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Comparative Study of Additional Antihypertensive Effects of Magnesium Supplement with or without Angiotensin II Receptor Blocker in Hypomagnesemic Rats

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Introduction: Magnesium (Mg) is an essential element critically involved in vascular function and influences blood pressure regulation by modulating vascular tone and reactivity. Several studies have shown that serum Mg is inversely associated with blood pressure and plasma renin activity. The purpose of this study was to evaluate the additional effects of dietary Mg supplement with angiotensin II receptor blocker on blood pressure in hypomagnesemic rats.

Methods: Fifty five Sprague-Dawley male rats were used. The rats were randomly divided into Mg-deficient and control groups. Mg-free and Mg-contained (3,200 mg/Kg, oral) diet were administered. After 14 weeks, ten Mg-deficient and five control rats were treated with Mg. Another group of ten Mg-deficient rats were received angiotensin II receptor blocker (ARB; losartan, 30 mg/Kg, intraperitoneal), and ten Mg-deficient rats received ARB plus Mg in the same way. During this experimental period, blood pressure, serum Mg, calcium, potassium, angiotensin, aldosterone, 1,25-dihydroxyvitamin D and vasopressin were measured. Immunohistochemistry for TGF-β1 and immunoblotting for aquaporin-2 (AQP-2) of renal tissue extract were preformed.

Results: At 14 weeks, systolic blood pressure was significantly higher in Mg-deficient rats than in control rats ($p=0.034$). In the hypomagnesemic rats, treatment with Mg resulted in a decrease of systolic blood pressure, which was further decreased by ARB and ARB/Mg combination. Treatment with ARB/Mg combination resulted in a decrease of systolic blood pressure most. However, the difference did not reach statistical significance. The serum calcium, angiotensin II, aldosterone and 1,25-dihydroxyvitamin D were higher while the vasopressin level lower in Mg-deficient rats. AQP-2 expression was increased in hypomagnesemic group and decreased in ARB treated group. There were no differences of pathological findings and expression of TGF-β1 in tissue of kidney and heart among groups.

Conclusion: Oral Mg supplementation can reduce the blood pressure in hypomagnesemic hypertension and may enhance the effect of antihypertensive medication of angiotensin II receptor blocker.

Key Words: Hypertension, Angiotensin II receptor blocker