Improvement of Arterial Stiffness by EDTA-Chelation in Combination with Vitamin, Mineral, Trace Element and Antioxidant Supplements

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Abstract ***Background:*** *Ethylenediaminetetraacetic acid-chelation therapy (EDTA-CT) has long been used in many countries in the treatment of cardiovascular disease (CVD).*
Objectives: *To use new techniques for the assay of CVD-risk factors in the evaluation of EDTA-CT combined with orally administered broad-spectrum nutrients, which included a mixture of essential vitamins, minerals and trace elements (except iron) in recommended dietary allowance doses and a broad spectrum of antioxidants, including selenium, vitamins C and E, several B-vitamins, beta-carotene, lycopene and citrus bioflavonoids.*
Design: *Case series involving 82 patients (ages ranged from 50–81 years), of which 54 were females and 28 were males.*
Setting: *Private medical practice (Bohus-Björkö, Sweden).*
Intervention: *Intravenous infusion over duration of 3 hours, containing 1.5 g of sodium-EDTA with corresponding amount of magnesium and bicarbonate in 250 mL of glucose 5%. This treatment was repeated 20–30 times at varying intervals. Patients were also given broad-spectrum nutrients.*
Main outcome measures: *Arterial stiffness was assayed before and after treatment, using two different methods: CardioVision MS-2000 (n=33) and Arteriograph (n=49). In addition, analysis was performed of erythrocyte fragility, a possible assay of inflammation.*
Results: *Highly significant improvement was seen in the majority of patients for brachial arterial stiffness (84.8% improved), aortic pulse wave velocity, (PWV, 87.8% improved), augmentation index (76.5% improved), and erythrocyte fragility (87.0% improved). The biological age of the aorta in 49 patients was decreased by 21.3 years and by 27.0 years among the patients demonstrating improvements in PWV.*
Conclusion: *These results support the value of EDTA-CT combined with essential nutrients in mitigating novel CVD-risk factors. New techniques for assay of risk factors for CVD used in this study may be of value not only as an indicator of risk factors, but also in treatment follow-up.*

Background

Ethylenediaminetetraacetic acid-chelation therapy (EDTA-CT) has long been used in many countries in the treatment of cardiovascular disease (CVD). With the advent of new techniques for the assay of CVD-risk factors, such as aortic and brachial arterial stiffness and endothelial function, a new type of evaluation of EDTA-CT has become possible.

Methods

Patient Selection

Patients were accepted into treatment if they had a diagnosis of myocardial infarction

or angina pectoris, stroke or intermittent claudication. Patients were excluded if they smoked or were older than 85 years of age. Patients contacted me on their own initiative with a wish to receive EDTA-CT. At any point during treatment, patients could refuse care and terminate their treatment. All patients were provided with informed and valid consent outlining the expected benefits and potential risks of EDTA-CT. Eighty-two patients were accepted into treatment, of which 54 were females and 28 were males. The ages ranged from 50-81 years. None of the patients had been on a systematic program of nutritional supplements prior to the start of treatment.

Analyses

In addition to routine assays, including serum creatinine, performed by their ordinary medical contacts, assays were made of brachial arterial stiffness, using the CardioVision,[1-3] aortic pulse wave velocity[4] and augmentation index, using the Arteriograph,[5-9] and of erythrocyte fragility.[10] The C-reactive protein (CRP) test was available at the start of this study in 2001, but was considered too insensitive for the purpose of assessing cardiovascular risk. Highly sensitive CRP did not become available until the latter part of the study, and was therefore not included in this analysis. All patients were initially and continuously evaluated by their ordinary medical contacts in hospitals and medical centres for potential complications as a result of treatment, including tests of kidney function.

For assay of erythrocyte fragility, a small capillary incision was made on the fingertip. One drop was left for 15-20 seconds; this drop had to stay constant and not flow or grow. A glass was touched against the drop five times in rapid succession. The five drops on the glass were left horizontally in the air for a few minutes until dry, and were then studied in low magnification in a microscope for the existence of erythrocyte fragmentation, which showed as white lacunae in the normal red pattern with a black net of fibrin. On a scale from 0-10 arbitrary units, 0 indicated no lacunae and 10 indicated a drop full of lacunae, resulting in a span from 0 to 50 units for the five drops (**Figure 1,** below).

Treatment

Patients were given an intravenous (IV) infusion lasting 3 hours, comprising of 1.5 g of sodium-EDTA together with corresponding amounts of magnesium and

Figure 1. Microscopic picture at low magnification of the erythrocyte fragility test

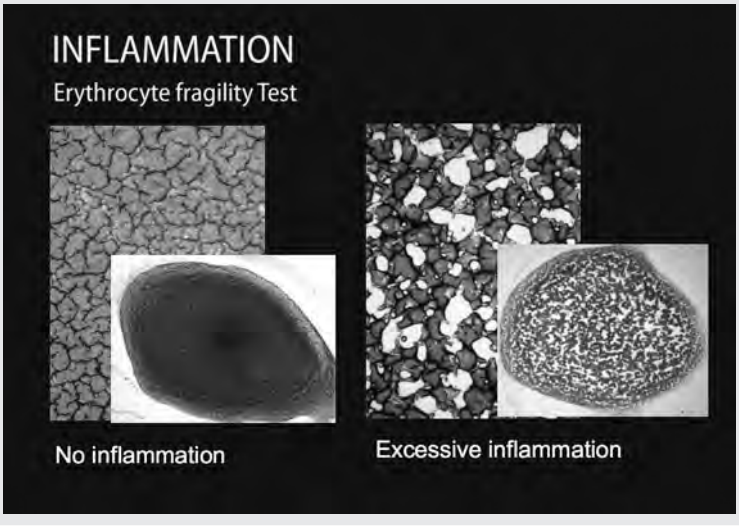

Table 1. Oral mixture of broad-spectrum nutrients (6 tablets)

Ingredients: Dicalcium phosphate, potassium chloride, ascorbic acid, d-alpha-tocopherol acetate, magnesium oxide, citrus extract, manganese gluconate, extract of tomatoes/lycopene, choline-L-bitartrate, selenomethionine, zink lactate, beta-carotene, calcium-d-pantothenate, nicotinamide, potassium molybdate, pyridoxine hydrochloride, inositol, riboflavine, thiaminehydrochloride, retinyl acetate, copper gluconate, chromium sulphate, cholecalciferol, d-biotin, folic acid, phyllokinone, iodine, cyanocobalamine.
Also: Microcrystalline cellulose, isomaltose, magnesium stearate, stearinic acid, silicium dioxide, mannitol
Surface treatment: Shellac and talcum
Vitamins: A: 2.4 mg; B_1 20 mg; B_2 20 mg; B_3 40 mg; B_5 48 mg; B_6 24 mg; B_{12} 0.04 mg; C 480 mg; D 0.02 mg; E 200 mg; K 0.12 mg; folic acid 0.4 mg
Minerals and trace elements: Calcium 320 mg; potassium 600 mg; magnesium 200 mg; phosphorus 240 mg; iodine 0.06 mg; copper 2 mg; chromium 0.16 mg; manganese 20 mg; molybdenum 0.06 mg; selenium 0.2 mg; zinc 20 mg
Antioxidants: Lycopene 12 mg; beta-carotene 12 mg; citrus flavonoids 100 mg
Other components: Biotin 0.6 mg; inositol 20 mg; choline 120 mg

Table 2. Brachial artery stiffness expressed as arterial stiffness index (ASI) in 33 patients treated with EDTA-CT and broad-spectrum nutrients

Pre-treatment mean value (reference value: <90)	Post-treatment meanvalue (reference value: <90)	p-value (p<0.001)
244.5	139.9	0.00087

Mean percentage decrease: 42.8%
Percentage of patients that improved: 84.8%

bicarbonate in 250 mL of glucose 5%.This treatment was repeated 20-30 times at varying intervals. Patients were also given an oral mixture of broad-spectrum nutrients, which included all essential vitamins, minerals and trace elements (except iron) in recommended dietary allowance (RDA) doses, and a broad spectrum of antioxidants (in doses greater than RDA levels), which included selenium, vitamins C and E, several B-vitamins, beta-carotene, lycopene and citrus bioflavonoids. The broad-spectrum nutrients in RDA doses were provided in order to compensate for possible deficiencies induced by high doses of a separate substance. Iron was excluded, unless a deficiency was proven, in which case the patient was referred to a medical centre or hospital for appropriate treatment. The standard dose was 6 tablets per day (**Table 1**, above). When the value in the erythrocyte fragility test was > 15 arbitrary units, the dose was increased to 12 tablets per day, until a value <15 units had been reached.

Results

None of the patients experienced untoward reactions as a result of EDTA-CT and broad-spectrum nutrients. **Tables 2-5,** p.95, 96) demonstrate a highly significant effect by the treatment on all measured variables.

Table 3. Pulse wave velocity (PWV, aortic arterial stiffness) expressed as m/sec and as biological age in 49 patients treated with EDTA-CT and broad-spectrum nutrients

Pre-treatment mean value (reference value: <10.0 m/sec)	Post-treatment mean value (reference value: <10.0 m/sec)	p-value (p<0.001)
11.6	10.1	0.000000763
Pre-treatment biological age (years)	Post-treatment biological age (years)	p-value (p<0.001)
84.5	63.2	0.00000000421

Mean decrease in biological age among all patients: 21.3 years
Mean decrease in biological age among only the improved patients: 27.0 years
Percentage of patient that improved: 87.8%

Table 4. Augmentation index (AIX) in 49 patients treated with EDTA-CT and broad-spectrum nutrients

Pre-treatment mean value*	Post-treatment mean value*	p-value (p<0.01)
+12.6	-.05	0.00202

*value calculated from quotient between the pressure peak of the initial and the reflected wave
Percentage of patient that improved: 76.5%

Table 5. Erythrocyte fragility test in 82 patients treated with EDTA-CT and broad-spectrum nutrients

Pre-treatment mean value (reference value: <10.0)	Post-treatment mean value (reference value: <10.0)	p-value (p<0.001)
20.1	8.8	0.000013

Discussion

EDTA-CT has long been used in many countries for the treatment of CVD. It is widely used for CVD patients in the USA, in universities and hospitals in many countries, e.g., Japan, Germany, France, Thailand and by private practitioners in a large number of countries (author's experience). Usually, the patients also receive nutritional supplements.[11]

There has been criticism, as always in medicine, that no good studies have been performed to prove the value of EDTA-CT. To come to a more conclusive opinion a large study is presently under way in the USA.[12] In a multi-centre study from four different countries Chappell et al. could demonstrate a highly significant decrease in serious CVD complications after EDTA-CT as compared to the expected and as compared to a group of patients, who did not receive EDTA-CT.[13]

The mechanism behind an effect by EDTA-CT in patients with CVD is unclear. There is general agreement that EDTA by chelation binds heavy metals, but also magnesium, zinc, and other minerals in the extracellular space outside of the central nervous system. Binding is decided by affinity, which

is very high for heavy metals, and by concentration which is high for some essential minerals (e.g., calcium, magnesium and zinc).

Perhaps the removal of deleterious heavy metals, in combination with the addition of broad-spectrum nutrients that might be wanting, helps to restore endothelial function. Important in this respect might be magnesium, vitamin C and other antioxidants that would counteract oxidation of, for example, low-density lipoprotein cholesterol, but also diminish free radical activity, since oxidative stress is a well-known CVD risk factor.

Another possibility that explains the observed results is that the chronic low-grade inflammation, common to CVD, rheumatoid arthritis and other degenerative diseases, is counteracted by EDTA-CT and broad-spectrum nutrients. The finding of a normalization of the erythrocyte fragility test might support this hypothesis, if this test is an indication of inflammation.

If EDTA-CT and broad-spectrum nutrients diminish inflammation, they might also be of value in other diseases, such as rheumatoid arthritis, in which an increased risk of cardiovascular disease has been demonstrated.[14] Additional support has been demonstrated by Knudtson et al.,[11] who, in a double-blind, placebo-controlled study of EDTA-CT therapy for patients with ischemic heart disease, found improvement also in the placebo group; both groups having been given multiple vitamin supplements.

Statement of Informed Consent

Written consent was obtained from all patients who underwent EDTA-chelation in combination with broad-spectrum nutrients.

Competing Interests

The author declares that he has no competing interests.

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