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ORIGINAL ARTICLE

Role of Computed Tomography Angiography for the diagnosis of Cerebral Aneurysm types in Patients with Atherosclerosis.

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ABSTRACT… Objective: To determine the role of CT Angiography for the Diagnosis of Cerebral Aneurysm types in Patients with Atherosclerosis. **Study Design:** Retrospective study. **Setting:** Chughtai Lab of Diagnostic Centre Jail Road, Lahore. **Period:** September 2024 to December 2024. **Methods:** In this study 44 patients who fulfilled the criteria, were taken, out of which 16(36.4%) were males and 28(63.6%) were females. Out of these 44 patients, 34(77.2%) were found to have cerebral aneurysms as detected on CTA. The important measurements included the shape and size of types of cerebral aneurysm. **Results:** The study concluded that CTA was found accurate in diagnosing and differentiating all the anatomical types of cerebral aneurysm and the ruptured aneurysms. The mean age of study participants is 56.68 ± 12.22 years with age range 37 to 80 years. In this study the aneurysms are categorized into small sized aneurysm (<5mm), medium sized aneurysm (5-10mm), large sized aneurysm (10-25mm) and giant aneurysm (>25mm). 19 patients (43.2%) had small size aneurysm, 11 patients (25%) had medium size aneurysm, 3 patients (6.8%) had large sized aneurysm and 1 patient (2.3%) had a giant aneurysm. In these 34 patients who had cerebral aneurysms, 12 patients (27.3%) had saccular aneurysm, 9 patients (20.5%) had fusiform aneurysm, 6 patients (13.6%) had dissecting aneurysm and 7 patients (15.9%) had ruptured irregular shaped aneurysms which means intracerebral bleeding is also detected in my study. **Conclusion:** Computed Tomography Angiography is the safe non-invasive diagnostic modality to detect all the morphologies of cerebral aneurysms. CTA can also detect the ruptured intracranial bleeding of an aneurysm which is less likely to be clearly seen on other modalities i.e. DSA.

Key words: Aneurysm, Atherosclerosis, CT Angiography, Aneurysm Shape, Aneurysm Size, Ruptured Aneurysm.

INTRODUCTION

Cerebral aneurysm is a balloon like out pouching arising from a weakened part of the wall of a blood vessel in the human brain.[1] If the brain aneurysm expands and the blood vessel wall becomes too thin and weak, the aneurysm will rupture and bleed into the intracerebral spaces around the brain.[2] Computed tomography angiography (CTA) is used clinically for the diagnosis of cerebral aneurysms because it is safe, non-invasive, and less harmful for the patient.[3] This scan has less complications rate for the patients undergoing Computed Tomography Angiography and can easily diagnose the size and shape of cerebral aneurysms.[4] Cerebral aneurysms can vary in size and shape. They are classified into saccular, fusiform and dissecting aneurysm depending on their shape. They are classified into small, medium and large sized out pouchings or buldges.[5] However, fusiform (circumferential) and mycotic (infectious) aneurysms are present in rare cases. Approximately 85% of the brain aneurysms are located in the ACA and at bifurcations of circle of willis.[6] The fusiform aneurysms are commonly caused by atherosclerosis and mycotic aneurysms from the septic emboli present in infective endocarditis.[6] Aneurysms are commonly found in patients between the ages of 35 and 60 years.[7] The female to male ratio is 3:2, but before age 40, females and males are equally affected by cerebral aneurysm.[8] In United states, almost every 1 in 50 people have cerebral aneurysms. The mean overall unruptured aneurysm prevalence is estimated to be about 2.8% in the entire population.[9] Treatment options, such as clipping and stent placement, can reduce the rupture risk.[10]

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The risk factors for the brain aneurysm include smoking, hypertriglyceridemia, head injury, atherosclerosis, hypertension and ADPKD.[11-14] Symptoms of a ruptured brain aneurysm include a thunderclap headache, a stiffened neck, loss of consciousness, sickness, seizure, drooping eyelid, vomiting and pain on looking at light.[14-25] Blood thinners including warfarin (Coumadin) and diet pills like ephedrine and samphetamines, can cause an aneurysm to burst.[17]

METHODS

This study was conducted on patients presenting with Cerebral Aneurysm in Chughtai Lab, Diagnostic Centre, Lahore. It was a retrospective study. The study was for four months September 2024 to December 2024 after the approval of the synopsis from Institutional Review Board (FMH-09/10/2024-IRB1528). Non-probability convenient sampling technique was used in this study. A self-designed Performa was used for data collection. Patients with Cerebral Aneurysm, Age: 18-80 years, history of headache, seizures, hypertension, visual changes and subarachnoid hemorrhage were included in this study. Severe claustrophobic patients, allergy to iodinated contrast media, severe renal failure (eGFR = <30ml), pregnancy, stroke and patients with brain hemorrhage were excluded in this study. This study was retrospective and data was collected from the previous records of hospital using a pre-designed Proforma. All patients underwent CT Angiography. Data was entered and analysed using IBM-SPSS V-26 software. Most appropriate statistical tool was used to analyse data, after approval from IRB. Continuous variable (Age) was expressed as mean ± SD, whereas categorical variables in the form of frequency and percentage. Bar chart and histogram were used to display the data. Qualitative data was shown as the frequency and percentage.

RESULTS

Out of 44 patients, there were 19 patients in which small size Aneurysm was present (43.2%), 11 patients in which medium size aneurysm was present (25.0%), 3 patient in which large aneurysm was present (6.8%), 1 patient in which giant aneurysm was present (2.3%), and 10 patients were those in which aneurysm was not visualized (22.7%).

Type of aneurysm on the basis of Size		
	Frequency	**Percentage**
Not Visualized	10	22.7
Small size aneurysm <5mm	19	43.2
Medium size aneurysm 5-10mm	11	25.0
Large aneurysm 10-25mm	3	6.8
Giant aneurysm >25mm	1	2.3

Table-I. Shows the percentage of type of aneurysm on the basis of size in the study

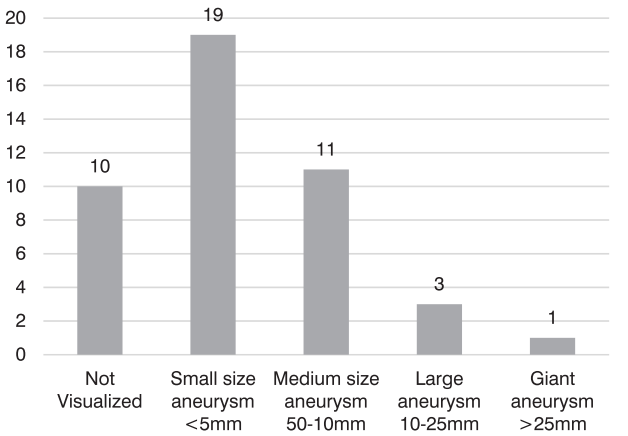

Figure-1. Shows the percentage of type of aneurysm on the basis of size

Types of Aneurysm on the basis of Shape

Out of 44 patients, there were 12 patients in which saccular shaped Aneurysm was present (27.3%), 9 patients in which fusiform aneurysm was present (20.5%), 6 patient in which spherical aneurysm was present (13.6%), 7 patients in irregular shape aneurysm was present (15.9%), and 10 patients were those in which aneurysm was not visualized (22.7%). Among 7 patients ruptured aneurysms were also diagnosed on Computed Tomography Angiography. It means CTA can also diagnose Ruptured aneurysms which are less likely to be detected on DSA.

Type of aneurysm on the basis of Size		
	Frequency	Percentage
Not Visualized	10	22.7
Saccular aneurysm	12	27.3
Fusiform aneurysm	9	20.5
Dissecting aneurysm	6	13.6
Irregular shaped / ruptured aneurysm	7	15.9

Table-II. Shows the percentage of type of aneurysm on the basis of shape in the study

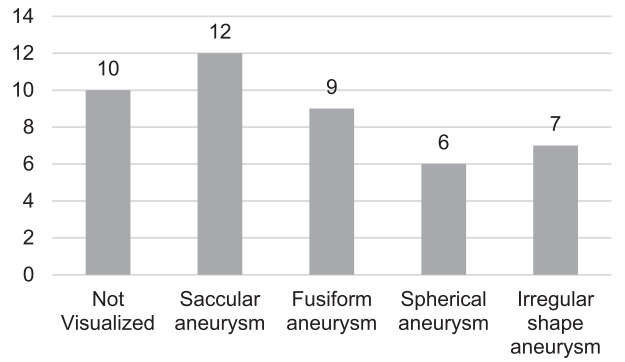

Figure-2. Shows the percentage of type of aneurysm on the basis of shape

DISCUSSION

This study was performed to determine the role of Computed Tomography Angiography for the diagnosis of types of cerebral aneurysm in atherosclerotic patients. In this study 44 patients were taken as sample who fulfilled the criteria with Aneurysm involved in this study. The age of the patients ranged from 18 to 80 years. In these 44 patients, 34 patients had cerebral aneurysms diagnosed on CTA. While the rest of the patients had no aneurysm. Of these 44 patients, 16(36.4%) were males patients and 28(63.6%) were female patients. J Menke, J Larsen, and K Kallenberg all conducted a retrospective study on "Diagnosing cerebral aneurysm by computed tomography angiography: meta-analysis". The study was aimed to determine accuracy of non-invasive CT Angiography for the assessment of intracranial aneurysms in symptomatic patients. Forty-five studies were involved in this research study out of which 43 scored 11 points on the QUADAS assessment. Based on the data and medical record of the patients, the sensitivity of CT Angiography was 97% and specificity was 98% for diagnosing the small sized aneurysms (less than 4mm).[7] In my study, I have checked the role of CTA for the diagnosis of cerebral aneurysms size and shape. I have categorized the aneurysms into small sized aneurysm (<5mm), medium sized aneurysm (5-10mm), large sized aneurysm (10-25mm) and giant aneurysm (>25mm). 19 patients (43.2%) had small size aneurysm, 11 patients (25%) had medium size aneurysm, 3 patients (6.8%) had large sized aneurysm and 1 patient (2.3%) had a giant aneurysm. In these 34 patients who had cerebral aneurysms, 12 patients (27.3%) had saccular aneurysm, 9 patients (20.5%) had fusiform aneurysm, 6 patients (13.6%) had dissecting aneurysm and 7 patients (15.9%) had ruptured irregular shaped aneurysms which means intracerebral bleeding is also detected in my study. It means CT Angiography can replace the DSA in patients with the ruptured intracranial aneurysms of brain.

CONCLUSION

Computed Tomography Angiography is the safe non-invasive diagnostic modality to detect all the morphologies of cerebral aneurysms. CTA can also detect the ruptured intracranial bleeding of an aneurysm which is less likely to be clearly seen on other modalities i.e. DSA.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Zara Javed:** Data analysis, data interpretation, design of work.
2	**Rimsha Badar:** Statistical technique, drafting, conception of work.
3	**Sheikh Daniyal Hanan:** Methodology design, topic given, review of the article.
4	**Sidra Inam:** Design questionnaire, data collection.