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The Relationship between Coronary Artery Calcium Score and Left Ventricular Wall Thickness: A Quantitative Evaluation using Cardiac Computed Tomography Imaging

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Abnormal thickening of the left ventricle wall and coronary artery calcification (CAC) are independent factors associated with poor cardiovascular outcomes. In identifying individuals at high risk for coronary artery disease, assessing left ventricular wall thickness (LVWT) plays a crucial role. Notably, cardiac ventricular wall thickness has been found to vary according to racial background. Therefore, the main aim of this study is to evaluate the association between coronary artery calcium score (CACS) and left ventricular wall thickness among the Sri Lankan population using cardiac computed tomography. Furthermore, demographic changes between CACS and LVWT and LVWT in the basal, mid, and apical areas were compared. A sample of 100 subjects within the age group of 18-90 yrs who have undergone clinically indicated contrast enhanced computed tomography coronary angiography (CTCA) scan have been analysed. The measurement of CACS was carried out using agaston score method and LVWT was measured semiautomatically. Individuals were categorized into four grades based on the total CACS. A positive correlation was found between total CACS and mean LVWT ($p<0.001$). Highest mean LVWT was reported in the CACS grade 4 (9.13 ± 1.15) with a significant difference compared to other three grades ($p< 0.05$). Moreover, male subjects displayed a higher total CACS and mean LVWT compared to female subjects ($p < 0.001$). Age showed a positive correlation with total CACS ($b = 0.354$, $p <0.001$) and mean LVWT ($rs(8) = 0.302$, $p = .002$). The findings of the current study indicate significant associations between CACS, LVMT, age and gender which contribute in shaping cardiovascular health outcomes while offering valuable insights for risk assessment and preventive strategies in clinical practice.

Keywords: *computed tomography coronary angiography, coronary artery calcium score, left ventricular wall thickness*

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Characterizing the Brain Network Topology in Patients with Migraine using Wavelet-based Morphometry

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There is compelling evidence that grey matter changes are associated with migraine, in turn, may alter brain network topology. The aim of this study is to characterize the brain network topology of the brains of migraine patients and healthy subjects using MRI (Magnetic Resonance Imaging) images and wavelet-based morphometry. 3D, T1W brain images were obtained from 45 patients with migraine and 46 healthy subjects. Then grey matter volume images were developed and decomposed and reconstructed at a level of n=3 using wavelet-based morphometry. 4D grey matter volumes were constructed for each subject and they were parcellated into 625 anatomical regions and structural covariance matrices were developed. Each matrix was binarized by applying a series of sparsity thresholds and global network topological metrics were computed. Finally, as the samples are normal and independent, two sample T-tests ($p < 0.05$) were performed using the area under curves of each metric for group-level comparisons of network topology. Patients with migraine showed increased small worldness ($p = 0.0029$) and global efficiency ($p = 0.0018$) compared to healthy controls. Local efficiency ($p = 0.490$) and assortativity ($p = 0.700$) have shown similar characteristics for both groups against network sparsity with no significant differences. Hierarchy ($p = 0.410$) was largely dispersed in the middle sparsity thresholds (0.15-0.35). The characteristics of synchronization ($p = 0.315$) between groups were almost the same from 0.05 to 0.4 of network sparsities. Patients with migraine exhibit better integration of information processing and wavelet-based morphometry in combination with graph theory provides valuable information on altered grey matter network topologies in migraine patients.

Keywords: *migraine, wavelet-based morphometry, brain network topology, grey matter, magnetic resonance imaging*