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COMPUTERIZED TOMOGRAPHIC (CT) ANGIOGRAPHY OF BRAIN IN MANAGEMENT OF NON-TRAUMATIC INTRA CRANIAL HAEMORRHAGE.

Neurosurgery

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ABSTRACT

Non traumatic Intracranial haemorrhage with underlying vascular pathology is associated with very high mortality and morbidity if not diagnosed timely. Our aim is to compare diagnostic accuracy of ct angiography of brain in detecting underlying pathology with gold standard more invasive digital substraction of angiography of brain and to identify high risk patients.

KEYWORDS

spontaneous intracranial haemorrhage, ct angiography of brain, digital subtraction angiography of brain.

INTRODUCTION

Intracranial hemorrhage (ICH) is a significant medical event that accounts for up to 15% of strokes.[1] The incidence of ICH is approximately 25 per 100,000 person-years, and it has a mortality of 40% within one month of presentation.[1] ICH may occur in multiple intracranial compartments and may be caused by diverse pathology.

Spontaneous ICH can be classified as primary (78-88%) that occur due to spontaneous rupture of small vessels and secondary that occur due to underlying vascular pathology.[2] In this study we have focused on secondary spontaneous ICH as if they do not detected early may lead to grave consequences.[3]

Conventional catheter angiography is the gold standard for diagnosis of vascular abnormality; however; other imaging modalities such as Computerized Tomographic Angiography (CTA) and Magnetic Resonance Angiography (MRA) can help to find out about vascular abnormalities.[4,5]

Intracranial aneurysms are the most common causes of non-traumatic ICH, occurring in 60%-85% of cases.[6,7] The most common place of intracranial aneurysms is the circle of Willis and its immediate branches. The location and the size of the aneurysms are the important factors influencing management and prognosis of patients.

In this study, we evaluated the role of CT Angiography in guiding the management of non-traumatic ICH.

PATIENTS AND METHODS

Fifty patients (age 12-60 years) of non-traumatic ICH with Glasgow Coma Scale (GCS) >9 were included in this hospital-based study was conducted at Department of Neurosurgery, VMMC & Safdarjung Hospital, New Delhi over a period of 18 months. Patients with serious comorbid conditions, history of cranial surgery, allergy to contrast, status epilepticus, coagulopathies with severe jaundice, decreased platelet counts (less than one lac), and present or past trauma were excluded.

The patients admitted in neurosurgery department were subjected to different available diagnosing modalities after initial resuscitation. Investigation of choice was CTA of brain. If kidney function was not normal then MRA of brain was done. DSA was done in all patients. Repeat CT angiography was performed if initial CTA was normal and NCCT Head suggested definitive SAH.

The study was approved by Institute Ethics Committee, and the patients were included after they agreed to provide consent to participate in the study.

Data were presented as frequency and percentage. Categorical variables were compared using Chi Square test. P value <0.05 was considered significant.

RESULTS

General characteristics

Table 1 shows general characteristics of the study participants. More than half of the patients (56%) aged between 31 and 50 years. Male predominance was observed with a ratio of 2:1. Headache was the most common clinical feature observed in all the patients followed by vomiting (74%), seizures (46%), and neurological deficit as well as altered sensorium (34%). Eight-six percent patients had abnormal findings on CTA. On NCCT examination, SAH was present in 72% and 18% had haematoma. Ten percent patients had SAH as well as haematoma. Pathology of haemorrhage revealed aneurysm in 82% and AVM in 12%. Among 41 patients with aneurysm, 28 patients had neurological deficit while 2 of 6 patients with AVM had neurological deficit.

Location and size of aneurysm

Among 41 patients with Aneurysm, majority of patients (31.7%) had ACoM (Figure 1), while 29.3% had ICA, 26.9% had MCA, 7.3% had ACA, 2.4% had Basilar top and 2.4% had PCA (Figure 2). More than four-fifth of patients (80.5%; n=33), had size of aneurysm > 5 mm, while remaining 19.5% patients had size of aneurysm ≤ 5 mm.

Association between CTA and DSA findings

Among patients with Positive DSA findings (n=47), most of patients (91.5%) had positive CTA findings, while remaining 8.5% patients had negative CTA findings. However, among patients with negative DSA findings (n=3), all patients (100%) had negative CTA findings. The relation was statistically significant (P=0.002) (Table 2).

DISCUSSION

In this study, we evaluated 50 cases of non-traumatic ICH which was confirmed through CT analysis. Age is known as the most important unchangeable risk factor for spontaneous ICH. Previous studies have reported that older age was a major risk factor for ICH.[8,9] In our study, majority of the patients aged between 31 and 50 years. In the study by Ghareb-Salehi et al, 39% of the patients aged between 31 and 50 years.[10] Increased age has been recognized as a risk factor of hemorrhage; however, extreme old age is protective, decreasing the risk of hemorrhage. A decrease in vessel elasticity with aging makes the vessel wall vulnerable to the effects of hypertension; this may be the hypothetic mechanism for increased risk of hemorrhage and result in with worse outcomes.

Male sex has been described as another risk factor for spontaneous ICH in the literature. In our study, 60% of the patients were males. However, some experts proposed the role of female hormones in female preference for non-traumatic ICH but there is a controversy about this.[11,12] The results of this study were in concordance with most other studies.

The common causes of non-traumatic intracranial hemorrhage are aneurysms and Arteriovenous Malformations (AVM) in our study. This is in concordance with previous studies.[10]

The risk of bleeding of an aneurysm elevates with increased size of it but aneurysms can present with bleeding at any size. According to the literature, aneurysms with size less than 5 mm are less prone to bleeding while larger aneurysms are more susceptible to bleeding.[13,14]

In this study, 80.5% had size of aneurysm > 5 mm.

The most common aneurysms in our study were Acom (31.7%), MCA (16%), and ICA (15%). This is compatible with most of other studies

We found sensitivity of 91.5% and specificity of 100% of CTA of brain in diagnosing the underlying pathology of the spontaneous ICH. Delgado et al[3] reported CTA of brain had specificity of 98.5% and sensitivity of 96.1% in diagnosing the underlying pathology for spontaneous intraparenchymal hemorrhage. Romero et al[15] reported sensitivity of 96.4% and specificity of 100% for the diagnosis of underlying pathology.

In conclusion, CT Angiography of the brain is very useful and time saving tool for the diagnosis of underlying pathology in patient presented with spontaneous intracranial haemorrhage. CT Angiography of brain can diagnose underlying pathology with very high sensitivity and specificity.

Table 1: General characteristics

	Frequency	Percentage
Age (years)		
≤30	9	18
31-50	28	56
>50	13	26
Sex		
Male	30	60
Female	20	40
Clinical features		
Headache	50	100
Vomiting	37	74
Seizures	23	46
Neurological deficit + altered sensorium	17	34
Abnormal CTA	43	86
Type of haemorrhage (NCCT)		
SAH	36	72
Haematoma	9	18
SAH + Haematoma	5	10
Pathology of haemorrhage		
No pathology	3	6
AVM	6	12
Aneurysm	41	82

Data expressed as frequency and percentage

CTA, Computed tomography angiography; NCCT, Non-contrast computerized tomography; SAH, Sub-arachnoid haemorrhage; AVM, Arteriovenous malformations

Table 2: Association between CTA and DSA findings

CTA	DSA findings		P value
	Positive (%)	Negative (%)	
Positive	43 (91.5)	0	0.002
Negative	4 (8.5)	3 (100.0)	
Total	47 (100.0)	3 (100.0)	

Data expressed as frequency (percentage)

DSA, Digital subtraction angiography; CTA, Computed tomography angiography

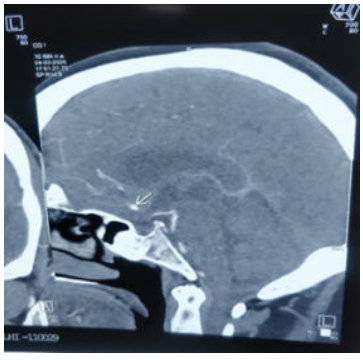

Figure 1: Saggital view of CT angiography of brain showing ACoM aneurysm

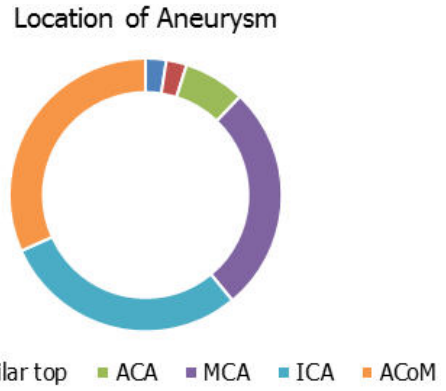

Figure 2: Location of aneurysm

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