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## Clinical Investigation and Reports

# Oral Magnesium Therapy Improves Endothelial Function in Patients With Coronary Artery Disease

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**Background**—Magnesium blocks many of the physiological actions of calcium. Nevertheless, the impact of magnesium supplementation on endothelial function and exercise tolerance in stable coronary artery disease (CAD) patients has not been assessed.

**Methods and Results**—In a randomized, double-blind, placebo-controlled trial, 50 stable CAD patients (41 men and 9 women, mean±SD age 67±11 years, age range 42 to 82 years) were randomized to receive either magnesium (n=25) (30 mmol/d Magosolv-Granulat; Asta Medica Company, Inc) or placebo (n=25) for 6 months. Before and after 6 months, endothelium-dependent brachial artery flow-mediated vasodilation (FMD) and endothelium-independent NTG-mediated vasodilation were assessed with high-resolution (10-MHz) ultrasound. Exercise stress testing was performed with use of the Bruce protocol. **Intracellular magnesium concentrations ( $[Mg^{2+}]_i$ ) were assessed from sublingual cells through x-ray dispersion (EXA) (normal mean±SD values 37.9±4.0 mEq/L). The magnesium therapy significantly increased postintervention ( $[Mg^{2+}]_i$ ) versus placebo (36.2±5.0 versus 32.7±2.7 mEq/L,  $P<0.02$ ). There was a significant correlation in the total population between baseline  $[Mg^{2+}]_i$  and baseline FMD ( $r=0.48$ ,  $P<0.01$ ). The magnesium intervention resulted in a significant improvement in postintervention FMD (15.5±12.0%,  $P=0.02$  compared with baseline), which was not evident with**

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placebo ( $4.4 \pm 2.5\%$ ,  $P=0.78$  compared with baseline). There was better exercise tolerance ( $9.3 \pm 2.0$  versus  $7.3 \pm 3.1$  minutes,  $P=0.05$ ) and less ischemic ST-segment changes (4 versus 10 patients,  $P=0.05$ ) in the magnesium versus placebo groups, respectively.

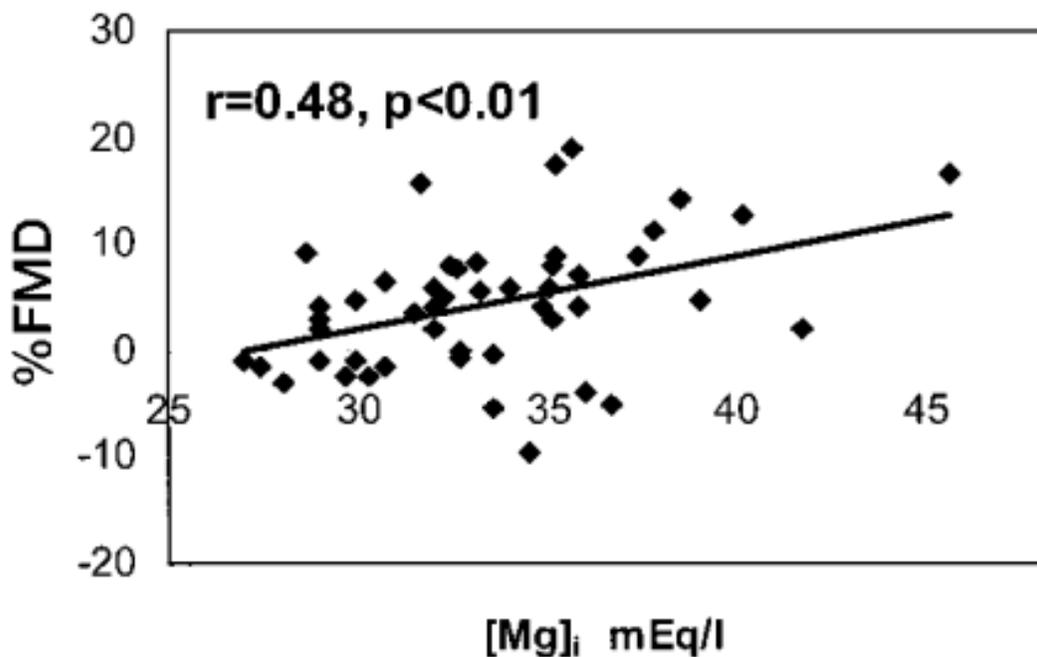
**Conclusions**—Oral magnesium therapy in CAD patients is associated with significant improvement in brachial artery endothelial function and exercise tolerance, suggesting a potential mechanism by which magnesium could beneficially alter outcomes in CAD patients.

**Key Words:** magnesium • lipoproteins • endothelium • coronary disease

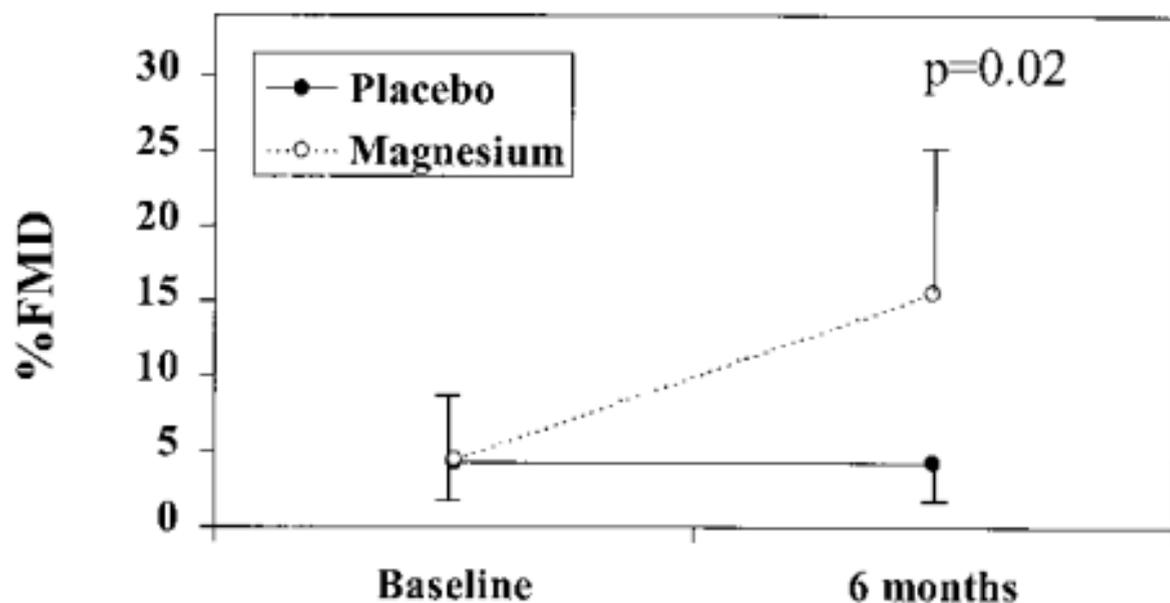
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**Figure 1.** Correlation of percent change in baseline brachial artery flow-mediated vasodilation (%FMD) and baseline intracellular magnesium level ( $[Mg]_i$ ) in total study population ( $n=50$ ), demonstrating a linear correlation.



**Figure 2.** Percent change in endothelium-dependent brachial artery flow-mediated vasodilation (%FMD) from baseline in placebo (●) (n=25) and magnesium (○) (n=25) groups at baseline and after 6 months.