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Original Article

Clinical and digital subtraction angiographic (DSA) evaluation of patients of subarachnoid haemorrhage (SAH) in a tertiary level hospital

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Abstract

The present study was undertaken to evaluate the morphological anatomy of cerebral vessels in patients of aneurysmal subarachnoid hemorrhage. The cross-sectional observational study was carried out in the Department of Neurology, Dhaka Medical College Hospital, Dhaka from January 2013 to June 2013.Adult patients of spontaneous subarachnoid haemorrhage (SAH), diagnosed clinically and confirmed by CT scan of the head were included in the study. However, patients who are not capable financially of undergoing Digital Subtraction Angiography (DSA), traumatic subarachnoid haemorrhage, intracerebral haemorrhage and patients taking antiplatelet and anticoagulant drugs and with comorbidities were excluded. A total of 30 subjects meeting the above eligibility criteria were selected consecutively from the study population. The present study demonstrated that 80% of the patients were 50 or younger than 50 years old (mean age 45.0 ± 9.4 years) with a male preponderance (60%). Sudden headache accompanied by vomiting was invariably complained by the patients at onset of Athe disease. On admission two-thirds (66.7%) of the patients were unconscious. 4 out of 30(16.65%) patients exhibited neurological deficit. Of the risk factors, hypertension and smoking demonstrated their significant presence (around 45%) among the patients studied. Based on Glasgow Coma Scale, 7(23.3%) patients out of 30 in the present study were in grade-v. Our data showed that the common site of aneurysm was anterior communication artery (36.7%) followed by middle cerebral artery (26.7%) and posterior communicating artery (23.3%). Saccular aneurysms formed the main bulk (93%) of the cases irrespective of anatomical distribution of aneurysm. In aneurysmal subarachnoid haemorrhage, aneurysms are mainly located in anterior communicating and middle cerebral arteries and of medium-sized. Majority are saccular type and narrow-necked.

Key wards: Subarachnoid haemorrhage (SAH), Digital subtraction angogram (DSA), Cerebral Aneurysm.

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Introduction

Subarachnoid hemorrhage (SAH) is the bleeding in the subarachnoid space - the area between the arachnoid mater and the pia mater surrounding the brain. This may occur spontaneously, usually from a ruptured cerebral aneurysm or may result from head injury.[1]

It is a form of stroke and comprises 1 to 7 % of all strokes [2] and affects about 6/100,000 of the population and women are affected more commonly than men, usually present before the age of 65.[3] Up to half of all cases are fatal and 10-15% dies before reaching to the hospital [4] and those who survive often have neurological or cognitive impairment.[5]

Cerebral aneurysms are the most common cause of non traumatic subarachnoid hemorrhage and is responsible for 70 to 75% of spontaneous SAH, 5% of which is caused by AVM (arterio-venous malformation) and in 20% cases no causes are found.[6] Ruptured "berry" aneurysm is the most common among the aneurysmal SAH and is responsible for 85% of cases.[3] So, to determine anatomical site of cerebral aneurysm and securing them is essential to reduce mortality. In view of subsequent increased mortality and morbidity in patients of SAH, any investigation that is effective in planning further management to prevent rebleeding, needs to be vigorously investigated. So, the purpose of the present

study was to evaluate patients of SAH clinically and to determine the anatomical distribution and morphology of cerebral aneurysms in patients with subarachnoid hemorrhage (SAH) by DSA.

Subarachnoid haemorrhage can be diagnosed clinically and can be confirmed by CT scan of head or by lumber puncture (LP) in CT scan negative cases. The classic symptoms of subarachnoid haemorrhage are sudden thunderclap headache, described as 'like being kicked in the head or the worst ever'.[7] The headache from aneurysmal rupture develops in seconds to few minutes.[8] Vomiting occurs in 70% of patients with aneurysmal rupture and 1 in every 14 cases exhibit seizure.[2] Confusion, decreased level of consciousness or coma may be present. Neck stiffness usually presents 6 hours after initial onset of SAH.[9] Subhyaloid hemorrhage or vitreous hemorrhage, which may be visible on fundoscopy, occurs in 3-13% patients with severe SAH.[10] Mono-ocular blindness may result from anterior communicating artery aneurysm if it is exceptionally large.[11] Complete or partial third nerve palsy is a well-recognized sign after rupture of an aneurysm of the internal carotid artery at the origin of posterior communicating artery.

If SAH is suspected, CT scan of head is the first line investigation because of the characteristically hyperdense appearance of extravasated blood in the basal cisterns. Lumbar puncture is done to exclude SAH in patients with a convincing history and negative brain imaging. Imaging modalities for detecting aneurysms are CT angiography, MR angiography and DSA. The first work using digital subtraction techniques was performed in the laboratory of Meyers. Later developments in robotic C-arms allowed larger image intensifiers to be manipulated in multiple plains creating multiple views with image resolution greater than conventional angiography. The multiple views obtained have also been manipulated into three-dimensional (3D) images and movies allowing further analysis of cerebral aneurysms regarding their location, size and morphology. The introduction of nonionic contrast agents further increased image quality and reduced patient's risk of complication. With these advancements DSA is still considered as the gold standard.[12]

Many studies showed that the sensitivity and specificity of digital subtraction angiography (DSA) is more than CTA and MRA in detecting, localizing and sizing cerebral aneurysms.[13,14] Moreover, DSA is the only technique for endovascular coiling to secure aneurysm.

Methods

This study was a cross-sectional observational study.The study was carried out in the Department of neurology, Dhaka Medical College Hospital, Dhaka from January 2013 to June 2013. Adult (18-75 years) patients of subarachnoid haemorrhage (SAH), diagnosed clinically and were confirmed by CT scan of the head, in both sex, patients who are financially capable of doing DSA and patients who gave consent were included in the study. Traumatic subarachnoid haemorrhage, intracerebral haemorrhage, patients taking antiplatelet and anticoagulant drugs and patient with co-morbid conditions were excluded from the study.Data were collected in pre-designed structured questionnaire by the researcher himself. Subjects were thoroughly inform about the procedure of DSA and informed written consent was taken. Data was analysed using statistical package for social software(SPSS).

Results

Among 30 patients in the study,18(60%) were male while 12(40%) were female. The median age of the patient was 45.00±9.4 years with the youngest and oldest patient were 18 and 59 years respectively. Presenting features demonstrate that headache and vomiting was invariably complained by the patients at the onset. Two-thirds (66.7%) of the patients were unconscious at presentation (Table I).

Table-I: Distribution of patients by presenting features (n = 30)

Presenting features	Frequency	Percentage
Headache	30	100.0
Vomiting	30	100.0
Unconsciousness	20	66.7

Risk factors distributions are shown in table II. Approximately 44% of the patients had smoking habit and nearly half (46.7%) had hypertension. A few patients had diabetes (10%) and family history SAH (6.7%).

Table-II: Distribution of patients by risk factors (n = 30)

Presence risk factors	Frequency	Percentage
Smoking	13	43.3
Hypertension	14	46.7
Diabetes	3	10.0
Family history of SAH	2	6.7

Assessment of neurological impairment shows that 1(3.3%) patient had impaired motor function and 1(3.3%) had sensory loss. Three patients (10%) exhibited cranial nerve palsy. While meningeal irritation (manifested as neck rigidity) was present in every patients, hemiplegia and monoplegia were completely absent (table III).

Table-III: Distribution of patients by neurological impairment (n = 30)

Neurological impairment	Frequency	Percentage
Abnormal m otor function	1	3.3
Impaired sensory function	1	3.3
Cranial nerve palsy	3	10.0

Over one-third (36.7%) of the patients exhibited aneurysm in the anterior communication artery, 26.7% in the middle cerebral artery, 23.3% in the posterior communicating artery. Internal carotid artery and top of the basilar artery were seldom involved (Table- IV).

Table-IV: Distribution of patients by anatomical location of aneurysm (n= 30)

Anatomical location	Frequency	Percentage
Anterior communicating artery	11	36.7
Middle cerebral artery	8	26.7
Posterior communicating artery	7	23.3
Internal carotid artery	1	3.3
Top of the basilar artery	1	3.3

In terms of size of the aneurysm, 53.3% was 5 – 12 mm, 30% was 4 or < 4 mm and 16.7% was 13 or > 13 mm (Table- V).

Table-V: Distribution of patients by size of the aneurysm (n = 30)

Size (mm)	Frequency	Percentage
≤ 4	9	30.0
5 – 12	12	53.3
≥ 13	5	16.7

Majority (93%) of the aneurysm was saccular type. Only 7% were non-saccular type (Figure 1). Regarding neck size 4(13%) were wide necked and 26(87%) were narrow necked.

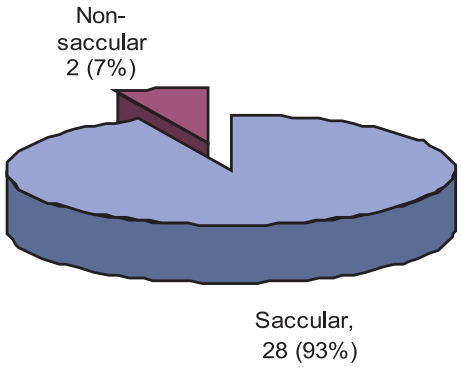

Figure 1: *Type of aneurysms*

Discussion

The present study demonstrated that 80% of the patients were 50 or younger than 50 years old with a male preponderance (60%). Although the incidence increase with age, half of the patients in any series are found younger than 55 years at the time of subarachnoid haemorrhage.[15] However, a female preponderance of the disease has been seen in several studies.[3] The medical records of all residents of Olmsted county Minnensoata with a view to find the population-based incidence and prevalence rates of intracranial saccular aneurysm showed a total 348 intracranial aneurysms were detected among 270 persons during the 31-year period. There were 105 male subjects (39%) and 165 female subjects (61%). The mean age at diagnosis was 59.1 years.[16] The age-sex adjusted incidence rate for intracranial aneurysms excluding asymptomatic autopsy cases was 9 per 100000 person/years. The aneurysms were seven times more likely to be detected in the anterior circulation than those in the posterior circulation or elsewhere, which is almost consistent with the findings of the present study.[16]

In the present study, sudden headache was invariably complained by the patients at the onset. Conversely, in patients who present with sudden headache alone in general practice, subarachnoid haemorrhage is the cause in one in ten patients.[17] Vomiting is not a distinctive feature either because almost half the patients with non haemorrhagic thunderclap headache also report vomiting at onset.[18] However in the present study all the patients experienced vomiting at the onset. Seizures at onset of the haemorrhage occur in one of every 14 patients with subarachnoid haemorrhage,[18-20] although none of the patients in the present series have had seizure, which may be due to chance error resulting from small sample-size.

On admission two-thirds (66.7%) of the patients were unconscious which quite consistent with the findings that two-thirds of all patients have depressed consciousness, of whom half remain in coma.[21] Neck stiffness is a common symptom, caused by the response to blood in the subarachnoid space. It takes some 3–12 h to appear and might not develop at all in deeply unconscious patients, or in patients with minor subarachnoid haemorrhage.[22] Very few patients in the present study exhibited neurological deficit (1 abnormal motor function, 1 sensory loss and 3 cranial nerve palsy). Focal neurological deficits occur when an aneurysm compresses a cranial nerve or bleeds into the brain parenchyma, or from focal ischaemia due to acute vasoconstriction immediately after aneurysmal rupture.

Of the risk factors, hypertension and smoking demonstrated their significant presence (around 45%) among the patients studied. Other studies also showed smoking, hypertension and heavy alcohol as major modifiable risk factors.[23-25]

Although CT scanning is the first investigation if subarachnoid haemorrhage is suspected, its ability to detect subarachnoid haemorrhage is dependent on the amount of subarachnoid blood, the interval after symptom onset, the resolution of the scanner, and the skills of the radiologist. In such circumstances the need of a lumbar puncture cannot be ignored. However, in patients with equivocal lumbar puncture, an imaging study, such as CT angiography of the head or cerebral angiography, should be the next step. Digital-subtraction cerebral angiography has been the gold standard for the detection of cerebral aneurysm, but CT angiography has gained popularity and is frequently used owing to its noninvasiveness and a sensitivity and specificity comparable to that of cerebral angiography.[26]

In the present study we used DSA in all patients to achieve a diagnosis. The sensitivity for detecting ruptured aneurysms, with conventional angiography as the gold standard, is currently about 95%.[27,28] A great advantage of CT angiography over MR angiography and catheter angiography is the speed with which it can be undertaken, preferably immediately after the CT scan of the brain by which the diagnosis of aneurysmal haemorrhage is made, and while the patient is still in the scanner.

From the findings of the study it can be concluded that in aneurysmal subarachnoid haemorrhage, aneurysms are mainly located in anterior communicating and middle cerebral arteries and of medium-sized. Majority are saccular type and narrow-necked. Victims are usually middle-aged (younger than 50 years) and predominantly female. Headache and vomiting are universal complaints at onset. Smoking and hypertension are common modifiable risk factors.

Subarachnoid haemorrhage is a seious form of haemorrhagic stroke. Thus appropriate intervention in appropriate time needs proper evaluation of the cerebral blood vessels by DSA to reduce the mortality and morbidity of the patient. Though this study is a very small one in this field to evaluate DSA procedure still it reflects a small light. A comprehensive and large scale study involving greater number of patients in multiple centres is required to make a final comment regarding this issue.

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