

The Effect of Ascorbic Acid Supplementation on Tooth Mobility

by

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LOOSENING OF THE TEETH has long been regarded as a symptom of scurvy.^{1,2} Westin's³ studies led him to conclude that the increased tooth mobility seen in scorbutic men is caused primarily by destruction of the supporting structures. The clinical and histologic findings of Orban et al⁴ in a case of scorbutic gingivitis are quite similar to those of Westin.

Waerhaug⁵ reported that the teeth of young primates, raised on an ascorbic acid deficient diet, became markedly loose. He found that the early stage of increased mobility was facilitated by destruction of the periodontal fibers while later extreme mobility was aided by resorption of the alveolar wall. The histopathologic picture of the periodontal structures in C-avitaminosis did not resemble that of periodontitis in man.

Other investigators have reported on the effect of vitamin C supplementation alone,⁶ and a combination of diet and nutritional supplementation,⁷ on the tooth mobility of subjects without overt clinical symptoms of ascorbic acid deficiency. The results from both studies suggested some improvement from the systemic therapy.

Crandon⁸ subsisted on a vitamin C free diet for six months. At the end of the experimental period, only a slight "bogginess" of the gingiva and interruptions in the lamina dura seen on roentgenograms were found. He made no reference to an increase in tooth mobility.

This paper reports on one part of a study designed to determine the effects of ascorbic acid supplementation

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on gingival health status, tooth mobility and levels of the vitamin in body fluids and tissue.

METHODS AND MATERIALS

Seventeen subjects, ranging in age from 21 to 55 years, participated in the study. The subjects were randomly placed in one of four groups. Group I (4 subjects) received a placebo for the 12-week experimental period. Group II (5 subjects) received a placebo for the first 6 weeks and received ascorbic acid supplementation for the second 6 weeks. Group III (4 subjects) received ascorbic acid supplementation for the first 6 weeks and placebo during the second 6 weeks. Group IV (4 subjects) received ascorbic acid supplementation for the entire 12-week period. The subjects received no dental treatment during the 30-day period prior to commencing the study and received no treatment during the experimental period.

The ascorbic acid supplement—300 mg—was contained in a sugar-coated, lemon-colored capsule. The placebo capsules were identical in all respects except they contained no ascorbic acid. The participants took one capsule daily with breakfast. The investigator (PPC) who assigned the subjects to the experimental groups dispensed the capsules. The investigators carrying out the clinical test procedures were unaware of the composition of the groups.

The mobility of six representative maxillary teeth (central and lateral incisor, cuspid, first and second premolar and first molar) was assessed on each subject on two pre-experimental days. It was also assessed at week 1, 2, 4, 6, 7, 8, 10 and 12, with assessments being made on two different days of weeks 6 and 12. The instrumentation and technic employed have been described in a previous report.⁹ Their periodontal status ranged from a high degree of health to advanced stages of disease, while their pre-experimental tooth mobility ranged from low normal to highly elevated values.

The data were examined in a number of ways in order to investigate the effect of ascorbic acid on tooth mobility. In examining just the first 6 weeks of data the subjects in Groups I and II were combined into a single placebo group of 9 subjects, and the subjects in Group III and IV into a single ascorbic acid group of 8 subjects. Groups I and IV provided a comparison of subjects on 12 weeks of placebo with subjects on 12 weeks of ascorbic acid. By looking at the last 6 weeks of data only, it could be determined whether the difference in tooth mobility between ascorbic acid and placebo subjects varied depending upon the treatment (placebo or ascorbic acid) for the first 6 weeks. Finally, since the subjects in Groups II and III were exposed to both placebo and ascorbic acid, it was possible to make a within person evaluation of the effects of ascorbic acid on tooth mobility.

Analysis of variance technics were used in the statistical analysis of these data. The 0.05 level of significance was used for all statistical tests.

RESULTS

Table 1 presents the tooth mobility means of subjects receiving ascorbic acid supplementation (Groups III and IV) or placebo (Groups I and II) for the first 6 weeks of the study. There was no statistically significant change in tooth mobility for the subjects on either regimen.

TABLE 1
Tooth Mobility Means of Subjects Receiving Ascorbic Acid Supplementation or Placebo for First Six Weeks*

Week	Ascorbic Acid Supplementation (9)	Placebo (8)
Pre-experimental†	.00345	.00313
1	.00351	.00307
2	.00347	.00313
4	.00350	.00327
6†	.00352	.00319
S. D.**	.000180	.000154

Figures in parentheses represent number of subjects.

*Tooth mobility measured in 0.0001 inch (10^{-4}).

†Mean of two assessments.

**Standard deviation to be used in comparing means in the same column, for example, to compare week #1 with week #6 in column one use (S. D.) $\sqrt{\frac{1}{9} + \frac{1}{18}}$

The tooth mobility means of subjects receiving ascorbic acid supplementation (Group IV) or placebo (Group I) for the 12-week period are given in Table 2. For the four subjects receiving ascorbic acid supplementation daily, the means ranged from a high of .00370 at the first experimental assessment to a low of .00344 at the eighth week. The decrease in mean mobility from the first assessment to the mean of the two assessments, carried out during the twelfth experimental week, was -.00010 inch and had no statistical significance. There was slightly more variability between weeks for the 4 subjects receiving the placebo. The change from the first experimental assessment to the mean of the two assessments carried out at week 12 (+.00013 inch) was not, however, statistically significant.

Table 3 presents the tooth mobility means of subjects receiving ascorbic acid supplementation (Groups II and IV) and placebo (Groups I and III) over the second 6 weeks of the study. The statistical analysis on these data indicated that the difference in tooth mobility between placebo and ascorbic acid subjects was not significant, either when the subjects had been on placebo for the previous 6 weeks or when they had been on the ascorbic acid supplement for the same time period.

Another way of looking at the data is presented in Table 4, which gives the time means for the two groups (II and III) that received both treatments. The analysis

of these data which provided a within-person comparison showed no statistically significant differences in tooth mobility which could be related to the effect of ascorbic acid.

TABLE 2
Tooth Mobility Means of Subjects Receiving Ascorbic Acid Supplementation or Placebo for 12 Weeks

Week	Ascorbic Acid Supplementation (4)	Placebo (4)
Pre-experimental*	.00365	.00291
1	.00370	.00280
2	.00368	.00294
4	.00365	.00302
6*	.00363	.00298
7	.00358	.00286
8	.00344	.00288
10	.00350	.00275
12*	.00356	.00293
S.D.	.000166	.000117

*Mean of two assessments.

TABLE 3
Tooth Mobility Means of Subjects Receiving Ascorbic Acid Supplementation or Placebo for Second Six Weeks

Week	Placebo*		Ascorbic Acid†	
	Group I Placebo (4)	Group II Ascorbic Acid Supplementation (5)	Group III Placebo (4)	Group IV Ascorbic Acid Supplementation (4)
7	.00286	.00320	.00335	.00358
8	.00288	.00313	.00326	.00344
10	.00275	.00340	.00336	.00350
12**	.00294	.00334	.00331	.00356
S.D.	.000117	.000166	.000168	.000166

*Subjects on placebo for first six weeks.

†Subjects on ascorbic acid supplementation for first six weeks.

**Mean of two assessments.

TABLE 4
Tooth Mobility Means During Ascorbic Acid and Placebo Treatment (for Two Groups Receiving Both Treatments)

Week	Group II Placebo (5)	Group III Ascorbic Acid (4)
Pre-experimental*	.00331	.00325
1	.00329	.00331
2	.00329	.00326
4	.00346	.00334
6*	.00335	.00340
Ascorbic Acid		Placebo
7	.00320	.00335
8	.00313	.00326
10	.00340	.00336
12*	.00334	.00331
S.D.	.000166	.000168

*Mean of two assessments.

DISCUSSION

The lack of response to the ascorbic acid supplementation could be due to a number of factors. Were the

participants in the groups receiving ascorbic acid faithful in taking the supplement? Data secured on whole blood, plasma, white blood cell and urine levels indicate the supplement was being taken.

A second point in question is the pre-experimental tooth mobility values of the participants. Each group contained subjects with elevated tooth mobility values. There was no decrease in the tooth mobility values of these individuals during the period of ascorbic acid supplementation.

One may ask if the supplement given was adequate. Would the results have been different if the supplement was increased to 500 or 1000 mg per day? An absolute answer cannot be given. However, the whole blood levels and urinary excretion rates indicate the subjects had achieved a satisfactory state of saturation.

The effectiveness of ascorbic acid supplementation in decreasing tooth mobility could be influenced by the pre-experimental ascorbic acid status of the subjects. If, prior to beginning the study, participants had subsisted on a vitamin C deficient diet long enough to induce tissue changes it is possible that tooth mobility values might decrease markedly with ascorbic acid supplementation. It is, however, difficult for an individual living on a normal dietary intake to avoid ingesting some ascorbic acid. Even if one abstains entirely from citrus and all other fruits he will secure a certain amount of ascorbic acid from vegetables and some animal products. The National Research Council has suggested a vitamin C intake of 75-100 mg per day for optimum human nutrition. This amount maintains tissue saturation and plasma vitamin C levels of 1 mg % without excessive loss in urine. However, it is probable that an intake of only 18-25 mg per day will prevent scurvy and maintain satisfactory health.¹⁰

SUMMARY

Seventeen subjects with wide variations in periodontal health and tooth mobility values were randomly placed in one of four experimental groups.

Group I (4 subjects) received a placebo for the 12-week experimental period. Group II (5 subjects) received a placebo for the first 6 weeks and ascorbic acid supplementation for the second 6 weeks. Group III (4 subjects) received ascorbic acid supplementation for the first 6 weeks and placebo during the second 6 weeks. Group IV (4 subjects) received ascorbic acid supplementation for the entire 12-week period. The ascorbic acid supplement (300 mg.) was taken daily with breakfast. Mobility of six teeth was assessed on each subject on two pre-experimental days and at week 1, 2, 4, 6, 7, 8, 10 and 12 with assessments being made on two different days of weeks 6 and 12. The ascorbic acid supplementation had no statistically significant ($P > .05$) effect on tooth mobility.

Under the conditions of this study in which the subjects did not have overt symptoms of ascorbic acid deficiency ascorbic acid supplementation did not decrease tooth mobility.

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