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## Examining Practitioner Standards Regarding Periodontal Clearance for the Orthodontic Patient

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EXAMINING PRACTITIONER STANDARDS REGARDING PERIODONTAL  
CLEARANCE FOR THE ORTHODONTIC PATIENT

William P. Brown, D.M.D.

A Thesis Presented to the Faculty of the College of Dental Medicine of  
Nova Southeastern University in Partial Fulfillment of the Requirements for the  
Degree of  
MASTER OF SCIENCE

December 2018

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By

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A Thesis Submitted to the College of Dental Medicine of Nova Southeastern

University in Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

Department of Orthodontics and Dentofacial Orthopedics

College of Dental Medicine  
Nova Southeastern University  
December 2018

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**DATE SUBMITTED:** December 2018

**I certify that I am the sole author of this thesis, and that any assistance I received in its preparation has been fully acknowledged and disclosed in the thesis. I have cited any sources from which I used ideas, data, or words, and labeled as quotations any directly quoted phrases or passages, as well as providing proper documentation and citations. This thesis was prepared by me, specifically for the M.Sc.D. degree and for this assignment.**

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## **Dedication**

To my wife, Jen, for her incredible support throughout my academic endeavors and for always believing in me every step of the way.

To my family, for being with me through my high school jock days, to buckling down in undergrad, and enduring the lack of Christmas and birthday gifts through my dental career. Without them, I would not be where I am today.

To my father, Dr. Paul Brown. As long as I can remember, I have wanted to be just like you. Thank you for being the best role model I can imagine. You have gone through more than anyone I know and if I turn out to be half as good as you in any aspect of life I will consider myself lucky.

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EXAMINING PRACTITIONER STANDARDS REGARDING PERIODONTAL  
CLEARANCE FOR THE ORTHODONTIC PATIENT

DEGREE DATE: December 2018

WILLIAM P. BROWN D.M.D.

COLLEGE OF DENTAL MEDICINE NOVA SOUTHEASTERN UNIVERSITY

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**Abstract**

**Introduction:** Orthodontic tooth movement relies largely on the physiology of the periodontium, which is comprised of various types of bone and soft tissues that surround and support the teeth. New orthodontic treatment modalities have emerged offering various combinations of improved esthetics and/or speed. However, the impact on standard and quality of care of these alternative treatment modalities is unclear. Institutional concern for the effects of orthodontics on a periodontally-compromised patient remains high, as evidenced by governing dental bodies mandating, and contemporary orthodontic leaders insisting, orthodontic treatment should not be carried out until active dental disease has been addressed. Therefore, this study aimed to determine if there existed an established, succinct, evidence-based criteria used by periodontists to clear a patient for orthodontic

tooth movement. **Methods:** A survey instrument was developed and used to obtain cross-sectional data from a representative sample of U.S. periodontists that included: demographic questions, topic-related questions and case-based questions. Simple descriptive analyses, bivariate and multivariate analyses and well as qualitative analyses were used to evaluate the specific aims. **Results:** The average age of participants was 49.6 years old, with an average of 18 years in practice. There was an association with age and a lack of specialized clearance criteria for prospective orthodontic patients ( $p= 0.038$ ). Probing depths, attachment loss and mobility were the three clinical factors considered most important in the clearance process. Increased bone loss, increased probing depths and root resorption were the three factors considered most important for cessation of orthodontic treatment. Periodontists consistently recommended oral hygiene instruction and scaling and root planning, followed by re-evaluation for possible osseous surgeries. **Conclusions:** Participants were consistent in their evaluation and treatment recommendations regarding periodontal issues, however, were more divided when determining cessation of orthodontic treatment. Participants largely felt knowledgeable enough about interdisciplinary treatment to make and receive recommendations regarding treatment.

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# **Chapter 1: Introduction**

## **1.1. Background**

### **1.1.1. Orthodontic Tooth Movement**

Orthodontic tooth movement relies largely on the physiology of the periodontium, which is comprised of various types of bone and soft tissues that surround and support the teeth. The most important of these is the periodontal ligament, which experiences the largest strain during orthodontic tooth movement.

The modulus of elasticity, or resistance to deformation, of bone and tooth is between 1,000 and 10,000 times greater than that of the periodontal ligament.<sup>1</sup> The relatively high elasticity of the periodontal ligament results in three phases of tooth movement upon application of forces: initial phase, lag phase, and post-lag phase.<sup>2</sup> According to Burstone,<sup>2</sup> the initial phase occurs immediately after force application and lasts about one to two days. It involves rapid movement of teeth within the confines of the dental socket. Following this initial movement, the “lag phase” follows in which there is little to no tooth movement. During this phase, areas of tension and compression form, recruiting cells to the area to aid in remodeling to facilitate movement. Tension of the PDL leads to vasodilation whereas pressure on the tissues leads to disorganization and vasoconstriction. This yields proliferation of cells on the tension side and hyalinization (cell death) of the pressure side, which results in the recruitment of specific cells to remove the hyalinized tissue.<sup>3</sup> This combined cellular response leads to resorption of bone on the pressure side and formation of bone on the tension side, resulting in tooth movement.<sup>4</sup> The



lag phase typically lasts three to four weeks. This brings about the post-lag phase, in which movement gradually or suddenly increases.

Contemporary thought gives a much more individual-centric outlook and is based on the idea that ideal force is combination of magnitude and temporal characteristics, and that each tooth and individual may have a different optimal force.<sup>5</sup>

### **1.1.2. The Effect of Mechanical Stimulation on Various Tissues and Cells**

Mechanical stimulation, in a physiological setting, can be considered a series of forces acting as stimuli to produce alterations in cellular homeostasis. Mechanical stimulation can have an effect on many different tissues. For example, connective tissues can be stimulated by both compression and tension forces.<sup>6</sup> In addition; cardiac, respiratory, urogenital, auditory, and vestibular systems can all be affected.<sup>7</sup> The skeleton, specifically bone, is also subject to compression and tension forces. Bone composition and shape is thought to constantly be remodeling via the mechanical influences. Studies show that stimulation of specific anatomical structures, joint fixation studies and weightlessness studies have all resulted in the conclusion that tissue is mechanically regulated, especially in regards to bone metabolism;<sup>8-10</sup> lending credence and support to the theory proposed by Burstone - that a tension-compression mechanism can lead to significant physiologic remodeling.

### **1.1.3. The Role of Inflammation in Bone Remodeling**

Early investigations into the role of inflammation in bone remodeling were performed on dogs and monkeys; observing the dilation and compression of vessels in the tension and compression sites of PDL. Findings indicate that large-diameter vessels were

unaffected, but the number of terminal arterioles decreased while the number of capillaries and postcapillary venules increased. There was a direct correlation of vascular reaction with tissue distortion.<sup>11</sup> Furthermore, Derringer and Linden<sup>12</sup> found that growth factors in the dentoalveolar region, including the teeth themselves, are stimulated by orthodontic forces. This was confirmed by introducing antibodies into cultured pulps of human teeth designed to neutralize these growth factors. Upon introduction, the number of expected micro-vessels in the pulp was significantly reduced when compared to the controls.

Davidovitch<sup>13, 14</sup> stated the following events occur during mechanically-induced tooth movement: 1) movement of PDL fluids from compression to tension areas; 2) gradual development of strain in cells and the extracellular matrix (ECM); 3) force transduction inducing an activation of specific genetic coding; 4) consequent cascade of events involving various signaling molecules; 5) activation of cells which participate in the remodeling of paradental tissues. In addition to inflammation, electric potentials are produced, which also contribute to tissue remodeling and contribute to orthodontic tooth movement (OTM).

#### **1.1.4. Periodontal Disease**

Periodontal disease are chronic inflammatory disorders that involve the gingiva and other surrounding tissues of the teeth. There are two primary forms of periodontal disease: gingivitis and periodontitis. The American Academy of Periodontology<sup>15</sup> (AAP) defines gingivitis as “the mildest form of periodontal disease.” Gingivitis exhibits as red, swollen gingiva with a tendency to bleed with minimal irritation. Typically, gingivitis is brought on by inadequate oral hygiene. Many risk factors contribute to gingivitis, including: smoking, diabetes, stress, hormone changes, medications and more. If uncontrolled,

gingivitis can develop into periodontitis. Periodontitis involves the loss of structures supporting teeth and, as of 2010, affects almost half the adult U.S. population.<sup>16</sup> Additionally, new evidence has forged change regarding disease classification. The previous classifications were based on the clinical indicators such as form, severity and extent.<sup>17</sup> Changes implemented by a task force at the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions focus not only on the aforementioned, but emphasize the rate of progression, risk factors, and the impact of general health on periodontal diseases.<sup>18, 19</sup>

Contemporary orthodontics has moved away from treating children and adolescents exclusively, as adults now comprise 23% of the orthodontic patients.<sup>20</sup> Understanding the factors leading to periodontal disease and the negative sequela of orthodontic treatment can help clinicians of both disciplines monitor and prevent adverse effects upon periodontium during orthodontic tooth movement.

#### **1.1.5. Orthodontic Treatment Effects on Periodontium**

Periodontal disease involves inflammation of the tissues surrounding teeth either supra- or subgingivally. Less severe forms of periodontal disease display characteristics such as bleeding, gingival hypertrophy, and redness of the gingival margin. The more serious forms lead to eventual loss of periodontal attachment and bone. It has been well established that the primary risk factor for gingival inflammation and periodontal disease is bacterial plaque.<sup>21</sup> Studies show that orthodontics alone does not induce periodontal disease.<sup>22</sup> However, adding plaque to the equation results in significant periodontal compromise. This includes, angular bone defects, attachment loss, gingivitis and periodontitis.<sup>23, 24</sup>

The periodontal flora changes significantly towards this unhealthier environment once orthodontic appliances are introduced into the oral cavity.<sup>25, 26</sup> Even for patients who are motivated to maintain proper oral hygiene during treatment, risk of developing periodontal disease remains high.<sup>27</sup> The aforementioned leads one to assume that orthodontics should not be performed on a patient with compromised periodontal health. However, it's been found that a compromised periodontium may not be a contradiction for orthodontic tooth movement. In fact, orthodontic treatment, done correctly, may improve the chances of maintaining and even restoring the compromised dentition and health of the periodontium, as well as reduce the risk of periodontitis.<sup>28-30</sup> The aforementioned lead ones to conclude that orthodontics can be both a help and hindrance to periodontal therapy, leading one to question how best to approach a situation that calls for intervention from both disciplines.

#### **1.1.6. Emerging Innovations and Current Guidelines**

The past decade has seen an increasing demand for orthodontic treatment among adults and a rise in adopting adjunct procedures such as microosteoperforations, vibration-facilitated tooth movement, and use of low intensity lasers to expedite orthodontic tooth movement.<sup>31, 32</sup> Adults and older minors seem to prefer clear aligners over the traditional metal and ceramic braces.<sup>33, 34</sup> The advent of Computer Aided Design, Computer Aided Manufacturing (CAD/CAM) has spawned direct to consumer modalities of treatment by several aligner companies,<sup>35, 36</sup> all claiming to promote access to care by offering lower costs and less appointments via teledentistry. However, the impact on standard and quality of care of these alternative treatment modalities is unclear. Institutional concern for the effects of orthodontics on a periodontally-compromised patient remains high, as evidenced

by governing dental bodies mandating,<sup>37, 38</sup> and contemporary orthodontic leaders insisting,<sup>39,40</sup> that orthodontic treatment should not be carried out until active dental disease has been addressed. Now has never been a more critical time to establish proper protocol for clearing the potential orthodontic patient for treatment, and providing adequate informed consent.

## **1.2. Current Study**

### **1.2.1. Purpose**

To our knowledge, no study to date has identified what contributes to a proper periodontal evaluation for the orthodontic patient. Furthermore, it is unclear how periodontists develop their basis for evaluation. This assessment is viewed as a first step in developing better interdisciplinary communication between dental providers. Much has been published in regards to orthodontic treatment outcomes of periodontally-involved dentition and how periodontium responds to given tooth movements. However, the factors evaluated prior to beginning orthodontic therapy have seemingly gone undocumented.

This study was an attempt to determine if periodontists adhere to set, structured guidelines to determine candidacy for orthodontic treatment; and if such guidelines were not in place, then try to establish or identify what was important to the majority of participants and develop a foundation to establish protocols for the benefit of patient and provider alike.

### **1.2.2. Specific Aims**

This study aimed to determine if there is an established, clear, evidence-based criteria used by periodontists to clear a patient for orthodontic tooth movement. The specific aims are as follow:

Specific Aim 1: To examine the consistency in the criteria used by periodontists in evaluating the periodontal status of prospective orthodontic patients.

Hypothesis: At least 80% of periodontists will be consistent in their evaluation of periodontal health of prospective orthodontic patients.

Specific Aim 2: To examine the consistency in the criteria used by periodontists in evaluating the periodontal status of orthodontic patients during orthodontic treatment.

Hypothesis: At least 80% of periodontists will be consistent in their evaluation of periodontal health of patients when presented with specific clinical scenarios of patients undergoing orthodontic treatment.

Specific Aim 3: To examine the consistency in the recommendations offered by periodontists in relation to periodontal status of patients during orthodontic treatment.

Hypothesis: At least 80% of periodontists will be consistent in their recommendations for periodontal treatment and follow-up when presented with specific clinical scenarios of patients undergoing orthodontic treatment.

Specific Aim 4: To examine the association between years of practicing periodontics and the basis for the criteria used for clearance.

Hypothesis: As the length of years practicing periodontics increases, more periodontists will use personal experiences as a basis for criteria used for clearance.

Hypothesis: As the length of years practicing periodontics decreases, more periodontists will use periodontal literature as a basis for criteria used for clearance.

Specific Aim 5: To examine whether periodontists feel comfortable when communicating with orthodontists about interdisciplinary care.

Hypothesis: At least 80% of periodontists will report comfortability when communicating with orthodontists about interdisciplinary cases.

## **Chapter 2: Materials and Methods**

### **2.1. Study**

This was a cross-sectional study. A survey instrument was sent to periodontal faculty, residents and non-academic practitioners via a publicly-available directory encompassing members of the American Academy of Periodontology (AAP). The survey consisted of questions aimed at determining the basis for periodontal clearance regarding patients pursuing orthodontic treatment. Various dental scenarios were presented to the participants to determine if there was consensus amongst practitioners when applying their proposed theories to patient care.

### **2.2. Participants**

The sample originated from a search of the AAP membership directory for the United States. Due to financial constraints, as well as the unwillingness of periodontal organizations to share member information for research purposes, a list-serve of all publicly available email addresses was compiled. Identical entries were identified and eliminated. The result was a full list of all publicly available AAP members. In cases of a two-doctor practice using the same email, this was counted as two separate entries. This yielded a total of 1,620 potential respondents. Participant inclusion criteria were:

- 1) actively practicing periodontists or periodontal residents who limit their practice to the discipline of periodontics, and
- 2) attended, instructing at, or currently attending an accredited U.S. postgraduate periodontal program.



Subjects were deidentified via the HIPAA-compliant software employed to conduct the survey. Participants' identities were kept anonymous. ID numbers were assigned to each participant in order to track data. Corresponding identifying information to the ID number were stored on a password protected university server.

### **2.3. Survey Instrument**

A 19 item survey instrument was employed. The lack of information and precedent regarding this topic of research indicates there was no existing material with which to base the survey upon. Hence, this survey was developed with input and cooperation from periodontists and orthodontists to address the aims stated above. The survey was designed to be completed in one sitting in less than twenty minutes to avoid response fatigue.<sup>41, 42</sup> All responses were recorded via electronic submission on the REDCap website, an online application for construction, administration, and management of digital survey instruments. After submissions were completed, responses were automatically recorded in an excel file for statistical analysis. As previously stated, identifiers disassociated from responses and stored on a separate password-protected university server.

### **2.4. Participant Communication**

Due to financial constraints and an unwillingness by periodontal organizations to share membership information for research purposes, the public AAP directory was used. As previously mentioned, 1,620 total periodontists were listed.

An all-electronic correspondence was employed. Each correspondence contained the link for participants to complete the survey instrument, which was generated from the HIPAA-compliant, NSU REDCap website. Following the initial invitation, one follow-up

invitation was sent every 2 weeks over a four week period with reminders to complete the survey for a total of 3 communications. Each communication included the invitation to participate as well as the attached informed consent. Individuals were informed they were free to disregard the communications, as well as free to opt out of participating at any point in time during survey administration, free of consequence or follow-up. Each communication included encouragement to reach out to the primary investigator for any needed clarification regarding the study.

Incomplete survey instruments were included in the study. The study had multiple parts spread across three pages. Each question was independent of the next, allowing the authors to include surveys that were not fully completed. All communications with prospective participants included the primary investigator's contact information so that participants could ask questions if necessary at any time during the study. It was explained that no part of this study would place individuals in harm's way. The primary risk was loss of anonymity to the participants. It was explained that, on the whole, results may prove to benefit participants to a large degree based on responses. Practitioners would be able to see a large amount of data regarding the professional standard in regards to periodontal clearance for the orthodontic patient.

Additionally, all participants who provided their contact information were entered to win one of the three \$1000 gift cards in gratitude for their time and effort. Upon full completion of the survey, the participant was automatically entered into the drawing. To determine winners, the incomplete entries from the raw data were eliminated, and three of the corresponding numerical identifiers were randomly selected using a random number generator. Upon completion of the study, the winning participants were to be contacted and

the gift cards awarded. The institutional review board of Nova Southeastern University approved our study design, methods, and protocols.

## **2.5. Statistical Analysis**

We based our sample size calculations on Cochran's formula developed for categorical outcomes.<sup>43</sup> First, we calculate the baseline sample size and then adjust for response rate:

- Where  $t$  = value for selected alpha level of .025 in each tail = 1.96 (the alpha level of .05 indicates the level of risk the researcher is willing to take that true margin of error may exceed the acceptable margin of error).
- Where  $(p)(q)$  = estimate of variance = .25.
- Where  $d$  = acceptable margin of error for proportion being estimated = 0.05 (error researcher is willing to except).

A total of 1536 surveys must be administered for a response rate of 25% to meet the assumptions above.

We first reviewed the data set for outliers, missing and incomplete data. We then conducted simple descriptive analyses. This was followed by Welch's t-test and analysis of variance to identify associations and measure levels of significance between the independent and dependent variables. R version 3.2.2 was used in all data analysis, and statistical significance was found at  $p < 0.05$ . Qualitative review for open ended comments was also presented.

## **2.6. Qualitative Analysis**

All free responses to the survey questions and clinical scenarios were copied into a word document. For each question, the responses were read and evaluated for common themes. Segments of texts were coded and categorized, using selected key phrases as labels for each category. All categories were further coded and clustered to identify themes and trends in responses. For each clinical scenario, a description that best reflected the common responses was selected and included in the results.

For example, common keywords were identified in responses to scenario one in relation to the recommended periodontal treatment prior to initiation of orthodontic treatment. Those include “Oral Hygiene Instruction (OHI)”, “Scaling and Root Planning (SRP)”, and “Follow- up” or “Maintenance”. All those responses were compared and the common threads were identified and presented as the most representative “protocol” suggested by the majority of periodontists.

When periodontists were asked about continuing or ceasing orthodontic treatment in scenario number 2, a deductive analysis was conducted to search for the key phrases such as “cease”, “discontinue”, “stop”, or “continue” treatment. This was followed by an inductive analysis to search for alternative phrases used by respondents to describe their preferred course of action. The common phrases were then used as codes for those responses. All those codes were then clustered and categorized based on their common threads. Three themes emerged, including cessation of orthodontic treatment, continuation of orthodontic treatment, and unclear action plans.

## **Chapter 3: Results**

### **3.1. Participation Summary**

A total of 1620 U.S. periodontists received an email with a description of the study and invitation to complete the survey. Out of all the emails sent, 493 invitation emails were returned as “undeliverable,” and 1127 emails were delivered. Due to the privacy policies on the AAP, obtaining the best contact information of the practicing periodontists was difficult. Many email addresses, which were publicly available, consisted of the practitioners’ office email addresses. There is a possibility that someone other than the periodontist was receiving the email about the survey. Two follow up emails were sent within one to two weeks after the original invitation to encourage participation. A total of 195 responses were obtained, resulting in a 17.3% response rate. Of these, however, there was a varying amount of responses as the survey progressed. Some respondents did not move passed the first page and some did not respond to the questions about the clinical scenarios. All responses were included to add as much value to the results as possible.

### **3.2. Descriptive Statistics**

Descriptive statistics are listed in tables 1 and 2. Ages of participates ranged between 28 and 78 years old with a mean of 49.6. The majority of participates were male (69.4%) and Caucasians were the most represented racial group (76.9%). The years of professional experience as a periodontist ranged between first year residents to 49 years of practice, with a median of 18 years of practice.

The majority of periodontists (68%) reported not having a set criteria used for examination and clearance of orthodontic patients that differed from their traditional new

patient exam. When asked what the basis for their criteria was, the majority of respondents (40.1%) reported modeling their clearance process after evidence found in the literature. A third (36.1%) of respondents developed their clearance method based on personal experience, followed by 19.7% modeling their clearance method after the clearance process learned in residency. A minority (4.1%) claimed they used a combination of the above. They reported using either a method developed by another professional, or performed a routine periodontal exam followed by consulting with the treating orthodontist to understand the goals of the orthodontic treatment.

Participants were asked to list, in order of priority, the clinical findings that they considered most important for clearing the orthodontic patient. Participants reported probing depths greater than 6mm as the most important (mean rank: 2.7), followed by attachment loss (3.6), mobility (4.2), bone loss (4.5), furcation involvement (5.3), bleeding on probing (5.3), oral hygiene (6.0), plaque index (6.6), gingival biotype (7.2), and age (9.3)

Participants were then asked to list, in order of priority, the clinical findings that they considered most important in making a decision to cease orthodontic treatment. Participants reported increased bone loss as the most important (mean rank: 2.3), followed by increased probing depths (3.3), root resorption (3.7), presence of inflammation (4.2), presence of recession (4.9), poor oral hygiene (5.1), increased mobility (5.4), and gingival hyperplasia (7.1)

The majority of participants (99.1%) believed some periodontal conditions can be improved via orthodontic treatment.

The majority of participants (64.5%) believed that periodontal clearance from a general dentist is not sufficient for the adult patient, while a smaller number of participants (10%) believed that clearance from a general dentist was sufficient. Some participants (25.2%) stated that a general dentist's clearance may be sufficient dependent upon either severity of the case, competence of the general dentist in diagnosing periodontal issues, or availability of a periodontist to a given patient population.

The majority of participants (61.7%) believed that it is the periodontist's responsibility to monitor and deliver follow-up evaluations following orthodontic treatment. A smaller number of participants believed the onus lies with the orthodontist (10.3%), or the general dentist (7.5%). The remainder (20.6%) believed that all practitioners should be involved in the periodontal monitoring of the patient, but the primary provider should be determined by the initial periodontal condition. During orthodontic treatment, most participants (80.4%) believed that periodontists should monitor periodontal health during orthodontic treatment; followed by the treating orthodontist (13.1%), then the general dentist (6.5%).

Regarding interdisciplinary cases, the majority of participants (73.8%) felt that orthodontists were not sufficiently informed about periodontal issues. The majority of participants (92.5%) felt knowledgeable enough to give recommendations on how to approach a given interdisciplinary treatment. However, a smaller number (3.7%) felt they were not knowledgeable enough or, while knowledgeable, felt it was not their place to recommend orthodontic treatment. Additionally, the majority of participants (96.3%) felt knowledgeable enough to receive and understand recommendations from the orthodontist on how to approach a given treatment.

Almost all participants (99.1%) stated that they were not comfortable with the idea of patients engaging in direct-to-consumer, remote, clear aligner treatment.

### **3.3. Welch's t-test, Analysis of Variance**

Results from a Welch t-test revealed that periodontists with no set criteria for examinations have been practicing longer (M= 22.12, SD= 12.17) than those with set criteria for examinations (M= 17.17, SD= 13.38),  $t(79.49) = -2.10$ ,  $p = 0.038$ . An analysis of variance showed that the periodontists' basis for developing a method of clearance did not vary based on the number of years they have been in practice,  $F(3,136) = 1.35$ ,  $p = 0.258$ .

Table 3 identifies correlations for years of practice and the clinical findings participants considered most important for clearing the orthodontic patient. A statistically significant negative correlation existed between years practicing and attachment loss (Corr. = -0.21,  $p=0.047$ ) and furcation involvement (Corr. = -0.17,  $p = 0.047$ ). Statistically significant positive correlations were established between years practicing and plaque index (Corr. = 0.22,  $p = 0.009$ ) and oral hygiene (Corr. = 0.25,  $p = 0.002$ ).

Table 4 identifies correlations for years of practice and the clinical findings participants considered most important in deciding to cease orthodontic treatment. A statistically significant negative correlation existed between years practicing and increased bone loss (Corr. = -0.4,  $p=0.028$ ) and root resorption (Corr. = -0.4,  $p=0.024$ ).



### 3.4. Qualitative Analysis

Participant responses to scenario 1 included general recommendations of: 1) oral hygiene instruction, 2) scaling and root planning, 3) re-evaluation in six to eight weeks, and 4) periodontal maintenance on a three to four month basis. Periodontal re-evaluation involved a diverse inclusion criteria, which included measuring plaque scores, bleeding on probing, reduced pocket depths, and evaluation for grafting. Additional recommendations included a significant portion of participants recommending extraction of 3<sup>rd</sup> molars, while a small minority suggested evaluation for mouth breathing and an orthognathic consult. A representative quotation would be the following:

“1. Oral hygiene instruction [is] an effective, non-traumatic technique, with hands on instruction in the use of a soft toothbrush/Sonicare power toothbrush, floss/Superfloss, Proxabrush and Stimulator (Gum-Sunstar-Butler), 30 minutes, with a dental hygienist, utilizing disclosing solution 2. Same visit, scaling and where needed, root planing, half-mouth, under local anesthesia. Up to 60 minutes 3. [Scaling and root planning] of the other half-mouth, under local anesthesia, up to 60 minutes, the next day or within 1 week. 4. Oral hygiene review, by a dental hygienist, using disclosing solution, with hands-on correction of techniques, guided by where the plaque is found. Full mouth prophylaxis. 45 minutes total 5. Periodontal reevaluation at 8 weeks post-SRP by the periodontist. 30 minutes. If pockets less than or equal to 4mm and bleeding percentage reduced by 2/3 of original score, then ok for Orthodontic treatment and 3 month periodontal maintenance schedule. A patient this young with attachment loss would be a concern to me.”

Participant responses to scenario 2 were split. 62 of 108 of responders (57.4%) recommended cessation of orthodontic treatment, while 21 of 108 (19.4%) recommended treatment continue. The remainder (25 of 108, 23.2%) were unclear of whether they would recommend to stop or continue orthodontic treatment. Many participants noted that peri-apical radiographs of the incisors, as well as a full-mouth series, and potentially a CBCT

would give a clearer picture and allow for better diagnosis. Specific treatment suggestions varied. Scaling and root planning, flap surgery, and oral hygiene instruction were common. Nineteen participants mentioned that trauma from occlusion was a possible cause of mobility. However, their recommendation of treatment varied. Some desired to cease orthodontic treatment and some did not. A representative quotation for those wishing to stop orthodontic treatment is as follows:

“While mobility often occurs during orthodontic treatment this appears excessive and combined with the increasing PDs is concerning. Stop orthodontic treatment, obtain conventional PAs of #6-11 and a 3D CBCT scan to assess position of roots in bone and if they have been moved out of the bone, resorption has occurred, or periodontal bone loss as cause for increase in pocketing and mobility. Assess prognosis and if repositioning of teeth back over the alveolus is needed. Treat periodontally as needed S/RP, LANAP, Extraction/implants, etc as deemed appropriate. Resume orthodontics once #7-10 are stabilized or removed then restored from there as needed.”

A representative statement for continuing orthodontic treatment is as follows:

“Continue with Orthodontic treatment. Teeth are edge to edge causing occlusal trauma to teeth which leads to widening of the PDL space and increase of mobility. Once teeth are in normal occlusion or forces are decreased the mobility will decrease.”

A representative quotation for those unclear on starting or stopping treatment is as follows:

“In my experience, it is not unusual to see increased tooth mobility during orthodontic treatment. I would evaluate the root surfaces of the areas with increased pocket depths. If there is detectable calculus, I would recommend SRP. However, if there is no detectable calculus, I would work on improving home care. In addition, I am concerned about the continued gingival inflammation so I would recommend more frequent hygiene visits at this point.”

The majority of participant responses to scenario 3 were more consistent. The majority recommended a treatment course of scaling and root planning, followed by a four to six-week reevaluation for possible osseous surgery or guided bone/tissue regeneration. Twelve participants did not believe that the patient was a candidate for orthodontic treatment. A representative response against treating orthodontically is as follows:

“[I] suggests generalized periodontitis stage 4, grade C (grade C given pts young age relative to bone loss). Clinically pathologic migration is evident especially of #7-10. Recommend a comprehensive perio exam with FMX radiographs from a periodontist. Most likely this patient's 'orthodontics' is best done prosthetically by extracting all teeth and replacing with fixed hybrid dentures on 4-6 implants per arch. If the patient wants to attempt to retain natural teeth the long term prognosis may be questionable due to aggressive disease but if she can be stabilized to the point of minimal PDs and reduction in mobility then orthodontic treatment may improve occlusal relationships to help improve prognosis, however it's unlikely that (at the very least) the maxillary incisors will survive orthodontics and if they do then permanent splinting may be an option to maintain mobility, assuming minimal PDs can be maintained and managed. Overall the unpredictability of such a case would require significant patient understanding and a patient who can accept being 'in treatment' almost forever. In the end most patients like this opt for a full arch implant solution as it is much more predictable, in the grand scheme costs less in the long term (although not inexpensive), and accomplishes treatment goals more efficiently.”

A representative response of those favorite orthodontic treatment is as follows:

“1. Oral hygiene instruction in an effective, non-traumatic technique, with hands on instruction in the use of a soft toothbrush/Sonicare power toothbrush, floss/Superfloss, Proxabrush and Stimulator (Gum-Sunstar-Butler), 30 minutes, with a dental hygienist, utilizing disclosing solution 2. Same visit, scaling and where needed, root planing, half-mouth, under local anesthesia. Up to 60 minutes 3. SRP of the the other half-mouth, under local anesthesia, up to 60 minutes, the next day or within 1 week. 4. Oral hygiene review, by a dental hygienist, using disclosing solution, with hands-on correction of techniques, guided by where the plaque is found. Full mouth prophylaxis. 45 minutes total 5. Periodontal reevaluation at 8 weeks post-SRP by the

periodontist. 30 minutes. If pockets less than or equal to 4mm and bleeding percentage reduced by 2/3 of original score, then ok for Orthodontic treatment and 3 month periodontal maintenance schedule. If deeper pockets persist, some form of surgical intervention would be indicated and treatment delayed until pockets are reduced to 4mm or less and the bleeding percentage is under 10%. Since significant bone loss has occurred, a regenerative treatment like LANAP could be considered as an alternative, more definitive initial treatment option.”

## Chapter 4: Discussion

At first glance, survey responses showed a diverse distribution of participants relative to age and years practicing. Interestingly enough, despite the interdependence of the orthodontic and periodontic specialties in regards to periodontally compromised treatment,<sup>44</sup> the majority of participants did not have exams different from their traditional new patient exam.

The association identified between years of practice and set criteria for orthodontic clearance seems plausible. Contemporary academic leaders have stressed the importance of interdisciplinary management of treatment,<sup>45</sup> and as such it would naturally follow that those closer removed from residency would tend to develop more problem-specific evaluation than those practicing longer with less heavy emphasis on interdisciplinary communication. Conversely, although there is a growing trend of more interdisciplinary treatment, it is of note that only one individual specified that they would develop their exam criteria after consulting with an orthodontist. Additionally, the type of overall clearance method preferred was not significantly correlated with age.

While oral hygiene and plaque index were valued relatively low compared to other clinical factors when clearing orthodontic patients for treatment, older periodontists valued plaque index and oral hygiene significantly more than younger periodontists. Conversely, the younger respondents valued attachment loss and furcation involvement. A 2001 article notes that while bacteria is the essential component for development of periodontitis, the following factors can strongly influence the degree of disease: smoking, diabetes, and genetic influences, specifically a variation in the interleukin-1 gene.<sup>46</sup> The importance of systemic and genetic influences on periodontal diseases was evident in the findings of a

previous study that found varying degrees of periodontal diseases in a population with no oral hygiene or dental care.<sup>47</sup> Hence, as mentioned earlier, while plaque index and oral hygiene are key considerations for periodontal evaluation, genetic and environmental influences cannot be discounted. This philosophical shift could conceivably indicate why older periodontists are more concerned with prevention than younger generations, whose education is more focused on the body as a whole rather than solely on the periodontium. A second consideration was that more experienced periodontists prioritized these factors differently due to their potential to be indicators for how hygiene and plaque levels may alter during orthodontic treatment. However, there were no significant differences between older and younger generations of periodontists with regards to oral hygiene as a determinant in ceasing orthodontic treatment, leading one to doubt this premise. Regarding cessation, older periodontists valued increased bone loss and root resorption significantly more than younger periodontists. Perhaps this can be explained as a product of experience, with older periodontists finding the most complications with such clinical factors.

The majority of periodontists do not feel clearance granted by general dentists is sufficient, nor do they feel general dentists should deliver follow-up evaluations. Past research has found general dentists to refer to periodontists based on how highly they valued their dental school education in periodontics. A higher regard for the dental school education in periodontics decreased the chance a referral would be made.<sup>48</sup> Such belief raises additional concerns. As of 1996, a majority of general dentists were providing some degree of orthodontic treatment (76.3%) and almost 19.3% were providing comprehensive orthodontic care, despite limited to no orthodontic instruction during one's dental school education.<sup>49, 50</sup> Those numbers have only increased as companies begin marketing directly

to dental practitioners, further complicating the clearance process. The latest trend of remote, do-it-yourself clear aligner therapy was universally rejected with the exception of a single practitioner.

Despite the differences in responses and clinical factor rankings, there were high levels of consistency in the majority of the scenarios.

Scenario 1 yielded consistent recommendations of oral hygiene instruction, then scaling and root planning. Treatment was followed by re-evaluation and maintenance. This indicates periodontists are united on how to treat the periodontal issues present. Of interest, was the suggestions made outside the perceived scope of periodontics. Evaluation for mouth breathing, condylar atrophy, Invisalign treatment to assist with oral hygiene and periapical radiographs to monitor root resorption were all suggested.

Scenario 2 was a continuation of the same case six months into orthodontic treatment. While periodontists seemed to largely agree in scenario 1 in regards to the periodontal treatment necessary, once orthodontics entered the picture, opinion was divided. Almost half of the participants recommended cessation of orthodontic treatment, while a significant portion recommended continuation. Reasoning from both factions was sound as it seemed the grade 2 mobility combined with increased attachment loss was troublesome to many. The divide comes to the forefront here as the largest identifiable group now views this as a periodontal problem and believe halting orthodontic treatment will allow for better stabilization of those maxillary anterior teeth, while the minority group believes continuing orthodontics will allow for teeth to be moved out of traumatic occlusion and thus improve the periodontal condition lessening the mobility. Regardless of viewpoint of continuation of orthodontic treatment, many participants agreed that

periodontal maintenance and increased visits were necessary due to the increased attachment loss. Studies have failed to find a direct link with what is deemed “normal occlusion” and periodontal disease. In fact, there is a lack of evidence supporting the idea that malocclusions lead to increased periodontal problems.<sup>51</sup> However, it is clear that the mechanics of orthodontic treatment can have a significant effect on the periodontium.<sup>30,31</sup>

Scenario 3 reinforces conclusions of scenario 1. When challenged with solely clearing for orthodontic treatment, participants were consistent in their evaluation and treatment. Only twelve participants did not view this case as a candidate for orthodontic treatment. A majority again was consistent with their periodontal treatment recommendations involving oral hygiene instruction, scaling and root planning, followed by re-evaluation in four to six weeks for possible osseous surgery.

This survey is a first attempt to gain insight into this complicated and delicate subject. The technological revolution occurring puts dentistry at an interesting crossroads where more information (both correct and incorrect) is accessible to the patient, and providers feel more confident providing a wider range of treatments. Future studies can examine the orthodontist’s perspective of this relationship or perhaps other interdisciplinary pairings such as the general dentist and orthodontist and how it may differ from that of the periodontist. Additionally, future research can examine how residency education have evolved over time and how that may shape practitioner belief. It is clear an opportunity exists for better interdisciplinary communication in a time when such cooperation should be easier than ever. A recent survey has found that periodontists are trending towards increasing the breadth of services offered, increasing number of providers



in individual practices, and a movement towards group practice models involving other specialists and general practitioners.<sup>52</sup>

This study is not without limitations. The participants were limited to those with publicly-available email addresses listed in the AAP directory. Due to the difficulty contacting participants and the limited response rate, we were unable to meet the assumptions of Cochran's formula. Therefore, it must be stressed that these responses may not be representative of the entire population of U.S. periodontists. Additionally, the lack of information and precedent regarding this topic of research indicates there was no existing material with which to base the survey upon. Hence, this survey was developed with input and cooperation from orthodontists and periodontists to address the aims of the study. To further validate the survey, a pilot study was attempted with the survey being sent to a number of periodontists. Unfortunately, after multiple attempts, the pilot study could not be completed. Further feedback to develop a more clear and concise survey would be beneficial for future studies.

## **Chapter 5: Conclusions**

A combined quantitative and qualitative analysis of the survey led to the following conclusions:

- 1) Periodontists were consistent in their evaluation and treatment recommendations of the prospective orthodontic patient.
- 2) Periodontists were consistent in their recommendations for periodontal treatment regarding patients undergoing orthodontic treatment. However, there was considerable disagreement on whether to continue orthodontic treatment concurrently with the periodontal intervention.
- 3) There is no association between years practicing and developed methods of clearance.
- 4) Periodontists feel comfortable giving and taking recommendations about interdisciplinary treatment. However, a majority feel orthodontists are not sufficiently informed on periodontal issues when treating these cases.

## Appendix A

<b>Table 1 – Demographic Information</b>					
<b>What is your age?</b>					
	Std Dev	Mean	Min	Max	
	12.8	49.6	28	78	
<b>With which ethnicity do you identify?</b>					
Ethnicity	Count	%			
Caucasian	113	76.9%			
Other	34	23.1%			
<b>With what gender do you identify?</b>					
Gender	Count	%			
Female	45	30.6%			
Male	102	69.4%			
<b>How many years have you practiced periodontics (including residency)?</b>					
	Median	Min	Max	1st Quartile	3rd Quartile
	18.0	0.0	49.0	8.8	30.3
<b>Do you have a set criteria used for examination and clearance of orthodontic patients that differs from your traditional new patient examination?</b>					
	Count	%			
No	100	68.0%			
Yes	47	32.0%			

## Appendix B

**Table 2 – Quantitative Data**

**What is the Basis For Your Developed Method of Clearance?**

	Count	%
Developed based on personal experience	53	36.1%
Modeled after evidence found in literature	59	40.1%
Modeled after residency clearance process	29	19.7%
Other	6	4.1%

**List of Clinical Findings Considered Most Important During Orthodontic Clearance Process in Order of Priority**

<u>Clinical Finding</u>	<u>N</u>	<u>Mean</u>	<u>Std Dev</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>
Probing depths >6mm	147	2.7	1.8	2	1	9
Attachment Loss	145	3.6	2.3	3	1	10
Mobility	145	4.2	2.4	4	1	9
Bone loss	147	4.5	2.4	4	1	9
Bleeding on probin	146	5.3	2.5	6	1	10
Furcation Involvement	145	5.3	2.4	5	1	10
Oral hygiene	144	6.0	2.3	6	1	10
Plaque index	146	6.6	2.1	7	1	10
Gingival biotype	146	7.2	2.4	8	1	10
Age	146	9.3	1.4	10	2	10

**Table 2 (Cont.)**

<b>List of Clinical Findings Considered Most Important in a Decision to Cease Orthodontic Treatment in Order of Priority</b>						
<u>Clinical Finding</u>	<u>N</u>	<u>Mean</u>	<u>Std Dev</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>
Increased bone loss	107	2.3	1.5	2	1	7
Increased probing depths	107	3.3	1.8	0	1	0
Root resorption	107	3.7	2.0	3	1	8
Presence of inflammation	107	4.2	2.2	4	1	8
Presence of recession	107	4.9	1.6	5	2	8
Poor oral hygiene	107	5.1	2.1	5	1	8
Increased mobility	107	5.4	2.1	6	1	8
Gingival hyperplasia	107	7.1	1.2	8	2	8

<b>Do You Believe Some Periodontal Conditions Can Be Improved Via Orthodontic Treatment?</b>		
	Count	%
No	1	0.9%
Yes	106	99.1%

<b>Do You Believe Periodontal Clearance From a General Dentist for Adult Patients is Sufficient to Begin Orthodontic Treatment?</b>		
N=107		
	Count	%
No	69	64.5%
Other	27	25.2%
Yes	11	10.3%

**Table 2 (Cont.)**

**Who Should Monitor and Deliver Follow-up Evaluations?**

N=107		
	Count	%
General Dentist	8	7.5%
Orthodontist	11	10.3%
Other	22	20.6%
Periodontist	66	61.7%

**Do You Feel Orthodontists are Sufficiently Informed on Periodontal Issues When Treating Interdisciplinary Cases?**

N=107		
	Count	%
No	79	73.8%
Yes	28	26.2%

**Who Should Monitor Periodontal Health During Orthodontic Treatment?**

N=107		
	Count	%
General dentist	7	6.5%
Periodontist	86	80.4%
Treating orthodontist	14	13.1%

**Do You Feel Knowledgeable About Giving Recommendations to the Orthodontist on How to Approach a Given Interdisciplinary Treatment?**

N=107		
	Count	%
No	4	3.7%
Other	4	3.7%
Yes	99	92.5%

**Table 2 (Cont.)**

**Do You Feel Knowledgeable About Taking Recommendations From the Orthodontist on How to Approach a Given Interdisciplinary Treatment?**

	Count	%
No	4	3.7%
Yes	103	96.3%

**Are You Comfortable with the Idea of Patients Engaging in Direct-to-Consumer, Remote Clear Aligner Treatment?**

N=107

	Count	%
No	106	99.1%
Yes	1	0.9%

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## Appendix C

**Table 3 - Correlations for years of practice and clinical findings you consider most important for clearing the orthodontic patient.**

Variable 1	Variable 2	N	Corr.	Lower 95% CI	Upper 95% CI	P-Value
How many years have you practiced periodontics (including residency)?	Attachment loss	138	-0.21	-0.37	-0.05	0.012*
How many years have you practiced periodontics (including residency)?	Furcation involvement	138	-0.17	-0.33	-0.00	0.047*
How many years have you practiced periodontics (including residency)?	Mobility	138	0.12	-0.04	0.29	0.145
How many years have you practiced periodontics (including residency)?	Probing depths >6mm	140	0.06	-0.11	0.22	0.503
How many years have you practiced periodontics (including residency)?	Bleeding on probing	139	-0.01	-0.18	0.16	0.903
How many years have you practiced periodontics (including residency)?	Plaque index	139	0.22	0.06	0.37	0.009*
How many years have you practiced periodontics (including residency)?	Oral hygiene	137	0.25	0.09	0.41	0.002*
How many years have you practiced periodontics (including residency)?	Age	139	-0.07	-0.24	0.09	0.391
How many years have you practiced periodontics (including residency)?	Bone loss	140	-0.10	-0.26	0.07	0.260
How many years have you practiced periodontics (including residency)?	Gingival biotype	139	-0.13	-0.29	0.04	0.135



## Appendix D

**Table 4 - Correlations for years of practice and the clinical findings dentists' consider most important in making a decision to cease orthodontic treatment.**

Variable 1	Variable 2	N	Corr.	Lower 95% CI	Upper 95% CI	P-Value
How many years have you practiced periodontics (including residency)?	Presence of inflammation	102	0.11	-0.09	0.30	0.277
How many years have you practiced periodontics (including residency)?	Increased mobility	102	0.18	-0.02	0.36	0.077
How many years have you practiced periodontics (including residency)?	Presence of recession	102	-0.01	-0.20	0.19	0.937
How many years have you practiced periodontics (including residency)?	Poor oral hygiene	102	0.06	-0.14	0.25	0.549
How many years have you practiced periodontics (including residency)?	Increased bone loss	102	-0.22	-0.40	-0.02	0.028*
How many years have you practiced periodontics (including residency)?	Root resorption	102	-0.22	-0.40	-0.03	0.024*
How many years have you practiced periodontics (including residency)?	Gingival hyperplasia	102	-0.05	-0.24	0.15	0.647
How many years have you practiced periodontics (including residency)?	Increased probing depths	102	0.06	-0.14	0.25	0.573

## Appendix E

### Survey Instrument

#### Demographic Information

1. What is your age?
  - a. Number response
2. With which ethnicity do you identify?
  - a. Caucasian
  - b. Other
3. With what gender do you identify?
  - a. Male
  - b. Female
4. How many years have you practiced periodontics (including residency)?
  - a. Free response

#### Question 1:

Do you have a set criteria used for examination and clearance of orthodontic patients that differs from your traditional new patient examination?

Yes

No

#### Question 2:

What is the basis for your developed method of clearance?

Modeled after residency clearance process

Modeled after evidence found in literature

Developed based on personal experience

Other

explain

#### Question 3:

From the following, please list in order of priority, the clinical findings you consider most important for clearing the orthodontic patient.

<i>Attachment Loss</i>	<i>Furcation Involvement</i>	<i>Mobility</i>	<i>Probing depths &gt;6mm</i>	<i>Bleeding on probing</i>
<i>Plaque index</i>	<i>Oral hygiene</i>	<i>Age</i>	<i>Bone loss</i>	<i>Gingival biotype</i>

#### Question 4:

From the following, please list in order of priority, the clinical findings you consider most important in making a decision to cease orthodontic treatment.

<i>Presence of inflammation</i>	<i>Increased mobility</i>	<i>Presence of recession</i>	<i>Poor oral hygiene</i>
<i>Increased bone loss</i>	<i>Root resorption</i>	<i>Gingival hyperplasia</i>	<i>Increased probing depths</i>

Question 5:

Do you believe some periodontal conditions can be improved via orthodontic treatment?

Yes

No

Question 6:

Do you believe periodontal clearance from a general dentist for adult patients is sufficient to begin orthodontic treatment?

Yes

No

Free response

Question 7:

Who should monitor and deliver follow-up evaluations?

Orthodontist

Periodontist

General Dentist

Free response

Question 8:

Do you feel orthodontists are sufficiently informed on periodontal issues when treating interdisciplinary cases?

Yes

No

Question 9:

Who should monitor periodontal health during orthodontic treatment?

Periodontist

General dentist

Treating orthodontist

Question 10:

Do you feel knowledgeable about giving recommendations to the orthodontist on how to approach a given interdisciplinary treatment?

Yes

No

Free response

Question 11:

Do you feel knowledgeable about taking recommendations from the orthodontist on how to approach a given interdisciplinary treatment?

Yes

No

Free response

Question 12:

- b. There is a growing trend in orthodontics of providing direct to consumer aligners, in which “clearance” is ensured by patients acknowledging they are in good dental health and limited or no office visits occur. Are you comfortable with the idea of patients engaging in this kind of remote clear aligner treatment?
  - i. Yes
  - ii. No
  - iii. Free response

### SCENARIOS (TWO)

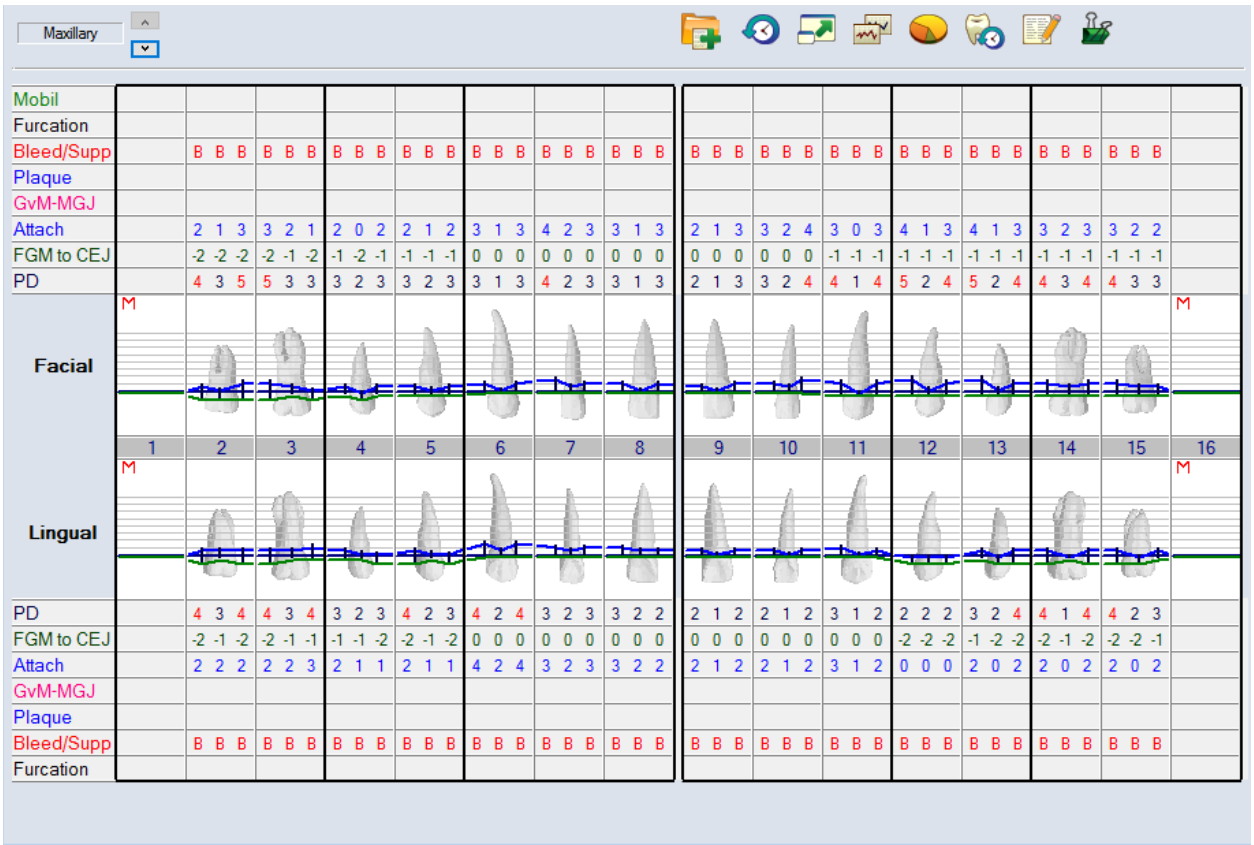
We will now present two cases to you with a total of three questions. The following patients have come to the periodontist upon referral from an orthodontist for clearance prior to beginning comprehensive orthodontics. Based upon the patient history, clinical and radiological findings, what would your recommendations be?

16yo, white, female patient presented with no significant medical history and a chief complaint of: “I want straight teeth.”

What are your recommendations for management prior to orthodontic treatment?









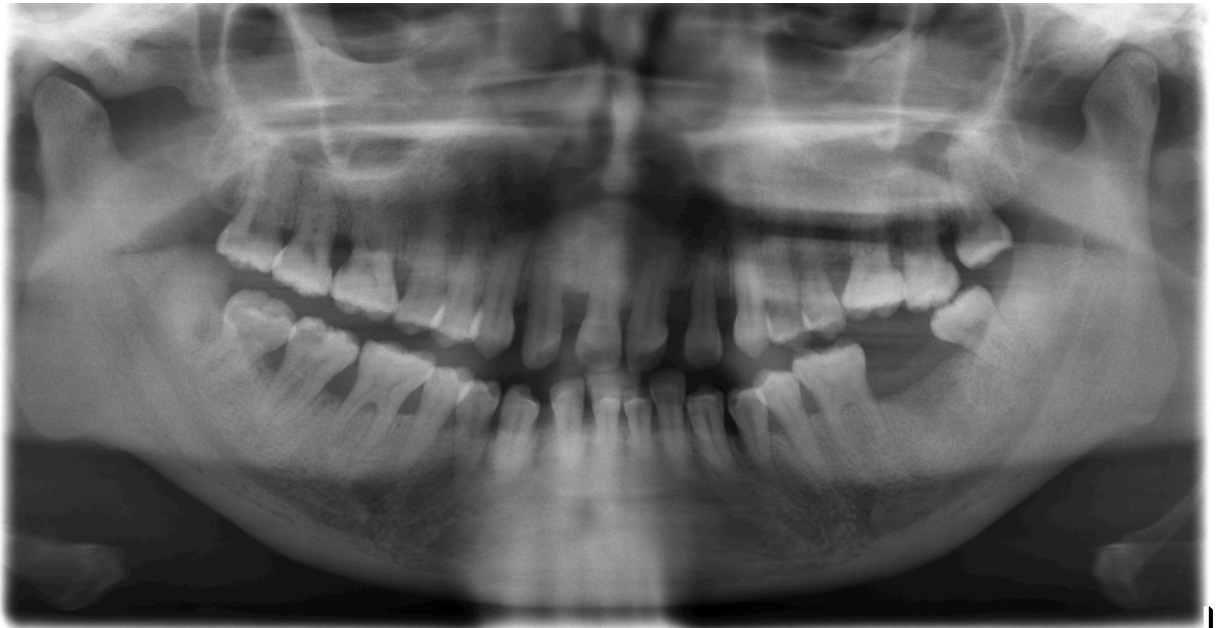
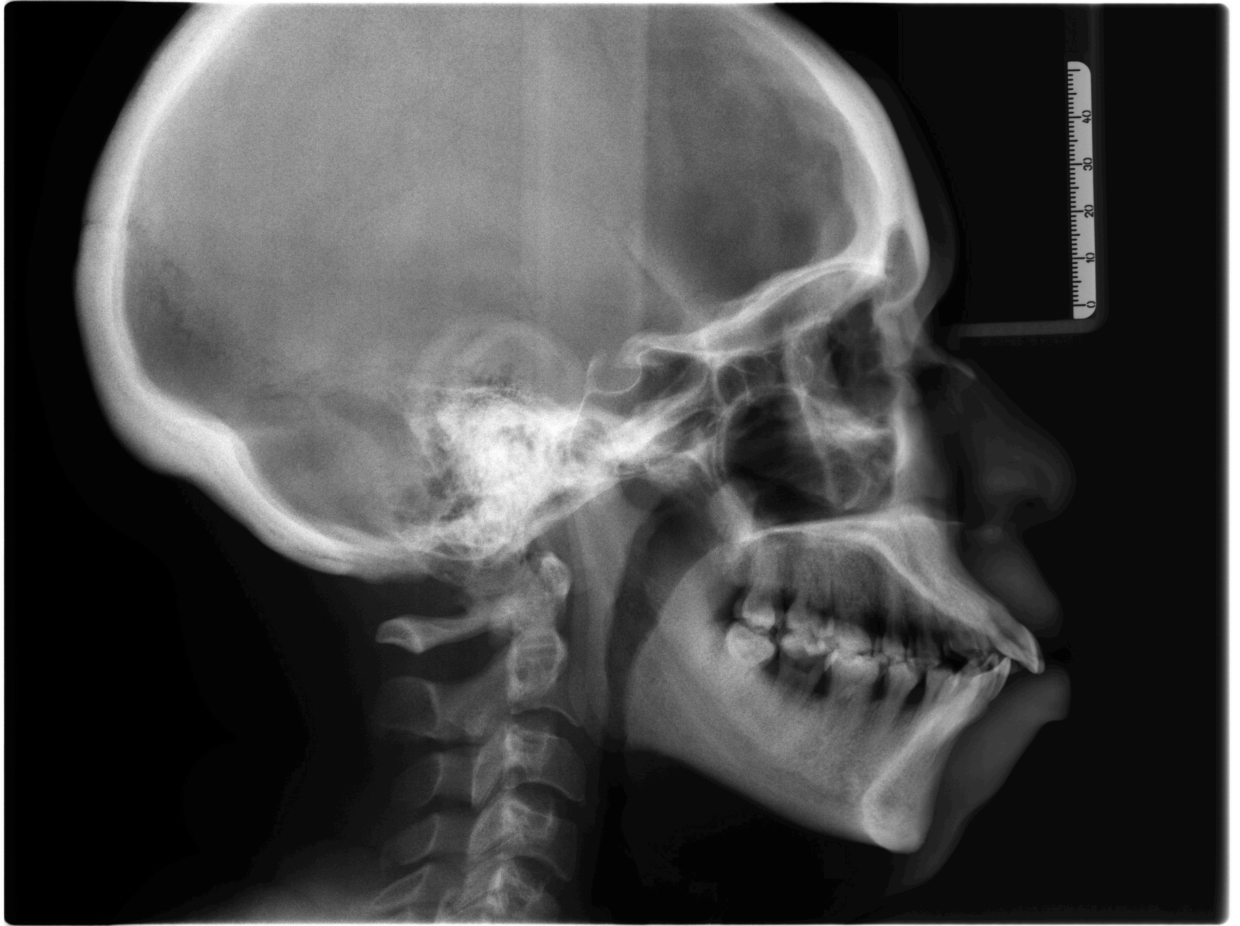
Mandibular																		
Furcation																		
Bleed/Supp	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B
Plaque																		
GvM-MGJ																		
Attach		3 3 3	3 3 3	4 2 3	3 2 3	3 2 3	3 1 2	2 1 2	2 2 2	2 2 2	2 1 3	3 2 4	3 2 4	4 3 3	3 2 3			
FGM to CEJ		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0			
PD		3 3 3	3 3 3	4 2 3	3 2 3	3 2 3	3 1 2	2 1 2	2 2 2	2 2 2	2 1 3	3 2 4	3 2 4	4 3 3	3 2 3			
Lingual																		
	M	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	M	17
Facial																		
	M																M	
PD		4 2 3	3 3 4	4 2 4	4 2 3	3 2 3	3 2 2	2 2 2	2 2 2	2 1 2	3 2 3	3 2 3	3 2 3	3 2 3	3 2 3			
FGM to CEJ		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0			
Attach		4 2 3	3 3 4	4 2 4	4 2 3	3 2 3	3 2 2	2 2 2	2 2 2	2 1 2	3 2 3	3 2 3	3 2 3	3 2 3	3 2 3			
GvM-MGJ																		
Plaque																		
Bleed/Supp	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B	B B B
Furcation																		
Mobil																		



32yo, black, female patient presented with no significant medical history and a chief complaint of “I want to fix my bottom teeth and close my gaps.”

What are your recommendations for management prior to orthodontic treatment?







## Appendix F

### Participation Letter

Dear Colleague,

We want to thank those that took the time to complete or attempt the survey, as well as for all the positive feedback we have received regarding the survey! For those of you who found the scenarios too cumbersome, we have taken steps to make that section easier. Additionally, Google Chrome browser seems to have caused issues for users, so we ask that you try another browser if you shared that issue.

For those of you yet to complete the survey, My name is William Brown and I am an Orthodontic resident enrolled in the Masters Program at Nova Southeastern University College of Dental Medicine. I am currently conducting a research study under the supervision of Dr. Shiva Khatami, DDS, Ph.D. You have been randomly selected among practicing U.S. periodontists to participate in a 10 to 15 minute, anonymous survey to examine questions regarding practitioner standards for periodontal clearance of the orthodontic patient.

In appreciation of your time and contribution to our research study, you will automatically receive an entry into a drawing for one of three **\$1000 Amazon gift cards**. The survey asks for, but not require, your name and email should you wish to be entered into the drawing. Surveys will be de-identified as explained in the attached consent. Please read the informed consent attached. After which, please use the following link to our secure online website (<https://redcap.nova.edu/redcap/surveys/?s=FN78K8TXL9>) to complete the survey. If you do not wish to participate in this study, please disregard this letter.

Thank you in advance for your participation. If you have any questions or concerns, please feel free to contact Dr. Khatami or me.

Thank you,

Principal Investigator:

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## Appendix G

### Informed Consent

#### Informed Consent

**Title of Study:** Examining Practitioner Standards Regarding Periodontal Clearance For the Orthodontic Patient

Principal investigator  
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For questions/concerns about your research rights, contact:  
Human Research Oversight Board (Institutional Review Board or IRB)  
Nova Southeastern University  
(954) 262-5369 / Toll Free: 866-499-0790  
[IRB@nsu.nova.edu](mailto:IRB@nsu.nova.edu)

**Explanation of Study:** Due to your status as a periodontal specialist/resident, you are invited to participate in this research study. The purpose of this study is to identify practitioner standards for periodontal clearance of the orthodontic patient.

We are inviting you to participate because you meet the following criteria: 1) a periodontist, 2) a faculty of an accredited U.S. periodontal program, or 3) a periodontal resident of an accredited U.S. periodontal program. The results of this study will be used to improve interdisciplinary collaboration and understanding between the periodontists and orthodontists involved in care of patients with compromised periodontal health.

You are asked to complete a self-administered 10 to 15 minute electronic survey housed on the secure, HIPAA-compliant NSU REDCap web site. The survey includes multiple choice and fill in the blank items, including demographic information. After you complete the survey instrument, your responses will be de-identified and analyzed.

**Risks/Benefits to the Participant:** There is minimal risk to you as a participant. The greatest potential risk may be compromised confidentiality and anonymity. However, every reasonable attempt has been designed into the study administration protocols to protect your confidentiality and anonymity. If you have any questions about the research or your research rights, please contact Dr. William Brown or Dr. Shiva Khatami at the phone numbers indicated above. You may also contact the IRB at the numbers indicated

above with questions as to your research rights. There are no direct benefits for your participation in this study.

**Cost and Payments to the Participant:** There are no costs to you and no monetary compensation for participating in this study. That said, participants who complete the survey will be provided entry into a drawing for three \$1000 Amazon gift cards in appreciation of their time and contribution to this project.

**Raffle Rules and Terms:** In order to be entered into the drawing for the \$1000 Amazon gift cards, a completed survey must be submitted to the principal investigator digitally through the REDCap website by 11:59pm on Sunday, September 23, 2018. This raffle will be conducted by Nova Southeastern University College of Dental Medicine, located at 3200 S. University Drive, Davie, FL, 33328. The source of funds for the prize is Nova Southeastern University's Health Professions Division grant for the purpose of funding the principal investigator's research project. No donation or purchase is necessary. The drawing will be conducted on September 24, 2018 at 12:45 p.m. in Room 4369 of the NSU College of Dental Medicine building.

**Confidentiality:** All information obtained in this study is strictly confidential, unless disclosure is required by law. Data collected using the secured web site, REDCap, will be automatically de-identified to ensure anonymity and confidentiality of participants. All participant email addresses and contact information will be disassociated from survey response data and stored on a separate password protected HIPAA-compliant university server. All data acquired during this research will be deleted after 36 months from the conclusion of the study as required by the IRB. The IRB, regulatory agencies, and Dr. Brown or Dr. Khatami may review research records.

**Participant's Right to Withdraw from the Study:** Your participation is voluntary; you are free to refuse to participate in or withdraw from this study at any time without penalty. If you do not want to continue, you can simply leave this website. If you do not click on the submit button at the end of the survey, your answers and participation will not be recorded. If you choose to withdraw after completion of the survey, any information collected from you before the date you leave the study will be kept in the research records for 36 months from the conclusion of the study, but you may request that it not be used by contacting the principal investigator in a timely manner.

**I have read this letter and I fully understand the contents of this document and voluntarily consent to participate. All of my questions concerning this research have been answered. If I have any questions in the future about this study, the investigator listed above or his staff will answer them.**

**I understand that the completion of this questionnaire implies my consent to participate in this study.**



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