EFFECT OF DIETARY MAGNESIUM AND CALCIUM ON REDUCING THE RISK OF ATHEROSCLEROSIS IN HIGH FAT DIET FED RATS

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Abstract:

Background: Magnesium and calcium have competing effects on many metabolic pathways of our body. Magnesium deficiency is associated with a high frequency of cardiac arrhythmias, hypertension and sudden ischemic myocardial death. On the other hand, calcium supplementation may promote the incidence of atherosclerosis via arterial calcification. A study from 1959 found that feeding the animals a high magnesium diet and moderate to high amounts of calcium prevented heart and kidney damage by lowering lipid deposition in the heart and its valves. This consequence revealed that high calcium intake did not cause problems as long as the magnesium intake was high suggesting that magnesium had no protective effects under low calcium diet. With regards to the above facts, the present study is concerned about finding suitable combined doses of dietary Magnesium and Calciumto reduce the risk of atherosclerosis.

Materials and methods: The studywas conducted with 68 Wister Albino rats divided in different groups (n = 4) based on their diets (normal diet, HFD/atherogenic diet, HFD + Mg/Ca salts) for 12 weeks. High fat diet induced atherogenic rats were treated with different individual and combined doses of $MgCO_3$ (200, 400 and 600mg/kg/day) and $CaCO_3$ (500, 1000 and 1500mg/kg/day) salts in diet throughout the study period. After 12 week, the extent of atherosclerosis in experimental animals have been analyzed by measuring body weight, systolic blood pressure and serum lipid levels (cholesterol, triglyceride, LDL, HDL). For further analysis, histopathology of the aorta, kidney and liver tissues ofatherogenic model was performed. The mean values of results of different treatment groups (treatment with Mg and Ca) were compared with Ca-deficit groups of atherogenic rats by using ANOVA and Dunnet's test.

Results: Groups XV (HFD + Ca1000mg +Mg 600 mg) and XVII (HFD + Ca 1500mg +Mg 600mg) showed significant results ($p < 0.01$) in lowering serum lipids and maintaining nearly normal SBP when compared with Mg-rich diet groups (200,400 & 600mg/kg/day). Histopathological report of aorta, kidney and liver of animals of these groups further provided evidence of hypolipidemia and reduced risk of atherosclerosis as well as kidney and liver damage.

Conclusion: Our present investigation clearly indicates thattreatmentwith combined doses of dietary Mg and Ca salts showed better response against atherosclerosis compared to treatment with only Mg salt.

Keywords: Atherosclerosis,high fat diet, dietary magnesium, dietary calcium, atherogenic rats.