



## Contribution of the doppler ultrasound of supraaortic trunks in the etiological diagnosis of ischemic stroke in A low-income country

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### Abstract

Stroke is a sudden focal neurological deficit, presumed to be vascular in origin by abrupt interruption of vascularization in the brain. Doppler ultrasound of supra-aortic trunks is one of the essential etiological assessments of ischemic strokes. The objective of our study is to describe the epidemic-ultrasound aspect of the presence of atheromatic plaques in the vessels of the neck as part of an ischemic stroke. We did a 24-month retrospective descriptive study. We collected 75 records of patients who received Doppler ultrasound of supra-aortic trunks for etiological ischemic stroke research. The average age of patients was 54 years with a sex ratio of 0.6. Of the collected records, 24 (68%) had no vascular abnormalities in the neck and 11 (32%) had vascular abnormalities such as medialcalcosis (18%), hypertrophy of the medial intima (10%) and atheroma plaques (8%). Plaque may be recent (8%) or calcified (3%). Stenosis occurs in 5% of cases. In our study, we found no aneurysm or dissection of the vessels in the neck. Doppler ultrasound of supra-aortic trunks is a useful and accessible examination for the etiological exploration of ischemic stroke in Madagascar.

**Keywords:** ischemic stroke, doppler, supraaortic trunk, atheromatic plaque

### Introduction

Stroke is a sudden focal neurological deficit, presumed to be vascular in origin by abrupt interruption of vascularization in the brain. Ischemic origin accounts for 45% of strokes in Madagascar <sup>[1]</sup>. It is a cardiovascular emergency whose origin is sometimes uncertain, especially in young subjects <sup>[2, 3]</sup>. The ischemic origin predominates by the occlusion of large vessels most common in the internal carotids <sup>[4]</sup>. Ultrasonographic exploration thus occupies a decisive place in the etiological assessment of stroke, especially those of ischemic origin. Doppler ultrasound of the supra-aortic trunks makes it possible to detect atheromatic plaques that represent 20% of etiologies with a sensitivity of 86% and a specificity of 87% <sup>[5]</sup>. The objective of our study is to describe the epidemical-ultrasound aspect of the presence of atheroma plaques in the vessels of the neck as part of an ischemic stroke in a low-income country.

### Materials and method

This is a retrospective descriptive study over a period of 24 months, at the Center of Medical Imaging of CHUJRA Antananarivo Madagascar in order to describe the epidemic aspects ultrasound of the presence of atherosopic plaques in the vessels of the neck as part of an ischemic stroke. We included all patients who received a supraaortic trunk ultrasound as part of the cerebral ischemia etiological assessment. The exam was performed with a Siemens Acuson X 300 ultrasound device, with a multi-frequency linear probe and modalities combining 2D imaging and doppler (color and pulsed) techniques. We looked for carotid anomalies. The patient was seated in a supine position, head flat or barely raised, with a contralateral rotation of the head exposing the part to be examined. The examiner was positioned on the patient's side. Several parameters were analyzed : the age and sex of the patients ; the measurement of intima-media thickness, the presence of medialcalcoses or plaques, the presence of stenosis using the formula of NASCET (North American Symptomatic Carotid Endarterectomy Trial) which is the ratio of the smallest luminal diameter to the regular diameter of the downstream carotid. In the study, statistical data were collected and analyzed on the Excel ®.

### Result

We collected 75 records of patients who received for Doppler ultrasound of supra-aortic trunks for etiological ischemic stroke research. These were 45 women (60%) and 30 men (40%) with a sex ratio of 0.6. The average age of patients was 54 years with extremes of 42 and 85 years. The vascular accident was transient in 9 patients (12%) and 66 patients (88%) had a constituted ischemic accident. Supra-aortic trunk echo-doppler was normal in 48 patients or 68% and 22 patients or 32% had vascular abnormalities. The main anomalies highlighted were medialcalcosis (18%, n = 13), hypertrophy of the medial intima (10%, n = 8), of the order of 0.72 to 1 mm left and 0.73 to 1.2 mm right. Atheroma plaques were found in 9 patients or 11% of cases. Plaque was recent in 8% (n=6)

and calcified in 3% (n=3), stenosis in 5% (Figure 2A and B).(n = 4) cases in the range of 31% to 59%. In our study, we found no aneurysm or dissection of the vessels of the neck.

### Discussion

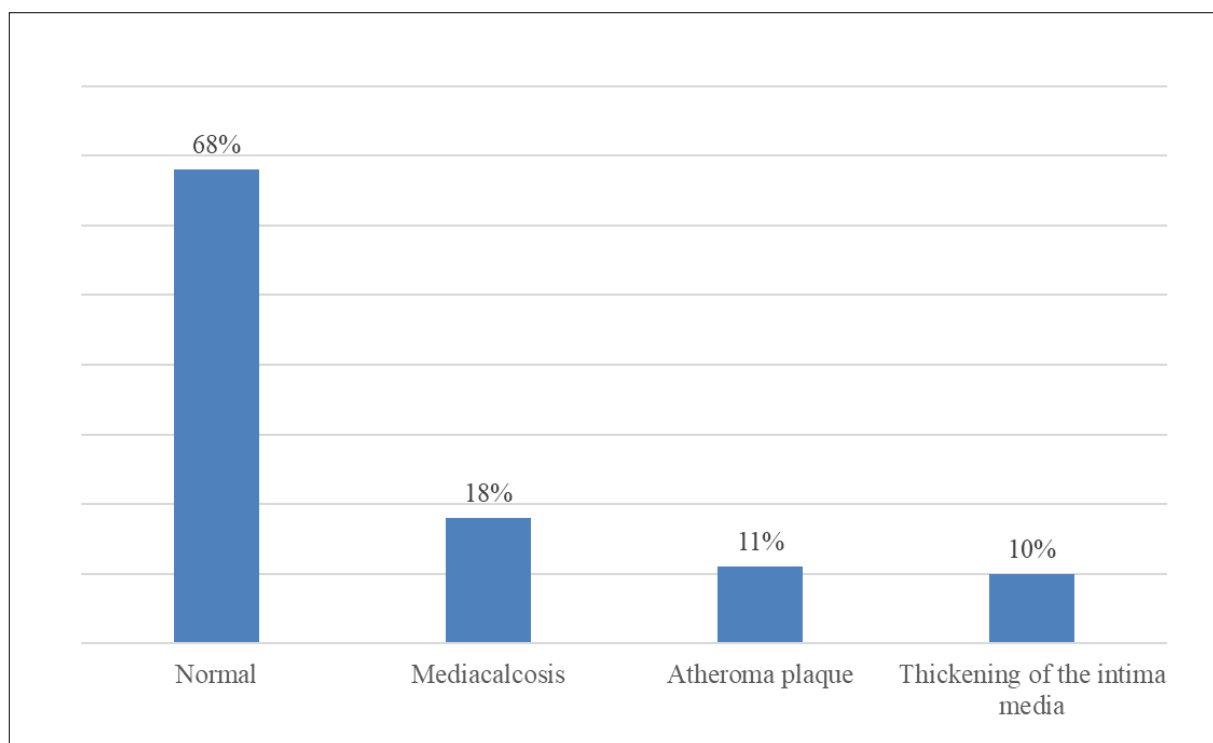
Very few studies are interested in the specific case of cerebral infarction <sup>[5]</sup>. Our study focuses on 75 patients in 12 months, this workforce does not represent the reality on stroke in Madagascar. A study in the Congo collected 73 cases over an 18-month period <sup>[6]</sup>. Our study population was relatively young, with an average age of 54, while in developed countries, strokes occurs 10 years later with an average age of 73.7 1.0 and 73.1 11.9 years respectively in Japan and Norway (2.3). The relatively young age of our patients does not allow the comparison of results with data from Western studies where patients are older with an average of around 70 years <sup>[4]</sup>.

This can be explained by the small sample of our study and the early onset of stroke in the Malagasy population. The involvement of traditional risk factors for atheromatous disease (high blood pressure, diabetes mellitus, dyslipidemia, smoking) is known in the probability of occurrence of these ischemic accidents <sup>[5]</sup>. Vascular Doppler echo is recognized as a reference exam in non-invasive atherothrombosis, with good sensitivity and specificity for carotid <sup>[6]</sup>. The increase in carotid intima media thickness is recognized to be associated with a higher risk of cardiovascular events in patients with atherosclerosis risk factors <sup>[7]</sup>.

In our study, the presence of an atheroma plaque is common in subjects with ischemic stroke, which can be explained by the presence of a high cardiovascular risk factor in our stroke patients. Carotid arterial abnormalities were highlighted, dominated by non-significant lesions, with a small proportion of major lesions such as significant stenosis. Regarding intima-media thickness (IMT), it has been recognized as a validated marker for the detection of subclinical atherosclerotic lesions, thus allowing the definition of the cardiovascular risk profile in certain patients <sup>[8]</sup>. Its increase is common with age, usually associated with the existence of risk factors for atheromatous disease <sup>[9]</sup>. There is a strong correlation between increased ADR and the likelihood of ischemic cerebrovascular events <sup>[10]</sup>. In our series, mediocalciosis with increased ADR were the most common abnormalities followed by the presence of carotid atheroma plaque which indicates in these patients a high cardiovascular risk.

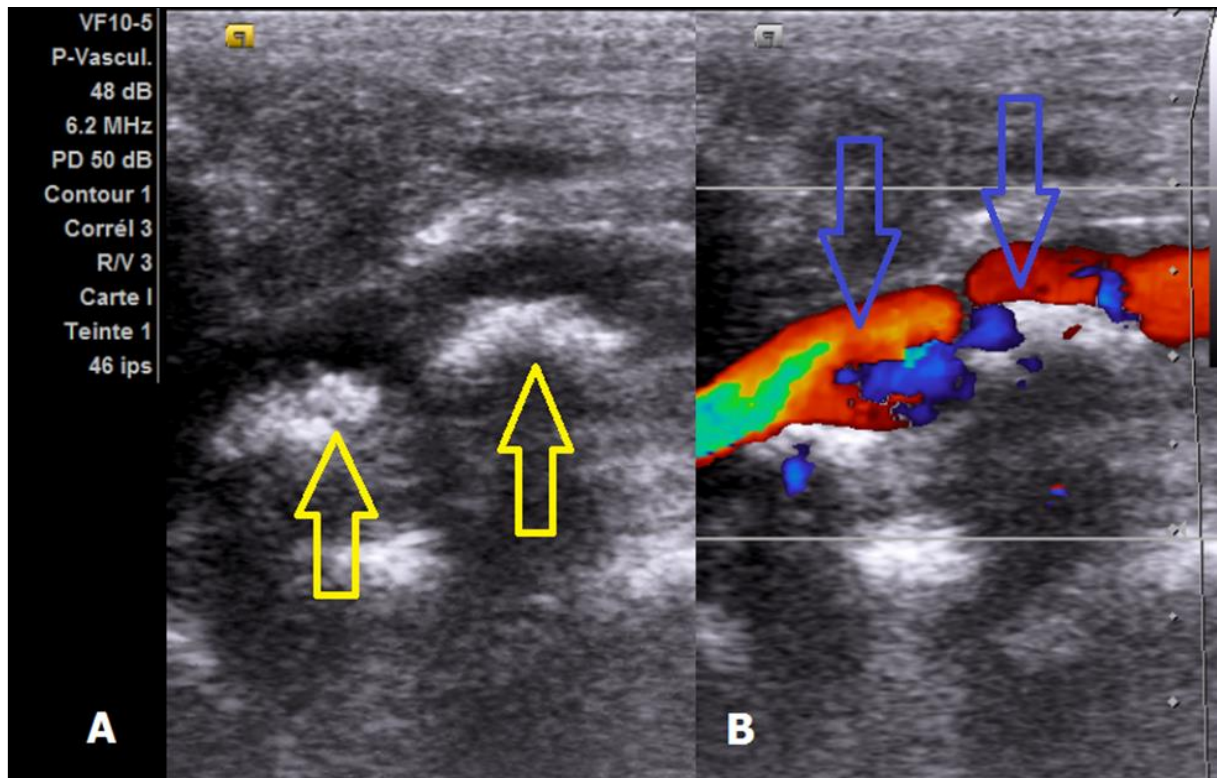
### Conclusion

Stroke is a common and serious condition. Through etiological research is essential. EDTSA is a useful and accessible examination for the majority of the population in the low-income country like Madagascar for the etiological exploration of ischemic stroke. Our study, showed the existence of carotid atheromatous lesions in patients suffering from ischemic strokes. These lesions must be systematically sought in the aftermath of an ischemic accident in order to improve the management of these patients or be sought early in asymptomatic patients with risk factors in order to prevent the occurrence of accidents ischemic.



**Fig 1:** Distribution of patients according to results.

Normal examinations were the most observed, followed by mediocalciosis, then atheroma plaques and thickening of the intima-media



**Fig 2:** (A) longitudinal section in B mode, showing calcified atheroma plaques (yellow arrows), reducing visible vascular lumen in flowing (B) mode (blue arrows)

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