

Effects of EDTA Chelation on Chronic Degenerative Diseases

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Abstract. Published results of EDTA chelation therapy for advanced life-threatening degenerative disease have consistently shown effective disease reversal and normalization over the last 30 years. There has been no organopathology or toxicity from this therapy.

Key Words: EDTA chelation—Ethylenediaminetetraacetic acid—Immune function—Homeostasis—Vascular occlusion—Arteriosclerosis—Atherosclerosis

History of EDTA Chelation Therapy

An effective, office administered, intravenous treatment called EDTA chelation therapy has been employed with great success in more than 20 foreign countries as well as the United States. Physicians in Czechoslovakia, Poland, England, Australia, New Zealand, Germany, Switzerland, Mexico, Brazil, Denmark, Indonesia, The Netherlands, The Philippines, France, Canada, and other countries are finding great benefits at a reasonable cost when employing this easily administered therapy for chronic degenerative diseases such as atherosclerosis, coronary occlusive disease, stroke paralysis, diabetes, and osteoporosis.

EDTA (ethylenediaminetetraacetic acid) treatment for chronic vascular disease is an American medical discovery. One of the earliest clinical uses of EDTA, a synthetically derived amino acid, was in the treatment of lead poisoning. Patients suffering from this disease, who also had atherosclerosis, showed a dramatic improvement in their disease following EDTA chelation therapy, as was demonstrated by Clarke [1]. He found that EDTA was effective in removing metastatic calcium deposits from the body, and also reported remarkable benefits and improvements in patients suffering from angina pectoris. In some cases his patients showed reversal of abnormal electrocardiographic changes. He reports case studies of 20 patients all of whom experienced consistent decrease, or total disappearance, of anginal symptoms which had

been constantly present for 2 years preceding the onset of EDTA therapy.

Method

After thorough testing and evaluation, a series of 3-g EDTA infusions are given. Multinutrient support, aerobic exercise, and dietary advice are prescribed. Periodic monitoring enables the physician to follow the patient's progress and insure safety.

Atherogenesis and EDTA

There are numerous theories for the development of atherosclerosis, and new ones seem to crop up frequently [2]. It is not the purpose of this paper to address these. Whatever the cause of atherogenesis, EDTA chelation therapy has been proven to significantly reduce or reverse this condition.

The Framingham study observed that increased blood lipids are associated with increased risk of atherosclerosis [3]. EDTA chelation therapy has been shown to enable blood lipid levels to reach a more normal level [4-7]. In those patients with exceptionally high blood lipids, the scores come down. Patients with low blood lipid numbers rise toward the normal. Patients whose blood lipids are in the normal range at the onset of treatment remain so throughout and after the treatment. This same homeostatic balancing mechanism is seen in all other blood chemistry tests [8-10].

Diabetic blood glucose readings come down, as do blood glucose readings in the higher elevations of the normal range. Patients whose blood glucose levels are considered too low will have a normalizing elevation by the end of this therapy. The therapy, therefore, seems to have a powerful effect in reestablishing normal homeostatic balance in chronic disease patients.

Cholesterol

It is generally recognized that as patients age, average serum cholesterol values rise [4]. There is also general

agreement that older persons with elevated cholesterol levels die more rapidly than older persons without elevated cholesterol levels, and that lowering hypercholesterolemia is, in fact, one way to enable people to live longer.

Studies were performed on several hundred routine private practice patients, all suffering from chronic degenerative diseases, and treated with a series of intravenous EDTA infusions and multiple vitamin and mineral support.

In the first study 221 subjects were studied before and after therapy of about 2 months duration. Favorable changes occurred in serum cholesterol, which suggests a possible reversal of the aging process [4]. It is clear that, in every age category, the mean cholesterol values are significantly lower following treatment.

In a second study of 142 patients it was possible to reduce hypercholesterolemia on the average by 14% in 2-4 weeks time [5]. Those with higher levels decreased about twice as much (17%) as those with the lower initial values (9%).

High Density Lipoprotein Cholesterol

High density lipoprotein cholesterol is considered protective for heart attack and stroke risk. In a group of 356 routine chronic degenerative disease patients, the HDL levels were measured before and approximately 50 days after completion of a series of EDTA infusions [6]. Patients were supported throughout with multiple trace minerals and vitamins.

Attention is drawn to three results of these studies: First low HDL scores rise under this form of therapy; as far as we know, this has not been reported previously. Second, the least change in HDL occurred around 31-41%. Third and predictably, the high scores declined.

Total Cholesterol/HDL Ratio

The effect of EDTA on the cholesterol/HDL ratio in 358 randomly chosen patients suffering with chronic degenerative diseases such as maturity onset diabetes mellitus, heart disease, and other circulatory problems was evaluated [7]. Those with ratios between 4.0 and 4.9 rose; those with ratios above 5 declined with an optimal ratio approaching 4.5. Again, we see a homeostatic balancing mechanism at work.

Oculocerebrovasculometry

The obvious improvement in blood lipid profiles from intravenous EDTA chelation therapy should also be ob-

vious in circulatory improvement. One way this was measured was by oculocerebrovasculometric analysis of the effect of this treatment on occlusive vascular disease in 57 patients [11]. The procedure measures the ophthalmic arterial pressure, which, when compared to the brachial blood pressure, provides a reasonably accurate method of assessing carotid artery occlusive disease, cerebral vascular disorders, and ocular vascular pathology. This test was performed before and after approximately 28 EDTA infusions. Before therapy the percentage of stenosis ranged from 3% to 74% with a mean of 28%. Following therapy, stenosis was reduced 18%.

Kidney Function

Early clinical researchers in the field of EDTA therapy using doses of EDTA of 10 g per infusion noted several instances of abnormal kidney function following therapy. When the dosage was reduced in subsequent patients to 5 g per infusion, renal function was not affected. Nevertheless, one of the alleged contraindications to EDTA therapy is possible renal damage, especially in cases of excessive dosage, or in treating patients with preexisting kidney pathology.

The effect of EDTA chelation therapy upon renal function was studied in 383 patients with chronic degenerative problems before and after EDTA therapy. We used serum creatinine as the measuring tool [8]. Fasting serum creatinine levels declined as a result of this therapy. The number of relatively low serum creatinines initially increased. Those relatively high serum creatinine levels declined. Those serum creatinine levels in the area of approximately 1.0 mg/dl, the ideal renal clearance, remained unchanged.

An additional study of the effects of EDTA therapy upon renal function by examining blood urea nitrogen scores was performed on 80 patients, all afflicted with chronic degenerative disorders, primarily occlusive arterial disease [9]. The lowest initial BUN scores rose toward the normal; those with the highest values significantly declined toward normal; those with normal values remained unchanged.

It would appear from our two studies regarding kidney function that EDTA therapy is not toxic, but, in fact, homeostatic, and may well improve kidney function.

Effect on Heart Rate

A study on the effect of EDTA chelation on the heart rate achieved during a submaximal stress test was done on 50 patients, divided into two groups: exercisers and nonexercisers [12]. All patients had either a medically established history of cardiac problems or were considered

prone to cardiac problems based on family history, elevated blood pressure, and/or obesity. All subjects underwent two maximal multistage stress tests on a motor driven treadmill, one test administered prior to treatment and one following completion of treatment. Protocols employed for the maximal test were varied, based on the age and work capacity of the patient. Most subjects underwent a standard Bruce test, but on certain individuals a modified Bruce, Naughton, or Ellstand test was performed.

End points for the maximal test was either reported angina, 2 mm S-T segment depression, diastolic blood pressure greater than 110 mm of mercury, or the patient's request to stop the testing procedure. All patients were verbally encouraged to achieve their highest possible work loads. All tests were administered by the same individual. The treatment program consisted of EDTA infusions along with supportive multivitamin/trace mineral supplementation approximately five to ten times the recommended daily allowance.

Results showed that EDTA chelation plus supplementation significantly reduces heart rate at all stages as judged by graded exercise technique. Secondly, the decrease in heart rate increases with the stage (6.2%, 7.2%, and 9.0%). It was also clear by the study that EDTA chelation significantly reduces heart rate in all stages as judged by a graded exercise technique in those patients in the exercise group. The decrement increases only slightly with the stage from 8.7%, 9.2%, and 9.2%.

Heart rate during exercise is clearly a measure of cardiovascular fitness. Physical training has been shown to reduce heart rate during submaximal work [13]. This reduction in heart rate allows the same amount of work to be performed with less cardiac strain or stress. This is beneficial to "normal healthy" people, but to heart patients this decrease in cardiac strain can be vital.

From our observations, within the limits of this study EDTA therapy with multinutrient support significantly reduces heart rate during submaximal work. This information, as far as we can determine, has never been previously reported. Our work suggests that there is additional potential mean reduction in submaximal heart rate when an aerobic program is incorporated into the chelation program. However, this increment is not statistically significant in this experiment.

Although it is well known that aerobic exercise will favorably alter heart rate, it has not been appreciated that similar results can be accomplished with EDTA chelation therapy without the addition of exercise. As might be expected, blood pressures responded in a similar matter. The treatment significantly reduced systolic blood pressure in all stages as judged by the graded exercise technique [14]. There is an additional very slight reduction in submaximal systolic blood pressure when an aerobic exercise program is added to the chelation regimen. It must

be underscored that this is not statistically significant, however. It would be reasonable to assume that EDTA, as seen by these studies, will serve as a useful additional tool in the management in systolic blood pressure in certain cardiac syndromes.

The effect of exercise upon systolic blood pressure has been reported by others. What has not been examined is the possible effect of EDTA chelation therapy with multinutrient support upon systolic blood pressure. The evidence is presented by this report that systolic blood pressure can statistically be reduced significantly by chelation therapy.

As patients with intermittent claudication seemed to improve with this therapy, a study designed to evaluate improvement in lower extremity circulation was undertaken. The ankle/brachial systolic blood pressure index was measured in 117 limbs in 77 elderly males and females with vascular stenosis [15]. After therapy, patients showed reduced vascular insufficiency to a significant degree as determined by Doppler method. This was accomplished in approximately 60 days with 26 infusions.

Bernstein and others make four pertinent points with regard to vascular diagnostics [16]: First, noninvasive diagnostic instrumentation and interpretation have now reached an operational state of excellence. Second, some of the procedures are simple and practical enough to warrant their use in the general private practice environment. Third, of all the possible available single diagnostic parameters, the ankle/brachial systolic blood pressure is preferred. Fourth, these diagnostic and predictive measures can be employed to monitor surgical and even medical treatment.

It is true that more precise information about the location and severity of occlusive vascular lesions may be derived by angiography. Clinical assessment is obviously highly subjective; angiography is invasive. The repeated quantification of blood pressure can be derived by noninvasive techniques, and so provide a sensitive index of the occlusive process. However, for the routine assessment of the occlusive state in the lower limbs, the ankle has been commonly used since it reflects, better than any other single reading, the overall state of proximal vessels.

The results of our study, subsequent to approximately 26 EDTA infusions extending over 60 days show the occlusive state decreased 22%. This was shown to be highly significant. Of the 117 limbs studied, 95 (81%) improved by an average of 29%; 22 (19%) worsened by an average of 10%.

In light of the wide range of initial ankle/brachial ratios (suggesting that some patients were suffering with more occlusion than others), the entire sample was divided into two subgroups. One subset of 46 showed an initial ratio less than 0.80, designated as the "poorer" group; the other 71 rated an initial ratio of 0.80 +, designated the "better" group.

In those with greater initial occlusion, the improvement, that is, the reduction in insufficiency, was 29% and statistically significant. Actually, 33 (71%) improved; 13 (29%) worsened. The 33 improved 46%; the 13 worsened 11%. It should be mentioned that ankle pressures below 50 mm mercury (and some of the patients were in this range) are limits below which gangrene may be expected.

In the healthier group of 71, the initial score was 0.91 ± 0.06 and the final values 1.08 ± 0.17 . This was a 19% improvement, which was also significant. Actually 62 of the 71 (87%) improved by an average of 23%; 9 (13%) worsened by an average of 10%.

EDTA chelation therapy, as shown by this clinical study, does significantly improve the vascular circulation in the legs. Our study is the very first to suggest the utility of EDTA chelation, plus supplementary nutrients, in the treatment of vascular disease of the limbs.

It should also be emphasized that those groups that worsened did so by a change of questionable significance (ca. 10%).

The ankle/brachial determination is an excellent index of peripheral artery disease; however, it is not perfect. It is known that patients with rigid arteries in the legs and ankles have artificially elevated blood pressures, especially in diabetes mellitus. Therefore, it is suggested that a more complete arterial examination should include measurements of the blood pressure at the thigh, calf, ankle, foot, and toe.

Blood Glucose

In order to ascertain the long term average blood glucose status in patients, the glycohemoglobin (hemoglobin A1C) distribution was measured in 334 patients who met the following specifications [17]: First, all of the subjects had been previously treated by one or more practitioners elsewhere. Secondly, as far as we can determine, all patients suffered with one form of chronic degenerative disease, mostly cardiovascular, and very few were known diabetics. Third, in the opinion of these patients, their therapy elsewhere had been unsuccessful. Finally, in our clinical judgment, based on our earlier treatment of several thousand subjects, all of the subjects were thought to be EDTA chelation-eligible. In our sample there were 178 males (age 59.2 ± 12.1 years) and 156 females (60.8 ± 12.4 years). The initial examination included an HbA1c measurement (METPATH method). There was no statistically significant sex difference.

Utilizing the Koenig (1976) criterion for diabetes mellitus, 26 males (15%) and 29 females (19%) of our group exceeded 7.6% glycohemoglobin and therefore could be viewed as potentially, if not actually, diabetic.

Employing the Gabbay standards (4.2–5.6%), 140 males (79%) and 126 females (81%) could be viewed as

having elevated levels and, therefore, possibly diabetic. On the basis of the conclusions by Ellul (<7%), the 44/178 (25%) of the males, 49/156 (31%) of the females and 93/334 (28%) of the total group in our series displayed elevated glycohemoglobins. Cole indicated a cutoff point of 5%. Thus, 320/334 (96%) of our group may be viewed as, at least potentially, diabetic. We would hope that this information will generate additional interest by other investigators, because of the obvious tie-in of abnormal glucose metabolism with the development of microvascular occlusive disease.

Serum Calcium

A literature search disclosed very limited published material, suggesting that EDTA therapy, when given slowly does not seem to derange serum calcium metabolism [1]. This might seem paradoxical to some readers, for it is well known that EDTA is quite capable of complexing calcium in the body. Calcium chelation might be expected.

The effects of EDTA infusions along with support nutrient supplementation and its effects on serum calcium were studied in 80 patients. The evidence indicates that, in general, this form of chelation therapy does not alter serum calcium concentration. Additionally, and perhaps more importantly, the evidence here suggests that so-called high normals decline slightly, the low normals rise slightly, and those in the intermediate range remain unchanged.

Bone Minerals

In addition to endocrinopathy, osteoporosis is influenced by many variables. Some of these would include calcium deficiency, lack of regular exercise, genetic factors, dietary excesses, and smoking. Many treatments have been attempted throughout the past years with varying degrees of success. Sixty-one patients were studied in a general practice environment, following approximately 18 months of therapy, including EDTA treatment. The evidence indicates that regardless of sex, there was no increase in bone density readings following EDTA therapy [18]. In fact, patients who had some degree of osteoporosis showed a slight but statistically significant improvement in bone density readings. These results seem to indicate that EDTA therapy in some cases is beneficial to bone growth.

All patients underwent a careful initial clinical examination. Each patient was then tested using a single photon bone densitometer manufactured by Norland. The bone densitometer was calibrated both prior to and following each test. When test results are broken down

compare males versus females, it was shown that the results were essentially the same from pre- and post-test. It was shown that the actual bone density levels increase slightly from pretest to post test but this was not statistically significant.

Possibly the most interesting group looked at was the group which had bone densitometer readings below that which would be predicted for age on the pretest. This group consisted of 25 individuals and was called the osteoporosis group. Over the course of treatment there is actually a 2% increase in the bone densitometer readings measured in this group. This difference was statistically significant at the 0.05 level of confidence.

The evidence shows that not only does EDTA therapy not cause calcium depletion (osteoporosis) but will, in fact, stimulate a regrowth of the bone in those patients effected with osteoporosis. Sixty-one routine private practice patients were studied before and after approximately 3 months of routine therapy including EDTA and general supportive care including multivitamin supplementation.

Pulmonary Function

Patients treated for chronic vascular disease with EDTA therapy have regularly commented that they experience an improvement in pulmonary function. It was noted that respiratory rate and auscultatory findings did indeed improve. Accordingly, a study was initiated to study the effect of EDTA chelation and supportive multivitamin/trace mineral supplementation on chronic lung disorders, specifically the forced vital capacity (FVC) and the forced expiratory volume in one second (FEV1).

Thirty-eight subjects with chronic degenerative disorders were treated with intravenous infusions of disodium ethylene diamine tetraacetic acid. These patients were evaluated objectively for maximum expiration lung volumes before and after EDTA chelation [19].

Each subject had 30 treatments over a period of approximately 9 months. Forced vital capacity (FVC) increased an average of 12.1% ($p < 0.001$) and forced expiration volume in 1 second (FEV1) increased an average of 12.8% ($p < 0.010$). Patients with lung disorders increased 18.9% ($p < 0.001$) in FVC and 20.8% ($p < 0.05$) in FEV1. Overall, 34 of the 38 subjects (90.5%) improved in pulmonary function after EDTA infusions.

The air we breathe is poisoned with 40 toxic metals [20]. Tobacco smoke, dust, motor exhaust, and pollution dilute our air with metals such as lead, cadmium, and nickel. Over time these small particles accumulate in the lungs. Cadmium has been linked with pulmonary emphysema and nickel with lung cancer. As this foreign matter collects, it damages the fragile alveoli, resulting in tissue calcification. It is suggested that the improved lung func-

tion seen in these patients was due in part to the removal of these accumulated materials.

Carotid Artery Occlusive Disease

Medical and surgical treatment for occlusive carotid artery disease has always proven difficult in the past. The Rand Corporation, for example, published a study that claimed approximately one third of carotid artery surgery is unnecessary, one third is ineffective, and only one third is helpful [21].

The authors have published two papers showing the effect of EDTA chelation therapy in this troublesome malady. In the first, a single patient with severe carotid occlusive disease and visibly evident shear motion in her right carotid artery was treated [22]. The patient was tested with standard, commonly employed methods of noninvasive vascular testing equipment including carotid duplex scanning, prior to and after, 30 intravenous infusions. The patient, a 60-year-old female, presented with a general complaint of fatigue. Physical exam was unremarkable, including an absence of carotid bruits. Plethysmographic studies showed a reduced amplitude of carotid artery tracing on the right side. Further evaluation by a Scannex SV ultrasonic, high resolution, advanced imaging unit showed 98% obstruction of the internal carotid artery close to bifurcation. Following EDTA therapy of 30 infusions, a repeat study was performed, and the obstructive artery was found to be 33% obstructed. In addition, the right common carotid artery on this examination showed abnormal shear motion. Following EDTA chelation, shear motion disappeared and was replaced by normal arterial pulsatile expansion after therapy. Further treatment at a more relaxed pace has shown continued reduction of the stenosis.

This report, to our knowledge, is the first attempt to examine the combined effects of intravenous EDTA therapy and nutrient supplementation upon carotid stenosis. The improvement was demonstrated by using Doppler ultrasonic imaging.

From clinical improvement experienced by these patients, we have known that there is an increase in the oxygen delivery and micronutrients to the cell. Whether this derives from improved microcirculation or by complexing free iron and copper ions, resulting in less free radical peroxidation, or both, is conjectural [2]. This study shows that this therapy improved the arterial blood flow for this patient by reducing the amount of obstructive arteriosclerotic plaque in the large diameter arteries.

One cannot discount the effect of EDTA in complexing copper and iron. In an earlier study on the effect of EDTA chelation on serum iron, the usual homeostatic mechanism at work was demonstrated [23]. One hundred twenty-two patients suffering from various chronic de-

generative disorders were evaluated objectively for fasting serum iron levels before and after EDTA chelation therapy. After 30 intravenous 3-g treatments of EDTA, average serum iron levels dropped 17.5%. Abnormally high initial iron decreased 43.1% while low initial iron increased 41%.

In a second follow-up study of carotid atheromatous disease, a larger study was undertaken at our clinic. Thirty subjects suffering chronic degenerative disorders were evaluated for carotid atheromatous stenosis [24]. There were 15 males ranging in age from 51 to 80 years, and 15 females ranging in age from 49 to 81 years.

A certified Horizons Research Laboratory technician performed the ultrasound with a Scannex SV HL advanced imaging unit. Echoes returning from tissue and interfaces provided instantaneous imaging on a calibrated TV screen. In the freeze-frame mode, the technician accurately measured the wall excursion, plaque, artery wall size, etc. by computing microprocessor-controlled distances between specific anatomical points. The Scannex SV has the capability of resolving arteriosclerotic plaque as small as 0.5 m. Blockage was observed in two of three views (anterior, posterior, lateral) to rule out a chance of shadow and artifact. For reference, a calibrated photograph and videotape were included in the record. Following the completion of 30 treatments of EDTA therapy, the carotid studies were repeated.

The patients were treated with 3-g intravenous infusions of EDTA. The patients were evaluated for right and left internal carotid atheromatous stenosis at the bifurcation before and after therapy. Treatment time was approximately 10 months.

Overall blockage dropped $20.88 \pm 2.34\%$, $p < 0.001$). Subjects with tight stenosis ($>30\%$ above the initial mean blockage) experienced a mean reduction in stenosis of 39.4% plus or minus 13.9% after treatment ($p < 0.050$).

Platelets

Since the platelet appears to be involved in acute vascular occlusive processes, a study to determine the effect of EDTA chelation and supportive multivitamin/trace mineral supplementation on blood platelet volume was undertaken. In this report [25], we studied 85 patients with chronic degenerative disorders. These patients were evaluated objectively for individual blood platelet volume before and after EDTA therapy. Each subject had 30 or more treatments over a period of approximately 13 months. Mean platelet volume increased 0.51 fl ($p < 0.001$). Overall, 72 patients (85.0%) had an increased mean platelet volume after EDTA infusions [25]. Studies by Haeren [26] and Van der Schaar [27] suggest that platelet aggregation may play a significant part in the

disease process and that sudden death may be more closely related to this than generally supposed.

Platelets function to repair small defects in the endothelial lining of blood vessels and to suppress hemorrhage by promoting coagulation of blood. In cases such as chronic hyperlipidemia, cigarette smoking, or excessive circulatory epinephrine, the damaged wall becomes progressively thicker. Calcification may follow and subsequent narrowing might eventually lead to thrombosis or infarction.

Previous studies indicate that platelets change shape after administration of EDTA *in vitro*. They become more rounded with less surface area and exhibit fewer pseudopodia which aid aggregation [21]. This change is associated with an increase in platelet volume.

When anticoagulants are added to whole blood, platelets change similarly as with EDTA. Mannucci and Sharp reported that the addition of cocaine, promethazine hydrochloride, and reserpine all produced rounder platelets, increase in volume, and inhibition of aggregation on glass [28]. During coagulation, platelet volume appears to decrease. They become large and flat with less endomembrane volume.

Thus, in addition to free radical and parathyroid hormone effects, increasing platelet volume may be a third mechanism by which EDTA helps fight the atherosclerotic process.

Olszewer and Carter published a retrospective study of 2870 patients treated with EDTA chelation therapy in which they report marked improvement in 76.9% and good improvement in 17% of treated patients with ischemic heart disease [29]. Marked improvement occurred in 91% and good improvement occurred in 8% of treated patients with peripheral vascular disease and intermittent claudication.

A follow-up placebo-controlled double-blind study by Olszewer et al. demonstrated the efficacy of EDTA in lower extremity vascular occlusive disease and intermittent claudication [30] and corroborates our earlier publication on this subject [15].

Blumer demonstrated a 90% reduction in cancer mortality after chelation therapy in a series of patients treated with EDTA [31]. There appears to be a great improvement in immune function and cancer prevention as a result of this treatment. He studied patients who had a short course of chelation therapy (10-15 treatments) 18 years previously.

Discussion

A vascular stroke trails only heart disease and cancer as America's leading cause of death. The bifurcation of the common carotid arteries is the most common site for occlusion. Approximately 5 million strokes occur each

year in this country, and 75% occur in the distribution of the carotid artery [32]. Drug therapy and/or surgery is the common treatment for carotid artery occlusion. The results of this study show that EDTA may be used as a third mechanism to combat the stenosis. After 10 months of chelation treatment on a relaxed treatment schedule, our patients' occlusions decrease an average of 20.88%, while patients with no treatment have been reported to increase 40% in blockage in less than 1 year.

Of 30 subjects tested, 15 had an average of more than 70% stenosis, which is an indication for carotid endarterectomy according to the Health and Public Policy Committee of the American College of Physicians [33]. After 30 infusions the same 15 subjects dropped to an average of 41.65% blockage, thus avoiding surgery. All of the patients treated experienced some decrease in atheromatous stenosis. No patients developed complications (stroke or death during treatment or within 30 days of the last treatment). In a Rand community-based study, the rate of major complications associated with endarterectomy (stroke or death within 30 days of surgery) was 9.8%. Restenosis within 2 years of surgery is also a significant problem that develops in as much as 25% of cases [22].

Significant improvement in the treatment of carotid occlusive disease would include a treatment that is as effective as surgery. It would seem chelation with EDTA satisfies this requirement. The results from this study demonstrate that EDTA infusion can significantly decrease atheromatous plaque, discouraging chance of cerebral infarction.

Summary

Historically, EDTA has been used to treat lead poisoning, digitalis intoxication, and certain collagen disorders. Many physicians have successfully used this therapy to treat atherosclerosis and related disorders. Theoretically, the chelate removes calcium deposits from the vessels, subsequently excreting bound calcium ions in the urine. As a result of this action the body's metabolic functions of calcium and other minerals are altered. Specifically, a turnover of calcium may be produced through the stimulation of the parathyroid gland, which may therefore contribute to the breakdown of atherosclerotic lesions, by the removal of metastatic calcium from the plaque [34].

From a simplistic viewpoint, the concept of chelation involves the use of a family of chemicals that are able to grasp metals with a claw-like action. The metal then becomes incorporated into a multinumbered ring structure, and in so doing loses its physiological toxic properties.

EDTA administered correctly, with appropriate dosage, rate, and concentration, will produce no deleterious

side effects. During the early stages of development, intravenous EDTA chelation therapy was hindered by overdoses that resulted from not understanding the effective therapeutic range of this drug. The result of this incorrectly administered dosage, usually exceeding 5 g, was kidney, liver, and spleen damage, and even death. As Walker reports, "the nature of EDTA nephrotoxicity is not known, but there is a definite association of increased vascular changes in the tubular epithelium of the kidney with a large dose of the chelate [35]."

However, several other studies have found that safe levels of the chelate produce no renal damage. In fact, our center has reported improved renal function with EDTA chelation therapy. The dosage should not exceed 50 mg/kg per day, or not exceed 3 g. A search of the scientific literature shows more than 3500 published studies showing the great benefits of EDTA therapy. Our own published work encompasses 27 papers showing great benefits to the human organism. In addition to benefits accruing to the circulation, heart, glucose metabolism, arterial stenosis, kidney function, blood lipids, heart rate, blood pressure, serum calcium, serum iron, bone density, and pulmonary function, additional improvements are seen to accrue to patients taking this therapy. Reduction in the amount of reported fatigue and improvement in the overall salutary emotional effects are seen [36-38]. It was seen, for example, that in 139 patients treated with 26 infusions of EDTA chelation extending over about 60 days of therapy, the overall clinical symptomology as measured by the Cornell Medical System analysis shows an improvement from a low of 11% in the gastrointestinal and urinary systems to a high of 31% in the musculoskeletal system [36].

It would seem that EDTA has a beneficial effect on all, or nearly all, body tissues. It is hoped that information furnished in this overview of EDTA chelation therapy will generate interest in physicians concerned with in high grade improvement and reversal of chronic degenerative disease in their patients. The efficacy and safety of this treatment is well established. Patient costs average 10% of the current surgical or hospital cost, and compete favorably in those patients taking multiple pharmaceuticals for their chronic disease conditions [39].

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