

Issue 62

In a nutshell

Vitamin C appears to have a role in promoting vasodilation of coronary arteries.

Recent human clinical trials have demonstrated the potential value of vitamin C supplementation in promoting vasodilation in patients with angina and hypertension. The doses used were large.

Vitamin C and the heart

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NUTRITION RESEARCH REVIEW

Study one: Vitamin C and coronary spasm

Vitamin C reverses the tendency of coronary arteries to constrict in patients with spastic angina, and this is due to its antioxidant effect, according to the results of recent Japanese research.

Subjects: 32 patients with coronary spastic angina and 34 control subjects.

Method: Subjects and controls were given intracoronary infusion of vitamin C during angiography. The vasomotor response of the subjects' left coronary arteries was measured (epicardial arterial diameters after infusion of acetylcholine). Saline was infused as a control intervention.

Results: Vitamin C infusion reversed the vasoconstrictive response in the patients with coronary arterial spasm. There was no such effect with saline. See Table.

The patients with coronary angina had a greater amount of lipid peroxidation in their coronary

circulation, compared with the controls, but this difference was eliminated by vitamin C infusion ($p < 0.01$ based on coronary sinus-arterial difference in plasma thiobarbituric acid reactive substances). There was no such effect seen with saline infusion.

Ref: *J Am Coll Cardiol* 1998;32:103-9

Study two: Vitamin C and hypertension

Vitamin C improves vasodilation in essential hypertension, a group of Italian researchers has recently reported.

Subjects: 14 adult patients with essential hypertension (mean BP 153/102) and 14 controls.

Method: Forearm blood flow was measured after vasodilating agents were infused, before and after intrabrachial infusion of vitamin C (2.4 mg/100 mL forearm tissue per minute).

Results: The hypertensive subjects had an impaired vasodilation compared to the controls. After vitamin C infusion, vasodilation was improved ($p < 0.01$).

By using two different vasodilating agents and also using indomethacin to reverse the effects, the researchers concluded that this effect was confined to endothelial vasodilation, and that it may be due to the action of vitamin C as an antioxidant on the cyclooxygenase pathway.

Ref: *Circulation* 1998;97:2222-9

Table: Change in diameter of left coronary artery (%)

	Before	After vitamin C infusion
Patients (SEM)	-8.2% (2.9)	+0.2% (3.8)
Controls	+8.4% (2.9)	+7.2% (1.3)
<p>$p < 0.01$. Negative values = spasm</p>		

Study three: Vitamin C and nitrate tolerance

Another study from Japan showed that oral vitamin C supplementation may help prevent the development of nitrate tolerance in angina patients.

Subjects: 24 patients with ischemic heart disease and 24 healthy controls.

Method: Forearm blood flow response to nitroglycerin was measured before and 3 days continuous use of a

nitroglycerin tape (10mg/24 hours). Subjects were also given either vitamin C orally (2gm 3x/day) or placebo.

Results: The vasodilatory effects of nitroglycerin were significantly greater after continued use when the patients were given vitamin C supplements at the same time, in both volunteers and patients with ischaemic heart disease ($p < 0.01$ in both groups).

Ref: *J Am Coll Cardiol* 1998;31:1323-9

Comments

The history of research into the antioxidant effects of vitamin C is interesting.

The initial stage starting more than 30 years ago was characterised by observational studies and some speculative ideas.

Then followed a long period during which a large amount of basic science was conducted, showing the many ways in which this vitamin (along with other antioxidants) exerts antioxidant effects in various tissues, pathways and disease states.

When it came to clinical impact of supplementation, however, useful results were not so easy to come by. The first areas in which it was studied in large scale trials (respiratory infection and cancer) proved a little disappointing.

What we are now seeing are more sophisticated clinical applications, based on a deeper understanding of how vitamin C in particular out of the antioxidant family might best be put to good clinical use.

The trials summarised in this Update are good examples, and take us back to an old idea where vitamin E has already gone ahead - that degenerative cardiovascular disease is to significant degree an oxidative process.

It is worth noting that the doses used in all studies were very high - certainly pharmacological, rather than dietary. Indeed, the mode of supplementation in two of these trials was highly invasive and impractical as therapy.

But they do at least demonstrate the key role of oxidation in the process of ischaemic cardiovascular disease and the potential for antioxidants to assist.

The third study (on tolerance to nitroglycerin) on the other hand suggests immediate and obvious direct clinical benefits from doses obtainable by oral supplementation. A further larger trial would seem indicated.

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