devastating subarachnoid hemorrhage (SAH) which has an incidence of 9 per 100 000 person-years and is associated with high morbidity and mortality.(2) Several grading scores have been used to predict development of complication and outcome of SAH such as Hunt and Hess Classification, World Federation of Neurosurgeons (WFNS) grading scale, modified Fisher score and VASOGRADE scale. (3)

Aneurysmal size was the first determinant of rupture risk, where larger aneurysms carry greater probability of rupture. Recent studies have demonstrated that small aneurysms are responsible for 30-40% of all SAH. Other aneurysm characteristics as neck diameter, aneurysm width, height, parent artery diameter, aspect ratio (AR) and size ratio play a major role in prediction of rupture. (4)

IAs can be classified according to rupture status, location, size and type (saccular, fusiform, dissecting and blister aneurysms) (5)

Detection of IAs done using CT angiography or magnetic resonance angiography, however digital subtraction angiography (DSA) remains the gold standard imaging modality (6)

Aim of work

Assess the pattern of intracranial aneurysms in terms of size, location, morphology and multiplicity in a sample of patients presenting at Alexandria University.

Create a nucleus for registry of all treated aneurysms.

Identify prognostic factors in individual patients.

Subjects

The study included 88 patients, of which 75 presented with SAH while 13 presented with non-rupture manifestations.

Patients with traumatic SAH, arteriovenous malformations and hemangioms were excluded.

Methods and Materials

All patients are subjected to the following :

- Complete history taking and neurological examination
- Grading of SAH using Hunt and Hess Classification, World Federation of Neurosurgeons (WFNS) grading scale, modified Fisher score and VASOGRADE scale.
- 4 vessel digital subtraction angiogram and 3D rotational angiogram.
- Aneurysm characteristics including location, size, width, height, parent artery diameter, aspect ratio, size ration, presence of daughter sac and lobulations will be collected and analyzed.

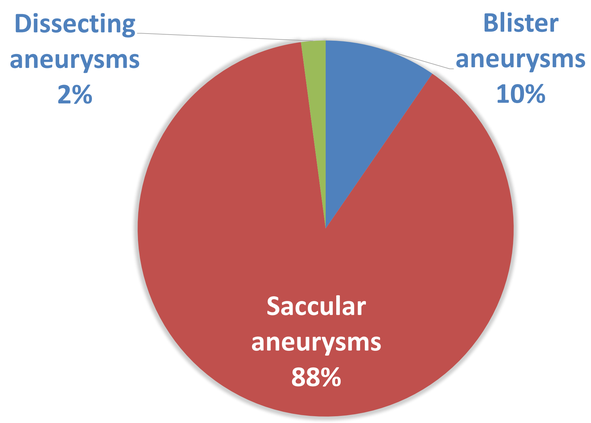
Results

88 patients were included, of them 49 patients (55.7%) were females while 39 patients (44.3%) were males, with a mean age of 50 years.

Those patients harbored 94 aneurysms, 78 ruptured with a mean size of 4.78 mm and 16 were unruptured with a mean size of 6.44 mm.

33.3% of RIA originated from Anterior Communicating Artery (ACoA) and 17.9 from the middle cerebral artery. While 31.3% of the UIA originated from the paraophthalmic segment of internal carotid artery.

Visual complain was the most common presentation (45.8%) of UIA while 15.4% were discovered incidentally.



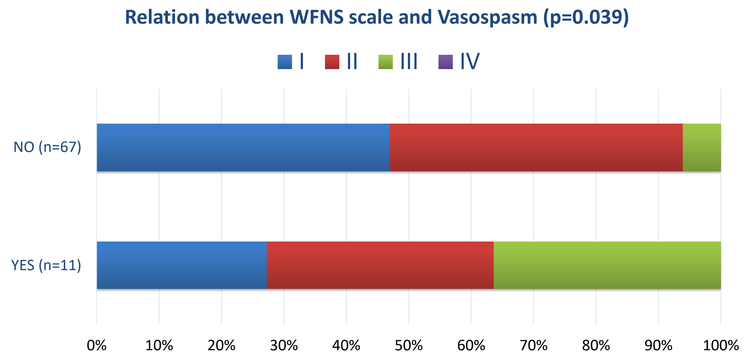


Table (1): Significant aneurysm characteristics between RIA and UIA

	RIA (78)	UIA (16)	P value
ACoA location (n)	26	0	0.005*
Paraophtalmic ICA location (n)	2	5	0.001*
Aneurysmal Neck (Mean ± SD)	2.22 ± 0.87	3.0 ± 1.11	0.010*
Aneurysmal Width(Mean ± SD)	4.33 ± 3.15	5.96 ± 3.50	0.040*
Parent Artery Diameter (Mean ± SD)	2.48 ± 0.82	3.07 ± 0.95	0.033*

Conclusions

- ❖ Higher WFNS scale was significantly associated with the development of vasospasm in patietns with SAH.
- ❖ Most of RIA were smaller than 7 mm in size.
- ❖ Several aneurysm characteristics are significantly different between RIA and UIA. ACoA aneurysms are the most common location for RIA while narrow neck might be associated with slower intra aneurysmal flow velocity and longer contact of blood with aneurysmal wall thus higher risk for rupture. Smaller parent arteries have thinner vessel wall thus aneurysms arising from them have thinner walls and less resistance to rupture.
- ❖ Paraophthalmic ICA location is associated with non rupture while larger width might be associated with more stable aneurysms thus less prone to rupture.

Recommendations

- Further studies with larger sample size to further establish risk factors for rupture.
- Follow up studies to determine efficacy of treatment modalities for each aneurysm.

Contact

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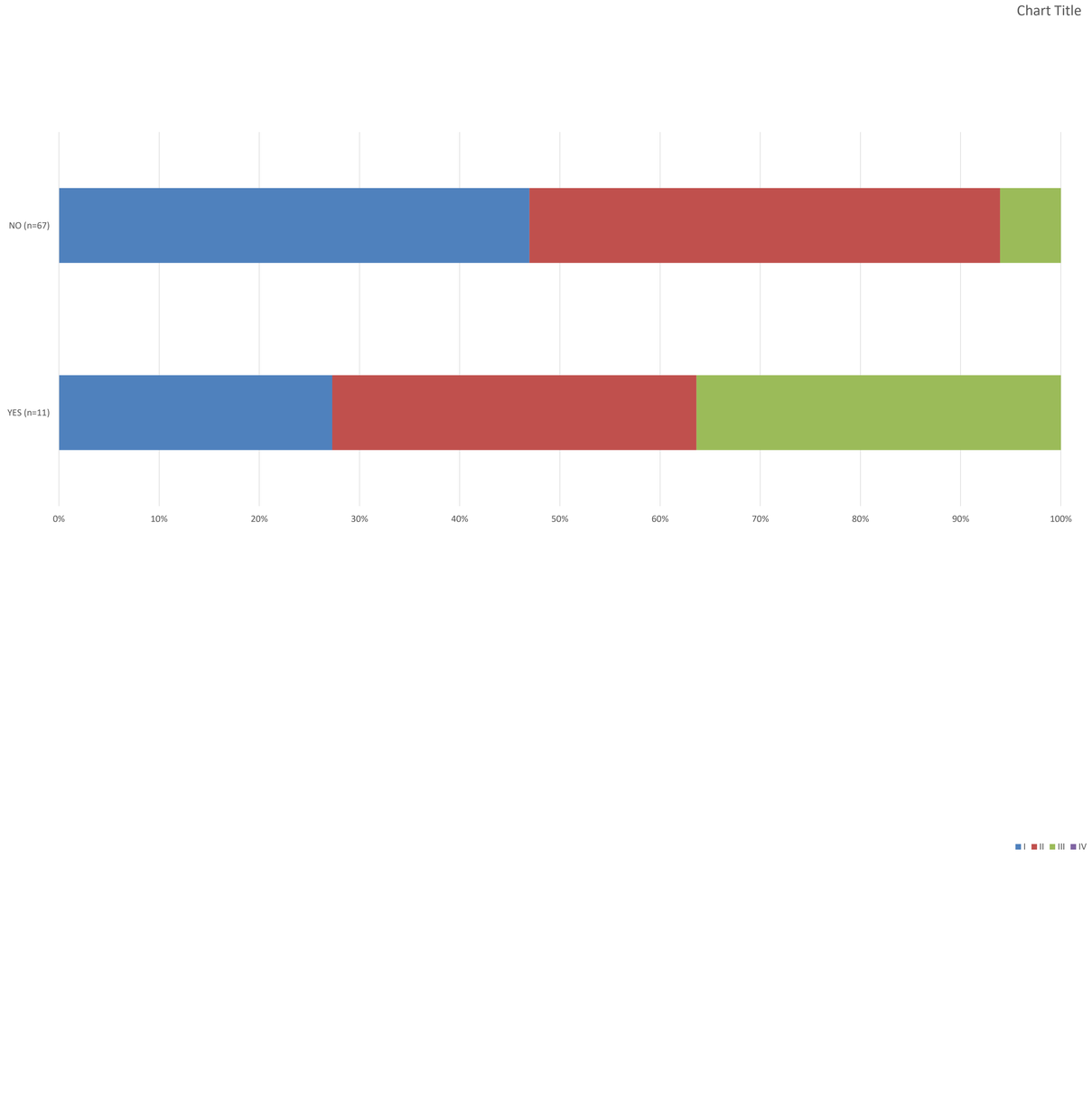
	Ruptured	Unruptured	P value
ACoA location (n)	26	0	0.005*
Aneurysmal Neck (Mean ± SD)	2.22 ± 0.87	3.0 ± 1.11	0.010*
Aneurysmal Width(Mean ± SD)	4.33 ± 3.15	5.96 ± 3.50	0.040*
Parent Artery Diameter (Mean ± SD)	2.48 ± 0.82	3.07 ± 0.95	0.033*

Location (n)	Size								
	Total (94)			Unruptured (16)			Ruptured (78)		
	<7	7 – 12	>12	<7	7 – 12	>12	<7	7 – 12	>12
ACA (4)	3 (75.0)	1 (25.0)	--	–	–	–	3 (75.0)	1 (25.0)	–
ACoA (26)	22(84.6)	4 (15.4)	–	–	–	–	22(84.6)	4 (15.4)	–
AICA (1)	1(100.0)	–	–	–	–	–	1(100.0)	–	–
PCA (4)	4(100.0)	–	–	–	–	–	4(100.0)	–	–
PCoA (6)	3 (50.0)	2 (33.3)	1 (16.7)	0 (0.0)	1 (50.0)	1 (50.0)	3 (75.0)	1 (25.0)	–
PICA (6)	6(100.0)	–	–	–	–	–	6(100.0)	–	–
MCA (17)	14(82.4)	3 (17.6)	–	3(100.0)	–	–	11 (78.6)	3 (21.4)	–
Basilar (6)	6(100.0)	–	–	2(100.0)	–	–	4 (100.0)	–	–
ICA (13)	12(92.3)	1 (7.7)	–	4(100.0)	–	–	8 (88.9)	1 (11.1)	–
Carotid bifurcation (4)	3 (75.0)	–	1 (25.0)	–	–	–	3 (75.0)	–	1 (25.0)
Paraophthalmic (7)	3 (42.9)	3 (42.9)	1 (14.3)	2 (40.0)	2 (40.0)	1 (20.0)	1 (50.0)	1 (50.0)	–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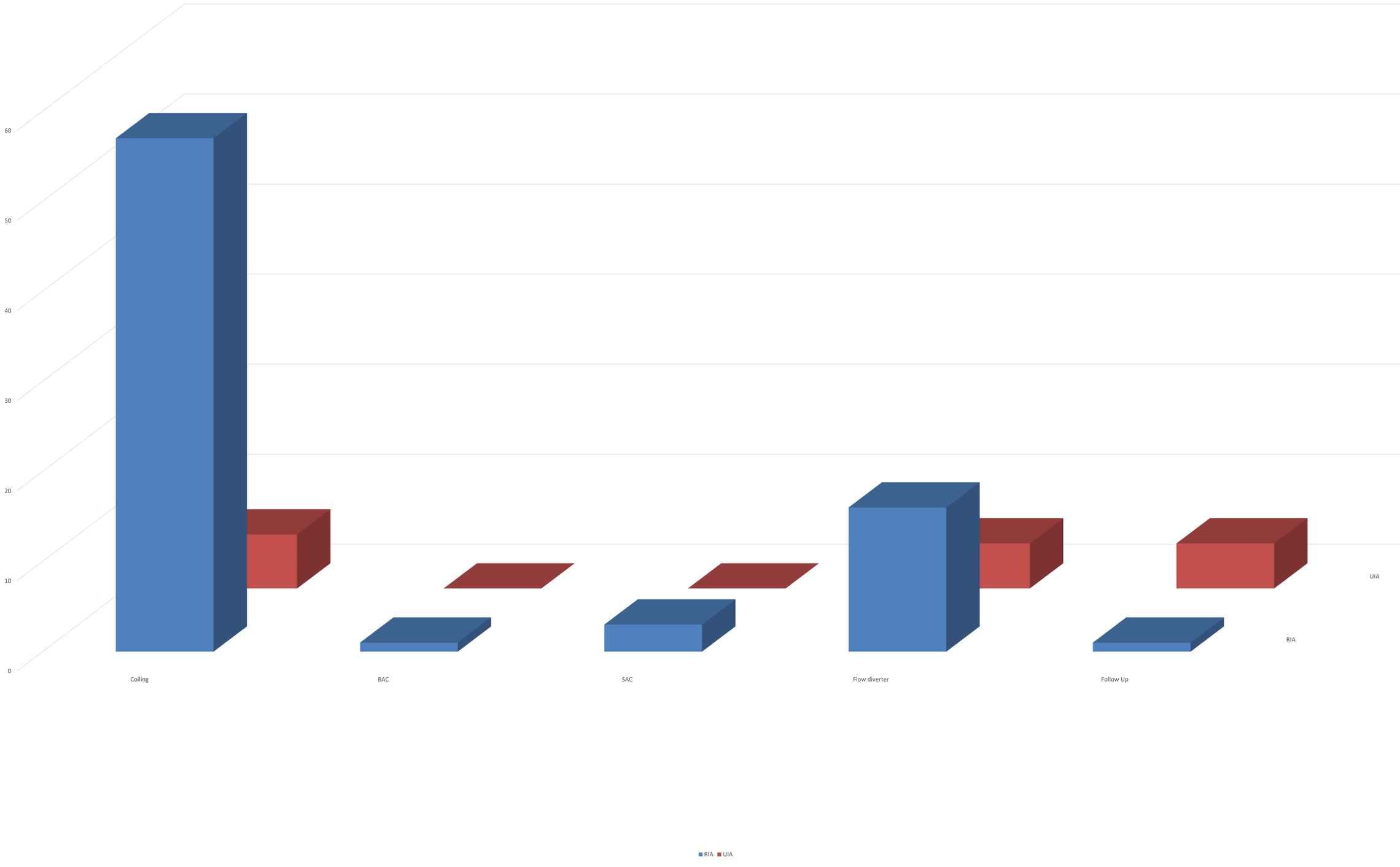
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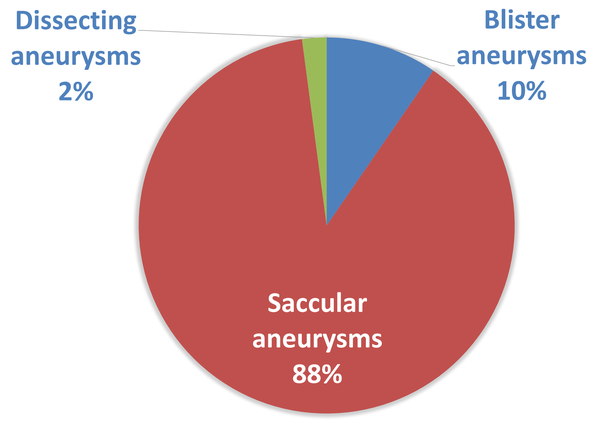
Dissecting aneurysms 2%
Blister aneurysms 10%
Saccular aneurysms 88%