JOURNAL OF ORAL THERAPEUTICS AND PHARMACOLOGY
Vol. 3, No. 4

Printed in U.S.A.

PERIODONTAL PATHOSIS IN MAN: XVII. EFFECT OF GLUCOSE DRINKS UPON CLINICAL TOOTH MOBILITY

E. CHERASKIN,* W. M. RINGSDORF, JR.,** AND A. T. S. H. SETYAADMADJA***

Department of Oral Medicine, University of Alabama Medical Center, Birmingham, Alabama

INTRODUCTION

In 1965[1], a study was described showing an increase in clinical tooth mobility following the administration of a three-day *sucrose* regimen versus no supplementation. The present report is designed to summarize the earlier findings and to pursue the subject through a study of the clinical tooth mobility effects of *glucose* versus placebo supplementation.

METHODS AND RESULTS

Seventy-eight presumably healthy dental students participated in this experiment. Thirty-six subjects, as previously described[1], were randomly divided so that 22 were supplied with sucrose drinks and 14 served as controls. Of the remaining 42, 21 were given glucose solutions and 21 were administered a low-calorie drink prepared with artificial sweeteners.

Clinical tooth mobility, graded on a three-point system (Table I), was determined for the lower incisor teeth, and the mean clinical tooth mobility score (expressed to the first decimal) was derived for each subject.

At the initial visit, on Monday of the week, clinical tooth mobility was graded. The 22 individuals in the sucrose group were supplied with only 100 grams of sucrose (C.P.) in solution daily, beginning Monday afternoon and ending Friday morning. Each subject received a 50-gram drink at 7:45 A.M. and at 1:15 P.M.; the other 14 subjects served as the control group. The remaining 42 students were equally divided. Twenty-one of the individuals were provided with a 225-gram glucose supplement daily for the three days, each receiving a 75-gram glucose drink at 7:45 A.M., at 9:45 A.M., and 1:15 P.M. The remaining 21 individuals (placebo group) were administered, at the same time intervals, an indistinguishable placebo drink. Each subject was recalled on Friday of the same week, at which time clinical tooth mobility was regraded by the same examiner. Neither the examiner nor the student was aware of the nature of the supplement or the earlier findings.

Table II provides the raw data for the sucrose and the control group. Included are the case numbers, the initial and final mean clinical tooth mobility scores, the differences, and a qualitative statistical analysis of the initial versus the difference from the initial visit. It will be observed that the 32 per cent increase in clinical tooth mobility in the sucrose group is statistically significant ($P < 0.0005$), whereas the 8 per cent increase in the control group is not statistically significant ($P > 0.25$). The data are also viewed quantitatively. Seventy-seven per cent of the sucrose-supplemented group showed in

* Professor and Chairman, Department of Oral Medicine, University of Alabama Medical Center, Birmingham, Alabama

** Associate Professor, Department of Oral Medicine, University of Alabama Medical Center, Birmingham, Alabama

*** Junior Lecturer, University of Indonesia School of Dentistry; presently Fellow of the National Heart Institute, Public Health Service

creased scores, in contrast to 29 per cent with increase in the control subjects. The importance of this difference is underscored by a chi-square of 9.428 and a $P < 0.01$.

Table III provides the information for the glucose versus placebo supplemented groups. There is a statistically significant ($P < 0.0005$) mean percentage deepening of 65 per cent with glucose supplementation. Of particular interest is the statistically significant

Table 1

Clinical tooth mobility evaluation

0 = No clinical tooth mobility
1 = Clinical tooth mobility less than one millimeter
2 = Clinical tooth mobility more than one millimeter

Table 2

Clinical tooth mobility patterns with sucrose versus no supplementation

Case Numbers	Sucrose Initial Mean Scores	Group Final Mean Scores	Differences	Case Numbers	Control Initial Mean Scores	Group Final Mean Scores	Differences
3289	0.3	1.0	+0.7	3301	0.5	0.8	+0.3
3288	0.5	1.0	+0.5	3304	0.0	0.3	+0.3
3291	0.8	1.3	+0.5	3298	0.3	0.5	+0.2
3293	0.5	0.8	+0.3	3305	0.3	0.5	+0.2
3297	0.5	0.8	+0.3	3290	0.5	0.5	0.0
3299	1.0	1.3	+0.3	3296	0.3	0.3	0.0
3311	0.5	0.8	+0.3	3300	1.8	1.8	0.0
3312	0.5	0.8	+0.3	3307	0.3	0.3	0.0
3328	0.5	0.8	+0.3	3308	0.8	0.8	0.0
3292	1.0	1.2	+0.2	3309	0.5	0.5	0.0
3294	0.8	1.0	+0.2	3319	0.5	0.5	0.0
3295	0.8	1.0	+0.2	3321	0.5	0.5	0.0
3303	0.3	0.5	+0.2	3306	1.0	0.8	−0.2
3310	0.8	1.0	+0.2	3323	1.0	0.8	−0.2
3317	0.3	0.5	+0.2				
3329	0.8	1.0	+0.2				
3302	0.9	1.0	+0.1				
3316	1.8	1.8	0.0				
3318	0.5	0.5	0.0				
3320	0.5	0.5	0.0				
3322	1.0	1.0	0.0				
3324	1.0	1.0	0.0				
Means	0.71	0.94	+0.23		0.59	0.64	+0.04
Standard Deviations	0.34	0.31			0.32	0.38	
Percentage Changes	+32%				+8%		
P	*<0.0005**				>0.2500		
Increase	17 (77%)				4 (29%)		
No Change	5 (23%)				8 (57%)		
Decrease	0 (0%)				2 (14%)		
Total	22 (100%)				14 (100%)		

Chi-square = 9.428
$P < 0.01$*

* Statistically significant

Table 3

Tooth mobility patterns with glucose versus nonglucose supplementation

Case Numbers	Glucose Initial Mean Scores	Group Final Mean Scores	Differences	Case Numbers	Placebo Initial Mean Scores	Group Final Mean Scores	Differences
13168	0.5	1.3	+0.8	13175	0.3	0.8	+0.5
13172	0.0	0.8	+0.8	13186	0.5	0.8	+0.3
13192	0.3	1.0	+0.7	13184	0.8	1.0	+0.2
13187	0.8	1.3	+0.5	13158	0.3	0.3	0.0
13159	0.8	1.3	+0.5	13191	0.3	0.3	0.0
13195	0.5	1.0	+0.5	13169	0.5	0.5	0.0
13171	0.5	1.0	+0.5	13194	0.8	0.8	0.0
13173	0.8	1.3	+0.5	13198	0.5	0.5	0.0
13205	0.8	1.3	+0.5	13176	0.5	0.5	0.0
13181	0.8	1.3	+0.5	13199	1.0	1.0	0.0
13203	0.0	0.5	+0.5	13182	0.3	0.3	0.0
13183	0.8	1.3	+0.5	13170	0.8	0.8	0.0
13196	0.5	0.8	+0.3	13160	0.5	0.3	−0.2
13161	0.5	0.8	+0.3	13163	0.5	0.3	−0.2
13185	0.5	0.8	+0.3	13204	1.0	0.8	−0.2
13206	1.0	1.3	+0.3	13165	0.5	0.3	−0.2
13162	0.8	1.0	+0.2	13167	1.0	0.8	−0.2
13177	0.8	1.0	+0.2	13179	0.5	0.3	−0.2
13180	0.8	1.0	+0.2	13178	1.3	1.0	−0.3
13164	0.8	0.8	0.0	13193	0.8	0.5	−0.3
13166	1.0	1.0	0.0	13197	1.3	0.8	−0.5
Means	0.63	1.04	+0.41		0.67	0.60	−0.06
Standard Deviations	0.28	0.24			0.31	0.27	
Percentage Changes	+65%				−9%		
P	*<0.0005**				*<0.025**		
Increase	19 (90%)				3 (14%)		
No Change	2 (10%)				9 (43%)		
Decrease	0 (0%)				9 (43%)		
Total	21 (100%)				21 (100%)		

Chi-square = 25.090
P < *0.001**

* Statistically significant

(P < 0.025) reduction in mean clinical tooth mobility of 9 per cent with the artificially sweetened drink. Furthermore, the table shows that a chi-square analysis is also statistically significant (P < 0.001).

Discussion

There are a number of features about these studies which deserve re-emphasis. First, it is now reasonably well established that altering carbohydrate intake significantly changes clinical tooth mobility very quickly. In these studies, the evidence suggests that alterations may be observed within a three- to four-day period. The validity of the findings in this report is underscored by like observations utilizing other oral parameters of health and disease. Specifically, very similar results were obtained with gingival pathosis and sulcus depth when sucrose was added,[2, 3] and when glucose was supplemented.[4, 5]

Second, a summary of the findings (Fig. 1) shows quite clearly the consistency of the results. The placebo group receiving the nonglucose (low-calorie) supplement (represented by the horizontally hatched column) shows an increase in clinical tooth mobility score in 14 per cent, no change in 43 per cent, and a decrease in 43 per cent of the subjects. The control group (characterized by the crosshatching) shows essentially no change, as evidenced by an increase of 29 per cent, no change in 57 per cent, and a 14 per cent decrease. The sucrose group (described in the stippled column) shows a significant increase in clinical tooth mobility scores in 77 per cent, with only 23 per cent no change, and 0 per cent decrease. Finally, the glucose group (black column) shows a more significant increase in clinical tooth mobility score in 90 per cent of the subjects, with only 10 per cent no change, and 0 per cent decrease.

Table IV summarizes the mean percentage changes in clinical tooth mobility with the different dietary regimens. The only decrease in clinical tooth mobility scores (9 per cent) occurred in the placebo group (the individuals given the nonglucose supplement). This change is statistically significant ($P < 0.025$). No significant change is found in the control group (individuals with no supplementation). Significant increases in clinical tooth mobility are observed in the

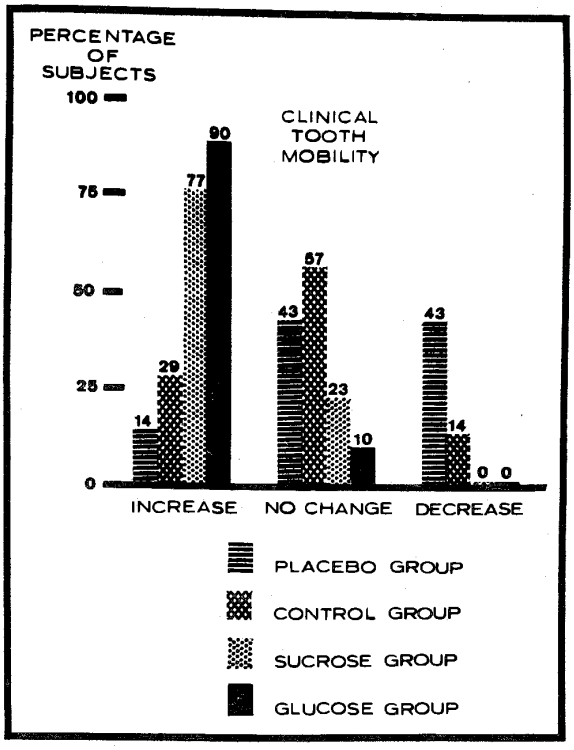

FIG. 1

Table 4

Mean percentage changes in clinical tooth mobility with different therapeutic regimens

Groups	Mean Percentage Change	Significance of the Difference of the Means
Placebo	−9%	$P < 0.025$*
Control	+8%	$P > 0.25$
Sucrose	+32%	$P < 0.0005$*
Glucose	+65%	$P < 0.0005$*

* Statistically significant

carbohydrate-supplemented groups. Greater deepening (65 per cent, $P < 0.0005$) is found in the glucose group (supplied with 225 grams of glucose daily) as compared to the sucrose group (those supplied with 100 grams of sucrose daily), which had an increase of 32 per cent ($P < 0.0005$).

While the evidence presented here suggests that refined carbohydrates may be the proximate cause, this in itself gives no inkling as to the mechanism. Surely, the addition of refined carbohydrate in the diet affects the control of carbohydrate homeostasis. Hence, the clinical tooth mobility findings may be due to some hormonal change. Also, there is suggestive evidence that the vitamin and trace mineral state varies directly with carbohydrate metabolism. There is, then, the possibility that the clinical tooth mobility findings may be associated with the various vitamins and particularly the vitamin B complex, as well as certain trace minerals. It is a clinical fact that the intake of carbohydrates and proteins is almost inversely related. In other words, the individual who consumes large amounts of carbohydrate frequently does not ingest much protein. Therefore, the possibility exists that protein metabolism is modified when refined carbohydrate foodstuffs are added.

Summary

1. Seventy-eight presumably healthy dental students participated in this study to demonstrate the effect of refined carbohydrate supplementation upon clinical tooth mobility.

2. The only decrease in clinical tooth mobility was found in the group given nonglucose drinks (artificially sweetened solutions). No change was observed when nothing was done (control group). Increases in clinical tooth mobility were observed when 100 grams of sucrose were administered on a daily basis, but the change was not as great as when 225 grams of glucose supplement were administered.

REFERENCES

1. Cheraskin, E., Ringsdorf, W. M., Jr., and Setyaadmadja, A. T. S. H.: Periodontal pathosis in man: XIV. Effect of sucrose drinks upon clinical tooth mobility. J. Dent. Med. *20:* 91, 1965.
2. Cheraskin, E., Ringsdorf, W. M., Jr., and Setyaadmadja, A. T. S. H.: Periodontal pathosis in man: XII. Effect of sucrose drinks upon gingival state. Pakistan Dent. Rev. *15:* 143, 1965.

3. Cheraskin, E., Ringsdorf, W. M., Jr., and Setyaadmadja, A. T. S. H.: Periodontal pathosis in man: XIII. Effect of sucrose drinks upon sulcus depth. J. Oral Therap. & Pharmacol. *2:* 195, 1965.
4. Cheraskin, E., Ringsdorf, W. M., Jr., Setyaadmadja, A. T. S. H., Ginn, D. S., and Medford, F. H.: Periodontal pathosis in man: XV. Effect of glucose drinks upon gingival state. J. Oral Med. *21:* 59, 1966.
5. Cheraskin, E., Ringsdorf, W. M., Jr., and Setyaadmadja, A. T. S. H.: Periodontal pathosis in man: XVI. Effect of glucose drinks upon sulcus depth. J. Oral Therap. & Pharmacol. *3:* 177, 1966.