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Complications of in-patient Cerebral Angiography: Comparison between patients with and without sub arachnoid haemorrhage.

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ORIGINAL ARTICLE

Complications of in-patient Cerebral Angiography: Comparison between patients with and without sub arachnoid haemorrhage

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Abstract

Objective: To compare complications of cerebral angiography among patients with and without subarachnoid haemorrhage.

Methods: This retrospective study was conducted at the Aga Khan University Hospital, Karachi, and comprised records of patients undergoing inpatient therapeutic and diagnostic cerebral angiographies from 2001 to 2010. The patients were divided into subarachnoid and non-subarachnoid haemorrhage groups. During the study period no modifications were made to the operational protocol and all patients were subjected to the same procedure and prophylactic care.

Results: Of the 93 patients, 42(45.2%) were women and 51(54.8%) were men. The overall mean age was 45.27±16.15 years (range: 4-80 years). The comparison between the two groups regarding new onset of neurological deficit was statistically significant (p=0.001). However, the same comparison regarding drop in Glasgow Coma Scale was statistically not significant (p=0.073).

Conclusion: The rate of neurological complications was higher in patients with subarachnoid haemorrhage.

Keywords: Cerebral angiography, Sub-arachnoid haemorrhage, Non-subarachnoid haemorrhage. (JPMA 67: 97; 2017)

Introduction

Despite the availability of non-invasive vascular imaging techniques, including computed tomography angiography (CTA) and magnetic resonance angiography (MRA), invasive catheter-based angiography remains the gold standard of imaging the cerebrovascular system,[1] especially in cases where aneurysms are suspected.[2] The major advantages of conventional catheter-based angiography include the ability to differentiate between critical stenosis and complete occlusion and identify plaque characteristics, such as ulceration and calcification, along with the fact that selective and super-selective angiographies can be performed to view collateral vessels in a circuit and appropriate interventional steps can be carried out in the same procedure.[1]

In recent years interventional cerebral procedures have received a lot of encouragement, especially after the international subarachnoid aneurysm trial reported that endovascular management of acutely ruptured aneurysms may be superior to surgery.[3] The trial reported a variable overall complication rate ranging between 0.6 and 10% in patients with cerebrovascular disease undergoing angiographies.

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The complications of the procedure are well documented. However, studies, comparing the complication rate between patients who underwent angiography for sub-arachnoid haemorrhage (SAH) and the patients who underwent angiography for indications other than SAH are lacking. The current study was planned to compare complications of cerebral angiography among patients with and without SAH.

Patients and Methods

This retrospective study was carried out at the Aga Khan University Hospital (AKUH), Karachi, and comprised record of patients having undergone in-patient cerebral angiographies from 2001 to 2010. Operational protocol was kept the same for all patients and they were subjected to the same procedure and prophylactic care.

The participants were divided into SAH and non-subarachnoid haemorrhage (NSAH) groups. All case notes and records were reviewed and the data was recorded in a predesigned data collection form. In addition to the demographic data, co-morbidities and complications of the procedure were recorded.

Cerebral angiography was performed under local and general anaesthesia as per procedure and patient cooperation. The femoral artery was accessed using 6 or 7 Fr sheath, while a 5 Fr microcatheter was used for super-selective catheterisation. A guiding catheter was positioned upstream in the appropriate feeding vessel

and initial angiographic runs were performed. Aminosalicylic acid (ASA) alone or in combination with clopidogrel was prophylactically administered pre-operatively to all patients with un-ruptured endovascular aneurysms and at the end of the case for those who had suffered SAH.

Mean and standard deviation (SD) for continuous variables were computed and Student's t-test was used to confirm significance of the results. Proportion and percentages were computed for categorical variables and chi-square test of significance was applied. P<0.05 was considered statistically significant.

Results

Of the 93 patients, 42(45.2%) were women and 51(54.8%) were men. The overall mean age was 45.27±16.15 years (range: 4-80 years). The SAH group consisted of 43(46.24%) patients; 25(58.1%) females and 18(41.9%) males with a mean age of 47.12±11 years, while the NSAH group had 50(53.76%) patients; 24(48%) females and 26(52%) males with a mean age of 43.68±19 years. In the SAH group, 23(53.5%) cases were diagnostic and 20(46.5%) were therapeutic procedures while in the NSAH group 22(44.0%) were diagnostic and 28(56.0%) were therapeutic. Both groups were demographically matched and statistically comparable. Co-morbidities including diabetes, ischaemic heart disease (IHD) and stroke were also equally distributed among both groups; however, 23(53.48%) patients in the SAH group were hypertensive when compared to 16(32%) in the NSAH group (p=0.03).

Complications were then grouped into neurological and non-neurological complications. Neurological complications included drop in Glasgow Coma Scale (GCS) and post-procedure neurological deficit. The findings showed that 7(19.4%) patients in the SAH group developed transient neurological deficits after the procedure compared to 2(4%) in the NSAH group (p=0.073). Post-procedure drop in GCS was seen in 13(30.23%) patients in the SAH group compared to 1(2%) patient in the NSAH group (p<0.001).

Moreover, 4(4.3%) patients developed non-neurological complications - 3(6.98%) in the SAH group and 1(2%) in the NSAH group. (p=0.4) (Table).

Discussion

Cerebral angiography, the brainchild of Egas Moniz, was first described in the year 1927 as a series of 6 patients,[4] of which 2 developed Horner's syndrome, 1 developed transient aphasia and 1 died of thromboembolism.[5] The complications were attributed to a lack of pre-procedure evaluation and toxicity of contrast material used.[5] However this was the infancy, from which cerebral angiography grew to become the gold standard of neurovascular imaging. In a series of 7,165 angiographic studies, the rate of complications was reported to be 6.43 per cent. When complications in patients with previous subarachnoid haemorrhage were compared to those in patients with no known haemorrhage, the rate of complications in the presence of haemorrhage was to be 7.6% against 5.9% in its absence.[6]

Parallel to the evolution of catheter-based angiography, CTA and MRA were also introduced as true non-invasive procedures. However, due to the accuracy and breadth of diagnostic information offered, the former retained its position as the gold standard. Kaufmann et al, when commenting on the future of catheter-based

Table: Summary of complications.

	Total (n=93)		SAH (n=43)		NSAH (n=50)		P-Value
	n	%	n	%	n	%	
Demographics							
Male	51	54.84	25	58.14	26	52.00	
Female	42	45.16	18	41.86	24	48.00	
Age	45.38	-	47+11	-	44+19	-	
Neurological Complications							
Drop in GCS	14	15.05	13	30.23	1	2.00	0.073
Neurological Deficits	9	9.68	7	16.28	2	4.00	<0.001
Non Neurological Complications	5	4.31	3	6.92	1	2.00	0.4
Death	1	1.08	1	2.33	-	-	
Aneurysm Rupture	2	2.15	2	4.65	-	-	
Failed Embolisation	1	1.08	-	-	1	2.00	

SAH: Subarachnoid haemorrhage
NSAH: Non-subarachnoid haemorrhage
GCS: Glasgow Coma Scale.

angiography highlighted that in measures of performance catheter-based angiography with a spatial resolution of 0.2mm and temporal resolution of 0.25 seconds remains the clear winner when compared to CTA with a spatial resolution of 0.4mm and temporal resolution of 0.5 seconds and MRA with a temporal resolution of 2 seconds.[7]

Although superior in measures of performance, the procedure is invasive to some degree and does involve some degree of manipulation of relatively fragile structures. Therefore, it has been tainted with serious, albeit rare, complications. In its history of over 8 decades of evolution, the complications including neurological and non-neurological sequelae, such as the ones described above, have been well documented in literature and no new complications were identified.[6]

Over the years variable complication rates have been described in literature; prospective data in 1984 showed an overall complication rate of 8.5%, with the rate of neurological complications at 2.6%.[8] With the development of the technique and medical innovation the incidence of neurological complications decreased to 1%.[9] A prospective study from the Mayo Clinic involving nearly 20,000 patients reported neurologic complications in 2.63% of the patients, of which 0.14% had strokes leading to permanent disability.[7] Some centres have even reported 0% neurological complication rates in patients undergoing diagnostic neuro-angiography, though there were some complications noted via imaging but no physical symptom was present in any case.[10,11]

Another important point to consider is that the patients included in the current study were those undergoing in-patient cerebral angiographies, therefore these patients had significantly complicated cases and histories which made the physicians opt for an in-patient procedure over regular patients undergoing out-patient procedures. Thus, this complication rate may be exaggerated due to the complexity and/or co-morbidities of the patients.

Conclusion

There was a significantly higher neurological complication in patients with SAH compared to NSAH patients. Whether this was due to the natural course of the disease or due to the procedure was undetermined by our study. A study with a larger group of SAH patients is needed to draw any conclusion.

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