

Abstract:

Patients who have undergone bypass surgery often find the bypasses fill up again with plaque ("new plaque") whereas the heart arteries not bypassed contain plaque deposited since childhood ("old plaque"). A preliminary study was undertaken to characterize and contrast the chemical compositions of these "new"; and "old"; plaques.

The samples were obtained from a particular surgeon. His patients had had bypass surgery but the bypasses had refilled over a period of a few years. In the surgery both bypassed and non-bypassed arteries were reopened as necessary to improve circulation by surgically drilling out some plaque. This plaque was analyzed.

Each particular sample was divided into two portions. One portion was used for lipid analysis using High Pressure Liquid Chromatography (HPLC) and Thin Layer Chromatography (TLC) while the other portion was used for the determination of selected metals using Inductively Coupled Plasma (ICP). The results are summarized below.

The analytical procedures (HPLC and ICP) were fast and reliable techniques for plaque characterization and provided extensive information.

Phospholipids, lipids, and triglycerides were found in the plaque but the types of phospholipids, lipids and triglycerides varied from one patient to the next.

Cholesterol and/or cholesterol esters such as oleate, linoleate and arachidonate were found in both old and newly deposited plaque but not all samples contained cholesterol.

The results of metal analyses indicated there was increased deposition of Cu, Zn, Mn, Ca, Mg and P in the newly deposited plaque compared to the old plaque, but Na, Cr, Fe and K decreased in concentration in the new material.

The concentrations of calcium and phosphorus were almost sixteen times higher in the new plaque compared to the old deposits.

Ca/Mg and Ca/Na ratios was much higher in the new material than the old plaque and the ratio in both the old and the new was much higher than in normal blood. For example the average Ca/Mg ratio in the new plaque was found to be about 77/1 while in the old plaque it was found to be 28/1 in matched samples. The normal ratio in the blood plasma is around 3/1.

The Cu/Zn ratios were less than 1/1 in all samples. The ratio in the new material was lower than in the old.

Results suggest a change in body metabolism in later life leading to the formation of a different plaque from that deposited in earlier life.