

Association Of Carotid Intima-Media Thickness And Stroke In Hypertensive Patients.

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Abstract

MATERIALS AND METHODS : A hospital-based case-control study of 200 hypertensive patients out of which 128 presented with stroke in Guntur government hospital between February and April 2023. Carotid ultrasonography examinations were performed with the use of esoate mylab8 and mylab6 sonography machine equipped with a 7.5 to 10 MHz linear-array transducer. With the subject in the supine position and the neck in slight hyperextension the common carotid artery, carotid bulb, and the extra-cranial part of internal carotid artery was identified of both side and intima media thickness was measured as the distance between the luminal Intimal interface and the medial adventitial interface.

RESULTS: The mean age of the study participants was 55 ± 15 years. Most participants had an ischemic stroke 64%(128/200), hypertensive 50%(100). The prevalence of significant carotid stenosis in participants with ischemic stroke was 21.8%(28/128) (i.e., 12.4% had severe carotid stenosis and 9.4% had moderate stenosis). The prevalence of high carotid intima media thickness (CIMT) and atherosclerotic plaques were 53.1%(68/128) and 40.6% (52/128), respectively. Most atherosclerotic plaques were echogenic. odds ratio [OR] = 2.2, 95% Confidence Interval [CI]:1.34,4.4; high blood pressure increased the likelihood of having abnormal carotid intima media thickness.

CONCLUSION : Increased intima and media thickness of the common carotid artery, measured noninvasively by ultrasonography, are associated with cerebrovascular disease manifested as stroke in hypertensive patients.

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INTRODUCTION:

Stroke is a cerebrovascular disease that results due to impact of chronic diseases that cause pathological changes in the cerebral vessels. There are three main types of stroke: ischaemic, intracerebral and subarachnoid haemorrhage. Ischemic stroke is the most common type of stroke pathophysiology of ischemic stroke can be acute such as occlusion by emboli or chronic secondary to atherosclerosis. Hypertension is the most common cause of vessel injury. CT is the first-line imaging modality used in neurologic emergencies owing to its speed, accurate depiction of acute intracranial disease, and availability. Early CT signs include loss of gray-white matter differentiation, hyperdense vessel, sulcal effacement.

Hypertension or high blood pressure is a major risk factor in stroke. Atherosclerosis is a slow and progressive disease of the arterial wall that underlies the majority of stroke. In the process of hypertension-induced atherosclerosis, blood vessels become smaller in size, rigid and lose compliance. Elevated blood pressure increases blood flow through the vessels, which induces shear stress elevation that leads to an increase in endothelial-derived relaxing factor (EDRF) production from endothelial cells. This includes nitric oxide, prostaglandin E and prostacyclin. These vasomotor activators induce the superoxide production and reduce the vessels permeability. The endothelial cells in the process of injury will release increased amounts of pro-inflammatory cytokines that will activate the leukocyte. This further induces the elevation of vasoactive substances such as nitric oxide and prostacycline which eventually induce complete endothelial injury.

HTN is a leading risk factor for atherosclerosis. The increase in intravascular pressure induces stress on the vessel wall in hypertension. This alters the vessel wall thickness through a process called vascular remodelling, through hypertrophy or through a eutrophic inner remodeling process. In hypertrophic remodeling, the media thickens to encroach into the lumen, resulting in increased media cross-sectional area and media/lumen ratio.

Change in the common-carotid-artery intima–media thickness is believed to be an indicator of generalized atherosclerosis. Ultrasonography (US) of the carotid arteries is the modality of choice for triage, diagnosis, and monitoring of cases of atheromatous disease. B-mode ultrasound is one of those imaging techniques which is frequently used to assess atherosclerosis in a safe, inexpensive, reliable, and reproducible manner. High-resolution carotid ultrasonography has been used to obtain measurements of the thickness of the tunica intima and media of the carotid arteries. In this study, we investigated the hypothesis that carotid-artery intima–media thickness is directly correlated with the incidence of stroke in hypertensive patients.

PROCEDURE:

Carotid ultrasonography examinations were performed with the use of esoate mylab8 and mylab6 sonography machine equipped with a 7.5 to 10 MHz linear-array transducer. With the subject in the supine position and the neck in slight hyperextension the common carotid artery, carotid bulb, and the extra-cranial part of internal carotid artery was identified of both side and intima media thickness was measured as the distance between the luminal Intimal interface and the medial adventitial interface. So finally, a total of 128 cases of Ischemic stroke were included and they were compared with 72 controls without the disease in study.

RESULTS: The mean age of the study participants was 55 ± 15 years. Most participants had an ischemic stroke 64%(128/200),hypertensive 50%(100). The prevalence of significant carotid stenosis in participants with ischemic stroke was 21.8%(28/128) (i.e., 12.4% had severe carotid stenosis and 9.4% had moderate stenosis). The prevalence of high carotid intima media thickness (CIMT) and atherosclerotic plaques were 53.1% (68/128) and 40.6% (52/128), respectively.

TABLE NO:1

	Number of patients
SEVERE STENOSIS	15 (12.4%)
MODERATE STENOSIS	13 (9.4%)
ATHEROSCLEROTIC PLAQUES	52(40.6%)
HIGH CAROTID INTIMA MEDIA	68(53.1%)

TABLE NO:2

Variable	frequency (%)	Percentage
Presence of Atherosclerotic plaques	52	40.6%
Type of plaque		
Echogenic	42	80.7%
Echolucent	10	19.3%
Plaque location		
CCA		
Carotid bulb	12	23%
	32	61%

TABLE NO:3

VARIABLE	STROKE	NON STROKE
HYPERTENSIVE	74(a)	26(b)
NON HYPERTENSIVE	54(c)	46(d)

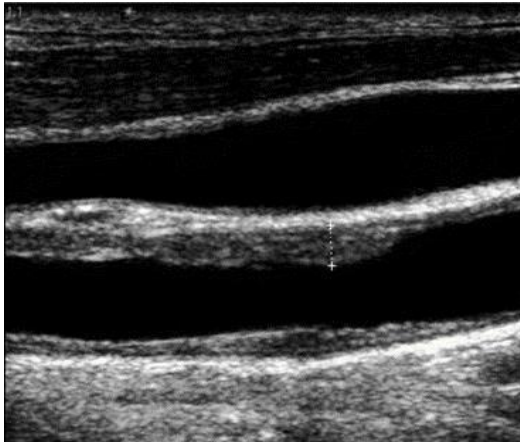


Figure 1: Gray-scale image shows common carotid , intima and media thickness measurement. In this case, the distance between the cursors is 2.8 mm.



Figure 2: Gray-scale image shows an echogenic soft homogeneous plaque in the proximal right internal carotid. surface of the plaque is smooth indicates plaque is stable



Figure 3: Grey scale image shows calcified plaque with 40%stenosis in carotid bulb.



Figure 4 : Grey scale image shows partially calcified plaque in distal commom carotid with 65%stenosis

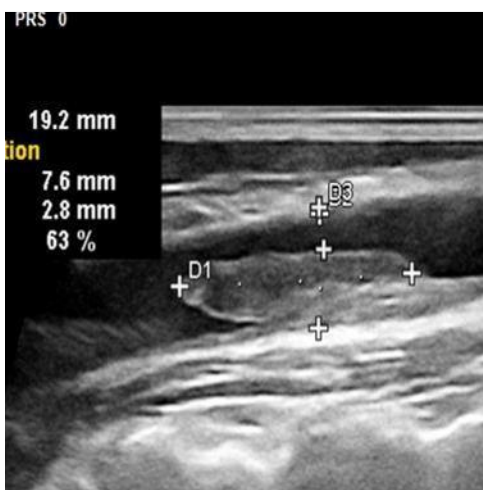


Figure5: Grey scale image shows non calcified free floating Plaque in common carotid.

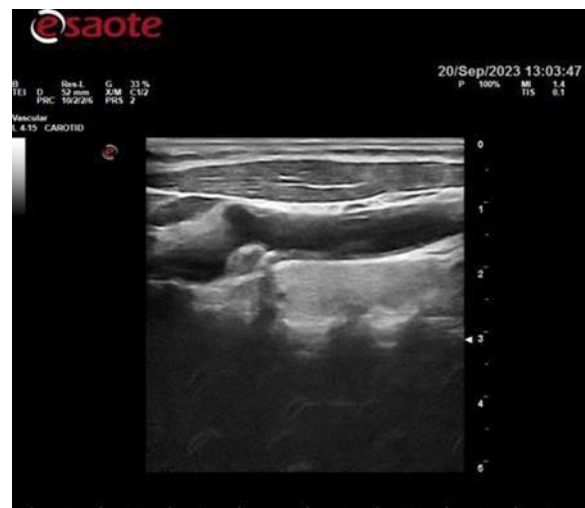


Figure 6: Grey scale image shows partially calcified plaque in carotid bulb.

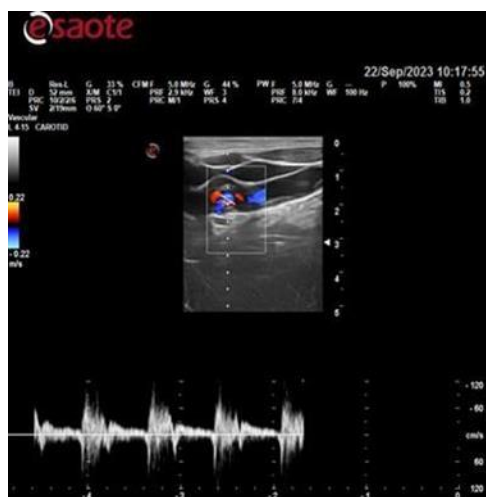
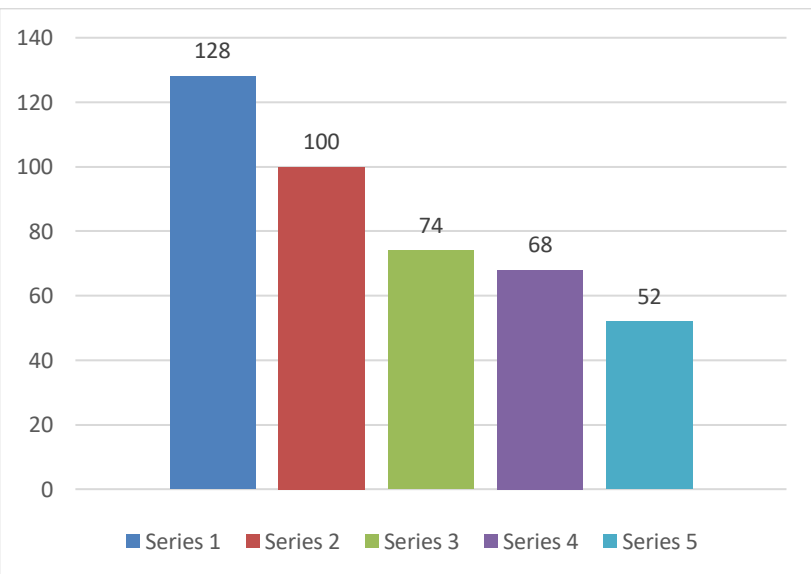


Figure 7: Grey scale imaging shows severe stenosis with in carotid bulb.



Figure 8: Grey scale image shows non calcified plaque in common carotid artery with 70% stenosis



Stroke	128(64%)
Hypertensive	100(50%)
Hypertensive stroke	74 (57%)
Increased intima media	68 (53%)
Atherosclerotic plaques	52 (40%)

CONCLUSION : Increased intima and media thickness of the common carotid artery, measured noninvasively by ultrasonography, are associated with cerebrovascular disease manifested as stroke in hypertensive patients.

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