

Data analysis to study correlations of pathological components in atherosclerotic arteries

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Atherosclerosis is characterized by formation of a lesion site at the intimal part of vessel wall. Atherosclerotic artery walls consist of multiple components. Early lesions consist of isolated macrophages with lipid droplets (foam cells) and fatty streaks. Fibrous plaques show extracellular lipid, including cholesterol crystals, which make up the lipid core. Fibrous connective tissue is being produced in the region between the lipid core and the endothelial surface. In advanced lesions various degrees of mineralizations are found due to a calcification process.

The study of variations in the concentrations of P, S, Cl and K in the vascular wall is found to be relevant in understanding the process of atherosclerosis. In addition, mineral component comprising Ca and P and the trace elements, in particular Fe, Cu, Zn are of special interest to understand their role in the onset and progression of atherosclerosis.

The intimal part of the vessel wall, which is one of the regions of interest, is usually a complex matrix. Differentiation of the pathological components in such regions is highly appreciated from the disease point of view. Multivariate analysis has been found to be a useful tool to distinguish various components in the region of interest. It differentiates cellular components from mineral ones. In certain cases two different mineral compositions could be obtained. Further, the variation in the lesion composition in a single region of interest can be explored. This method makes it possible to re-construct maps representing a particular component. Scan areas over the vascular wall are found to comprise various biological components. The results and differences will be described in this paper.