

## Validity of Carotid Doppler Ultrasound for Detection of Carotid Stenosis keeping Computed Tomography Sensitivity as Gold Standard

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### ABSTRACT

**Background:** Stroke is the world leading reason for death and major incapacity. Arterial sclerosis is answerable for over half of all ischemic strokes. Plaque morphology has recently been discovered to assist within the prediction of arterial sclerosis, Clinical behaviour and stroke risk.

**Objective:** To gauge the frequency and diagnostic exactitude of artery Doppler imaging pathology detection to arterial blood vessel pathology.

**Material and Methods:** This Cross sectional validation study was conducted in Combined Military Hospital, Peshawar from 1<sup>st</sup> August 2019 to 31<sup>st</sup> March 2020. A total of 120 patients were consecutively selected. The inclusion criteria were all the patients having ischemic cerebrovascular disease. Doppler ultrasound was performed in every patient by a consultant radiologist. Doppler ultrasound findings were compared with Carotid artery stenosis reports.

**Results:** Age range in this study was from 30-80 years with mean age of 63.07±3.76 years. Mean duration of disease was 1 Years ±3.32 months. Overall sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of Doppler Ultrasound is 89.5%, 76.20%, 45.5%, 93.88% and 76.9% respectively.

**Conclusion:** With the advancement in technology, the accuracy of Carotid artery stenosis diagnosis has significantly improved over the decades. From measuring the narrowing carotid artery diameter to evaluating the increased velocity field near the obstruction/lesion site, the identification of additional parameters to characterize plaque vulnerability has become more important in the carotid artery. Via various imaging modalities, the use of computer-aided programmes has increased the sensitivity, precision, and accuracy of Carotid artery stenosis diagnosis.

**Key Words:** Carotid artery stenosis, Doppler ultrasound Sensitivity, Specificity

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### INTRODUCTION

Cardiovascular diseases are unit sicknesses that affect the heart, blood vessels, or both. Arterial disease, arterial blood vessel carotid disease, and peripheral tube illness are all common CVD manifestations in clinical medication. Arterial stenosis, at intervals which a coronary-artery disease plaque forms as a result of a physical or metabolic injury, may lead to a disabling stroke; thus, early detection, prevention, and treatment are unit essential. consistent with the yank Heart Association, stroke was the second leading reason behind death worldwide in 2013 (6.5 million).<sup>1</sup>

Over a 5-year amount, patients with sixty % or a lot of pathology are unit expected to own a sixteen % likelihood of getting a stroke<sup>2</sup>. Men are unit a lot of affected than ladies by moderate/severe arterial blood vessel pathology, that will increase with age, significantly once the age of fifty<sup>3</sup>.

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The most common imaging procedure wanted to diagnose artery illness is Doppler ultrasound<sup>4-6</sup>. This system has many benefits, together with the very fact that it's a quick, noninvasive, and wide offered screening technique for artery pathology with high diagnostic accuracy. arterial blood vessel pathology may be wanted to assess the severity of pathology within the arterial blood vessel<sup>7</sup>.

Cardiovascular disease is one in each of the primary causes of death and morbidity around the world. correct prediction of a person's risk of developing a vessel event is needed for preventive treatment of bad well people. as a result of arterial sclerosis underpins the prevalence of vessel events, develops over decades, and contains a protracted well section throughout that it's potential to alter the disease's course, higher vessel risk prediction is needed. this might be achieved by together with a live of presymptomatic arterial sclerosis in risk prediction algorithms<sup>8,9</sup>.

In recent years, artery intimamedia thickness has gotten several attentions as a predictor of vessel events. The variability in activity and thus the shortage of proof for its utility in clinical risk prediction limit the employment of CIMT in

associate passing clinical surroundings, as a result of patients with sort two polygenic disease area unit at a high risk of vessel events<sup>10,11</sup>.

Atherosclerotic lesions in coronary arteries area unit well till they advance to the aim wherever they generate a hemodynamically substantial flow limiting lesion, resulting in heart muscle anemia symptoms. However, coagulum formation following acute rupture or erosion of non-stenotic plaques causes a giant proportion of individuals to travel from no symptoms to an infarction or death<sup>12</sup>.

The intima-media thickness of the blood vessel is changing into a lot of wide used as a surrogate marker of early arterial sclerosis. A recent review found that CIMT could also be a powerful predictor of future tube events like MI and stroke, that it's joined to quality, age, sex, ancient and non-traditional risk factors. per bound analysis, a value of CIMT of zero.8 metric linear unit is connected with traditional healthy individuals, whereas a price of CIMT of one metric linear unit or on top of is alleged with arterial sclerosis and a greatly elevated risk of upset in individuals of any cohort<sup>12</sup>.

As antecedently expressed, CIMT activity is associate economical noninvasive tool that will assist in distinguishing individuals with polygenic disease World Health Organization area unit at higher risk of developing small and macro tube complications, still as evaluating numerous treatment ways want to treat patients with polygenic disease, which we have a tendency to were unable to find associate native studies throughout this regard once conducting an intensive literature search. This study was provided US with native statistics regarding high CIMT in diabetic people and additionally the results of this study area unit compared with alternative internationally offered literature to draw suggestions for future analysis and follow up patients.

### **MATERIALANDMETHODS**

This Cross-sectional validation study was conducted in Combined hospital, Peshawar from 1<sup>st</sup> August 2019 to 31<sup>st</sup> March 2020. One hundred twenty patients were consecutively hand-picked. The inclusion criteria were all the patients having anemia neural structure, age eighteen and on top of having each gender were enclosed. All the Patients antecedently operated on for artery diseases. Those with already verified occlusion at

intervals the ventricle and/or auricle. Patients with verified tumour, Patients with neural structure hemorrhages. Patients allergic to distinction agents and Patients with half-crazed nephritic operate tests were excluded from the study. once obtaining approval from the hospital moral committee to conduct the study, knowledge was collected of all those patients with stroke (diagnosed on clinical grounds) presenting to patient department of this hospital. associate consent was taken from the patient attendants World Health Organization full fill the inclusion criteria.

Patients on top of eighteen years were excited with careful history. Risk factors were evaluated by history, physical examination, and sonogram and laboratory investigation throughout hospitalization. This enclosed age, sex, cardiovascular disease, DM, lipoidaemia, smoking and anemia cardiovascular disease. A Mitsubishi e HD ultrasound system with 7-MHz linear-array transducers was used for the examinations. in associate passing supine position, the artery arteries were scanned with the highest slightly raised and turned to the opposite facet. Grey scale, colour, and undulation were accustomed study arteries. With associate angle of insonation however or up to sixty degrees, the Doppler undulation was obtained.

MDCTA of the supra-aortic vessels was performed exploitation 160-slice X-radiation (Prime Aquilion -Toshiba). associate influence gadget with a rate of flow of 4-5 mL/s associated an eighteen gauge endovenous tube were used to inject one.2 mL/Kg of contrast medium (Omnipaque) into associate ginglymus vein. The slice distance zero.5mm and section thickness zero.5 cm could also be exaggerated up to 10mm. The data was entered and analyzed on SPSS 20. Frequency and percentages were calculated for all categorical variables like sex and presence /absence of carotid plaque. Mean + variance was calculated for continuous variables like age. All the information were presented in tables and graphs (frequency tables and bar charts). The 2×2 contingency table was used to calculate sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy. Post stratification was used through Chi- square test keeping <0.05 level of significance to compare the difference between the two groups.

**RESULTS**

Age range was from 30-80 years with mean age of 63.07±3.76 years. Mean duration of disease was 1 Year ±3.32 months. Overall sensitivity,

specificity, positive predictive value, negative predictive value and diagnostic accuracy of Doppler Ultrasound is 89.5%, 76.20%, 45.5%, 93.88% and 76.9% respectively.

**Table 1. Participants' Baseline Demographic and Clinical Characteristics**

<b>Age, mean (SD)</b>	<b>63.07±3.76</b>
<b>Gender, n (%)</b>	
Male	70 (58.3%)
Female	50 (41.6%)
<b>Co morbidities, n (%)</b>	
Smoker	69 (57.5%)
IHD	90 (75%)
HTN	77 (64.1%)
AF	26 (21.6%)
DM / IGT	91 (75.8%)
Dyslipidemia	103 (85.8)
Ischemic stroke/TIA	93 (41%)

**Table 2. Reliability of Colour Doppler Ultrasonography**

<b>Stenosis</b>	<b>P value</b>	<b>Cronbach's alpha</b>	<b>Sensitivity</b>	<b>PPV</b>	<b>NPV</b>
<b>Small CS</b>	< 0.001	0.571	89.5%	35.4%	98.0%
<b>Large CS</b>	0.014	0.382	83.3%	45.5%	76.9%

**DISCUSSION**

Atherosclerosis-related tube-shaped structure issues square measure variety one reason for morbidity and mortality in sort a pair of polygenic disease patients, notably in Asian nation, wherever the population of diabetics is speedily increasing thirteen diabetes accelerates hardening of the arteries, which can be a significant risk issue. The arteriosclerosis risk project claims that the arteriosclerosis method happens at the same time inside the arteria, cerebral, and coronary arteries. B mode prenatal diagnosis will assess the membrane media thickness (IMT) of the artery (CIMT) with a high degree of accuracy and consistency, providing a reliable and valid estimate of the blood vessel wall thickness<sup>14</sup>.

The use of non-invasive B mode designation} to live arteria membrane media thickness will observe hardening of the arteries at associate degree early diagnosis stage and aid within the diagnosis of well upset, associate degreeed

whether or not exaggerated CIMT is joined to an exaggerated risk of arteriosclerosis events is of nice interest<sup>15</sup>.

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CIMT was well higher in men than in girls in associate degree extremely study of healthy Taiwanese individuals (0.558 vs 0.527 mm, P = 0.012). This result was replicated by Kablak-Ziembicka et al in participants while not CVD (men vs. women 1.05 vs. 0.93 mm, P0.001)<sup>92</sup>. In our investigation, CIMT was over in Taiwanese healthy individuals, however but in individual while not CVD<sup>92</sup> or with traditional aldohexose tolerance<sup>16</sup>.

As a result, they underline the link between IMT and symptom and therefore the agglomeration of ancient risk variables. CCA-IMT was joined to age, high blood pressure, dyslipidemia, polygenic disease period, and smoking habits, consistent with Kawamori et al. a spread of vas risk factors are joined to IMT in epidemiological research; Temelkova Kurktschiev et al<sup>102</sup> found a link between the next variety of risk variables and a thicker intima-media thickness<sup>17</sup>.

### CONCLUSION

Mechanical advancements have greatly improved the accuracy of CAS determination over the years. The evident verification of extra metrics to identify plaque helplessness at intervals the artery channel has adult in importance, starting from assessing the decreasing artery route breadth to evaluating the inflated speed field close to the obstruction/lesion location.. The use of computer-aided programmes has improved the predictability, accuracy, and precision of CAS conclusions using various imaging modalities.

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**DATA SHARING STATEMENT:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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#### AUTHOR'S CONTRIBUTION

The following authors full fill authorship criteria as per ICMJE guidelines;

<b>Ahmad S, Wahid K:</b>	Idea conception, drafting the work, final approval, agreed to be accountable for all the work.
<b>Ayub G, Khan PJ:</b>	Design of the work, data acquisition, critical revision, final approval, agreed to be accountable for all the work.
<b>Khan MSA:</b>	Data analysis, drafting of the work, final approval, agreed to be accountable for all the work.
<b>Ali O:</b>	Data interpretation, critical revision, final approval, agreed to be accountable for all the work.