ABSTRACT

Aging blood vessels are fertile soil in which the seeds of cardiovascular diseases flourish. Cardiovascular diseases remain and will continue to be the leading cause of death in all countries. The profound impact of age on the risk of occurrence of this disease is due to age-associated changes in cardiovascular structure. Wall thickening and dilatation of the vessel lumen (artery wall) are prominent structural changes that occur within large elastic arteries and change in the elasticity of the vessel is a functional change which occurs during aging. This work understands the age-associated changes in the arteries, evaluates a strategy to understand those aspects of aging that occur in apparently healthy persons, but confer risk for over subsequent clinical cardiovascular diseases and hence conclude the relation between vascular aging and chronological aging.

The large elastic artery, common carotid artery of about 71 subjects, with age varying from 22 years to 75 years is imaged with the economical ultrasound imaging system. The movement of the carotid artery is recorded in transversal as well as longitudinal sections in B-mode. Time mode information is needed along with spatial information for measuring distension and hence B-mode is preferred. Using image processing techniques the boundary of the vessel lumen is extracted, its diameter measured and its distension stored for each individual subject. Boundary extraction is tried with...
two methods. The first method uses canny operator with other pre and post processing techniques. The second method uses wavelets with watersheds for boundary extraction. The second method gives better boundary of the artery wall for both transversal as well as longitudinal sections of the artery. The variation in the distension is very less. Since human expertise is rare and highly subjective, neural networks are applied for diagnosis as the problem is highly fuzzy and subjective.

A Neural network using back propagation algorithm is trained with the measured maximum diameter measured and the distension of the vessel for different age groups. The distension and diameter of the vessel wall for the subject under test is measured and fed as input for the neural network. The system compares with the training data set and gives the final output confirming if chronological aging is same as vascular aging. If vascular aging is more the subject is suggested to meet the cardiologist for further diagnosis and treatment.