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File: ■ Garlic (*Allium sativum*, Amaryllidaceae)
■ Brachial Endothelial Function
■ Cholesterol Efflux
■ Coronary Artery Disease

HC 071764-585

Date: January 31, 2018

RE: Adjunct Garlic Improves Vascular Function in Patients with Coronary Artery Disease after Angioplasty

Mahdavi-Roshan M, Mirmiran P, Arjmand M, Nasrollahzadeh J. Effects of garlic on brachial endothelial function and capacity of plasma to mediate cholesterol efflux in patients with coronary artery disease. *Anatol J Cardiol.* August 2017;18(2):116-121. doi: 10.14744/AnatolJCardiol.2017.7669.

Impairment of cholesterol efflux (CE), the process by which cholesterol is removed from macrophage cells, has been shown to lead to the accumulation of cholesterol, negatively affecting vascular function and contributing to atherosclerosis. Garlic (*Allium sativum*, Amaryllidaceae) bulb has traditionally been used as a food in many parts of the world and has been shown to have cholesterol-lowering activity and to modulate CE. This randomized, placebo-controlled clinical trial investigated the potential for garlic supplementation to increase CE and improve vascular function in those having undergone angioplasty for coronary artery disease (CAD).

This study recruited patients (males and females from 25 to 75 years old) with CAD who had angioplasty at the Rajaei Cardiovascular Medical and Research Center in Tehran, Iran, from August 2013 to April 2014. Those who had coronary problems for less than 6 months, smoked, were diabetic or had kidney disease, had a body mass index (BMI) > 30 kg/m^2, used garlic within a month of the study, or used vitamin C, vitamin E, selenium, or other antioxidant supplements were excluded. Included patients were randomly assigned to take either garlic powder tablets (800 mg daily) or placebo tablets 2 times daily for 3 months. Garlic tablets (Amin Pharmaceutical Company; Isfahan, Iran) "contained alliin, ajoene, diallyl disulfide, diallyl trisulfide, in addition to 1200 mg allicin per tablet." Placebo tablets were identical in appearance and were made of corn (*Zea mays*, Poaceae) starch.

Patients started on the study within 3 days of angioplasty. Dietary changes were implemented with a dietician, and 3-day food assessments were completed at baseline and endpoint of the study. At baseline and at 3 months, the following parameters were assessed: blood pressure, BMI, plasma lipids, vascular function, ABCA1, ABCG1, and

CE. Vascular function was determined using flow-mediated dilation (FMD), a standard procedure based on ultrasound of the brachial artery. The expression of ABCA1 and ABCG1 (molecular transporters important in CE) in peripheral blood mononuclear cells was assessed using real-time polymerase chain reaction. CE was assayed by incubating patient plasma with human THP-1 monocytes.

From a total of 57 patients, plasma samples were collected from 42 patients, with 21 patients in each group. [Note: It is assumed that all other data reported are from 42 patients, but this is not mentioned, nor are reasons given for lack of plasma on other patients.] All patients were given standard treatments, including clopidogrel (a blood thinner), aspirin, angiotensin-converting enzyme inhibitor, angiotensin receptor blocker, and statins. Physical parameters of each group were not different at baseline, with the exception of higher average age in the placebo group as compared with the garlic group, approaching significance (P=0.06). Diet modifications were successfully implemented in both groups. At baseline, CE in the placebo group was significantly higher than in the garlic group (P=0.001), but at endpoint, this metric was not different between groups. Also, CE significantly increased in both groups (P<0.05 in both).

FMD was significantly higher in the garlic group at endpoint, in comparison to the placebo group (P=0.016). There was also a significant increase in FMD in the garlic group at endpoint as compared with baseline (P<0.01). In those taking garlic, high-sensitivity C-reactive protein (hs-CRP, an inflammatory marker used to assess cardiovascular disease risk) was significantly decreased at endpoint as compared with baseline concentrations (P<0.05). Gene expression of ABCA1 was significantly decreased in both groups at endpoint (P<0.05 for both), but no change in either group was observed in ABCG1 expression. Both apolipoprotein A1 and high-density lipoprotein cholesterol were elevated in both groups at the end of the study (P<0.05 for all). However, there were no significant differences between groups in any of these metrics.

In summary, those taking standard treatments and garlic had an improvement in vascular function (FMD), while those taking standard treatments and a placebo did not; however, no differences between groups were observed with CE, suggesting that this is not a mechanism by which garlic modifies vascular function. It is postulated that as cholesterol concentrations were not elevated at baseline in this population, no effects of treatment were seen. Discussed limitations include short study duration, and the placebo effect in several parameters is somewhat confounding. Despite these, the adjuvant use of garlic may improve vascular function in those having undergone angioplasty.

—*Amy C. Keller, PhD*

Referenced article can be accessed at http://www.anatoljcardiol.com/jvi.aspx?un=AJC-49932.