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THE EFFECT OF INTRAVENOUS DISODIUM ETHYLENEDIAMINETETRAACETIC ACID (EDTA) PLUS SUPPORTIVE MULTIVITAMIN/TRACE MINERAL SUPPLEMENTATION UPON FASTING SERUM CALCIUM

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ABSTRACT

A literature search disclosed only very limited published material suggesting that EDTA therapy when given slowly does not seem to derange serum calcium metabolism. This report summarizes the observations of eighty private practice patients treated with EDTA and supportive multivitamin/trace mineral supplementation and its effects upon serum calcium. 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 the so-called high normals declined slightly, the low normals rise slightly, and those in the intermediate range remain unchanged.

INTRODUCTION

This is another, in a series of published papers, designed to analyze the biochemical reflections of EDTA plus multivitamin/trace mineral supplementation. Earlier publications dealt with serum cholesterol[1,2], high-density lipoprotein cholesterol[3], serum cholesterol/high-density lipoprotein cholesterol[4], and serum creatinine[5].

Since one of the cardinal reasons for EDTA therapy is the removal of ectopic calcium and because there are isolated statements suggesting that this form of chelation therapy deranges calcium metabolism, this report is intended to study the effect of EDTA and supportive multivitamin/trace mineral therapy upon fasting serum calcium.

This particular report in the series is designed to cast additional light on the following three important questions: (1) What is the effect of EDTA therapy plus multivitamin/trace mineral support upon fasting serum calcium? (2) Is the effect a function of the initial serum calcium? (3) What are the clinical implications?

REVIEW OF THE LITERATURE

As far as we can determine, a literature search revealed very little information regarding the effect of this form of chelation therapy upon serum calcium.

Spencer, Vankinscott, Lewin and Laszlo[6] studied the effect of the sodium and calcium salts of ethylenediaminetetraacetic acid upon calcium metabolism in fifteen patients. The slow intravenous infusion of the sodium salt of this agent induced excess calcinuria without lowering the serum calcium levels. This suggested to the investigators the prompt replenishment of the complex serum calcium by ionized calcium mobilized from the skeletal depots. The calcium salt of ethylenediaminetetraacetic acid was noted to be rapidly excreted through the kidneys.

MATERIALS AND METHODS

Eighty patients participated in this study. The age and sex distribution is summarized (Table 1). The mean age and standard deviation for the entire group is 63.8 and 9.2 years. The age range extended from the fourth to the ninth decades (31 to 86 years with a spread of 55 years). The means and standard deviations for the male and female groups separately are very similar (64.3±9.0 and 63.1±9.6 years).

Table 1

age and sex distribution

age groups	male group	female group	total group
<40	0 (0.0%)	1 (2.9%)	1 (1.2%)
40-49	2 (4.4%)	1 (2.9%)	3 (3.7%)
50-59	14 (30.4%)	9 (26.5%)	23 (28.8%)
60-69	17 (37.0%)	15 (44.1%)	32 (40.0%)
70-79	10 (21.7%)	7 (20.7%)	17 (21.3%)
80-89	3 (6.5%)	1 (2.9%)	4 (5.0%)
totals	46 (100.0%)	34 (100.0%)	80 (100.0%)
mean	64.3	63.1	63.8
S.D.	9.0	9.6	9.2
minimum	43	31	31
maximum	83	86	86
range	40	55	55

On the basis of their diagnoses, all of these subjects were selected for chelation therapy, dietary recommendations, and supportive multivitamin/trace mineral supplementation.

Initially, a battery of biochemical tests was performed including fasting serum calcium. The distribution of serum calcium for the entire group is summarized (Table 2). It will be noted that, for the entire sample, the mean and the standard deviation is 9.67 ± 0.41 mg%. Second, the range is considerable (from a low of 8.7 to a high of 10.9 with a spread of 2.2 mg%). Third, according to the METPATH (the laboratory which performed the biochemical testing) standards of 8.8 to 10.8 mg%, one subject could be regarded as hypocalcemic and one as hypercalcemic.

Table 2

initial serum calcium distribution

serum calcium groups	number and percentage of subjects
<9.0	2 (2.5%)
9.0- 9.4	18 (22.5%)
9.5- 9.9	45 (56.2%)
10.0-10.4	11 (13.8%)
10.5-10.9	4 (5.0%)
totals	80 (100.0%)
mean	9.67
S.D.	0.41
minimum	8.7
maximum	10.9
range	2.2

Each subject was then subjected to approximately thirty EDTA infusions along with a supportive multivitamin/trace mineral supportive regime as previously reported[1-5]. The biochemical battery of tests, including serum calcium, was repeated after the tenth, twentieth, and thirtieth infusions. Table 3 summarizes serum calcium levels, in means and standard deviations, prior to therapy and after the tenth, twentieth, and thirtieth infusions.

Table 3

fasting serum calcium levels
in 80 subjects

	mean	S.D.
pretreatment	9.66	0.41
10 infusions	9.62	0.52
20 infusions	9.64	0.50
30 infusions	9.57	0.48

RESULTS

Question One: Table 3 summarizes the means and standard deviations for fasting serum calcium prior to EDTA therapy and after the tenth, twentieth, and thirtieth infusions. It is evident that there are minimal differences in the means and standard deviations under those conditions. The fact that there are no significant differences at the 0.05 level is underlined by Table 4. Hence, in answer to the first question, under the conditions of this experiment and for the entire group, EDTA chelation therapy plus multivitamin/trace mineral supplementation did not significantly alter fasting serum calcium levels.

Table 4

significance of the difference of the means
(student t test) of fasting serum calcium levels
before and after different amounts
of EDTA solution

number of infusions	10	20	30
0	0.96	0.38	1.84
10	-	0.38	0.99
20	-	-	1.29

no significant differences of the means at 0.05 level

Question Two: The point was made earlier that, the initial serum calcium levels varied from a low of 8.7 to a high of 10.9 (Table 2). Accordingly, it was thought to be interesting to analyze the effect of EDTA chelation therapy plus multivitamin/trace mineral support in terms of the initial serum calcium level.

Accordingly, the eighty subjects were divided into near-equal subgroups (Table5). Hence, the lowest group ranged from 8.7 to 9.5 mg%. A second group ranged from 9.6 to 9.7 mg%, and the highest group from 9.8 to 10.9 mg%.

Table 5

initial and post-infusion fasting serum calcium levels in terms of initial serum calcium score

number of infusions	initial serum calcium 8.7-9.5 (n=27)	9.6-9.7 (n=23)	9.8-10.9 (n=30)
0	9.25±0.23	9.64±0.05	10.06±0.30
10	9.33±0.46	9.57±0.49	9.91±0.43
20	9.53±0.47	9.55±0.59	9.80±0.43
30	9.35±0.48	9.69±0.44	9.68±0.48

The most glaring observation is that, in those with initially the highest serum calcium scores, there was a slight but progressive decline in serum calcium from 10.06 prior to infusion therapy to 9.91 after the tenth infusion, 9.80 after the twentieth, and 9.68 after the thirtieth. The second most interesting observation is that there seems to be a rise in those with the lowest initial serum calcium from 9.25 initially to 9.33 and then to 9.53 at the twentieth infusion and then a slight drop. The least change seemed to appear in the group characterized by the intermediate serum calcium levels of 9.6 to 9.7 mg%.

The importance of these changes is summarized in Tables 6-8. Specifically, in Table 6 it will be observed that, in those characterized by the lowest initial serum calcium levels (8.7-9.5 mg%), there was a statistically significant increase in serum calcium when the pretherapy and the twentieth infusions were compared. There was also a significant difference between the twentieth and thirtieth infusions. There is a borderline significant change ($P>0.0500$) between the twentieth and thirtieth infusions. In Table 7, it is glaringly evident that there are no statistically significant changes in any of the combinations when the fasting serum calcium is 9.6-9.7 mg%. Finally, in Table 8, it is noteworthy that serum calcium declined significantly when the pretherapy findings were compared to the tenth, twentieth, and thirtieth infusions as well as between the tenth and thirtieth infusions. Hence, within the limits of this study, it seems clear that relatively high serum calcium levels will decline, relatively low may rise and those in the intermediate state will remain unchanged.

Table 6

significance of the difference of the means in those with the lowest (8.7-9.5 mg%) serum calcium levels

number of infusions	10	20	30
0	t=0.9812 P>0.5000	t=3.0283 P<0.0100*	t=1.0983 P>0.2000
10	-	t=2.0079 P>0.0500	t=0.6114 P>0.5000
20	-	-	t=2.2966 P<0.0500*

*statistically significant difference of the means

Table 7

significance of the difference of the means in those with the intermediate (9.6-9.7 mg%) serum calcium levels

number of infusions	10	20	30
0	t=0.4996 P>0.5000	t=0.6974 P>0.4000	t=0.5302 P>0.5000
10	-	t=0.1540 P>0.5000	t=1.0798 P>0.2000
20	-	-	t=1.0144 P>0.2000

Table 8

significance of the difference of the means in those with the highest (9.8-10.9 mg%) serum calcium levels

number of infusions	10	20	30
0	t=2.3532 P<0.0500*	t=3.8502 P<0.0010*	t=4.6725 P<0.0010*
10	-	t=1.3601 P>0.1000	t=2.7416 P<0.0250*
20	-	-	t=1.3519 P>0.1000

*statistically significant difference of the means

DISCUSSION

There are two items which warrant particular consideration. First, within the limits of this study, it appears that, in a group of subjects characterized by so-called normal fasting serum calcium level, EDTA chelation therapy plus multivitamin/trace mineral supplementation does not alter the blood serum calcium levels. Second, it is especially interesting that, within this so-called normal range, those individuals characterized by a high normal serum calcium level decline slightly, those with a relatively low so-called normal serum calcium level increase slightly, and those in the intermediate range remain unchanged (Figure 1).

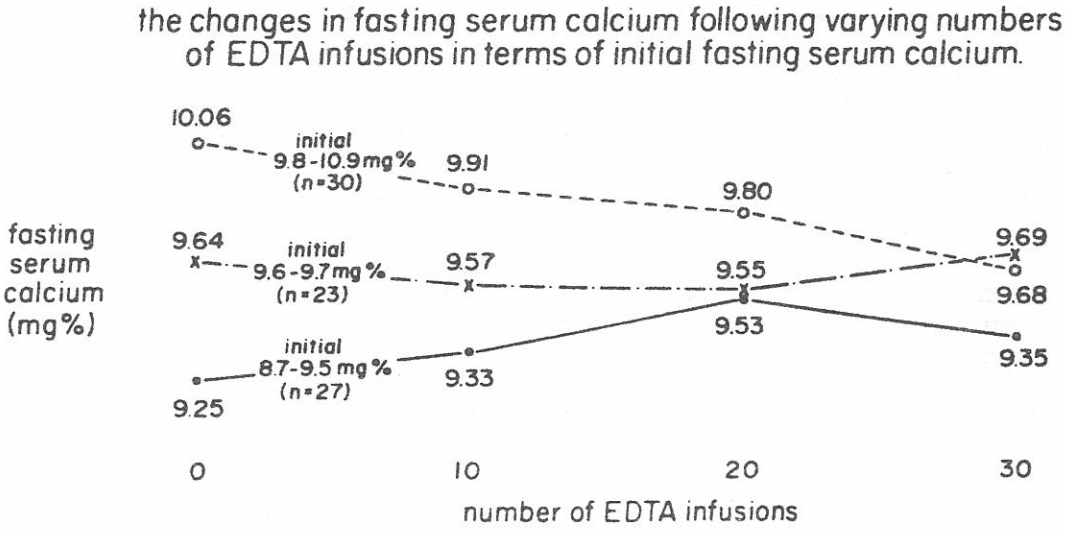

Figure 1

This takes on additional meaning when it is recognized that in fact, one of the treatments for hypercalcemia is EDTA chelation therapy as suggested by Barbara Lukert[7] in the November/December 1978 issue of Cancer Control for the Professional, as indicated in a report by Schneider and Sherwood[8] and by Spencer, Greenberg, Berger, Perrone and Laszlo[9].

REFERENCES

1. McDonagh, E. W., Rudolph, C. J., and Cheraskin, E. Serum cholesterol and the aging process. Med. Hypotheses 7: 685, 1981.

2. McDonagh, E. W., Rudolph, C. J., and Cheraskin, E. The effect of intravenous disodium ethylenediaminetetraacetic acid (EDTA) upon blood cholesterol in a private practice environment. J. Int. Acad. Prevent. Med. 7: 5, 1982.

3. McDonagh, E. W., Rudolph, C. J., and Cheraskin, E. The homeostatic effect of EDTA with supportive multivitamin-trace mineral supplementation upon high-density lipoproteins (HDL). J. Osteopath. Physicians & Surg. Calif. 8: 34, 1982.

4. McDonagh, E. W., Rudolph, C. J. and Cheraskin, E. The influence of EDTA salts plus multivitamin-trace mineral therapy upon total serum cholesterol/high-density lipoprotein cholesterol. Med. Hypotheses (in press)

5. McDonagh, E. W., Rudolph, C. J. and Cheraskin, E. The effect of EDTA salts plus multivitamin-trace mineral supplementation upon renal function: A study in serum creatinine. J Holistic Med. (in press)

6. Spencer, H., Vankinscott, V., Lewin, I. and Laszlo, D. Removal of calcium in man by ethylenediamine tetra-acetic acid. A metabolic study. J. Clin. Invest. 31: 1023, 1952.

7. Lukert, B. Update on hypercalcemia. Cancer Control for the Professional 5: 1978.

8. Schneider, A. B. and Sherwood, L. M. Calcium homeostasis and the pathogenesis and management of hypercalcemia disorders. Metabolism 23: 975, 1974.

9. Spencer, H., Greenberg, J., Berger, E., Perrone, M. and Laszlo, D. Studies on the effect of ethylenediamine-tetraacetic acid in hypercalcemia. J. Lab. and Clin. Med. 47: 29, 1956.