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Research Article

Analysis of Body Mass Index and Carotid Artery Thickness in Healthy Young Male Adults; Using Ultrasound Method

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Abstract

In view of the implication of Carotid disease in several researches, as risk factor for stroke which is a third leading cause of death in Western European countries and the association between stroke and obesity; We investigated some randomly selected healthy, young male adults' carotid artery wall thickness and the association with Body Mass Index (BMI). The weight and height of each person was measured, and the BMI calculated using the formula Weight (kg) / [Height (m)]^2. A Philips HD11 Scan machine, with 7.5 MHz linear probe was used for Carotid Doppler Test, following standard procedure. The mean BMI of the males was 21.2 ± 2.54 kg/m^2, While the mean thickness of the right and left common carotid arteries (0.05 ± 0.01 and 0.05 ± 0.01) respectively, when compared showed no difference, $P < 0.05$. The result of the correlation analysis between BMI and right common carotid artery showed that correlation coefficient $r = 0.1$, and that between BMI and left common carotid artery showed that correlation coefficient $r = 0.1$. Thus, the findings imply that the study sample had healthy weight or normal BMI, and there was no difference in thickness between right and left common carotid arteries. Also, BMI is positively correlated with the left and right carotid arteries thickness. However, the association is a weak one, therefore it may be inferred that when BMI increases beyond a healthy normal weight, the right and left carotid arteries may also increase in thickness, but factors other than BMI could possibly contribute to the thickening of common carotid artery walls.

Keywords: *BMI; Weight; Height; Carotid Artery; Stroke; Obesity*

Introduction

As humans advance in age, the walls of blood vessels become thickened, and the lumen narrowed due to accumulation of lipids and other substances. Carotid arteries commonly become affected when plaques are formed by accumulation of fat or adipose substances in the blood vessels [1,2]. This is reported to occur more in people who are obese. And obesity has largely been estimated by a relationship between the weight and height, i.e. (weight (kg) / [height (m)]^2), referred to as Body Mass Index (BMI).

According to a World Health Organization guideline, persons whose BMI falls within the range BMI < 18.4 kg/m^2 is underweight; BMI 18.5 - 24.9 kg/m^2 is Healthy or normal weight; BMI 25.0 - 29.9 kg/m^2 is overweight; BMI 30 - 34.9 kg/m^2 is Obese; BMI > 40.0 kg/m^2 is extremely Obese [3]. Meanwhile, obesity has been established as risk factor for several diseases including cardiovascular related ones like hypertension, diabetes, and stroke [4].

Stroke which is one of the leading debilitating cardiovascular risk diseases has been associated with carotid disease as one of its risk factor and in particular the cause of ischemic stroke [5,6]. Carotid disease refers to disease of the arteries which generally is due to accumulation of lipids, cells, including muscle cells, macrophages, lymphocytes, and minerals such as calcium on the walls of the arteries to form plaques; thereby causing thickening of the tunica intima and presenting narrowing of arterial lumen called carotid stenosis [5,7].

In the present study, we investigated healthy, young adult male volunteers, with no established history of development of plaques and stenosis in the common carotid arteries; whether there is correlation between the BMI and carotid artery thickness.

Materials and Methods

100 healthy, young male adult volunteers were randomly selected from a student population in Niger Delta University, for this research. Their consent was sought and they made informed decision to participate in the study. The Weight and height of each volunteer was measured using weighing balance and a graduated wall platform respectively. The weight was measured at a designated point and height at a different point. Each volunteer stood upright on the weighing balance with bare feet and the weight was recorded, after which each one proceeded to the next point and stood erect, backing a meter rule - graduated wall platform where the height was recorded. The BMI was calculated using the formula BMI = weight (kg) / [height (m)]^2.

All the volunteers were briefed on the simple procedure for the ultrasonography, and any questions asked were answered. Then each one took turn for the observational procedure, and was asked to lay flat on an examination couch, with head slightly turned away from the side being examined per time. A Philips HD11, machine with 7.5 MHz linear probe on which a little gel was applied and placed with slight pressure on the side of the neck in view was used for the scan. The image of the common carotid arteries as well as the thickness was recorded for both right and left sides.

Results

The mean BMI of the young adult male volunteers was 21.2 ± 2.54 kg/m^2, While the mean thickness of the right and left common carotid arteries (0.05 ± 0.01 and 0.05 ± 0.01) respectively, was statistically not different (Table 1). The result of the correlation analysis between BMI and right common carotid artery showed that correlation coefficient r = 0.1 (Figure 1). And that between the BMI and left common carotid artery showed that correlation coefficient r = 0.1 (Figure 2).

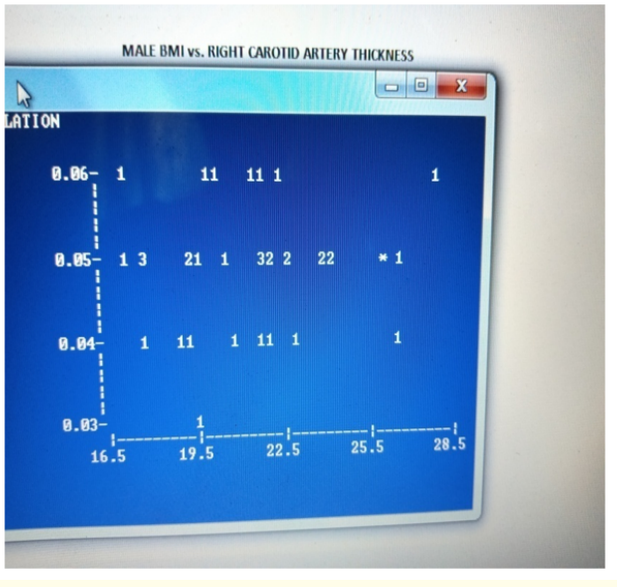

Figure 1: *Omphalocele major with conservative approach.*

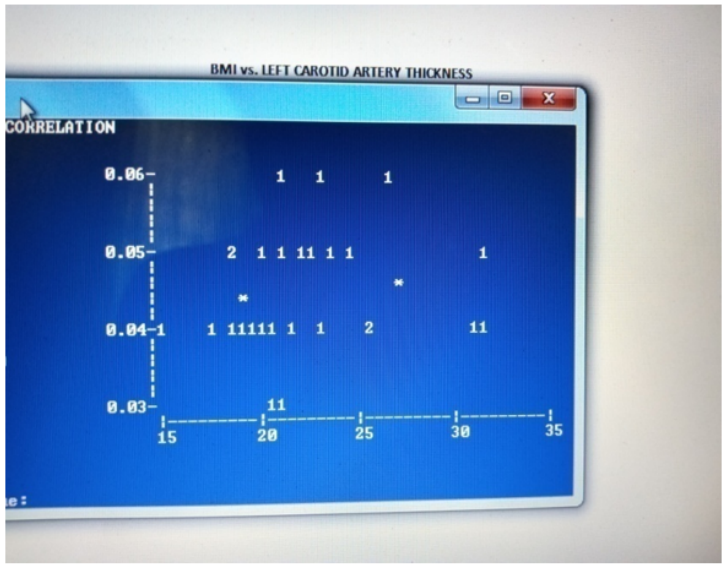

Figure 2: *Correlation between BMI and Left Carotid Artery Thickness r = -0.053.*

Asrotid Aetery	Asmple Size (N)	Mean Bmi	Sd
Right	85	0.05	±0.01
Left	85	0.05	±0.01

Table 1: *Comparison of Mean thickness of the Right and left Carotid arteries P < 0.05.*

Discussion and Conclusion

The burden of stroke is huge, being reported as third leading cause of death in Western European countries, [5,8]. and fourth leading cause of death in the United States, where 136,000 annual mortality and 660,000 survivors are recorded; costing $74 billion a year to care for stroke victims and make up for lost productivity (Harvard Medical School, 2011). Recent researches have also implicated carotid artery disease as a major cause of stroke [9], with incidence of left carotid artery disease being more common [5].

In view of these we investigated whether in healthy young male adults who had no history of carotid disease, the BMI is associated with the thickness of the right and left carotid arteries. We found that the mean BMI of the young adult male volunteers was 21.2 ± 2.54 kg/m^2, so it can be inferred that on average, the weight of the volunteer study sample was in the healthy weight or normal BMI range. Similarly, the mean thickness of the right and left common carotid arteries were (0.05 ± 0.01 and 0.05 ± 0.01) respectively.

Comparison of the mean thickness of right and left common carotid arteries showed no significant difference, at $p < 0.05$. But the result of correlation analysis between BMI and right common carotid artery showed that correlation coefficient r = 0.1 (Figure 1). While that between the BMI and left common carotid artery showed that correlation coefficient r = 0.1 (Figure 2).

These imply that the study sample had healthy weight or normal BMI which is positively correlated with the left and right common carotid arteries thickness. However, interpretation of the statistical strength of the association will consider it as a weak one [10], therefore it may be inferred that when BMI increases beyond a healthy normal weight, the left and right carotid arteries may also increase in thickness. This may corroborate the studies of Kappus., *et al*. [11] that reported increased carotid intima media thickness in people that were obese. The study of Ionescu., *et al.* [5] that recorded more cases of left carotid artery plaque was not supported by the finding in this investigation. It is possible that, there may not be any underlying condition associated with predisposal or proneness of the left carotid artery to atherosclerosis or carotid artery disease.

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