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Research Paper

Evaluation of Occlusive Diseases in Cervical Arteries in Patients of Acute Ischemic Stroke- A Ct Angiography Based Study

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Stroke is defined as an abrupt onset of focal neurological deficit. Acute ischemia constitutes approximately 80%-85% of all strokes and is an important cause of morbidity and mortality [(1)] Most of the ischemic strokes are caused by thelarge artery atherosclerosis, cardiac embolism, or cerebral microangiopathy. In the past few years, the treatment of acute ischemic stroke (AIS) has changed dramatically.[(3)] Newer mechanical devices offer rapid and successful recanalization in the majority of patients who undergo treatment. [(4-6)] Various studies show that clinical outcome improves if patients (A) have a salvageable brain at presentation and (b) undergo early recanalization.[(7-9)]Recent five clinical trials have shown us the efficacy of endovascular treatment with mechanical devices in the care of patients with acute ischemic stroke.[(10-14)] CTA is widely available and allows rapid assessment of the entire arterial vasculature from aortic arch to vertex.[(2)] Most of clinically relevant arterial occlusive disease is found in the intra and extra cranial arteries supporting the aortic arch to vertex CTA for patients with AIS. The purpose of the study was to obtain the associations of extra cranial cervical vessels atherosclerotic changes with AIS. Admission CTA study was used for evaluation of vessels. The aim was to calculate the percentage of patients with the vascular stenosis and occlusion in patients of AIS.

I. MATERIAL AND METHODS

Patients

The patients taken for the study includes those who were admitted in our hospital with symptoms of acute stroke in between the time period of Dec 2016 to May 2017. Patient with hemorrhagic stroke were excluded from the study. Only those patients were included which have their CTA done. There CTA images were collected and were evaluated.

Neuroimaging

The CTA was done onGE OPTIMA 128 SLICE CT. Technical parameters includes-

Coverage	aortic arch to circle of willis
Scanning parameters	120kv , 250-350 mAs
Scanning delay	Dependent on ROI placed over aortic arch to detect contrast medium bolus (empiric delay of 12 sec)
Contrast medium dose	100-120 ml of non ionic contrast medium 350mgI/ml @ 3 -4 ml/sec.
Section thickness	0.625mm
Section reconstruction	0.625mm

Image Interpretation

CTA images were used for analyzing the degree of stenosis and occlusion in the cervical vessels. Images were interpreted by three of the authors. Three of them independently interpreted the images and there results were collaborated. Vessels were studied for the wall thickening, presence of plaque, degree of stenosis or complete obstruction of the vessels. Vessels studied includes bilateral common carotid artery, extra cranial part of internal carotid artery and vertebral artery (V1-V3 segment) .

In total result was interpreted for 300 vessels. Occlusion is defined as the absence of the contrast media and stenosis was defined in percentage of luminal narrowing. In further, side of the vessel involved was correlated with the side of the brain area affected to see the correlation of the vessel involvement with AIS .

Fig 1 showing origin of both common carotid arteries from brachiocephalic trunk and hypoplastic right vertebral artery. Mild diffuse circumferential wall thickening in bilateral CCA without luminal narrowing .

II. RESULTS

Total of the 50 patients were taken up for the study. 36 were males and 14 were females. The youngest of these was a male of 16 years who was a known case of rheumatic heart disease and had left cerebellar infarct. Cause was found to be thrombus in left vertebral artery with occlusion of left PICA. Youngest female was 34 years of age with aberrant artery origins and was on OCPs from last 10 years. In total 300 vessels were studied for 50 patients. Any aberrant origins of the arteries were also noted down.

38 Patients out of the total shows vessels involvement while 12of the patients did not show any vessel involvement. These 12 patients shows no changes in extra cranial vessels. Out of these 38 patients 21 **(**54 vessels), shows diffuse wall thickening or calcification of wall in some of these however, none of these shows significant luminal narrowing. Luminal narrowing was seen in13 patients. For the ease of calculating the results narrowing was divided as mild with <40% of luminal narrowing , moderate with 41-70 % luminal narrowing and severe with >71% of narrowing . Mild luminal narrowing was seen in 20 vessels . Moderate luminal narrowing was seen in 18 vessels. Severe narrowing was seen in 7 vessels. In 4 patients complete occlusion with non opacification of the vessel was noted. So out of the total 300 vessels studied 99 vessels shows the findings. 45 of these 99 vessels shows luminal narrowing due to plaque formation and rest 54 shows either diffuse wall thickening or calcification.

Further evaluating the results, 18 of the total 50 patients shows vessels involvement on the ipsilateral side of the ischemic area, 6 on the contralateral side and 24 on bilateral side. Direct correlation could be seen between the occurrences of atherosclerotic change in the vessels as changes were seen in 38 patients. Findings suggesting that although atherosclerotic changes in the neck vessels forms the direct impact on the occurrence of acute ischemic stroke but there are other factors like hypercougublestates, thromboembolism from heart and other cardiac disease which also contribute to significant number of cases of AIS which were likely the cause of AIS in 12 patients with normal neck vessels and in 6 patients with changes on contralateral side. So in 50 patients of acute ischemic stroke 76 % have the neck vessels involvement showing the direct correlation between atherosclerosis and AIS. Luminal narrowing was seen in 26% of total and 8% with complete luminal occlusion. Aberrant origin of the vessels was seen in 4 patients.

III. DISCUSSION

In the group of 50 patients taken up for the study 38 of patients show the presence of vascular abnormalities in form of atherosclerotic changes , while only 13 out of these shows actual luminal narrowing and plaque formation. These values with significant number of patient with the changes proves the direct correlation of atherosclerotic changes in neck vessels with AIS. So early recognition of the changes and timely treatment can decrease the mortality and morbidity rates. Early CTA performed in AIS can guide for the appropriate and timely management. although significant number of patients shows the changes , out of the total 300 vessels studied only 45 of the total shows significant luminal narrowing and plaque formation. Figure tells us the number of normal vessels and chances of better outcome withproper treatment. Approximately 25 % of

the patients were without any changes increasing the chances of outcome to be better and making endovascular treatment unnecessary.

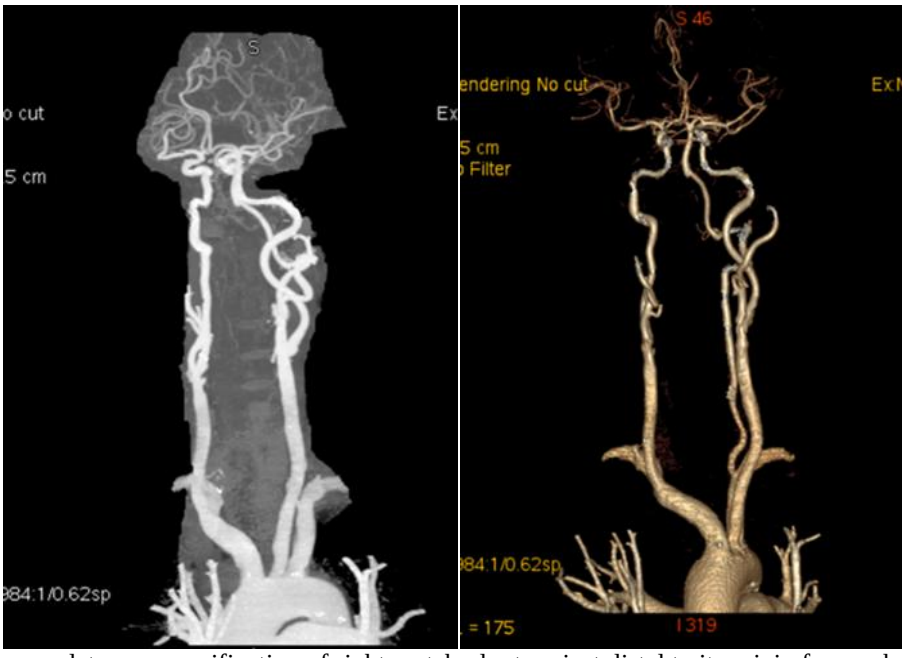

Fig 2 showing complete non opacification of right vertebral artery just distal to its origin from subclavian artery.

Fig 3 circumferential wall thickening with intraluminal thrombus in proximal portion of cervical part of right ICA with 60-70% luminal narrowing.

IV. CONCLUSION

The study gives a comprehensive picture of the frequency and the extent of relevant arterial pathology on CTA in cases of acute ischemic stroke. Approximately 76% of the patients have the neck vessels involvement in cases of AIS. This value tells us the significant correlation between atherosclerotic changes in the neck vessels and stroke.

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