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DIAGNOSTIC ACCURACY OF MODIFIED ALLEN TEST IN EVALUATING ADEQUACY OF HAND COLLATERAL ARTERIAL BLOOD CIRCULATION AMONG DIABETICS AT MULAGO HOSPITAL, UGANDA.

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ABSTRACT

Background:

Diabetes mellitus is common and on the increase globally. The associated accelerated macro-vascular angiopathy impairs blood flow in medium sized arteries including hand collateral arteries among others with consequent risk of hand ischemia after any surgical intervention on the radial artery e.g. as free arterial grafts for coronary artery by-pass graft, arterial-venous fistula creation for dialysis among others. The Modified Allen test evaluates the adequacy of hand arterial collateral circulation by mimicking total occlusion of the radial artery which is frequently used in such procedures. Although proved to be accurate by several previous studies, there is great variability in the arbitrary selected modified Allen test cutoff time used. In addition, no prior study evaluates the accuracy of this test in a diabetic population despite the high predisposition for vascular disease in this group.

Objectives:

The objectives of the study were; 1. To estimate the optimal sensitivity, specificity, positive and negative predictive value of the modified Allen test. 2. To determine the optimal cutoff time of modified Allen test for evaluating the adequacy of hand collateral circulation among diabetics. 3. To identify the structural abnormalities responsible for abnormal hand collateral circulation among diabetics attending Mulago hospital.

Methods:

It was a cross sectional study with consecutive sampling used to select 202 diabetes mellitus patients above eighteen years of age and of at least five years duration of diabetes mellitus while excluding smokers from the diabetic outpatient clinic at Mulago hospital, Uganda. A pre-tested semi-structured questionnaire was administered, then modified Allen test and Doppler scan were performed by two different investigators blinded for results of the other test result. Data was summarized as proportions and means wherever applicable. Modified Allen test results were dichotomized at several cutoff time and compared with the dichotomized results of Doppler scan as the gold standard according to a defined criteria. The sensitivity, specificity, positive and negative predictive values along with optimal modified Allen test cutoff time were estimated from a receiver operating characteristic curve and analysis of the identified structural abnormalities was performed and presented as proportions.

Results:

Two hundred and two diabetes mellitus patients were studied with mean duration of diabetes mellitus of 11(6) years and mean age of 52(11) years.

The optimal sensitivity of modified Allen test was sufficiently accurate at 64% while the optimal specificity was also sufficiently accurate at 68%. The modified Allen test had a good negative predictive value of 78% but a non-useful positive predictive value of 43%.

The estimated optimal cutoff time of modified Allen test was ten seconds.

Fifty six patients had abnormal Doppler scan results of which 20% (11/56) had abnormal structure lesions. Overall, the prevalence of abnormal structural lesions on Doppler scan was 5% (11/202) with the majority being stenosis at 82% (9/11).

Conclusions:

The modified Allen test at an optimal cutoff time of ten seconds was sufficiently accurate with a good negative predictive value to underscore the recommendation for its routine use as a screening test for evaluation of the adequacy of hand collateral circulation among diabetes mellitus patients. Abnormal results of modified Allen test require further evaluation by duplex Doppler scan using both dynamic and structural Doppler criteria for confirmation of abnormal collateral flow due to the non-useful positive predictive value of modified Allen test.