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THE EFFECTS OF THE RUBBER TOOTH POSITIONER ON THE GINGIVA OF ORTHODONTIC PATIENTS DURING RETENTION

by

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Submitted in partial fullfillment of the requirements

for the degree of Master of Science

Department of Orthodontics

CASE WESTERN RESERVE UNIVERSITY

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THE EFFECTS OF THE RUBBER TOOTH POSITIONER ON THE GINGIVA OF ORTHODONTIC PATIENTS DURING RETENTION

Abstract

by

Andrew Richard Bekeny, B.S., D.D.S.

It has been a common clinical impression that the rubber tooth positioner used as a retention appliance favorably affects the gingiva. The purpose of this thesis is to objectively evaluate the effects of the rubber tooth positioner upon the gingiva, when the positioner is used as a post-orthodontic treatment retention appliance.

A study was performed on a random group of thirteen patients who have completed fixed orthodontic appliance therapy at Case Western Reserve University, School of Dentistry, Department of Graduate Orthodontics. Each of these patients was treated with a tooth positioner constructed by T. P. Laboratories, Inc. Each tooth positioner was then modified by having the maxillary right and mandibular left tissue bearing portion of each positioner removed. The gin-

giva covered by the rubber tooth positioner was compared with the uncovered area. The study ran for eight weeks and data was collected at 0, 1, 2, 4, and 8 weeks.

The following is a list of conclusions that have evolved from this study:

1. The tooth positioner with tissue coverage did not significantly enhance the rate and degree of tissue recovery following orthodontic treatment.

2. The tooth positioner with tissue coverage was not detrimental and did not hinder the recovery of the gingival tissue when used as a retention appliance.

3. There was no difference in the rate or degree of recovery of the gingival tissue in the covered or uncovered quadrants.

4. Young, healthy patients in the age group of 12-17 years of age have a very great inherent ability to heal, signified by the rapid rate and degree of recovery of the gingival tissues following removal of orthodontic appliances.

DEDICATION

To my loving wife, Ilze

for her encouragement, patience, and perseverance

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INTRODUCTION

The health of the periodontium is of great concern to the dental profession. Presently we realize that unless we can maintain a healthy periodontium that all other dental efforts will have been done in vain. Therefore, one of the main objectives of orthodontic treatment is to maintain the health of the periodontium.

Following orthodontic treatment, the status of the periodontium will vary from patient to patient, and from area to area within the same mouth. This condition may vary from a minor localized gingivitis, which usually resolves itself in a few days after the appliances are removed, to a severe periodontitis. Periodontal pathology usually is associated with pocket formation, irreversible gingival hypertrophy, and crevicular ulceration with connective tissue invasion.

Some factors that might adversely affect the periodontium during treatment are the patient's oral hygiene, poorly fabricated appliances, systemic

health of the patient, pre-pubertal and post-pubertal hormone changes, or merely the application of the force used to move the teeth.

Since we, as orthodontists, are concerned with the periodontium, this study was undertaken to determine the effect of a retention appliance, the tooth positioner on the periodontium.

A rubber tooth positioner is a one piece, resilient appliance that fills the freeway space and covers the clinical crowns of the teeth and a portion of the gingiva, both buccal and lingual. The positioner has been used in orthodontics for twenty-five years as a post-treatment functional retention appliance with the aim of perfecting the relationships of the teeth to a more refined state.

In the clinical practice of orthodontics, there has been an impression that the tooth positioner favorably affects the gingival condition post-orthodontically. In the field of periodontics, the tooth positioner or positive pressure appliance, as they prefer to call it, has been used to successfully treat dilantin gingival hyperplasia and gingival hemangioma (1,2,6). Many dental practitioners feel that the tooth positioner can massage and soothe the

the irritated gingival tissue and thus increase the circulation of the underlying capillaries to bring fresh blood to the entire periodontium (5). Therefore, a clinical study has been designed to evaluate the effects of the rubber tooth positioner upon the gingiva, when the positioner is used as a post-orthodontic treatment retention appliance. If this study substantiates this hypothesis, the tooth positioner could be used not only to retain and perfect tooth position, but to improve gingival health.

The appearance of the gingiva is one of the best indices of the health status of the periodontal tissues (4). The initial changes in inflammatory periodontal diseases are produced in the epithelium of the sulcus and/or col. These changes are evident clinically by a change in the surface characteristics, contour, and general appearance of the gingiva. Therefore, the clinical appearance of the gingival tissue is carefully noted and rated through the course of the study.

REVIEW OF THE LITERATURE

It has only been in the last twenty years that the health of the periodontium has been of general concern to the dental profession. Prior to that time the profession focused its attention on the elimination of caries and acute infection of the oral cavity, restoration of teeth, replacement of teeth, and the correction of malocclusion. Little or no effort was made to establish and/or maintain a healthy periodontium, and many dental treatments were iatrogenic to the periodontium. The orthodontist's main objective was to align all the teeth in a good occlusion in the hope that they would not relapse.

As early as 1940 investigators like Skillen began to histologically study the effects of orthodontic appliances. Skillen (24) found that an inflammatory change was produced in the gingiva by orthodontic bands. He also stated that this could extend into the underlying tissues and cause resorption of bone.

Reitan (20) histologically studied the tissue rearrangement during the retention of orthodontically rotated teeth and found that stretching of the free

gingival fibers would cause displacement of fibrous structures. Reitan (21) found that contraction of fibrous structures after tooth movement must be considered a normal reaction. After a tipping movement this contraction may produce compressed cell-free areas on the traction side. The ensuing undermining bone resorption may increase the relapse tendency. The mechanics involved in a bodily movement tend to favor a direct bone resorption on the pressure side. Following rotation and tension the displacement of supra-alveolar structures may persist even after retention. Thus, early treatment and/or overrotation may, to a large extent, prevent relapse tendencies.

Fish (8) showed that incipient periodontal disease manifested itself in the gingiva prior to invading deeper structures. He also demonstrated that the col area was not covered by well keratinized epithelium but by the vestigial remnants of the epithelial attachment, and that this was ineffective protection.

Burket (4) stated that a careful examination of the gingival tissues, oral mucosa, and dorsum of the tongue is of great importance to both the orthodontist and the periodontist. Changes in the contour, color,

or surface characteristics of these structures may be the first indication of systemic disease states or of an inadequate response of these tissues to the oral environmental factors. The gingiva and the periodontal ligament have a similar blood supply or source of nutrients and a somewhat comparable environment; hence, the appearance of the gingiva is one of the best indices of the health status of the periodontal ligament. He went on to say that school children in Philadelphia, Pennsylvania had a 30 per cent incidence of gingivitis and that in Chicago this incidence was 60 per cent.

With the knowledge that orthodontic treatment affects the periodontium to various degrees and that incipient periodontal disease manifests itself in the gingiva, an endeavor was begun to find a way to improve the gingiva following orthodontic treatment. A search of the periodontal literature revealed the use of certain positive pressure appliances in the treatment of dilantin gingival hyperplasia and gingival hemangioma (1,2,6).

Baer, Stanwich and Lewis (2) treated a gingival hemangioma associated with Struge-Weber Syndrome in a ten year old female with the use of a clear poly-

styrene positive pressure appliance lined with rubber silicone (P59). The tissue was normal in one month and continued to be normal after eighteen months. All other previous approaches had failed.

Davis, Baer and Palmer (6) studied the effects of positive pressure appliances on patients with dilantin gingival hyperplasia following gingivectomy. Eighteen patients were placed in two groups, an experimental and a control. Two types of appliances were used, a natural rubber appliance and a chrome-cobalt frame lined with silicone. Seven out of nine in the experimental group had no reoccurrence. Five out of nine had a reoccurrence in the control group.

Babcock (1) treated twelve chronic epileptics with positive pressure appliances. It was found that appliances made of hard natural rubber have successfully prevented the regrowth of gingival tissue following gingivectomy.

The natural rubber positive pressure appliance used by some of the above investigators is very similar to the natural rubber tooth positioner first described by Dr. H. D. Kesling (13) in 1945. It is used in orthodontics to perfect tooth position following orthodontic treatment. The rubber tooth

positioner is a one piece, resilient appliance that fills the freeway space and covers the clinical crowns of the teeth and a portion of the gingiva, both buccal and lingual.

Elsasser (7) in his study on the uses of the tooth positioner found that six to eight weeks of positioner wear was adequate for tooth position perfection and then the teeth settle and reach their own physiologic position (6).

Kesling (14) stated:

> "The normal proliferation of the gingiva that accompanies fixed appliance therapy is not a contraindication for a positioner but rather an indication for the benefit of the positioner's gingival massage. The gingiva is carefully recontoured when repositioning the teeth on the set-up, attention being made of the normal gingival margin."
>
> "The positioner's benefit as a method of gingival massage is evident in its effect upon the proliferation of the gingiva due to the lack of normal therapy. It would, therefore, seem evident that a positioner type appliance could be beneficial to non-orthodontic patients requiring stimulation of the gingiva. In cases such as this, the set-up would consist not of reorienting the teeth but rather a careful recontouring of the gingiva. Again, as in cases of extreme tooth changes, it may be advisable to construct more than one "Set-up and Positioner" to achieve the results desired."

Cottingham (5) discussed the use of the gnathologic clear plastic positioner. He has used the appliance for twenty-five years in his practice. He feels that as a culmination of mechanical appliances, the positioner will close band spaces, stimulate circulation in the gingiva, and place each tooth where it will be in optimum function with its opponents, the muscles of mastication, and the temporomandibular joints.

STATEMENT OF THE PROBLEM

It has been a common clinical impression that the rubber tooth positioner used as a retention appliance favorably affects the gingiva. The purpose of this thesis is to objectively evaluate the effects of the rubber tooth positioner upon the gingiva, when the positioner is used as a post-orthodontic treatment retention appliance.

INVESTIGATIVE METHODS AND MATERIALS UTILIZED

Procurement of Sample:

The patients used in this study were treated at Case Western Reserve University, School of Dentistry, Department of Graduate Orthodontics. Patients who had completed fixed appliance orthodontic treatment were approached, and generally told about the tooth positioner as a retention appliance. If the patient was not interested or felt that he could not cooperate, he was not involved in this study. A letter was then sent to the parents of the patients under consideration, explaining the tooth positioner. Details of the project were kept from the patients and the parents in an attempt to reduce the bias inherent in this type of clinical study. From the group of patients with parental consent, thirteen patients were randomly selected (seven females and six males).

Project Appliance:

The positioners used in the study were made of black natural rubber. The positioners and diagnostic

set-ups were constructed in the usual manner by T. P. Laboratories, Inc. T. P. Laboratories, Inc., Laport, Indiana donated the tooth positioners and diagnostic set-ups for this project. Prior to their insertion, the tooth positioners were modified (See Figure 1) for the study. The modification consisted of the removal of the maxillary right tissue bearing portion of the positioner and the mandibular left tissue bearing portion. The gross removal of the tissue bearing flange of the tooth positioner was accomplished with small curved scissors (Crown and Bridge contouring scissors). The final festooning around the tooth stalls was done with a two inch medium grit carborundum wheel mounted on a dental lathe. The positioner was then polished to a smooth finish with a four inch rag wheel rotating at high speed. The festooning around the tooth stalls is an important aspect of the modification because the force from the activated rubber positioner is delivered through the clinical crown of the tooth. Therefore, if the tooth stalls were deminished in size, less of the clinical crown would be influenced by the force from the activated rubber.

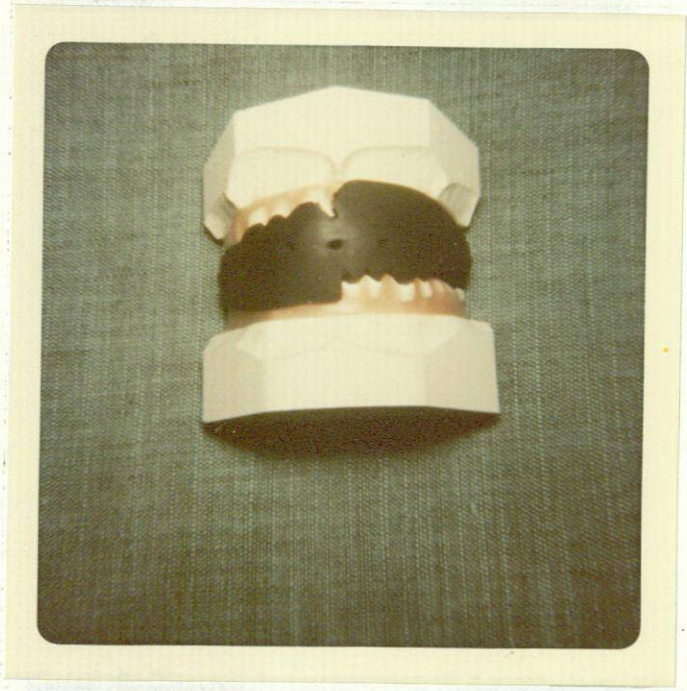


Fig. 1a - Modified tooth positioner

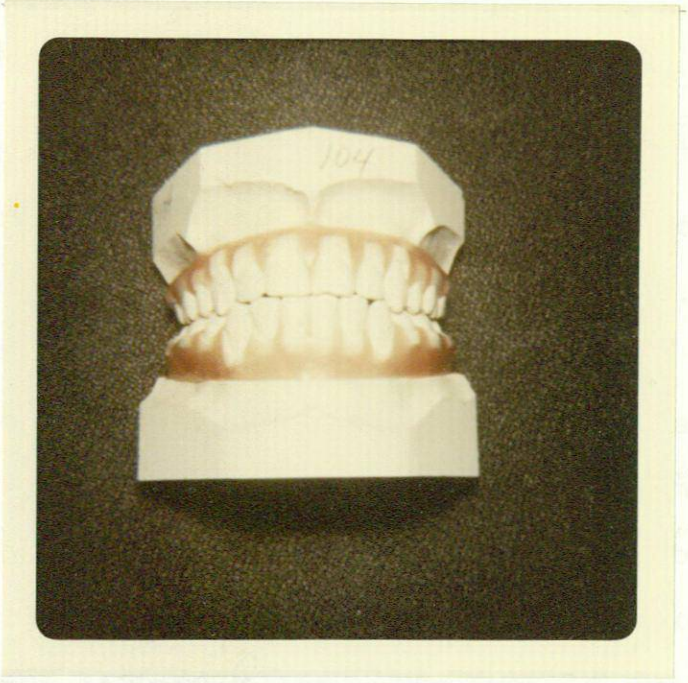


Fig. 1b - Set-up models

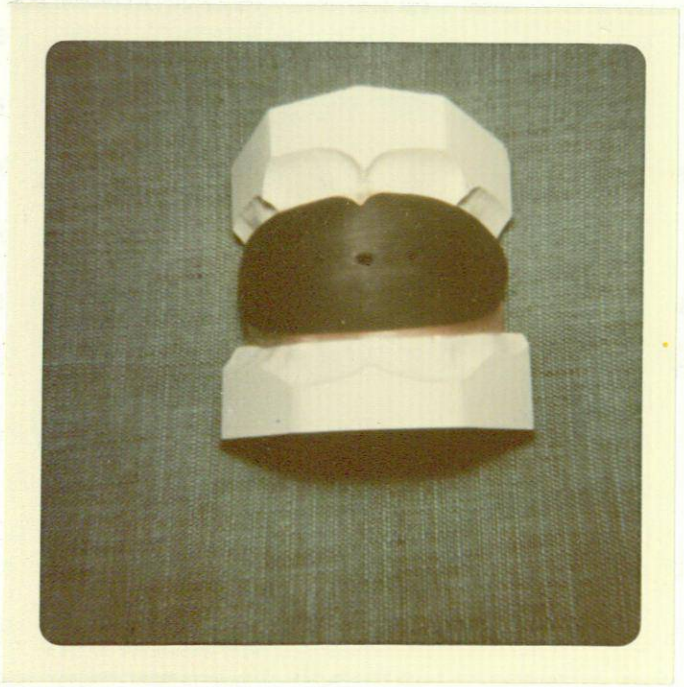


Fig. 1c - Tooth positioner

Project Flow:

Appointment 1:

At the first visit, each patient was instructed in the use and care of the tooth positioner. This was a blind study and every effort was made to keep all pertinent information from biasing the examiner. Each patient was assigned a code number from a master sheet and from now on was referred to only by number. A comprehensive medical history was then taken of each patient (Appendix II). The type of orthodontic case, type of treatment performed, length of treatment time, age, sex, and race of each patient was recorded. At this time the main arch wires were removed. Maxillary, mandibular alginate impressions, and a wax bite were taken of each patient. The main arch wires were then replaced. The impressions were poured in cast stone, and the models trimmed with the centric wax bite in place. These models of the patient's teeth with the bands on were then sent with the patient's pre-treatment models to the T. P. Laboratories, Inc. for the construction of a diagnostic set-up and immediate rubber tooth positioner.

Appointment 2:

Data was recorded by a clinical evaluation of the patient's gingiva and oral hygiene by a qualified and trained examiner (Thomas J. De Marco, B.S., D.M.D., Ph.D., Chairman of the Division of Undergraduate Periodontics, School of Dentistry, Case Western Reserve University). The criteria and techniques of the Gingival (15) and the Oral Hygiene (9,10,11,12) Indices used in this study can be found in AppendicesIII and IV. All four quadrants were graded excluding the third molars. Since this was a blind study, the examiner did not know what portion of the tooth positioner was modified. Frontal, right and left lateral intraoral photographs were taken with Kodachrome II film. The fixed orthodontic appliance was then removed and the teeth thoroughly cleaned. The positioner was then adjusted to the patient. The patient was told to wear the positioner four hours during the day and all night, exercising with it in the conventional manner. The patients kept record of how many hours the positioner was actually worn. The patient was given an instructive pamphlet about the tooth positioner issued by T. P. Laboratories, Inc.

Appointments 3, 4, 5, 6:

The Gingival and Oral Hygiene Indices were scored, and the intraoral photographs taken. Data was collected at time one (T-1) and at 1, 2, 4, and at 8 weeks.

RESULTS

The experimental data in this study consisted of approximately 13,000 separate readings. The mean of the Gingival Index and Oral Hygiene Index was calculated for each quadrant and combined for all thirteen experimental subjects. Statistical analysis was carried out by the use of the t- Test described by Snedecor (25). To insure that an adequate base line was established from which to make comparisons, the mean values for each quadrant at time one (T 1) were computed and compared with one another. Comparisons were made between the maxillary and mandibular, right and left quadrants, and contra-lateral quadrants. All these comparisons showed that there were no significant differences between any of the quadrants. Therefore, the control values (time T-1) could be used as a valid point of comparison.

Since an individual's oral hygiene can and does affect the health of the gingival tissue, it was necessary to evaluate the oral hygiene throughout the study. The Gingival Index was scored at each time interval.

Since it was not possible to accurately evaluate the oral hygiene at time one because the orthodontic bands were still in place, no Oral Hygiene Index was made at this time. Therefore, time two was used as a base line for oral hygiene comparisons. As can be seen in Figures 4, 5, 6, the Oral Hygiene Index remained relatively constant throughout the experimental time except for a significant increase in the Oral Hygiene Index in the last four weeks. This decreased oral hygiene was not associated with an increase in the Gingival Index scoring and accordingly, did not bias the results. Since the Oral Hygiene Index did remain constant throughout the study, it was not considered as an important variable in accounting for any tissue changes which might otherwise be attributed to the tooth positioner appliance. The Gingival scores revealed that there was a significant improvement in the health of the gingival tissue during the first week interval. This improved gingival health was noted in both the covered and uncovered quadrants. The covered quadrants showed an increase in gingival health of approximately 51 per cent over the control value ($p < .0005$), while the uncovered quadrants showed an improvement of 47 per cent over the control value ($p < .0005$).

During the second week interval there was a significant change in the health of the tissue of the covered quadrant ($p < .05$), while the health of the uncovered gingival tissue did not increase significantly. However, the percentage changes in the health of the covered and uncovered tissue at the second week interval were 30 per cent for the covered and 27 per cent for the uncovered; the former being significant. During the third and fourth intervals there was a slight tendency for improvement in the health of the tissue, but all these changes were insignificant. The mean values for the covered and uncovered quadrants were almost identical throughout these intervals. Thus, one could not ascribe any difference to having the tissue covered or uncovered. This data is summarized in graphic form in Figures 2, 3, 4, 5, 6 and in tabular form in Figure 7.

GINGIVAL INDEX OF COVERED GINGIVA

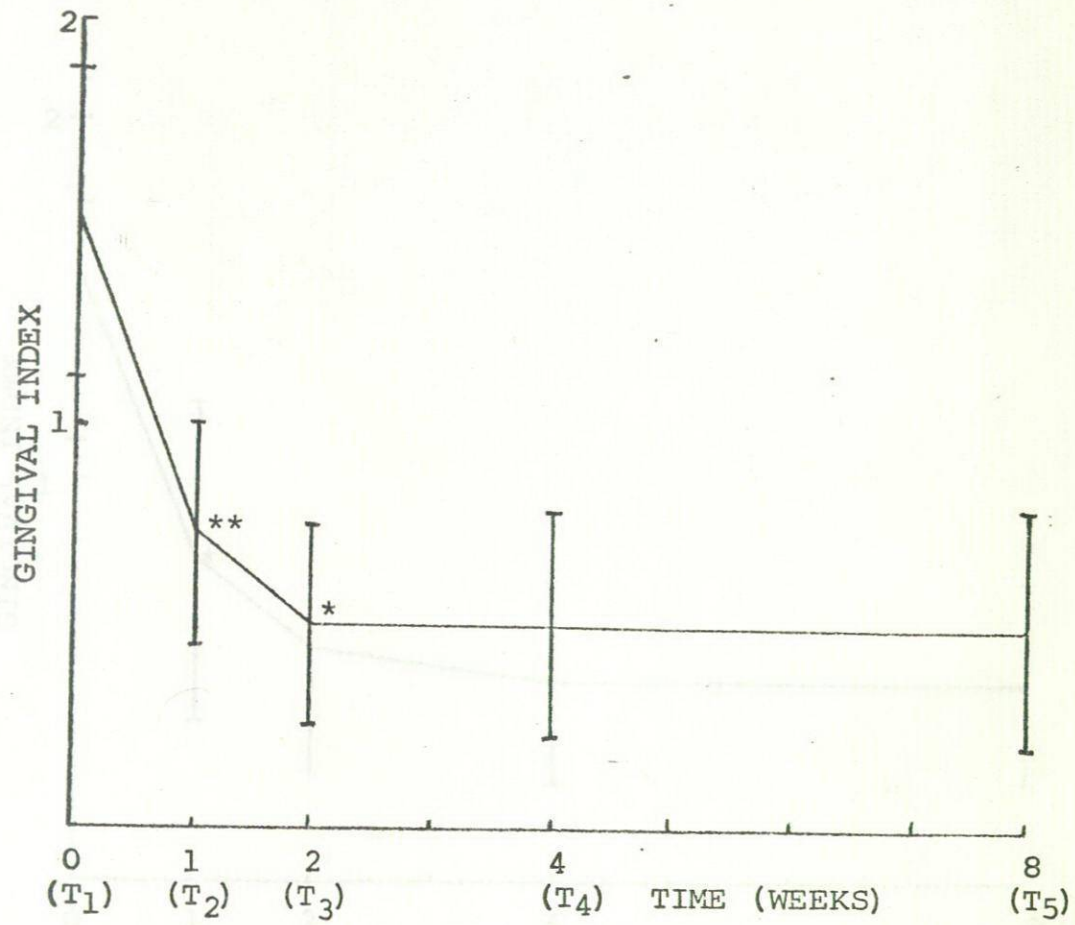


Fig. 2 This graph illustrates the health of the gingival tissue during an eight week interval with the use of a tooth positioner with tissue coverage. All values are mean values. The vertical lines represent the standard deviations of these means.

** Significantly different from time one (T1) at $p < .0005$

* Significantly different from time two (T2) at $p < .05$

GINGIVAL INDEX OF UNCOVERED GINGIVA

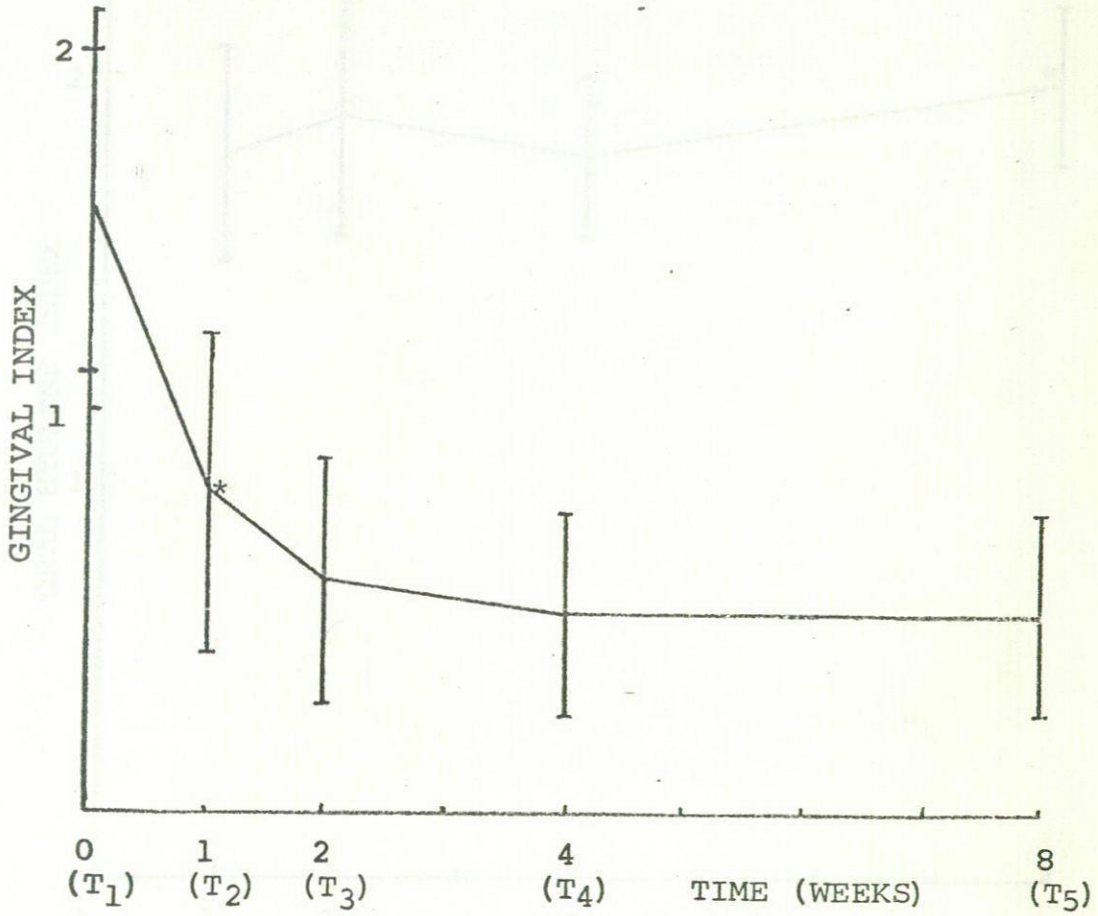


Fig. 3 This graph illustrates the health of the gingival tissue during an eight week interval with the use of a tooth positioner without tissue coverage. All values are mean values. The vertical lines represent the standard deviations of these means.

* Significantly different from time one (T1) at $p < .0005$

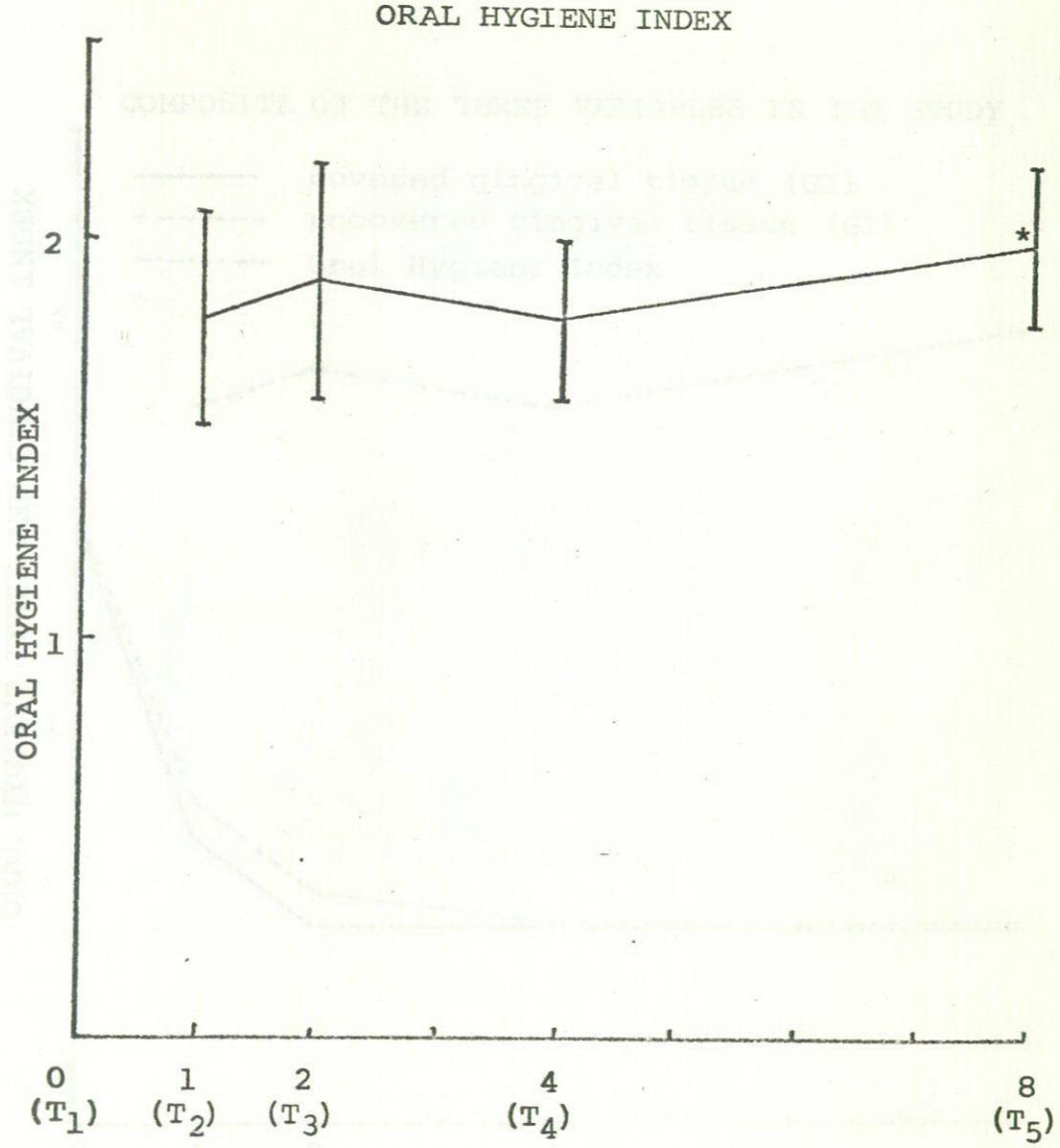


Fig. 4 This graph shows the variation in the oral hygiene during the eight week interval of the study. All values are mean values. The vertical lines represent the standard deviations of these means.

* Significantly different from time four (T4) at $p < .05$

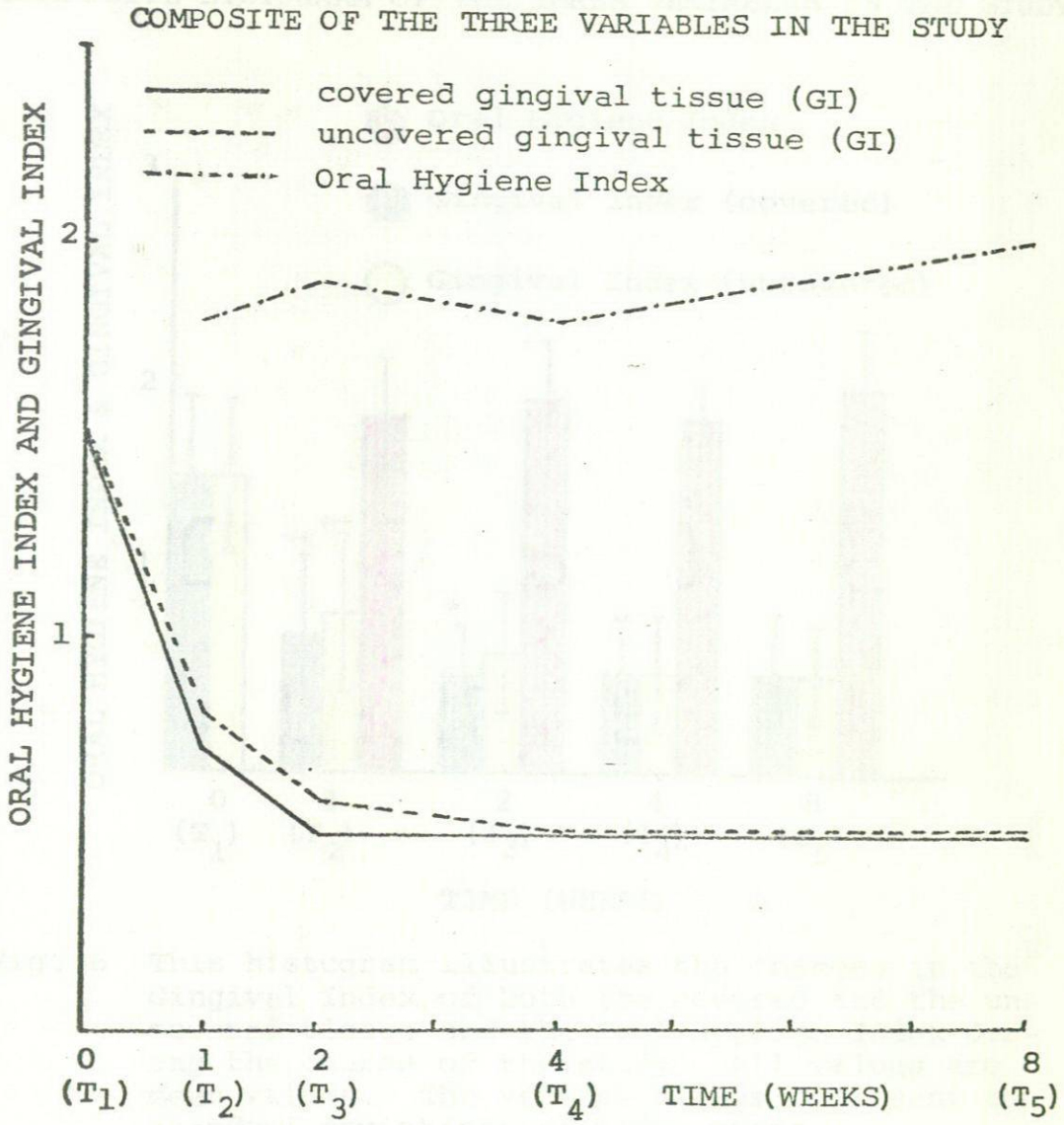


Fig. 5 This graph is a composite of Figures 2,3,4 and illustrates the relationship between the oral hygiene (OHI) and the health of the covered and uncovered gingival tissue (GI). All values are mean values.

COMPOSITE HISTOGRAM OF THE THREE VARIABLES IN THE STUDY

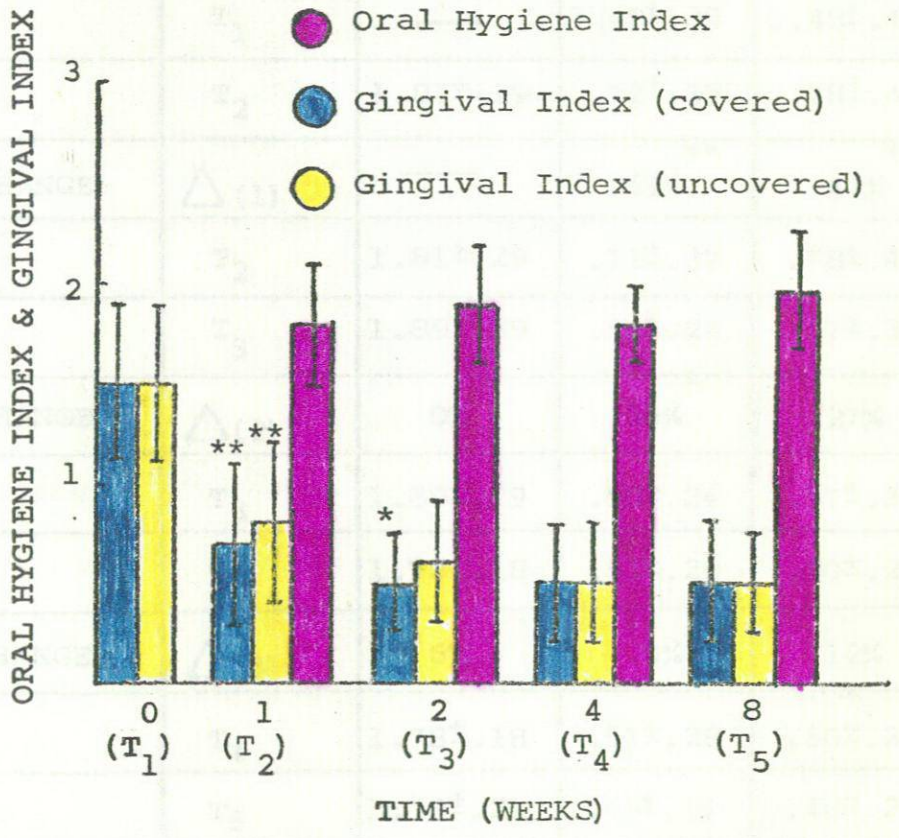


Fig. 6 This histogram illustrates the changes in the Gingival Index of both the covered and the uncovered tissue and the Oral Hygiene Index during the course of the study. All values are mean values. The vertical lines represent the standard deviations of these means.

** Significantly different from time one (T1) at $p < .0005$

* Significantly different from time two (T2) at $p < .05$

MEAN, STANDARD DEVIATION, AND PERCENT CHANGE OF THE ORAL HYGIENE INDEX AND THE GINGIVAL INDEX

	TIME	OHI	GI (covered)	GI (uncovered)
	T_1	——	$1.48 \pm .38$	$1.48 \pm .41$
	T_2	$1.81 \pm .29$	$.72 \pm .37$	$.78 \pm .41$
% CHANGE	$\Delta_{(1)}$	——	51%**	47%**
	T_2	$1.81 \pm .29$	$.72 \pm .37$	$.78 \pm .41$
	T_3	$1.89 \pm .29$	$.50 \pm .24$	$.57 \pm .31$
% CHANGE	$\Delta_{(2)}$	0%	30%*	27%
	T_3	$1.89 \pm .29$	$.50 \pm .24$	$.57 \pm .31$
	T_4	$1.78 \pm .18$	$.51 \pm .28$	$.50 \pm .26$
% CHANGE	$\Delta_{(3)}$	6%	0%	12%
	T_4	$1.78 \pm .18$	$.51 \pm .28$	$.50 \pm .26$
	T_5	$1.98 \pm .21$	$.49 \pm .30$	$.48 \pm .25$
% CHANGE	$\Delta_{(4)}$	-11%***	4%	4%

Fig. 7 This table shows the mean value, the standard deviation, and the percent change of the Oral Hygiene Index and the Gingival Index with both covered and uncovered tissue during an eight week interval.

* Significant difference at $p < .05$
** Significant difference at $p < .0005$
*** Decrease in the oral hygiene

DISCUSSION

The purpose of this study was to evaluate the effects of the rubber tooth positioner on gingival health. It was shown that there was no significant difference when the tissue was covered or uncovered and that the tissue had the same potential to heal under either situation. These results do not agree with the findings of Babcock (1) and Baer (2) obtained in studies with gingival hyperplasia and gingival hemangioma, respectively. Kesling (14) has recommended that the tooth positioner be used in periodontal patients to enhance the health of the periodontium. This study would not appear to substantiate this recommendation. Since this study was performed on young healthy patients in the anabolic phase of their lives, one cannot predict that these results would be universally applicable in the use of the tooth positioner.

The photographs in Figures 8 through 20 serve to illustrate the dramatic change in the health of the tissue following the removal of the bands. It would

seem obvious that it would be difficult for any appliance to enhance the ability of this tissue to heal since it already possesses such a high affinity for healing. Before one can draw any valid conclusions concerning the affect of this appliance on the tissue of any other group of patients (i.e., chronic periodontal diseases, hyperplastic tissue, etc.) further studies should be carried out. This study has shown conclusively that the tooth positioner does not enhance, or more importantly, impede the ability of the gingival tissue to heal following orthodontic therapy.

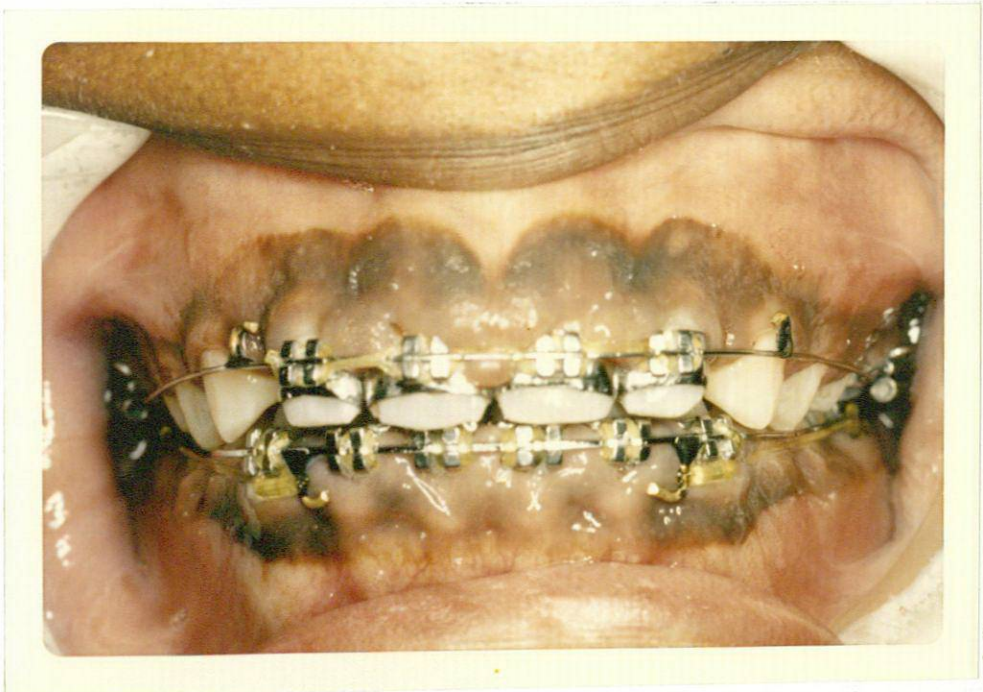


Fig. 8a-Time one (T1) orthodontic appliance in place



Fig. 8b-Time one (T1) orthodontic appliance removed



Fig. 8c - Time two (T2) after one week



Fig. 8d - Time three (T3) after two weeks



Fig. 8e-Time four (T4) after four weeks

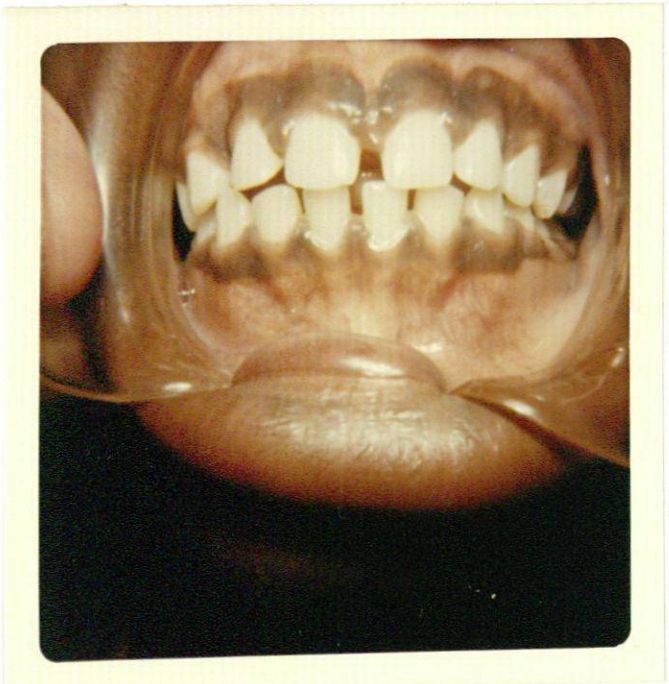


Fig. 8f-Time five (T5) after eight weeks



Fig. 9a-Time one (T1) orthodontic appliance in place



Fig. 9b-Time one (T1) orthodontic appliance removed



Fig. 9c-Time two (T2) after one week

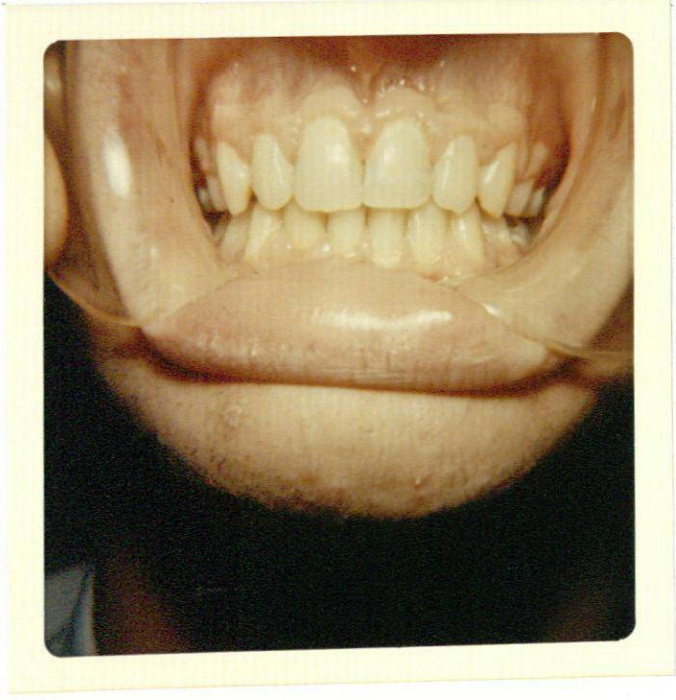


Fig. 9d- Time five (T5) after eight weeks

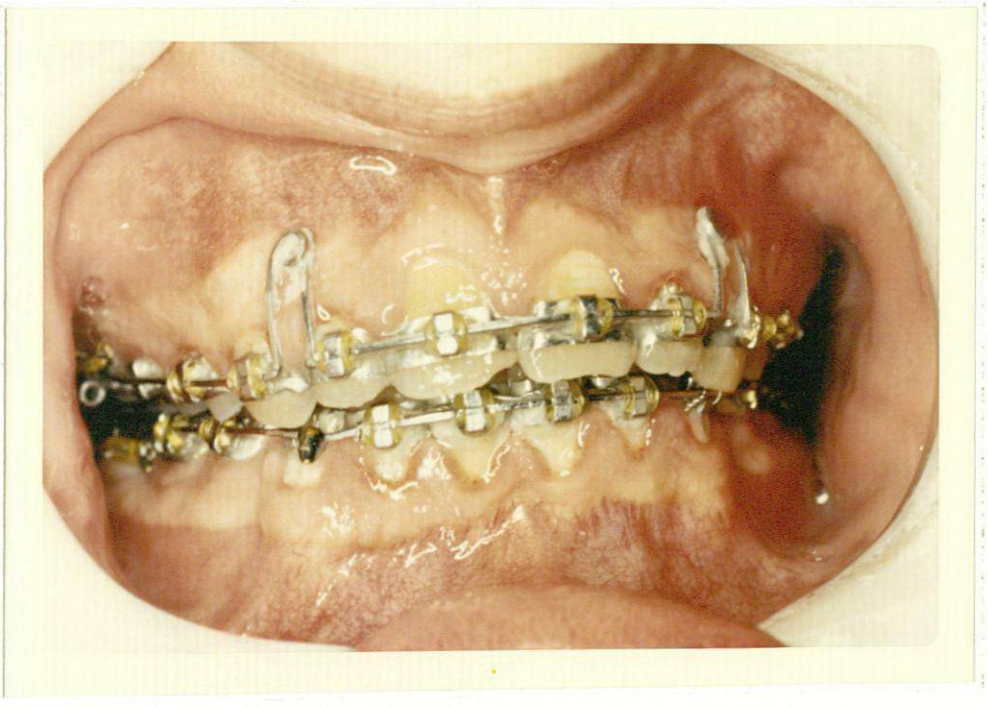


Fig. 10a-Time one (T1) orthodontic appliance in place



Fig. 10b-Time two (T2) after one week

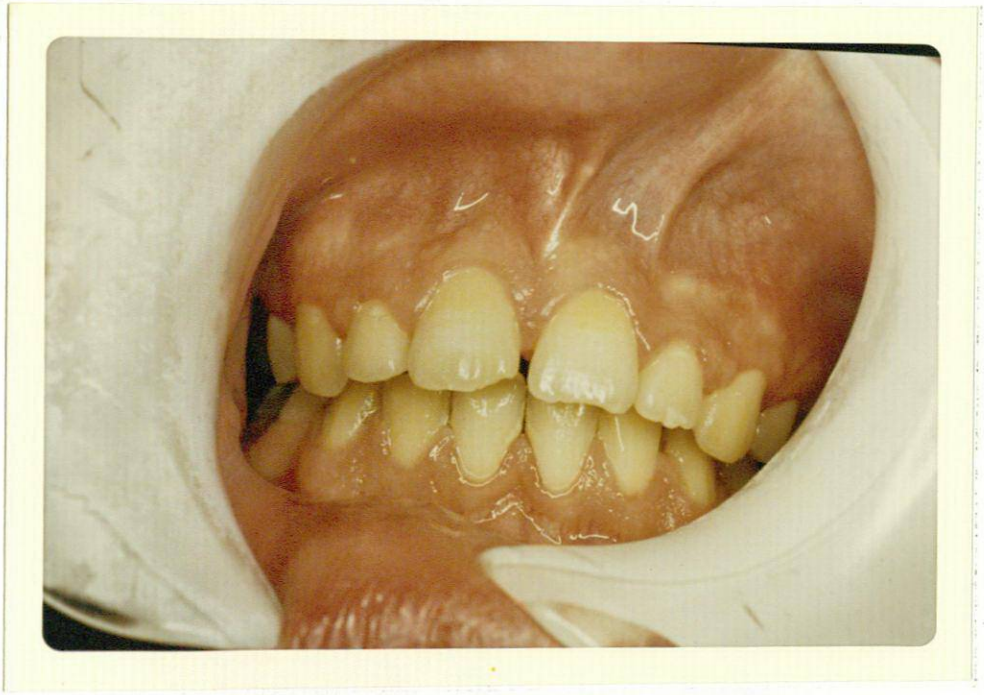


Fig. 10c-Time three (T3) after two weeks



Fig. 10d-Time four (T4) after four weeks

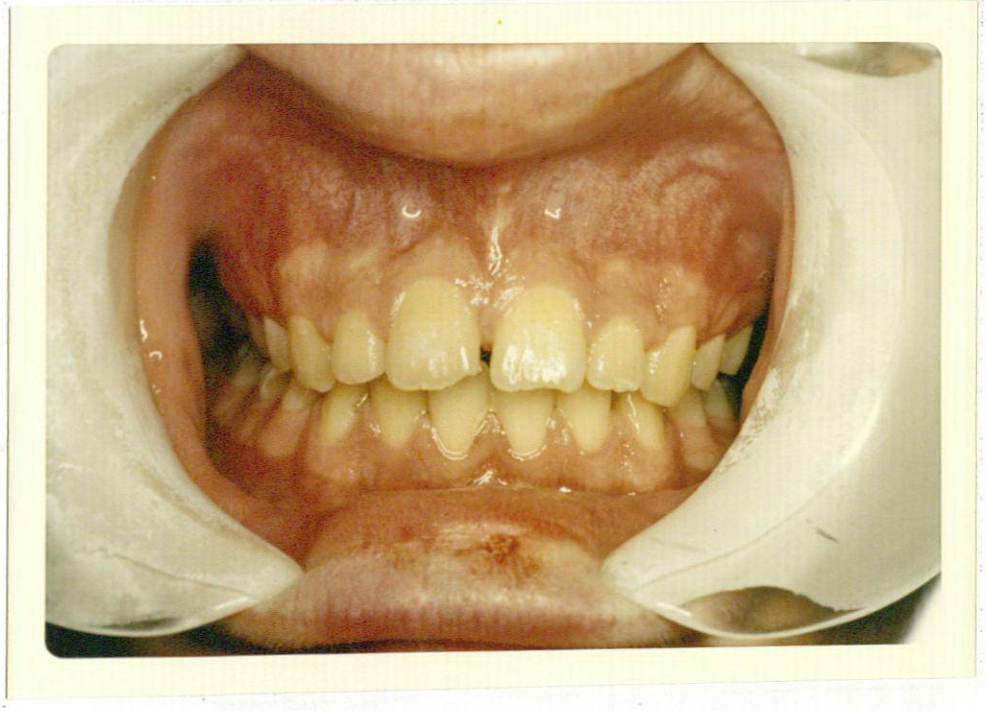


Fig. 10e-Time five (T5) after eight weeks

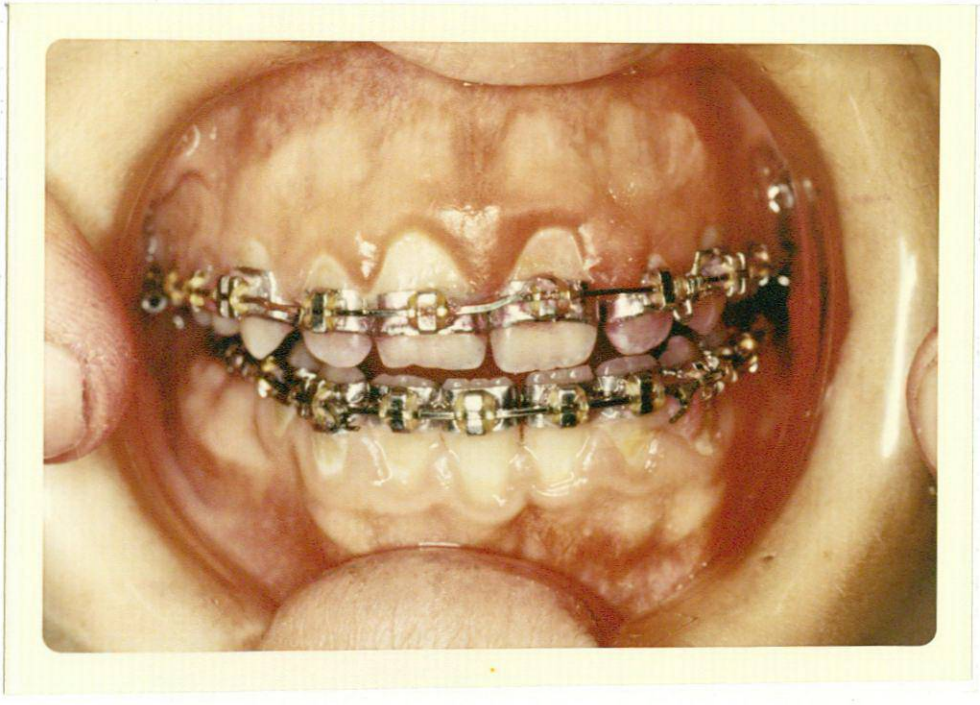


Fig. 11a-Time one (T1) orthodontic appliance in place

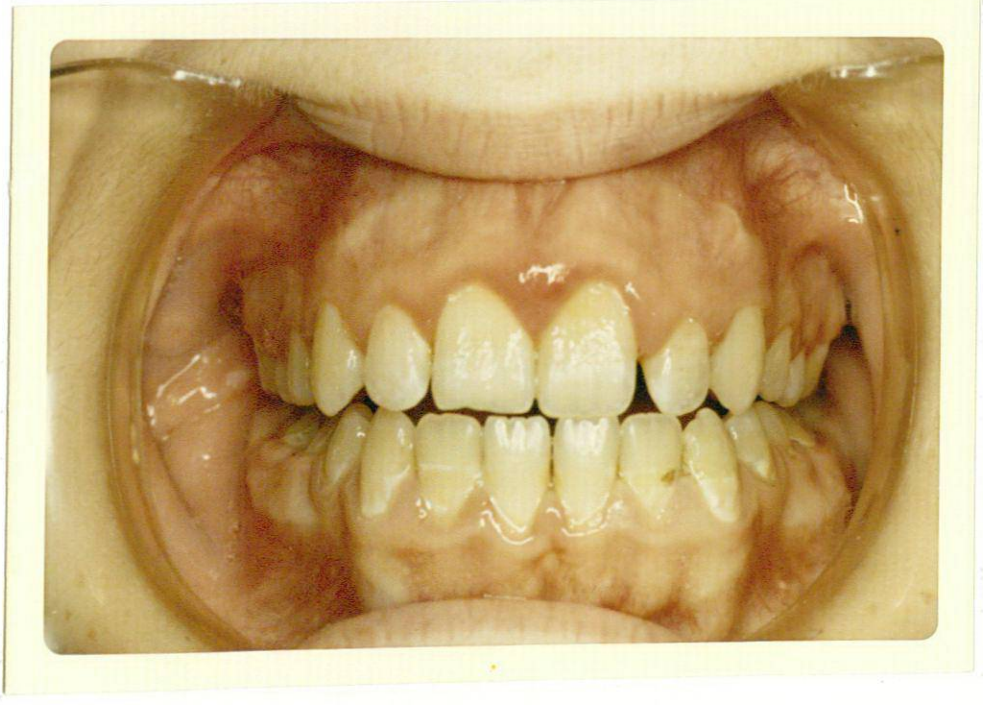


Fig. 11b-Time two (T2) after one week



Fig. 12a-Time one (T1) orthodontic appliance in place

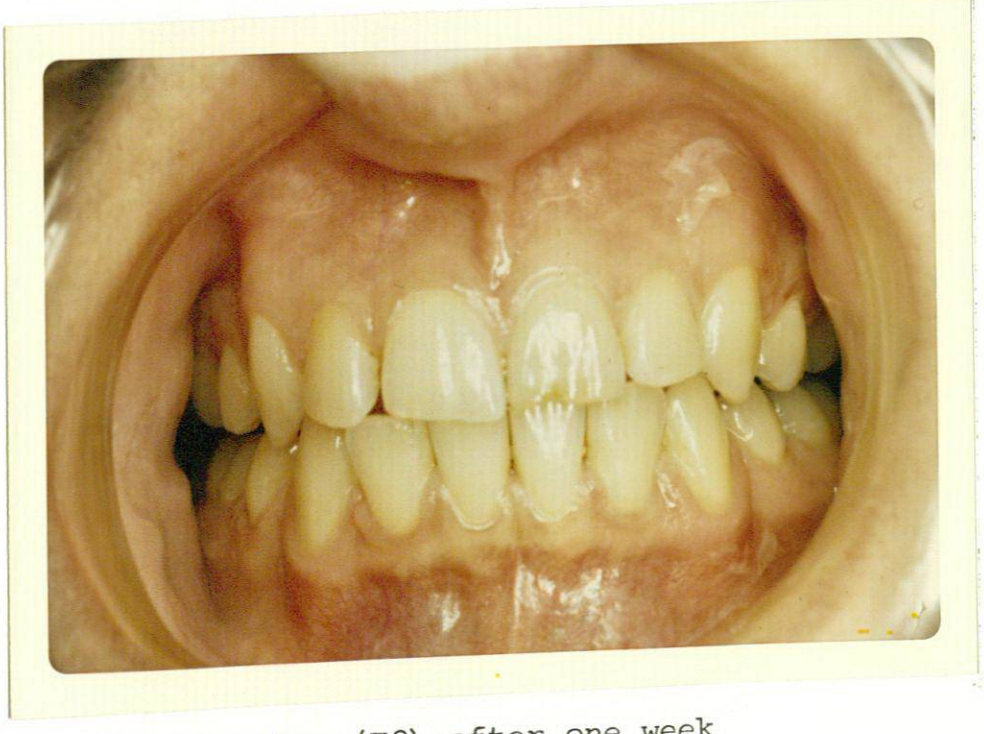


Fig. 12b-Time two (T2) after one week

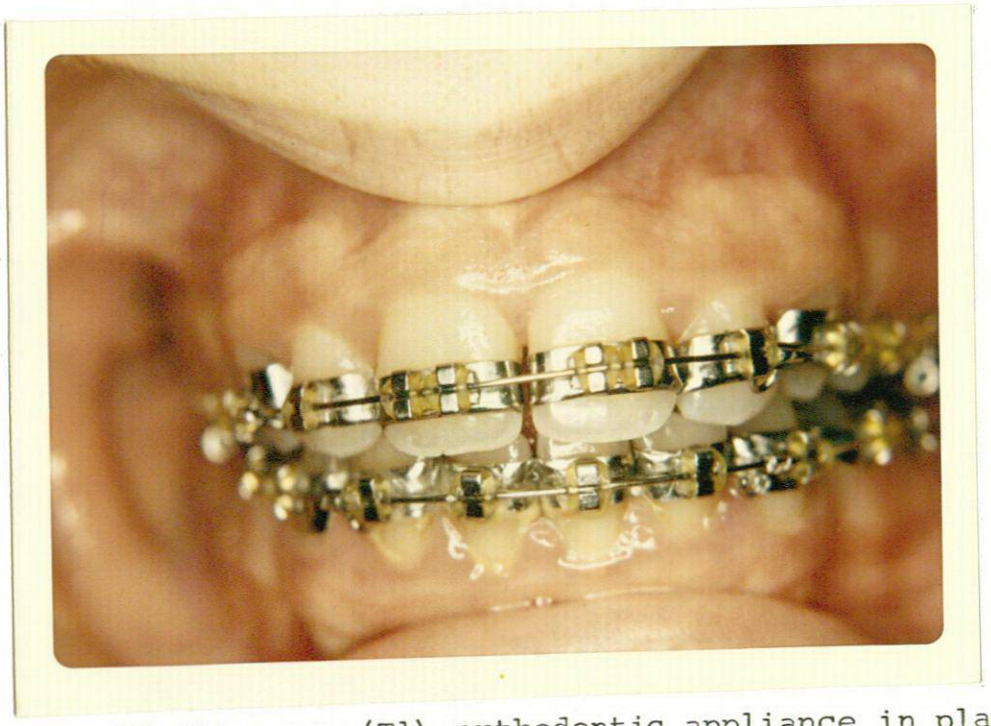


Fig. 13a-Time one (T1) orthodontic appliance in place

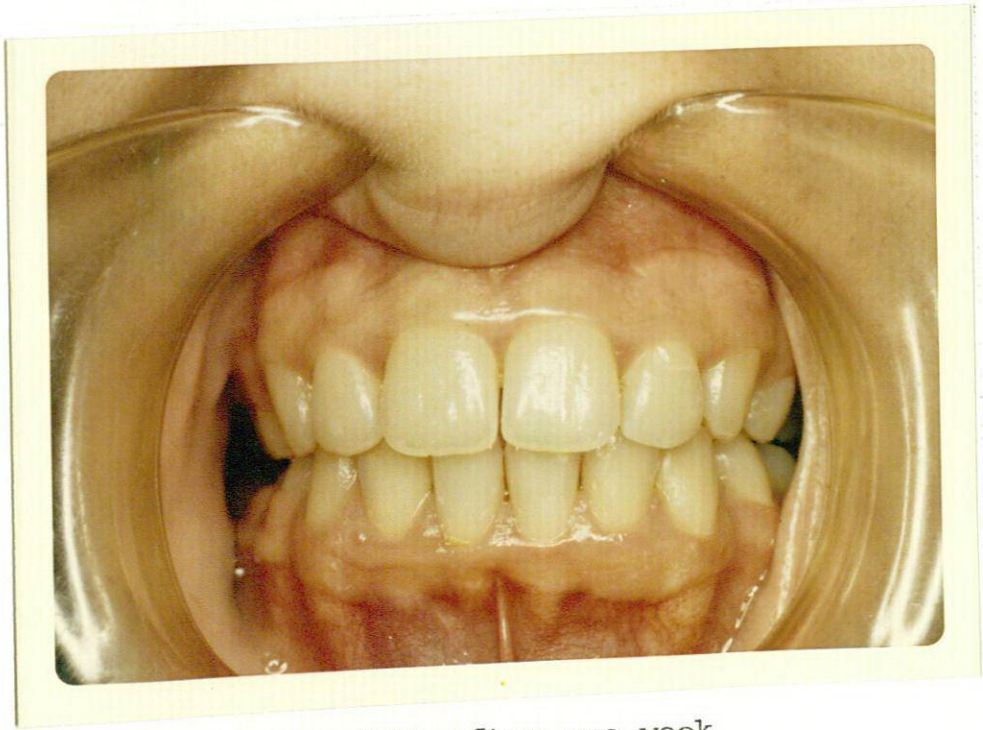


Fig. 13b-Time two (T2) after one week



Fig. 14a-Time one (T1) orthodontic appliance in place



Fig. 14b-Time five (T5) after eight weeks



Fig. 15a-Time one (T1) orthodontic appliance in place

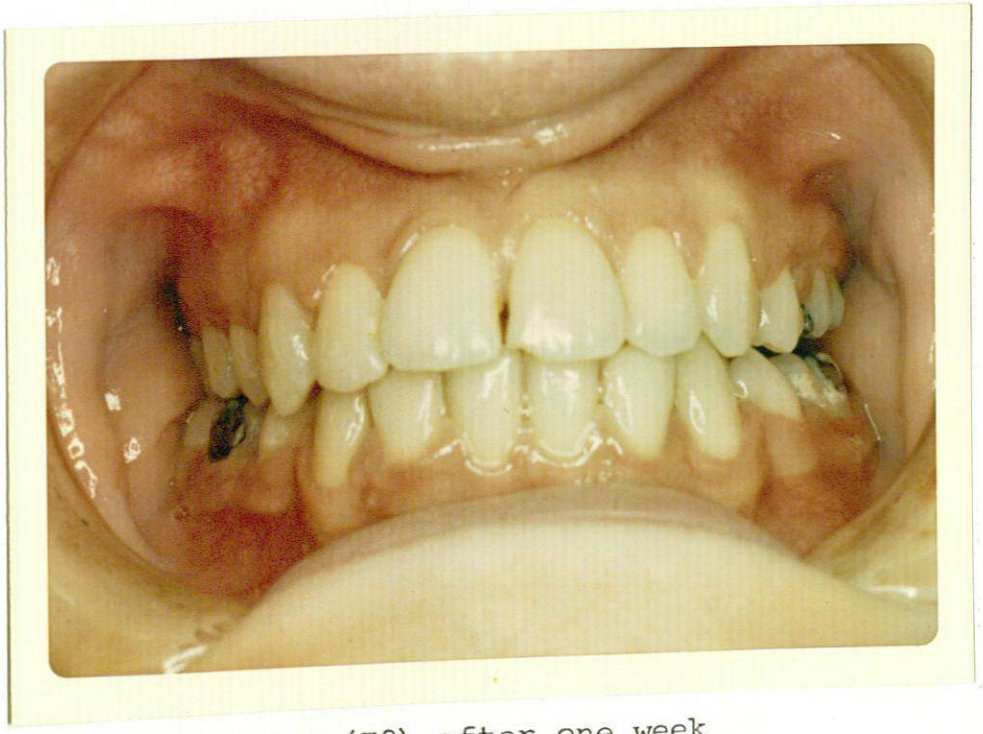


Fig. 15b-Time two (T2) after one week



Fig. 16a-Time one (T1) orthodontic appliance in place

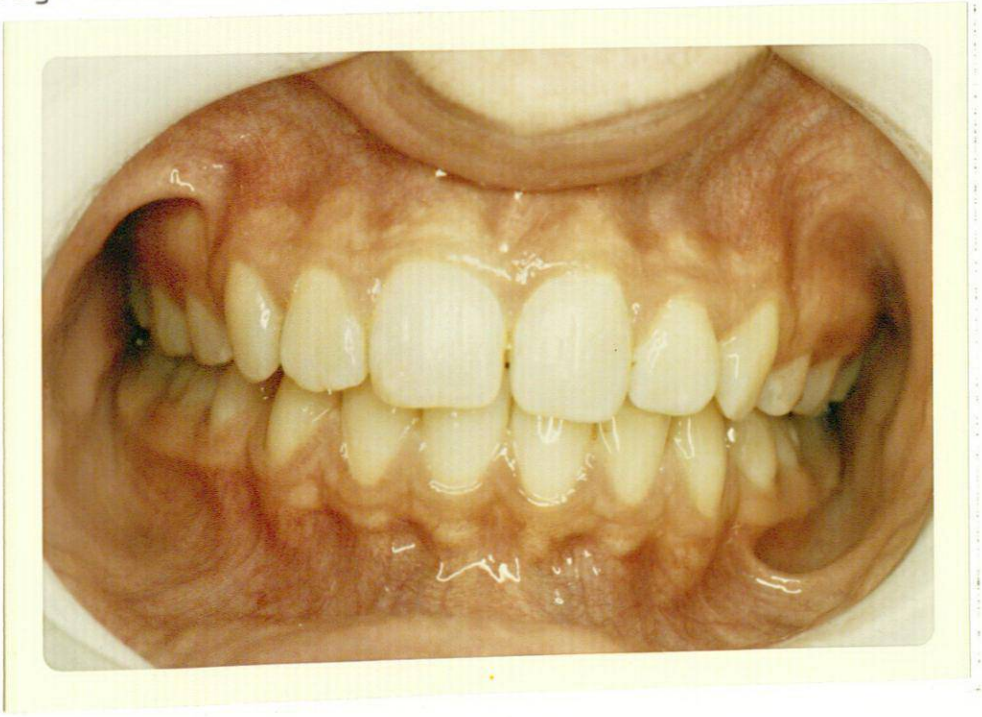


Fig. 16b-Time five (T5) after eight weeks



Fig. 17a-Time one (T1) orthodontic appliance in place



Fig. 17b-Time five (T5) after eight weeks



Fig. 18a-Time one (T1) orthodontic appliance in place



Fig. 18b-Time five (T5) after eight weeks



Fig. 19a-Time one (T1) orthodontic appliance in place

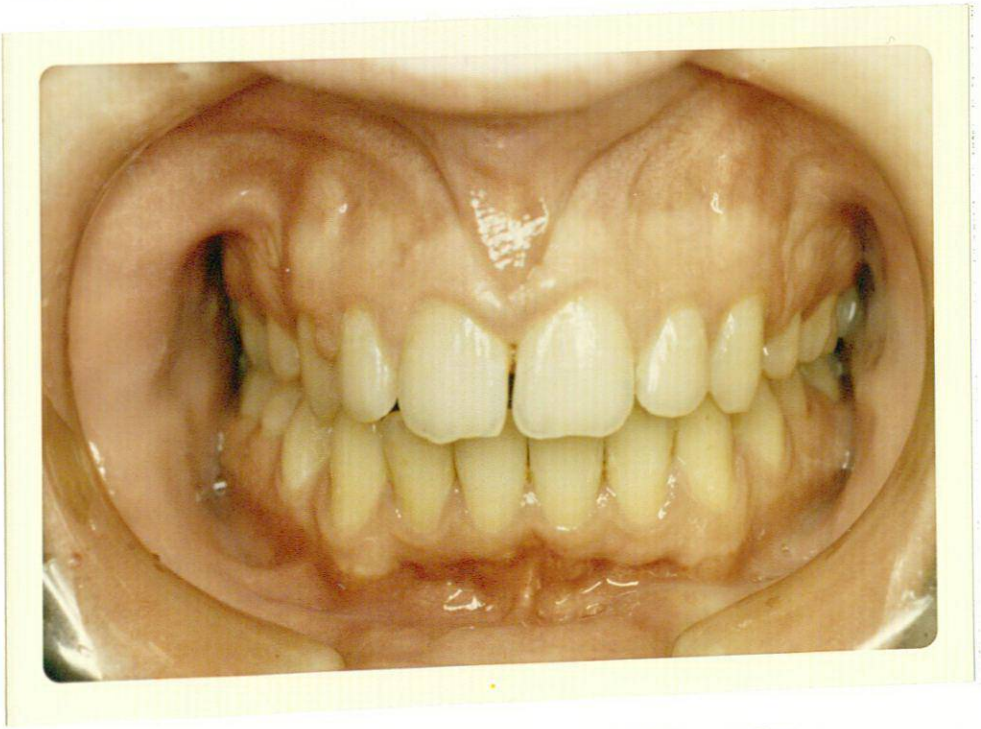


Fig. 19b-Time five (T5) after eight weeks



Fig. 20a-Time one (T1) orthodontic appliance removed



Fig. 20b-Time five (T5) after eight weeks

SUMMARY AND CONCLUSIONS

A study was performed on a random group of thirteen patients who have completed fixed orthodontic appliance therapy at Case Western Reserve University, School of Dentistry, Department of Graduate Orthodontics. Each of these patients was treated with a tooth positioner constructed by T. P. Laboratories, Inc. Each tooth positioner was then modified by having the maxillary right and mandibular left tissue bearing portion of each positioner removed. The gingiva covered by the rubber tooth positioner was compared with the uncovered area. The study ran for eight weeks and data was collected at 0, 1, 2, 4, and 8 weeks.

The following is a list of conclusions that have evolved from this study:

1. The tooth positioner with tissue coverage did not significantly enhance the rate and degree of tissue recovery following orthodontic treatment.

2. The tooth positioner with tissue coverage was not detrimental and did not hinder the recovery

of the gingival tissue when used as a retention appliance.

3. There was no difference in the rate or degree of recovery of the gingival tissue in the covered or uncovered quadrants.

4. Young, healthy patients in the age group of 12-17 years of age have a very great inherent ability to heal, signified by the rapid rate and degree of recovery of the gingival tissues following removal of orthodontic appliances.

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APPENDIX I

Dear Mr. and Mrs. _____:

Your son's or daughter's active phase of orthodontic treatment is nearing completion. Soon his or her bands will be removed and a retainer placed. This is a very important phase of orthodontics. When the bands and wires are removed the teeth are slightly mobile. A retainer is necessary to hold the teeth in their corrected position until the teeth are firm.

In the next few months we are going to be conducting a study on a special retainer. This retainer or Tooth Positioner has been used for may years with great success and is in many ways superior to the routine plastic retainer. One reason for its infrequent use is the expense of constructing it - $50.00. However, those patients chosen for this study will have an opportunity to be treated with the Tooth Positioner at no charge. Another reason is patient cooperation which is absolutely necessary. The Tooth Positioner is made of rubber. It must be worn four hours during the day and all night. The duration of the Study will be two months, but your son or daughter will be maintained on the Tooth Positioner as long as necessary. Patients in the past have found it convenient to wear the Tooth Positioner while watching T.V., doing homework, playing sports, babysitting, etc.

Only patients which in the opinion of the Orthodontic Faculty would benefit the most with the use of the Tooth Positioner will be considered for this Study. During the two month period your son or daughter will have to come weekly for a short appointment at which time his or her progress will be evaluated.

Since we will be able to furnish Tooth Positioners to only a limited number of patients, please understand that your consent does not guarantee that your son or daughter will be used in this Study.

If you would like to have us consider your son or daughter for this Study, please sign the blank below and return it in the enclosed envelope. If you have any questions, please feel free to contact me at 368-3268.

Sincerely,

Andrew R. Bekeny, B.S., D.D.S.

Sanford Neuger, B.S., D.D.S., M.S.
Chairman, Department of Orthodontics

I consent to have my son or daughter _____
name of patient
take part in the Tooth Positioner Study.

_____
Signature of Parent of Guardian

APPENDIX II

MEDICAL HISTORY

Has there been any serious change in your health within the past year? ____ Yes ____ No

Are you now under the care of a physician? ____ Yes ____ No If yes, what condition(s) is (are) being treated? _____

Have you had any serious illness or operation? ____Yes ____ No If so, what was the illness or operation? _____

Do you have any of the following diseases or problems?

_____ Rheumatic Fever
_____ Rheumatic Heart Disease
_____ Congenital Heart Lesions
_____ Heart Trouble
_____ Allergy
_____ Asthma
_____ Hives or Skin Rash
_____ Fainting Spells or Seizures
_____ Diabetes
_____ Measles
_____ Mumps
_____ Pneumonia
_____ Scarlet Fever
_____ Convulsions
_____ Vitamin Deficiency
_____ Food Allergies
_____ Hepatitis
_____ Jaundice or Liver Disease
_____ Painfully Swollen Joints
_____ Stomach Ulcers
_____ Kidney Trouble
_____ Tuberculosis
_____ Venereal Disease
_____ Chickenpox
_____ Diphtheria
_____ Rickets
_____ Endocrine Disturbance
_____ Polio (Infantile Paralysis)

_____ Anemia
_____ Whooping Cough
_____ Abnormal Blood Pressure

Have you had abnormal bleeding associated with previous extraction, surgery or trauma? ____ Yes ____ No

Do you bruise easily? ____ Yes ____ No

APPENDIX III

THE GINGIVAL INDEX (GI)

Criteria

0 = Normal Gingiva

1. = Mild inflammation - slight change in color, slight edema, no bleeding in probing.

2. = Moderate inflammation - redness, edema and glazing: Bleeding in probing.

3. = Severe inflammation - marked redness and edema: ulceration. Tendency to spontaneous bleeding.

GI=0 is given to gingiva the color of which is pale pink to pink. The surface after drying is matt. The degree of stippling may vary. The gingival margin may be located on the enamel or at various levels apical to the cemento-enamel junction. Although the margin should be thin, the buccal and lingual gingiva may present a rounded termination against the tooth, thereby forming the entrance or orifice of the gingival crevice. The form of the interdental gingiva depends on the shape and size of the interdental areas. The tip of the papilla should be the most incisally or occlusally located part of the gingiva. On palpation with a blunt instrument (pocket probe) the gingiva should be firm.

GI=1 is a score given when the gingiva is subject to mild inflammation. The gingival margin is slightly more reddish or bluish-reddish than normal and there is slight edema or the margin. A colorless gingival exudate may be observed or collected at the entrance of the crevice. Bleeding is not provoked when a blunt instrument (pocket probe) is run along the soft tissue wall of the entrance of the gingival crevice.

GI=2 is the score for a moderately inflammed gingiva. The gingiva is red or reddish-blue and glazy. There is enlargement of the margin due to edema. Bleeding is provoked when a blunt instrument (pocket probe) is run along the soft tissue wall of the entrance of the gingival crevice.

GI=3 is the score for severe inflammation. The gingiva is markedly red or reddish-blue and enlarged. Tendency to spontaneous bleeding. Ulceration.

As seen, the decisive criterion in the differentiation between the GI=scores 1, 2, and 3 is the various tendencies of the gingiva to bleeding: GI=1 is the score for the slight change from normal, but the change is

not of the order that bleeding may be provoked by gentle probing. GI=2 represents the stage where bleeding may be initiated by probing, and GI=3 shows a tendency to spontaneous bleeding.

Technique

1. Dry the teeth and gingiva lightly.
2. Examine using mouth mirror and pocket probe.
3. Start with right upper second molar continuing over to the left side. On teeth on right side the sequence will be: distal surface, buccal surface, mesial surface. On the left side: mesial surface, buccal surface and distal surface. The palatal surface of all maxillary teeth are assessed beginning with the upper left second molar.
4. Lower jaw starts with the lower left second molar and is carried through to the lower right second molar. On the teeth of the left side the sequence will be: distal surface, buccal surface, mesial surface and on those of the right side: mesial surface, buccal surface and distal surface. Finally, all lingual surfaces are scored beginning with the lower left second molar.

5. The score for each surface is given to the recorder. When the three (distal, buccal, mesial) scores for the upper right second molar have been recorded, the recorder indicates to the examiner, the next tooth to be examined, for instance by saying: "first molar," or the number of the tooth.
6. When in doubt between two units of the Index the examiner should go to the next higher unit. For example, if the examiner believes the area should be graded 1.5 he should give it a 2 value.

Reference:

Loe, Harold: The Gingival Index, the Plaque Index, and the Retention Index. J. Periodont., 38: Suppl. 610-616 Nov.-Dec. 1967.

APPENDIX IV

ORAL HYGIENE INDEX SIMPLIFIED - MODIFIED

1. Patient will be given red dye tablet to chew. After one minute patient will rinse once with water.
2. Criteria
   - 0 = No stain present
   - 1 = Stain covering 1/3 of buccal and/or major lingual surfaces
   - 2 = Stain covering 2/3 of buccal and/or lingual surfaces
   - 3 = Stain covering more than 2/3 of buccal and/or lingual surfaces
3. Examiner will always give next higher value when score falls between two units.
4. The Oral Hygiene Index will be done after both examiners have scored the patient for GI.

Reference:

Green, J.C. - The Oral Hygiene Index - Development and Uses, J. Periodont., 38: Suppl. 625-635, Nov.-Dec. 1967.

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