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Correlation of serum magnesium with dyslipidemia in maintenance hemodialysis patients

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Abstract

One of the factors involved in accelerated atherosclerosis in hemodialysis patients is dyslipidemia. In this study we considered factors involved in intensification of dyslipidemia in hemodialysis patients.This study was done on 36 maintenance hemodialysis patients. Serum lipoprotein (a), triglyceride, cholesterol, HDL-C, LDL-C and serum Intact Parathormone (iPTH), Ca, P, Magnesium were measured.In statistical analysis there was no correlation between serum lipids levels and iPTH, serum calcium and CaxP product (p>0.05). There was a positive correlation between serum magnesium and lipoprotein(a) and also between serum magnesium levels with serum triglyceride level (P<0.05). Magnesium doesn't directly increase lipoprotein synthesis. It may be involved in the regulation of enzymes responsible for lipoprotein synthesis. Correlation of serum magnesium with serum triglyceride can be due to changes in hepatic triglyceride metabolism. Lipoprotein(a) is a non traditional factor of premature atherosclerosis, its association with increase in serum magnesium needs to be investigated in hemodialysis patients.

Keywords: Serum magnesium, hemodialysis, dyslipidemia, parathormone.

Introduction

Hemodialysis patients have a number of biochemical abnormalities including hyperlipidemia. The cardiovascular illness is an important cause of death in hemodialysis patients[1]. Hyperlipidemia has been incriminated as a risk factor of atherosclerotic vascular disease in dialyzed patients[2]. Hemodialysis is associated with hypertriglyceridemia. The other dyslipidemias consist of (a) high serum lipoprotein levels (b) low serum high density lipoprotein. Plasma low density lipoprotein (LDL) cholestrol is usually not elevated[1-3]. The cause of hypertriglyceridemia is an increased production of Apo B protein and a marked decrease in the metabolism of VLDL, primarily as a result of decreased endothelial cell delipidation of VLDL[2]. Magnesium (Mg) retention can occur in patients on maintenance hemodialysis. Magnesium deficiency has a role in the disturbances of lipid metabolism in the non-uremic population. Furthermore other reports show that there is correlation between dyslipidemia and high magnesium level in hemodialysis patients[4]. This study evaluates the association of serum magnesium and the disturbances in lipid profile in patients on maintenance hemodialysis treatment due to end-stage renal failure.

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Materials & methods

This study included thirty-six patients under regular hemodialysis due to end-stage renal failure. For 3 years all the patients were hemodialyzed with polysulfone membrane hollow fibers. Patients underwent thrice or twice weekly hemodialysis. The duration of each hemodialysis session was four hours. The magnesium concentration in the dialysate fluid was 1mEq / lit. Factors used for exclusion were: use of antilipid drug and active or chronic infection. Plasma cholesterol (Chol) triglyceride (Tg), high- density lipoprotein-cholestrol (HDL-C), lipoprotein (a) [Lp(a)] and Intact Parathormone (iPTH) serum magnesium (Mg), calcium (Ca), phosphorus(P) were measured. Low-density lipoprotein-cholestrol (LDL-C) was calculated by Friedewald's formula[5]. Lipoprotein (a) was measured by enzyme immunoassay (ELISA) with Immuno-biological laboratories (IBL) kit (Germany). Other lipids were measured by standard kits. iPTH was measured by RIA

Table 1 - The results of biochemical investigations

with DSL-8000 kit (USA). Magnesium was measured by colorimetric method. For correlations Spearman rho test was used and P value less than 0. 05 was considered significant.

Results

Total patients were thirty-six (F=16 M=20) with mean age of 47. 5±16. 6years. The length of the time patients had been on hemodialysis was 25±24. 4 months. Table 1 show values of biochemical and hormonal levels. In this study, there was a significant positive correlation between serum magnesium and lipoprotein (a) (r=0.65, P<0. 05) (Figure 1). Significant positive correlation between serum magnesium and triglyceride level (r=0.32, P<0. 05) was observed too (Figure 2). There was no significant correlation between serum magnesium with cholesterol, HDL-C, and LDL-C (p>0. 05) (Figures 3 and 4). There was no correlation between serum calcium, iPTH and Ca x P product with serum lipids (P>0. 05).

Discussion

In this study there was a positive correlation between serum Mg levels and serum LP(a). Significant positive correlation of serum Mg levels with Tg was seen too, which means high serum Mg in hemodialysis patients might be associated with some types of dyslipidemia seen in hemodialysis patients. Uremic patients undergoing hemodialysis had dyslipidemia consisting of high serum Tg and LP(a) levels without increase in serum cholesterol, while high-density lipoprotein-cholesterol levels have generally been found to be decreased[1,2,6]. It is well documented that lipid profile, specially high serum LP(a) and low HDL-C is highly atherogenic and is one of the factors that accelerates atherosclerosis seen in these patients on maintenance hemodialysis[1-4,6]. It has

Figure 1: Correlation of magnesium with serum Lp(a) values (r=0.65 ,p<0.05).

Figure 2: Correlation of magnesium with serum triglyceride values (r=0.32 ,p<0.05).

Figure 3: Correlation of magnesium with serum cholesterol values (r=0.097,P>0.05)

Figure 4: Correlation of magnesium with serum LDL values(r=0.047,P>0.05)

been suggested that Mg deficiency is related to alteration in lipid metabolism[4]. Some animal studies have shown that Mg- deficient diet is associated with high serum Tg or cholesterol levels. But in Mg-deficient non-uremic rats, no changes in serum cholesterol were found[8,9]. It has been reported that in uremic rats, magnesium deficiency increased Tg levels and decreased HDL-chol levels[10]. In contrast, magnesium hydroxide (548 mg/dl in males and 411 mg/dl for females) used for 4 weeks showed a significant improvement in blood pressure. Also the HDL:LDL ratio and total cholesterol improved with the magnesium treatment[11]. A study in twenty-five hemodialysis patients reported a positive significant correlation between serum magnesium levels and serum total cholesterol, and serum triglycerides[4]. In contrast to this study we found no positive correlation between seurm cholesterol with serum magnesium levels, though there was a positive correlation between serum magnesium and serum triglyceride levels. Lipoprotein(a) is an independent risk factor for atherosclerotic cardiovascular disease (CVD) in general population and dialysis patients[3]. In this study we found a significant correlation between serum magnesium and LP(a) levels. Serum LP (a) elevation in hemodialysis patients can be due to uremia that could influence LP(a) metabolism. The kidneys may also play a role in LP(a) catabolism and the end-stage renal disease might result in elevated LP(a) levels[2,6,7]. Based on recent observations, showing significant correlations between serum lipoprotein (a), IL-6 and TNF- Levels, it is hypothesized that an activated acute phase reaction may be the underlying cause for high levels of lipoprotein (a) found in patients receiving chronic hemodialysis[4,11]. Mg does not seem to increase lipoprotein synthesis. It may be involved in the regulation of enzymes responsible for lipoprotein synthesis[4]. While there was a trend towards an increase in triglyceride levels with increasing magnesium levels, it could be due to changes in hepatic triglyceride metabolism induced by magnesium[4]. Further clinical studies into the effect of serum magnesium on lipoprotien metabolism are required in hemodialysis patients.

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