ABSTRACT

Title of Thesis: Treatment of Congenitally Missing Lateral Incisors- A Post-Treatment Esthetic Evaluation

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Maxillary lateral incisor agenesis is relatively common in orthodontic offices and requires multidisciplinary action. While these cases are usually treated with a lateral incisor implant, a resin-modified bridge (RMB), or orthodontic space closure, little attention has been placed in the literature on comparing these three treatments in a post-treatment esthetic evaluation. This study asked orthodontists, prosthodontists, and general dentists to evaluate the final aesthetic outcomes of these treatment options. Using anterior intraoral photographs, all dentists were asked to rate the esthetics of differently treated missing lateral incisors, to identify which treatment was rendered, and develop a treatment plan a lateral incisor agenesis case. Results showed that implants and RMBs separately were esthetically rated the same for all three doctor groups, while space closure was ranked less esthetic by prosthodontists than by orthodontists or general dentists. All doctor groups could distinguish between treated or natural lateral incisors the same. For a Class I lateral incisor agenesis prosthodontists and orthodontists are more inclined to do implants than general dentists. In a Class II case orthodontists are more inclined to plan for space closure than prosthodontists or general dentists.

Treatment of Congenitally Missing Lateral Incisors- A Post-Treatment Esthetic Evaluation

By
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Master's Thesis

Treatment of Congenitally Missing Lateral Incisors- A Post-Treatment Esthetic Evaluation

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INTRODUCTION

Agenesis, the absence of permanent teeth, is a common occurrence among dental patients. The total incidence of tooth agenesis is about 4.2% among patients that are seeking orthodontic treatment (Celikoglu, 2010); and with the exception of third molars, the maxillary lateral incisors are the most common congenitally missing teeth with about a 2% incidence (Harris, 2008). Esthetically correcting congenitally missing maxillary lateral incisors is a common challenge that every orthodontist and dental team will face, and dentists must consider the treatment options that are most appropriate for each patient. The main treatment options are: implants, resin-modified bridges (RMB), and orthodontic space closure. Not every case is suitable for each of the three treatment options, and there is a little in the literature to indicate which treatment leads to the most esthetic outcome. The objective of this study was to have orthodontists, prosthodontists, and general dentists evaluate the esthetics of treated cases utilizing one of the three aforementioned options.

LITERATURE REVIEW

Esthetics

Since the maxillary lateral is in the anterior esthetic zone, details of the total smile and individual dental esthetics need to be considered. Recent literature ranks esthetics high in orthodontic patient diagnosis. "Wylie emphasized that the goal of orthodontic treatment should be to attain the best possible esthetic result, both dentally and facially (Roden-Johnson, 2005)" Studies have shown the importance of having an attractive smile; attractive people are perceived to be kinder, more sensitive, interesting, modest, sociable, exciting, obtain better jobs and lead more fulfilling lives (Anderson, 2005). Besides achieving the best possible functional occlusion and healthiest position of the teeth, dentists have the demanding task of creating an esthetic result for patients that will effect the rest of their life. Dental professionals must always strive to treat to the highest esthetic standards known to the profession.

Smile Esthetics

The smile arc allows dental professionals to correlate the upper anterior teeth to the lower lip (Figure 1). If the maxillary anterior incisal edges follow the curvature of the lower lip while smiling, it is called consonant. A flat smile arc is characterized as nonconsonant. Research has shown that flatter smile arcs are less attractive (Sarver, 2001). From an anterior view, the maxillary teeth should follow the guide of the golden proportion: the maxillary lateral incisor appearance in the smile should be 2/3 or 62% the width of the central incisor. The maxillary canine should be about 62% of the lateral incisor width; thus a tooth will show 62% of the tooth mesial to it in an anterior view (Sarver, 2004; Proffit, 2007).

Buccal corridor spaces have recently become more important to smile esthetics. The buccal corridor is the space between the facial surfaces of the posterior teeth and the corners of the lips when smiling (Figure 2). While researchers like Hulsey (1970) did not believe that this buccal corridor contributed to smile esthetics, research by Moore et al (2005) and Parekh et al (2006) show that decreasing the buccal corridor space is more esthetic. Researchers and clinicians now consider larger buccal corridors as part of the problem list during diagnosis. One study confirmed that orthodontists and lay persons thought that a broader arch form produces a more attractive smile, and lay persons think it is more attractive to have a greater number of teeth displayed while smiling than having fewer teeth visible (Parekh, 2006).

Dental Esthetics

The inherent shape and proportion of the anterior teeth are other key factors that affect a patient’s overall smile. Each person’s anterior teeth have nuances in shape and size that affect appearance. The maxillary central and lateral incisors should ideally have a width/height ratio of 8/10 or 80% (Sarver, 2004; Proffit, 2007, Figure 3). Several factors may contribute to a discrepancy in these proportions. A short clinical crown height could be due to inherent tooth size, attrition, incomplete passive eruption, or vertical gingival encroachment.

Contact points, the point where teeth actually touch each other on their mesial and distal surfaces, tend to be more incisal in the anterior region and more gingival in the posterior. The area where the teeth appear to touch is called the connector (Figure 4). This connector site is longest between the central incisors and decreases toward the posterior. The connector between the maxillary centrals tends to be about 50% of the tooth height, 40% between the central and lateral incisors, and 30% between the lateral incisor and canine. The areas incisal or gingival to the connector are called the embrasures. The embrasures are smallest between the central incisors and larger in the posterior. Gingivally, the embrasures should be filled with the papillary tissue; but if the interdental papilla is absent, an unesthetic dark triangle occurs (Sarver, 2004).

The shape of an individual's anterior teeth varies enough to influence dental esthetics. Anderson (2005) researched the different tooth shapes of male and female patients. He divided the shapes of anterior teeth into: square, square-round, and round. For female patients, general dentists preferred round incisors while orthodontists preferred round and square-round incisors. For the male patient, dentists and orthodontists both preferred square-round incisors.

Tooth color also reflects the attractiveness of a smile. In general, posterior teeth tend to have a more yellowish color than the anterior teeth, which are whiter. Yellow teeth are deemed to be unattractive by dental professionals and lay persons alike (Brough 2010). The color shade of each tooth and how they blend with the adjacent teeth is crucial to dental esthetics. A study showed that orthodontists, general dentists, and laypeople all thought a dark shade of an anterior tooth was less attractive than an unesthetic gingival margin, crown width, or incisal shape (Brough, 2010).

Gingival Esthetics

As one smiles, the height of the gingiva displayed between the maxillary central incisors and the upper lip is important. An ideal amount of gingival display is 2.1mm (Ker 2008), while too much gingival display is unesthetic and called a ‘gummy smile’. Gingival shape and contour are determined by the osseous contour (Zetu, 2005). The gingival margin of the maxillary central incisor and the canine should bet one to two millimeters higher than that of the lateral incisor. The bony projection over the labial surface of the canine root is called a *canine eminence*. The *gingival zenith* is the most apical point of the gingival tissue on the facial cervical area of a tooth (Figure 5). For mandibular centrals and maxillary laterals, the gingival zenith is in line with the long axis of the tooth. The gingival zenith for the maxillary central incisors is located distal to the longitudinal axis (Sarver, 2004).

Planning Lateral Incisor Agenesis Cases

For patients with a congenitally missing maxillary lateral incisor, multiple factors should be considered when formulating a treatment plan. These should include available space for the crown and root, canine position, molar occlusion, smile/dental/gingival esthetics, bone quality and quantity, age, facial profile, lip posture, and finances. Whatever treatment option is chosen will depend primarily on two factors: occlusion and anterior esthetics. In the past, orthodontists thought the presence or absence of a major malocclusion was the most important factor, but with anterior esthetics as a more recent major orthodontic goal this may not always hold true. Currently, treatment planning is becoming more directed toward the importance of anterior esthetics and the position of the maxillary incisors, the best treatment may be one that provides the best esthetic outcome. Anterior esthetics and occlusion must both be considered together; since a less favorable treatment plan may be implemented if only one is considered (McNeill, 1971). However, finances also factor into the decision making process and resulting treatment. Unfortunately, not every patient will follow through with ideal treatment, or any treatment at all due to monetary constraints.

Treatment Options

Treatment options available for patients with missing lateral incisors and no other malocclusion include implants, RMBs, or even a conventional bridge. Orthodontics may not need to be a part of this procedure if the teeth are in good alignment and the lateral space is sufficient for a prosthesis. Treatment of malocclusions having agenesis of one or both maxillary lateral incisors generally falls into two possible options. The space can be either opened or closed (Sabri, 1999). If the space is opened, a prosthetic procedure is required to replace the missing tooth. Implants are becoming the treatment of choice, but resin-modified bridges (RMB), cantilevers, or conventional fixed partial dentures are still performed due to finances or because they are a less invasive procedure, or there is deficient bone volume for implants (Kinzer, 2005; Kinzer, 2005). If the space is closed, the canine must be reshaped to resemble a lateral incisor, and the first premolar will substitute for the canine. This is called canine substitution (Kinzer, 2007; Thordarson, 1991).

There will be different esthetic demands depending on the treatment. For example, canine substitution cases may present more difficulty in achieving the golden proportions or matching the shade and shape with the contralateral lateral incisor. RMBs make it difficult to create a good emergence profile and maintain a good bony alveolar ridge. Ideally, canine substitution, RMBs, or an implant will aim for correct papilla projection, contour, and a natural zenith point. For example, a canine substitution case will require disguising the canine eminence and a higher gingival contour in the lateral site, while an implant restoration may have difficulty creating an ideal papilla projection and no gray coloring of the gingiva.

Resin-Modified Bridges

The RMB became a standard dental restorative treatment in the 1980s (Savage, 2002). The appealing concept for this treatment is that the adjacent teeth receive very minimal preparation as they serve as abutments for an anterior bridge composed of metal and composite. A bridge, which is a less invasive procedure, is an alternative when there is not enough space between bone and teeth for an implant (Spear, 2009).

Recently RMBs have become more of a temporary restoration due to their high failure rate and diminished esthetics when compared to other options. Many RMBs tend to have a gray cast through the adjacent teeth due to the metal covering the lingual of the abutment teeth. Creugers et al (1992), showed that anterior RMBs have a survival rate of 75% over 7.5 years, but others have shown less favorable rates of 54% survival over 11 months (Kinzer, 2005). With the possibility of bond failures, RMBs have been recommended for shallow overbites and contraindicated for deep overbites. Many clinicians will use a RMB as an interim restoration until growth is complete prior to implant placement.

Implants

With lateral incisor agenesis and available space, implants are usually the treatment of choice. Implants are a favorable option because no adjacent tooth is prepared for restorations, and implants have a success rate of 90% over 10 years (Zachrisson, 2004). Pre-implant orthodontics must leave adequate room for the implant between the adjacent roots as well as sufficient crown space. This can be achieved by using the golden proportion, the contralateral lateral incisor, a Bolton analysis, or a diagnostic wax-setup. Generally the lateral incisor site should be 5-7mm. Space between the roots of the adjacent teeth and the implant can be no less 0.75mm, with 1.5-2mm space between the adjacent crowns and implant head (Kinzer, 2005). Implants must be placed after growth cessation due to the continuing vertical growth of the jaws. If growth has not stopped, this can lead to infraocclusion of the implant with an unesthetic gingival architecture. On average boys finish growth at 21 years of age and girls at 17 years (Kokich, 2006). After orthodontics, the adjacent roots must be maintained out of the edentulous site, and the alveolar ridge may need bone grafting in the future if the ridge narrows. The lateral incisor space will also need a temporary pontic, which is often built into a retainer or a RMB. If the implant is placed too labially, the thin buccal bone can resorb and the gingiva can appear gray in color. Poor soft tissue management can also lead to loss of papillary esthetics; the papilla distal to the lateral incisor implant can be particularly difficult to fill in the embrasure space.

Orthodontic Space Closure-Canine Substitution

Closing the space created by maxillary lateral incisor agenesis orthodontically is called canine substitution. This is a frequent option when the molar relationship is Class II (Sabri, 1999). As the canine is brought into the lateral site, certain orthodontic movements are essential for an acceptable esthetic result. The canine will first be protracted and then extruded to align the scalloped free gingival margin slightly more incisal than the central incisor gingival margin. Proper position of the canine root to the lingual will decrease the canine eminence. The first premolar should be rotated more mesially and buccal root torque applied to mimic a canine eminence; intrusion of the tooth may also be done to achieve a more canine-like gingival architecture (Kinzer, 2007; Tuverson, 1970).

Another necessary step in canine substitution is changing the canine crown shape. The incisal tip must be flattened and the mesial and distal surfaces must be reduced to make the canine ‘thinner.’ The pronounced canine labial ridge should be reduced for a flatter facial surface, and the lingual cingulum reduced if there are premature occlusal contacts (Kinzer, 2007). Likewise, the first premolar may need to have the lingual cusp reduced for occlusion and esthetics. If the premolar was intruded for gingival architecture, the buccal cusp may need to be lengthened with restorative material. If the canine cannot be reshaped to appear like a lateral incisor, or the color is too dark and yellow (McNeill, 1971), restorative treatment can be performed to create a lateral incisor’s shape and color. Often the incisal corners of the canine may require direct composite build-ups to achieve the lateral incisor shape, but porcelain restorations can also be chosen for better color or durability (Zachrisson, 1978). Temporary crowns are a good option to get correct gingival shape before final restorations are placed (Czochrowska, 2003). Even with some of these restorative options, the cost is much more affordable and the course is less invasive than an implant procedure (Rosa, 2007).

Research has shown that removing the enamel of the canine does not cause harm to the tooth or pulp except for a temporary sensitivity (Zacchrison, 1975). Canine substitution has had no correlation with development of temporomandibular dysfunction (Robertson, 2000). Possibly the most common objection expressed by a layperson is the yellowish-white color of the canine when used as a lateral; most researchers recommend selective bleaching or restorative treatment (Kinzer, 2007).

Another problem doctors see with canine substitution treatment is the loss of the canine guidance for excursive movements in a Class I occlusion. Nordquist et al (1975) showed that canine substituted teeth are periodontally healthier than prosthetic lateral incisors, and no differences existed in occlusal function between canine substitution, group function, or prosthetically replaced lateral incisors with the canine in Class I. Thordarson et al (1991), also found that no significant long-term clinical and radiographic findings occurred to enamel reduced teeth (Zachrisson, 1975).

While a great deal of literature has been devoted to planning treatment of lateral incisor agenesis cases, and techniques to perform each option, few articles have evaluated the post-treatment esthetic results for the different options. From an esthetic standpoint, no comparison has been made between lateral incisor implants, resin-modified bridges, and canine substitution for replacing a maxillary lateral incisor. The subjects in this study will have to use their esthetic knowledge as they evaluate the final result of different treatment options. The plan of this study will attempt to determine which treatment may yield the most esthetic result and compare the views of the different subjects.

GOALS

For patient's having missing maxillary lateral incisors that have been treated by RMBs, implants, or canine substitution, this research seeks to accomplish three goals.

1. To compare the opinions of orthodontists, prosthodontists, and general dentists as to which type of treatment they consider most esthetic.
2. To determine if orthodontists, prosthodontists, and general dentists can differentiate between non-restored and restored lateral incisors and identify the type of treatment provided.
3. To determine the treatment preferences of orthodontists, prosthodontists, and general dentists when planning treatment for patients with a congenitally missing lateral incisor.

HYPOTHESIS

1. Null hypothesis: There is no significant difference among orthodontists, prosthodontists, and general dentists in their rating of esthetic treatment outcomes when missing lateral incisors have been replaced.

Research Hypothesis: There will be a significant difference in the esthetic rating of treatments between the three doctor groups.

2. Null Hypothesis: There is no significant difference among the doctor groups in their ability to identify which type of treatment was rendered, or distinguish between non-restored and restored lateral incisors.

Research Hypothesis: There will be differences between the three doctor groups in their ability to identify if treatment was rendered, and if so which treatment was performed.

3. Null Hypothesis: There is no significant difference in the choice of treatment between the doctor groups for a patient with missing lateral incisors.

Research Hypothesis: The three doctor groups will prefer different treatment options when evaluating the same patient.

MATERIAL AND METHODS

Subjects

All doctors taking the survey practice in the mid-Atlantic region to minimize regional differences in treatment approach and biases. Subjects included orthodontists in Maryland and Washington DC; prosthodontists in Maryland, Pennsylvania, and Washington DC; and general dentists in Maryland. The general dentist group is larger than the other groups because the Maryland chapter of Academy of General Dentists could only forward an email to their entire membership. This was beneficial since specialists tend to respond to surveys at a higher rate than general dentists (Kokich, 2005).

Subject Selection

- Orthodontist group- email addresses of 132 orthodontists were obtained through the American Association of Orthodontic membership directory for Maryland and Washington DC.
- Prosthodontist group- email addresses of 144 prosthodontists were obtained from the membership directory of the American College of Prosthodontists for Pennsylvania, Maryland, and Washington DC.
- General Dentist group- email addresses of 975 general dentists were obtained from the Maryland chapter of the Academy of General Dentists.

As the email lists were compiled, no other contact information or names were collected nor documented in order to keep anonymity. Doctors from each group were able to submit their responses and remain anonymous through the Qualtrics survey software. Survey responses did not include any contact information or names.

The proposal and evaluation were approved by the University of Maryland Institutional Review Board (IRB) who categorized this study as a non-human research proposal. As such, the IRB review stated that there was no further analysis was needed to insure that this project was within Human Research Protections Office guidelines (Appendix 3).

Procedure

Photographs

Intraoral photographs of cases with maxillary lateral agenesis treated and natural laterals were collected. These photographs were collected from private orthodontists, prosthodontists, and general dentists affiliated with the University of Maryland Dental School. Anonymity was maintained; the pictures contained no patient identifiers, and the photos depict only the intraoral area. Doctors who donated the photographs also were not identified.

The missing maxillary laterals were either replaced by implants, canine substitution, or resin-modified bridges (RMB). The photographs consisted of: anterior intraoral views with the lips retracted to minimize upper lip coverage and with the maximum of the dentition displayed. Some photographs were excluded for poor lighting and/or insufficient focus. Each of the photographs selected for analysis demonstrated esthetic details such as: gingival architecture, color, shape, incisal relationships, emergence profile, papillary anatomy, and overall esthetic appearance and occlusion of the restored lateral incisors. Cases utilized contained a mixture of unilateral and bilateral treated dentitions. The questions in the evaluation indicated specifically which maxillary lateral (right or left) was to be evaluated. Eleven pictures for implants, six pictures for RMBs, and nineteen pictures of canine substitution treatments were collected, along with eight photographs of natural lateral incisors. It was arbitrarily decided that five pictures were needed per treatment category per hypothesis since it seemed reasonable that a doctor could decide their restoration preference after five views. From the collected photographs, five photographs were selected from each group to best represent each treatment method.

The photographs selected did not favor the best or worst results for any of these treatments. Thus, the quality of treatment varied and the sample was not composed of special cases that resulted in extraordinary results.

The questionnaire and photographs were formatted into the Qualtrics software. Qualtrics is a fourth generation online survey software; a platform for designing, distributing, and evaluating survey results. Digital photographs and questions were downloaded onto the Qualtrics software to create the survey. The cover letter was emailed to all the doctors and contained a hyperlink to connect to the evaluation in the Qualtrics software. The doctor was then able to complete the survey and submit responses. The digital survey was sent out to the aforementioned subject groups. After two weeks, a reminder email with the same link to the survey was resent to the same subjects. After two more weeks, the survey was closed from receiving any more responses. The survey was open for a total of four weeks. The Qualtrics software prohibited a duplicate survey from being submitted by the same doctor.

Evaluation Structure

The following is a description of the evaluation process:

1. Five intraoral anterior photographs from each of the three treatment categories (canine substitution, implant, and RMB) were placed in a random order for a total of fifteen questions with photographs. Each photograph was accompanied by the

question: How esthetic is the patient's maxillary right (or left) lateral incisor? Responses ranged from 1 (unaesthetic) to 10 (highly aesthetic).

2. Five different intraoral anterior photographs for each of the three treatment categories, plus an additional five, showing natural lateral incisors, for a total of twenty questions with photographs were prepared. If a photograph from the previous section was re-used, the picture was edited to produce a mirror image. The subjects were asked to identify which type of lateral was present (implant, canine substitution, RMB, or natural tooth).
3. Pre-treatment intraoral pictures showing anterior, sagittal, and occlusal views of two patients with maxillary lateral incisor agenesis, one with a Class I molar occlusion and one with a Class II molar occlusion were presented. The subjects were asked to select which type of treatment they would prefer for the missing lateral: implant, canine substitution, or RMB for that given case.
4. In addition, questions regarding the opinions of the subjects concerning treatment options for congenitally missing lateral incisors were recorded. The subject was asked if they are an orthodontist, prosthodontist, or general dentist, and how long they have been in the profession. An additional 'comments' box was available for the participants.

Statistical analysis

A power analysis was conducted for each of the three hypotheses. Large differences between groups were considered important. For the first hypothesis, with an N of 21, an effect size of 0.40, 21 subjects in each of the three groups, and a p of 0.05, power was equal to 0.80. For the second hypothesis, with an N of 53, an effect size of

0.25, 53 subjects in each of the three groups, and a p of 0.05, power was equal to 0.80. For the third hypothesis, with an N of 27, an effect size of 0.40, 27 subjects in each of the three groups, and a p of 0.05, power was equal to 0.80 (Tables I, II, III).

The statistical analysis used for the first hypothesis was a One-Way Anova (SPSS Inc. 2008, student version™ 16.0 by Prentice Hall). If a significant difference were found, Tukey's honestly significant difference test would be used to find those differences. The second and third hypotheses required a Chi-square test (Stat Package by Jeffery L. Plotkin and instructional support services, Dental School, University of Maryland at Baltimore). A p value of 0.05 was considered significant.

RESULTS

Doctor response rate

A total of 1251 doctors were emailed the cover letter and link to complete the evaluation. The survey was sent to 975 general dentists, 144 prosthodontists, and 132 orthodontists, and after four weeks, 140 (11.2%) responses were received. The response rate was 28.0% (37) for orthodontists, 18.1% (26) for prosthodontists, and 7.9% (77) for general dentists. Since, not every doctor answered every question in the survey, those incomplete answers were eliminated from the statistical analysis they pertained to. The incomplete answers amounted to a range of one to four per doctor group in each category in each hypothesis (for more details see Appendix 2.)

Hypothesis 1 Esthetic Rating

A. Implants

For lateral incisor implants, there was no significant difference in the esthetic rating between the three doctor groups ($F = 2.086$, $p = 0.128$). On average orthodontists gave implants an esthetic rating of 6.0 ± 1.3, prosthodontists 5.3 ± 1.4, and general dentists 6.0 ± 1.5.

B. Resin-Modified Bridges

For RMBs, there was no significant difference in the esthetic rating between the three doctor groups ($F = 1.814$, $p = 0.167$). On average, orthodontists gave RMBs an esthetic rating of 5.2 ± 1.5, prosthodontists 5.0 ± 1.4, and general dentists 5.6 ± 1.5.

C. Canine Substitution

For canine substitutions, there was a significant difference in the esthetic rating between the three doctor groups ($F = 4.064$, $p = 0.019$). Prosthodontists gave canine substitution a significantly lower esthetic rating than orthodontists and general dentists. On average, orthodontists rated canine substitution 6.3 ± 1.6, and general dentists 6.0 ± 1.8, while prosthodontists rated canine substitution 5.1 ± 1.8 (Table IV).

Hypothesis 2: Treatment Identification

There was no significant difference among the three doctor groups in their ability to identify which treatment was rendered (RMB, implant, or canine substitution, $X^2 = 4.980$, $p > 0.05$). Approximately ¾ of the doctors in each group of (74.7%) orthodontists, (74.0%) prosthodontists, and (70.1%) of general dentists correctly identified which treatment was rendered (Table V).

Hypothesis 3: Treatment Planning

For patients having both Class I and Class II malocclusions, the initial Chi-Square analysis revealed that greater than 20% of the cells had expected values less than 5. Therefore, the results were collapsed so that implants were compared to a combination of canine substitution and RMB cases for a Class I malocclusion, and for a Class II malocclusion canine substitution was compared to a combination of implants and RMBs (Table VI).

A. For patients with a Class I malocclusion

The results showed that for a patient having a Class I molar, orthodontists and prosthodontists were significantly more inclined to favor implants as a treatment of choice than general dentists (X^2 =11.374, p = 0.01). This result is significant, but it is important to note that implants were chosen by the majority within every subject group. While orthodontists and prosthodontists preferred implants 86% and 96% of the time respectively, general dentists only preferred implants 67%. The other 1/3 of general dentists preferred canine substitution (n = 19, 25%) or RMB (n = 6, 8%). For those who did not choose implants, canine substitution was selected by orthodontists 11% (n = 4) and by prosthodontists 0%; RMB was selected by orthodontists 3% (n = 1) and by prosthodontists 4% (n = 1).

B. For patients with a Class II malocclusion

For patients having a Class II malocclusion, orthodontists were significantly more inclined to choose canine substitution than prosthodontists and general dentists (X^2 = 8.155, p = 0.025). Orthodontists chose canine substitution 89% (n = 32) of the time while prosthodontists and general dentists chose this option only 60% (n = 15) and 65% (n = 49) respectively. Furthermore, in a Class II case, prosthodontists and general dentists would still choose an implant 36% (n = 9) and 32% (n = 24) respectively. RMBs were selected rarely for all groups, 0% for orthodontists, 4% (n = 1) for prosthodontists, and 3% (n = 2) for general dentists.

DISCUSSION

More specialists than general dentists responded to the survey; and orthodontists responded at a higher rate than prosthodontists. Although the general dentist group had a low response rate, the high number of emails sent to this group resulted in the highest number of responses. A similar online survey taken by orthodontic residents (Anning, 2011) produced a higher response rate (33%) than the orthodontists (28%) in this study, and even more so than the prosthodontists or general dentists. The lower response rate for practicing doctors may be due to their focus on provision of care rather than research. Additionally, the Anning survey sent email reminders every week for three months while this survey only sent one email reminder after two weeks and closed after four.

This evaluation was undertaken to determine if specialists and general dentists are biased toward treatment planning based on their type of practice or training. A doctor may be biased toward those procedures with which they are more comfortable and reliable for themselves, or for financial reasons. This study also attempted to determine what treatment types dentists found most esthetic. With unlabeled pictures, the doctors were also challenged to identify which type of treatment was rendered in each case.

Maxillary lateral incisor agenesis does not consistently have one best treatment plan, so the results of this survey could help determine which treatment is generally agreed as being more esthetic.

This survey showed that orthodontists, prosthodontists, and general dentists find lateral incisor implants to be similar in esthetics. Some of the cases presented appeared better or worse than others when considering gingival architecture, color and crown shape. Although the range of answers was not significant, characteristics that appear to have influenced a higher esthetic rating by all dentists were: gingival contour just lower than the central and canine teeth, white crown shades, and natural appearing crown shapes (Figure 6). Spear's (2009) study supports the need for osseous and soft tissue detail to produce an esthetic implant. Prosthodontists, who restore the most implants, might have had a bias in rating implant restorations higher esthetically, a theory not confirmed by the data in this study.

Resin-modified bridges, like the implant treatments, had no significant esthetic rating differences. General dentists and prosthodontists utilize RMBs, but the esthetic rating was not significantly different among the three doctor groups. There seemed to be no bias for dentists and prosthodontists rating RMB higher. What may have influenced the rating between the higher rated RMB and the lower rated RMB was the crown shape and gingival margin (Figure 7). Robertson (2000) showed that in general, subjects treated with space closure were more satisfied with the appearance of their teeth than those who had a prosthesis (RMB).

There was a statistically significant difference in the esthetic rating of patients having canine substitution. Prosthodontists disliked the esthetics of this treatment more than orthodontists and general dentists. This treatment group had a smaller range in ratings than the implant and RMB group. It appears that the higher rated canine substitution cases tended to include the teeth that were recontoured more and appear most like a lateral incisor (Figure 8). Some prosthodontists commented during the survey and expressed a dislike for canine substitution for two reasons: esthetics and function. Prosthodontists do not like the crown shape or the gingival architecture for canine substitution cases. They also feel the need to keep the canines in a Class I relationship and use their long roots to bear the heavier biting forces. One study (Nordquist, 1975), demonstrated no difference in the health and function of Class I canines and those with group function with canine substitution. While the results are statistically significant between the three groups, this may not necessitate a clinical significance since the difference was not large on the zero to ten scale. With proper enamel reduction, canine position and care to detail, canine substitution can still be clinically acceptable and esthetic for all dentists. This also applies to implants and RMBs, where good technique and attention to detail make these restorations esthetically acceptable.

It appears that crown shape may be a major determining factor in esthetic ratings. Too many canine substitution cases had insufficient reshaping, showing a labial prominence and not a flat incisal edge. This often occurs when the orthodontist desires to minimize enamel reduction on the canine, the orthodontist may also be opposed to making the patient uncomfortable with a handpiece or the need to get the patient numb. If the crown cannot be reshaped by recontouring alone, then the patient should be referred to another dental professional for restorative techniques to improve the morphology. Kokich (2007) emphasized the need for restorations when dentin has been exposed, incisal shape must be modified, or tooth color improved. Unfortunately, based on the collected photographs it appears that many patients may not have followed through with the referral and thus many canine substitution cases end with a compromised esthetic result.

All three doctor groups demonstrated a strong ability to identify which treatment was rendered, and there was not a significant difference between them. This further shows the importance of treatment plan selection since the esthetic end result is noticeable. The most easily identified condition was a natural tooth, whereas implant and canine substitution treatments are the most difficult. This shows that dentists are able to detect natural teeth, but once a missing lateral incisor has received some type of treatment identification of the type of restoration may be more difficult. Kokich (1999) concluded in a study that, in general, orthodontists could discern esthetic details more often than general dentists or laypersons. On the other hand, this study shows that general dentists and orthodontists were no different in their ability to discern restored lateral incisors.

For patients with a Class I molar occlusion, orthodontists and prosthodontists more often choose to place implants at a greater rate than general dentists. With Class I occlusions orthodontists prefer to maintain the maxillary lateral incisor space in order to limit the duration of orthodontic treatment. This can help minimize other orthodontic risks such as root resorption and white spot lesions. Prosthodontists place many implants and thus are probably comfortable with making the decision to place them.

General dentists tend to have more variation in treatment selection, resulting in fewer implant restorations.

For patients with Class II molar occlusions, orthodontists are more willing to recommend canine substitution than are prosthodontists or general dentists. With a Class II posterior occlusion, there is less room for the prosthetic replacement of the maxillary lateral incisor. Many orthodontists expressed that they often choose canine substitution in these cases even if the anterior smile esthetics and lip projection would be better if the space were opened and the missing tooth replaced in another fashion. The rationale results from the difficulty in moving the whole upper dentition into a Class I occlusion in order to obtain enough lateral incisor space. The only other way to create lateral incisor space would be to extract the first premolar, leaving molars in Class II and canines Class I. This is generally not considered an option because it requires an unnecessary extraction to place a lateral incisor implant. In a 2002 article, Savage states the importance of the molar occlusion as the 'first factor to analyze' in patients with lateral incisor agenesis.

One of the last questions in the survey asked each doctor to rank certain factors in the order of their importance when considering treatment for congenitally missing maxillary lateral incisors. General dentists and prosthodontists rank canine position as a primary factor, but molar classification (Class I, II, III) was ranked as last for both of these doctor groups. When this question was posed to orthodontists, the primary factor was molar classification. Orthodontists do not always agree with the general dentists and prosthodontists views on what factors are the most important for treatment planning these types of cases. It is obvious that a discussion needs to take place between dental professionals so that they understand each other’s points of view. Opening space for lateral incisor prosthesis in a Class II case is difficult. All too often general dentists and prosthodontists are not aware of the advantages and disadvantages of orthodontics. Moving the whole maxillary dentition from Class II to Class I requires a longer time in appliances with the subsequent risks such as root resorption, decalcified enamel, gingival hyperplasia, and carious lesions.

Financial issues may present another concern. Absent a malocclusion, treatment for lateral incisor agenesis may be done with implants or RMBs alone. With a malocclusion present, restoring the lateral with an implant or RMB will have the additional cost of braces. If canine substitution is the chosen procedure, then orthodontics is the patient’s only cost. Rosa (2007) stated that a canine substitution that needs composite build-ups still compares favorably with the cost of an implant. Also, if a prosthesis is placed, continual maintenance will be required. Hopefully the patient’s best interest is main factor during multidisciplinary treatment planning.

In retrospect, this study had some limitations. The survey would be enhanced if more time was allotted to collecting better pictures, especially for the RMB group. Some of the pictures were not the best quality or a full view of the dentition. Different results might be obtained by increasing the sample size by surveying a larger geographical area, and by increasing the number of subjects per group. This study could be made more comprehensive by adding other dental specialist or layperson groups. Another factor that could alter the results is, by not retracting the upper lip for the anterior photographs. The variability of the upper lip upon the smile may or may not show gingival architecture and change the esthetic dynamics.

CONCLUSIONS

1. Orthodontists, prosthodontists, and general dentists equally prefer the esthetics of maxillary lateral incisor implants, the three doctor groups also ranked the esthetics of RMBs equally. Orthodontists and general dentists prefer the esthetics of canine substituted lateral teeth the same, while prosthodontists find this option less esthetic.

2. Orthodontists, prosthodontists and general dentists could correctly identify the procedure preformed (implant, RMB, canine substitution, or natural) about ¾ of the time.

3. For patients with a Class I molar occlusion and lateral incisor agenesis, orthodontists and prosthodontists are more likely to prefer an implant than general dentists. For patients with a Class II molar occlusion and lateral incisor agenesis, orthodontists are more likely to prefer canine substitution than prosthodontists or general dentists.

4. It is the practitioner's or dental institution's obligation to explain the limits and risks of extensive orthodontic, restorative, and implant therapy to other dental professionals so all can mutually agree while planning treatment.

5. It appears that with the right conditions and attention to detail each treatment category can reach a clinically esthetic result.

Table I: Power analysis--Hypothesis 1

Factor Name	Number of levels	Cases per level	Effect size f	Power
Hypothesis 1	Levels = 3	21	0.40	0.80

Within cells SD=1.00, Variance=1.00. Cases per cell=21, Total N of cases=63. Alpha (2-tailed)=0.05. Power computations: Non-central F

Table II: Power analysis--Hypothesis 2

Factor Name	Number of levels	Cases per level	Effect size f	Power
Hypothesis 2	Levels=3	53	0.25	0.80

Within cells SD=1.00, Variance=1.00. Cases per cell=53, Total N of cases=159. Alpha (2-tailed)=0.05. Power computations: Non-central F

Table III: Power analysis--Hypothesis 3

Factor Name	Number of levels	Cases per level	Effect size f	Power
Hypothesis 3	Levels=3	27	0.35	0.80

Within cells SD=1.00, Variance=1.00. Cases per cell=27, Total N of cases=81. Alpha (2-tailed)=0.05. Power computations: Non-central F

Table IV. Hypothesis 1 Esthetic Rating

Treatment Options	Doctor Groups	Mean	SD	F	p
Implant	Orthodontists	6.0	1.3	2.086	0.128
	General Dentists	6.0	1.5		
	Prosthodontists	5.3	1.4		
RMB	General Dentists	5.6	1.5	1.814	0.167
	Orthodontists	5.2	1.5		
	Prosthodontists	5.0	1.4		
Canine Substitution	Orthodontists	6.3^{a*}	1.6	4.064	0.019
	General Dentists	6.0^{a*}	1.8		
	Prosthodontists	5.1^{b*}	1.8		

*Means with the same letter are not significantly different

Table V. Hypothesis 2 Treatment Identification

	Orthodontists	Prosthodontists	General Dentists
Correct Identification	74.7% (553)	74.0% (385)	70.1% (1085)
Incorrect Identification	24.5% (181)	25.4% (132)	28.4% (438)

$X^2 = 4.980$, $p > 0.05$

Table VI. Hypothesis 3 Treatment Planning

A. Class I

	Orthodontists	Prosthodontists	General Dentists
Implant	86% (31)	96% (24)	67% (50)
Canine Substitution/ RMB	14% (5)	4% (1)	33% (25)

$X^2 = 11.374$, $p = 0.01$

B. Class II

	Orthodontist	Prosthodontists	General Dentists
Canine Substitution	89% (32)	60% (15)	65% (49)
Implant/RMB	11% (4)	40% (10)	35% (26)

$X^2 = 8.155$, $p = 0.025$

Figure 1 – Smile Arc
Picture on left shows a consonant smile arc and on the right a nonconsonant smile arc (Sarver, 2001).

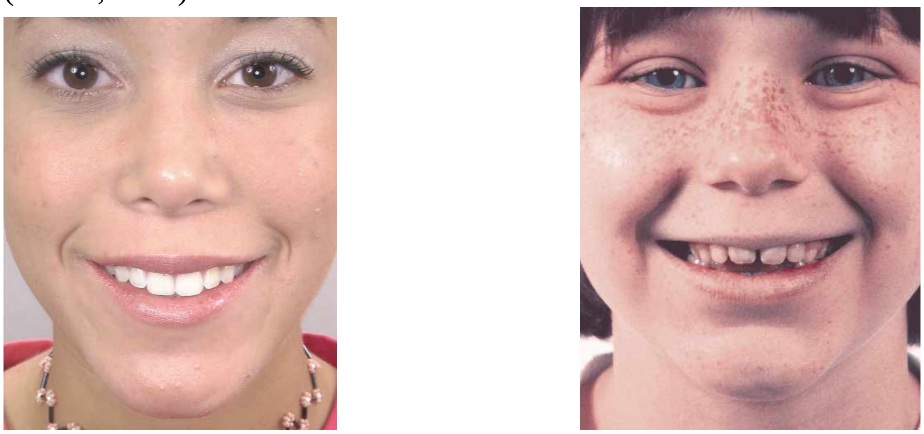


Figure 2 – Buccal Corridor

A smile with increasing buccal corridor size from left to right (Moore, 2005).

Figure 3 – Tooth Proportions

(Sarver, 2004).

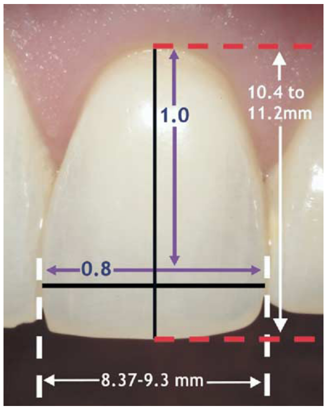


Figure 4 – Contacts/Connectors
(Sarver 2004).

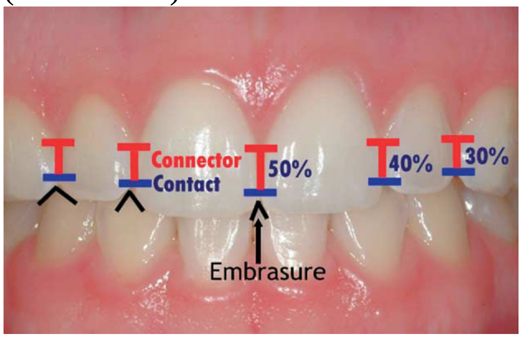


Figure 5 – Zentith points and gum architecture
Gingival zenith points compared to the long axis of the tooth; maxillary anterior gum architecture (Sarver, 2004).

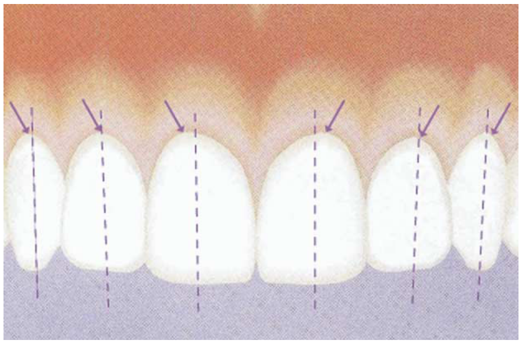


Figure 6 – Implant high and low ranked pictures
A lower ranked (left-patient's right lateral) and higher ranked (right- patient's right lateral) implant restoration

Figure 7 – RMB high and low ranked pictures
A lower ranked (left- patient's right lateral) and higher ranked (right- patient's right lateral) RMB restorations

Figure 8 – Canine Substitution high and low ranked pictures
A lower ranked (left- patient's right lateral) and higher ranked (right- patient's right lateral) canine substitution lateral.

Appendix 1: The survey

Please click the bubble below the number which you chose to be your answer.
How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1	2	3	4	5	6	7	8	9	10

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1	2	3	4	5	6	7	8	9	10

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1	2	3	4	5	6	7	8	9	10

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1	2	3	4	5	6	7	8	9	10

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1	2	3	4	5	6	7	8	9	10

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1	2	3	4	5	6	7	8	9	10

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1 2 3 4 5 6 7 8 9 10

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1 2 3 4 5 6 7 8 9 10

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1 2 3 4 5 6 7 8 9 10

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1	2	3	4	5	6	7	8	9	10
◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1	2	3	4	5	6	7	8	9	10
◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

How aesthetic is the patient's maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1	2	3	4	5	6	7	8	9	10
◻	◻	◻	◻	◻	◻	◻	◻	◻	◻

How aesthetic is the patient’s maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1 2 3 4 5 6 7 8 9 10

How aesthetic is the patient’s maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1 2 3 4 5 6 7 8 9 10

How aesthetic is the patient’s maxillary right lateral incisor? (1=Unaesthetic and 10=highly aesthetic)

1 2 3 4 5 6 7 8 9 10

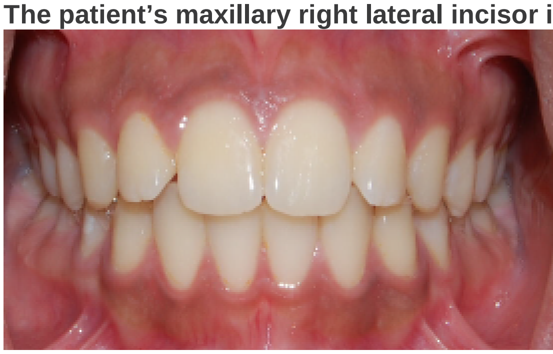
The patient's maxillary left lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary right lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary right lateral incisor is:



a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary left lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
☐	☐	☐	☐

The patient's maxillary right lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
☐	☐	☐	☐

The patient's maxillary right lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
☐	☐	☐	☐

The patient's maxillary left lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor

The patient's maxillary left lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor

The patient's maxillary right lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor

The patient's maxillary left lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary right lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary right lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary left lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary left lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary right lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary right lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary left lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary left lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
◻	◻	◻	◻

The patient's maxillary right lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
☐	☐	☐	☐

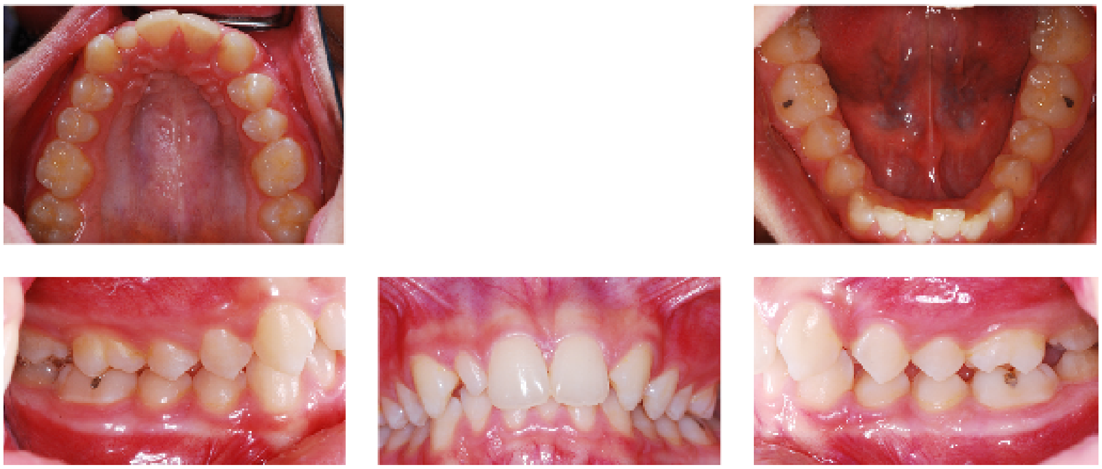
The patient's maxillary right lateral incisor is:

a resin modified bridge	an implant	a canine substitution	a natural incisor
☐	☐	☐	☐

In regards to the missing maxillary left lateral, what would be your treatment of choice for this patient?

- ☐ Implant
- ☐ Canine substitution
- ☐ Maryland Bridge

In regards to the missing maxillary left lateral, what would be your treatment of choice for this patient?



- Implant
- Canine Substitution
- Maryland Bridge

Are you an orthodontist, prosthodontist, or a general dentist

- Orthodontist
- Prosthodontist
- General dentist

How many years have you been associated to your profession?

- 0-5 years
- 6-10 years
- 10-20 years
- 20 or more years

When a patient presents with congenitally missing maxillary lateral incisors, which is *your* preferred treatment plan of choice?

- Implant
- Canine Substitution
- Maryland Bridge

Rank the following in order of importance when considering treatment for congenitally missing maxillary lateral incisors. Click and drag each item to your desired place (top is first and bottom is last)

molar classification (Class I, II, III)

canine postion

Lip and facial profile

Maxillary central incisors position

Gingival display upon smiling

Comments

Appendix 2: All individual responses

1. Implant- All response

#	Answer	Response	%
1	1	18	13%
2	2	29	21%
3	3	27	20%
4	4	11	8%
5	5	22	16%
6	6	11	8%
7	7	12	9%
8	8	6	4%
9	9	2	1%
10	10	0	0%
	Total	138	100%

Ave=3.82, SD= 2.13

Orthodontists

#	Answer	Response	%
1	1	3	8%
2	2	12	32%
3	3	6	16%
4	4	6	16%
5	5	2	5%
6	6	3	8%
7	7	1	3%
8	8	3	8%
9	9	1	3%
10	10	0	0%
	Total	37	100%

Ave= 3.7, SD= 2.20

Prosthodontists

#	Answer	Response	%
1	1	7	28%
2	2	4	16%
3	3	8	32%
4	4	0	0%
5	5	4	16%
6	6	2	8%
7	7	0	0%
8	8	0	0%
9	9	0	0%
10	10	0	0%
	Total	25	100%

Ave= 2.84, SD= 1.65

General Dentists

#	Answer	Response	%
1	1	8	11%
2	2	13	17%
3	3	13	17%
4	4	5	7%
5	5	16	21%
6	6	6	8%
7	7	11	14%
8	8	3	4%
9	9	1	1%
10	10	0	0%
	Total	76	100%

Ave= 4.2, SD= 2.15

2. Resin Modified Bridge (RMB)–All responses

#	Answer	Response	%
1	1	7	5%
2	2	13	9%
3	3	22	16%
4	4	11	8%
5	5	20	15%
6	6	18	13%
7	7	17	12%
8	8	18	13%
9	9	7	5%
10	10	4	3%
	Total	137	100%

Ave = 5.23, SD = 2.40

Orthodontists

#	Answer	Response	%
1	1	1	3%
2	2	3	8%
3	3	4	11%
4	4	6	17%
5	5	5	14%
6	6	4	11%
7	7	3	8%
8	8	8	22%
9	9	1	3%
10	10	1	3%
	Total	36	100%

Ave = 5.44, SD = 2.31

Prosthodontists

#	Answer	Response	%
1	1	2	8%
2	2	3	12%
3	3	6	24%
4	4	1	4%
5	5	3	12%
6	6	1	4%
7	7	4	16%
8	8	1	4%
9	9	3	12%
10	10	1	4%
	Total	25	100%

Ave = 4.96, SD = 2.76

General Dentists

#	Answer	Response	%
1	1	4	5%
2	2	7	9%
3	3	12	16%
4	4	4	5%
5	5	12	16%
6	6	13	17%
7	7	10	13%
8	8	9	12%
9	9	3	4%
10	10	2	3%
	Total	76	100%

Ave = 5.22, SD = 2.33

3. Canine Substitution – All response

#	Answer	Response	%
1	1	7	5%
2	2	13	10%
3	3	9	7%
4	4	18	13%
5	5	13	10%
6	6	25	18%
7	7	18	13%
8	8	18	13%
9	9	7	5%
10	10	8	6%
	Total	136	100%

Ave = 5.59, SD = 2.44

Orthodontists

#	Answer	Response	%
1	1	1	3%
2	2	2	6%
3	3	5	14%
4	4	5	14%
5	5	3	8%
6	6	4	11%
7	7	9	25%
8	8	4	11%
9	9	2	6%
10	10	1	3%
	Total	36	100%

Ave = 5.61, SD = 2.26

Prosthodontists

#	Answer	Response	%
1	1	3	12%
2	2	5	20%
3	3	2	8%
4	4	4	16%
5	5	3	12%
6	6	4	16%
7	7	1	4%
8	8	2	8%
9	9	0	0%
10	10	1	4%
	Total	25	100%

Ave =4.28, SD = 2.44

General Dentists

#	Answer	Response	%
1	1	3	4%
2	2	6	8%
3	3	2	3%
4	4	9	12%
5	5	7	9%
6	6	17	23%
7	7	8	11%
8	8	12	16%
9	9	5	7%
10	10	6	8%
	Total	75	100%

Ave = 6.01, SD = 2.41

4. Implant –All Response

#	Answer	Response	%
1	1	3	2%
2	2	6	4%
3	3	16	12%
4	4	18	13%
5	5	21	15%
6	6	18	13%
7	7	13	9%
8	8	25	18%
9	9	14	10%
10	10	3	2%
	Total	137	100%

Ave = 5.8, SD = 2.25

Orthodontist

#	Answer	Response	%
1	1	0	0%
2	2	1	3%
3	3	6	17%
4	4	6	17%
5	5	4	11%
6	6	7	20%
7	7	2	6%
8	8	6	17%
9	9	1	3%
10	10	2	6%
	Total	35	100%

Ave = 5.63, SD = 2.17

Prosthodontists

#	Answer	Response	%
1	1	2	8%
2	2	1	4%
3	3	5	20%
4	4	3	12%
5	5	4	16%
6	6	2	8%
7	7	3	12%
8	8	4	16%
9	9	1	4%
10	10	0	0%
	Total	25	100%

Ave = 5.0, SD = 2.33

General Dentist

#	Answer	Response	%
1	1	1	1%
2	2	4	5%
3	3	5	6%
4	4	9	12%
5	5	13	17%
6	6	9	12%
7	7	8	10%
8	8	15	19%
9	9	12	16%
10	10	1	1%
	Total	77	100%

Ave = 6.14, SD = 2.22

5 RMB -All Responses

#	Answer		Response	%
1	1		11	8%
2	2		14	10%
3	3		23	17%
4	4		22	16%
5	5		16	12%
6	6		10	7%
7	7		19	14%
8	8		12	9%
9	9		7	5%
10	10		1	1%
	Total		135	100%

Ave = 4.73, SD = 2.34

Orthodontists

#	Answer		Response	%
1	1		3	9%
2	2		4	12%
3	3		8	24%
4	4		5	15%
5	5		2	6%
6	6		1	3%
7	7		4	12%
8	8		5	15%
9	9		2	6%
10	10		0	0%
	Total		34	100%

Ave = 4.62, SD = 2.52

Prosthodontists

#	Answer		Response	%
1	1		1	4%
2	2		2	8%
3	3		6	23%
4	4		3	12%
5	5		4	15%
6	6		2	8%
7	7		4	15%
8	8		0	0%
9	9		3	12%
10	10		1	4%
	Total		26	100%

Ave = 5.08, SD = 2.46

General Dentist

#	Answer		Response	%
1	1		7	9%
2	2		8	11%
3	3		9	12%
4	4		14	19%
5	5		10	13%
6	6		7	9%
7	7		11	15%
8	8		7	9%
9	9		2	3%
10	10		0	0%
	Total		75	100%

Ave = 4.65, SD = 2.24

6. Implant –All Responses

#	Answer	Response	%
1	1	0	0%
2	2	3	2%
3	3	2	1%
4	4	9	7%
5	5	10	7%
6	6	16	12%
7	7	31	22%
8	8	27	20%
9	9	31	22%
10	10	9	7%
	Total	138	100%

Ave = 7.22, SD = 1.85

Orthodontist

#	Answer	Response	%
1	1	0	0%
2	2	1	3%
3	3	0	0%
4	4	4	11%
5	5	2	6%
6	6	3	8%
7	7	6	17%
8	8	8	22%
9	9	10	28%
10	10	2	6%
	Total	36	100%

Ave = 7.28, SD = 1.97

Prosthodontist

#	Answer	Response	%
1	1	0	0%
2	2	1	4%
3	3	0	0%
4	4	1	4%
5	5	1	4%
6	6	4	15%
7	7	8	31%
8	8	2	8%
9	9	9	35%
10	10	0	0%
	Total	26	100%

Ave = 7.23, SD = 1.77

General Dentist

#	Answer	Response	%
1	1	0	0%
2	2	1	1%
3	3	2	3%
4	4	4	5%
5	5	7	9%
6	6	9	12%
7	7	17	22%
8	8	17	22%
9	9	12	16%
10	10	7	9%
	Total	76	100%

Ave = 7.18, SD = 1.85

7. RMB - All response

#	Answer		Response	%
1	1		0	0%
2	2		12	9%
3	3		11	8%
4	4		14	10%
5	5		19	14%
6	6		23	17%
7	7		23	17%
8	8		20	14%
9	9		14	10%
10	10		3	2%
	Total		139	100%

Ave = 5.92, SD = 2.16

Orthodontist

#	Answer		Response	%
1	1		0	0%
2	2		4	11%
3	3		5	14%
4	4		3	8%
5	5		9	24%
6	6		1	3%
7	7		5	14%
8	8		4	11%
9	9		6	16%
10	10		0	0%
	Total		37	100%

Ave = 5.59, SD = 2.35

Prosthodontists

#	Answer		Response	%
1	1		0	0%
2	2		2	8%
3	3		3	12%
4	4		7	27%
5	5		2	8%
6	6		4	15%
7	7		6	23%
8	8		1	4%
9	9		1	4%
10	10		0	0%
	Total		26	100%

Ave = 5.15, SD = 1.89

General Dentists

#	Answer		Response	%
1	1		0	0%
2	2		6	8%
3	3		3	4%
4	4		4	5%
5	5		8	11%
6	6		18	24%
7	7		12	16%
8	8		15	20%
9	9		7	9%
10	10		3	4%
	Total		76	100%

Ave = 6.34, SD = 2.07

8. Canine Substitution – All responses

#	Answer	Response	%
1	1	2	1%
2	2	8	6%
3	3	12	9%
4	4	19	14%
5	5	20	15%
6	6	14	10%
7	7	20	15%
8	8	21	15%
9	9	12	9%
10	10	8	6%
	Total	136	100%

Ave = 5.96, SD = 2.31

Orthodontists

#	Answer	Response	%
1	1	0	0%
2	2	1	3%
3	3	1	3%
4	4	3	9%
5	5	8	23%
6	6	3	9%
7	7	5	14%
8	8	9	26%
9	9	2	6%
10	10	3	9%
	Total	35	100%

Ave = 6.57, SD = 2.03

Prosthodontists

#	Answer	Response	%
1	1	2	8%
2	2	4	15%
3	3	3	12%
4	4	4	15%
5	5	2	8%
6	6	3	12%
7	7	4	15%
8	8	1	4%
9	9	2	8%
10	10	1	4%
	Total	26	100%

Ave = 4.88, SD = 2.6

General Dentists

#	Answer	Response	%
1	1	0	0%
2	2	3	4%
3	3	8	11%
4	4	12	16%
5	5	10	13%
6	6	8	11%
7	7	11	15%
8	8	11	15%
9	9	8	11%
10	10	4	5%
	Total	75	100%

Ave = 6.04, SD = 2.23

9. RMB – All Responses

#	Answer	Response	%
1	1	33	24%
2	2	39	28%
3	3	22	16%
4	4	17	12%
5	5	15	11%
6	6	8	6%
7	7	2	1%
8	8	1	1%
9	9	2	1%
10	10	1	1%
	Total	140	100%

Ave = 2.99, SD = 1.89

Orthodontists

#	Answer	Response	%
1	1	9	24%
2	2	8	22%
3	3	7	19%
4	4	6	16%
5	5	2	5%
6	6	2	5%
7	7	2	5%
8	8	0	0%
9	9	1	3%
10	10	0	0%
	Total	37	100%

Ave = 3.11, SD = 2.00

Prosthodontists

#	Answer	Response	%
1	1	8	31%
2	2	11	42%
3	3	5	19%
4	4	0	0%
5	5	2	8%
6	6	0	0%
7	7	0	0%
8	8	0	0%
9	9	0	0%
10	10	0	0%
	Total	26	100%

Ave = 2.12, SD = 1.11

General Dentists

#	Answer	Response	%
1	1	16	21%
2	2	20	26%
3	3	10	13%
4	4	11	14%
5	5	11	14%
6	6	6	8%
7	7	0	0%
8	8	1	1%
9	9	1	1%
10	10	1	1%
	Total	77	100%

Ave = 3.22, SD = 1.98

10. Implant – All Responses

#	Answer	Response	%
1	1	1	1%
2	2	0	0%
3	3	5	4%
4	4	1	1%
5	5	4	3%
6	6	3	2%
7	7	19	14%
8	8	33	24%
9	9	43	31%
10	10	30	22%
	Total	139	100%

Ave = 8.22, SD = 1.73

Orthodontists

#	Answer	Response	%
1	1	1	3%
2	2	0	0%
3	3	0	0%
4	4	0	0%
5	5	1	3%
6	6	1	3%
7	7	6	16%
8	8	9	24%
9	9	7	19%
10	10	12	32%
	Total	37	100%

Ave = 8.35, SD = 1.81

Prosthodontists

#	Answer	Response	%
1	1	0	0%
2	2	0	0%
3	3	2	8%
4	4	0	0%
5	5	2	8%
6	6	1	4%
7	7	2	8%
8	8	11	42%
9	9	4	15%
10	10	4	15%
	Total	26	100%

Ave = 7.69, SD = 1.91

General Dentists

#	Answer	Response	%
1	1	0	0%
2	2	0	0%
3	3	3	4%
4	4	1	1%
5	5	1	1%
6	6	1	1%
7	7	11	14%
8	8	13	17%
9	9	32	42%
10	10	14	18%
	Total	76	100%

Ave 8.33, SD = 1.61

11. RMB – All responses

#	Answer	Response	%
1	1	0	0%
2	2	1	1%
3	3	1	1%
4	4	5	4%
5	5	4	3%
6	6	6	4%
7	7	20	14%
8	8	30	21%
9	9	42	30%
10	10	31	22%
	Total	140	100%

Ave = 8.21, SD = 1.66

Orthodontists

#	Answer	Response	%
1	1	0	0%
2	2	1	3%
3	3	0	0%
4	4	0	0%
5	5	2	5%
6	6	2	5%
7	7	6	16%
8	8	9	24%
9	9	8	22%
10	10	9	24%
	Total	37	100%

Ave = 8.11, SD = 1.76

Prosthodontists

#	Answer	Response	%
1	1	0	0%
2	2	0	0%
3	3	0	0%
4	4	3	12%
5	5	1	4%
6	6	1	4%
7	7	4	15%
8	8	6	23%
9	9	8	31%
10	10	3	12%
	Total	26	100%

Ave = 7.73, SD = 1.82

General Dentist

#	Answer	Response	%
1	1	0	0%
2	2	0	0%
3	3	1	1%
4	4	2	3%
5	5	1	1%
6	6	3	4%
7	7	10	13%
8	8	15	19%
9	9	26	34%
10	10	19	25%
	Total	77	100%

Ave = 8.42, SD = 1.52

12. Canine Substitution – All Responses

#	Answer	Response	%
1	1	9	6%
2	2	23	17%
3	3	17	12%
4	4	21	15%
5	5	19	14%
6	6	16	12%
7	7	14	10%
8	8	10	7%
9	9	8	6%
10	10	2	1%
	Total	139	100%

Ave = 4.68, SD = 2.36

Orthodontists

#	Answer	Response	%
1	1	1	3%
2	2	4	11%
3	3	7	19%
4	4	7	19%
5	5	6	16%
6	6	2	5%
7	7	5	14%
8	8	4	11%
9	9	0	0%
10	10	1	3%
	Total	37	100%

Ave = 4.78, SD = 2.16

Prosthodontists

#	Answer	Response	%
1	1	3	12%
2	2	7	27%
3	3	3	12%
4	4	3	12%
5	5	4	15%
6	6	1	4%
7	7	4	15%
8	8	0	0%
9	9	1	4%
10	10	0	0%
	Total	26	100%

Ave = 3.88, SD = 2.25

General Dentists

#	Answer	Response	%
1	1	5	7%
2	2	12	16%
3	3	7	9%
4	4	11	14%
5	5	9	12%
6	6	13	17%
7	7	5	7%
8	8	6	8%
9	9	7	9%
10	10	1	1%
	Total	76	100%

Ave = 4.91, SD = 2.45

13. Canine Substitution – All Reponses

#	Answer	Response	%
1	1	0	0%
2	2	2	1%
3	3	5	4%
4	4	8	6%
5	5	16	12%
6	6	13	9%
7	7	19	14%
8	8	29	21%
9	9	34	24%
10	10	13	9%
	Total	139	100%

Ave = 7.27, SD = 2.0

Orthodontists

#	Answer	Response	%
1	1	0	0%
2	2	0	0%
3	3	0	0%
4	4	2	6%
5	5	5	14%
6	6	2	6%
7	7	8	22%
8	8	7	19%
9	9	6	17%
10	10	6	17%
	Total	36	100%

Ave = 7.53, SD = 1.81

Prosthodontists

#	Answer	Response	%
1	1	0	0%
2	2	1	4%
3	3	4	15%
4	4	2	8%
5	5	2	8%
6	6	3	12%
7	7	2	8%
8	8	4	15%
9	9	8	31%
10	10	0	0%
	Total	26	100%

Ave = 6.46, SD = 2.42

General Dentists

#	Answer	Response	%
1	1	0	0%
2	2	1	1%
3	3	1	1%
4	4	4	5%
5	5	9	12%
6	6	8	10%
7	7	9	12%
8	8	18	23%
9	9	20	26%
10	10	7	9%
	Total	77	100%

Ave = 7.42, SD = 1.88

14. Canine Substitution – All Responses

#	Answer	Response	%
1	1	2	1%
2	2	4	3%
3	3	9	6%
4	4	21	15%
5	5	23	17%
6	6	20	14%
7	7	26	19%
8	8	19	14%
9	9	12	9%
10	10	3	2%
	Total	139	100%

Ave = 5.96, SD = 2.01

Orthodontists

#	Answer	Response	%
1	1	0	0%
2	2	0	0%
3	3	0	0%
4	4	5	14%
5	5	7	19%
6	6	6	16%
7	7	6	16%
8	8	9	24%
9	9	2	5%
10	10	2	5%
	Total	37	100%

Ave = 6.57, SD = 1.72

Prosthodontists

#	Answer	Response	%
1	1	0	0%
2	2	0	0%
3	3	4	15%
4	4	7	27%
5	5	4	15%
6	6	3	12%
7	7	2	8%
8	8	3	12%
9	9	2	8%
10	10	1	4%
	Total	26	100%

Ave = 5.54, SD = 2.10

General Dentists

#	Answer	Response	%
1	1	2	3%
2	2	4	5%
3	3	5	7%
4	4	9	12%
5	5	12	16%
6	6	11	14%
7	7	18	24%
8	8	7	9%
9	9	8	11%
10	10	0	0%
	Total	76	100%

Ave = 5.8, SD = 2.07

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15. Implant – All Responses

#	Answer	Response	%
1	1	8	6%
2	2	20	14%
3	3	18	13%
4	4	21	15%
5	5	22	16%
6	6	21	15%
7	7	20	14%
8	8	7	5%
9	9	2	1%
10	10	0	0%
	Total	139	100%

Ave = 4.58, SD = 2.04

Orthodontists

#	Answer	Response	%
1	1	1	3%
2	2	3	8%
3	3	5	14%
4	4	8	22%
5	5	7	19%
6	6	5	14%
7	7	3	8%
8	8	3	8%
9	9	1	3%
10	10	0	0%
	Total	36	100%

Ave = 4.81, SD = 1.92

Prosthodontists

#	Answer	Response	%
1	1	1	4%
2	2	6	23%
3	3	4	15%
4	4	3	12%
5	5	3	12%
6	6	6	23%
7	7	2	8%
8	8	1	4%
9	9	0	0%
10	10	0	0%
	Total	26	100%

Ave = 4.23, SD = 1.97

General Dentists

#	Answer	Response	%
1	1	6	8%
2	2	11	14%
3	3	9	12%
4	4	10	13%
5	5	12	16%
6	6	10	13%
7	7	15	19%
8	8	3	4%
9	9	1	1%
10	10	0	0%
	Total	77	100%

Ave = 4.58, SD = 2.12

16. Implant- All responses

#	Answer		Response	%
1	a resin modified bridge		65	46%
2	an implant		68	49%
3	a canine substitution		4	3%
4	a natural incisor		3	2%
	Total		140	100%

Ave = 1.67, SD = 0.65

Orthodontist

#	Answer		Response	%
1	a resin modified bridge		15	41%
2	an implant		18	49%
3	a canine substitution		3	8%
4	a natural incisor		1	3%
	Total		37	100%

Ave = 1.73, SD = 0.73

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		13	50%
2	an implant		13	50%
3	a canine substitution		0	0%
4	a natural incisor		0	0%
	Total		26	100%

Ave = 1.5, SD = 0.51

General Dentists

#	Answer		Response	%
1	a resin modified bridge		37	48%
2	an implant		37	48%
3	a canine substitution		1	1%
4	a natural incisor		2	3%
	Total		77	100%

Ave = 1.58, SD = 0.66

17. Implant – All responses

#	Answer		Response	%
1	a resin modified bridge		26	19%
2	an implant		106	76%
3	a canine substitution		0	0%
4	a natural incisor		8	6%
	Total		140	100%

Ave = 1.93, SD = 0.64

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		5	14%
2	an implant		30	81%
3	a canine substitution		0	0%
4	a natural incisor		2	5%
	Total		37	100%

Ave = 1.97, SD = 0.60

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		6	23%
2	an implant		19	73%
3	a canine substitution		0	0%
4	a natural incisor		1	4%
	Total		26	100%

Ave = 1.85, SD = 0.61

General Dentists

#	Answer		Response	%
1	a resin modified bridge		15	19%
2	an implant		57	74%
3	a canine substitution		0	0%
4	a natural incisor		5	6%
	Total		77	100%

Ave = 1.94, SD = 0.68

18. Natural Lateral Incisor – All Responses

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		2	1%
3	a canine substitution		24	17%
4	a natural incisor		114	81%
	Total		140	100%

Ave = 3.8, SD = 0.44

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		0	0%
3	a canine substitution		3	8%
4	a natural incisor		34	92%
	Total		37	100%

Ave = 3.92, SD = 0.28

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		1	4%
3	a canine substitution		6	23%
4	a natural incisor		19	73%
	Total		26	100%

Ave = 3.69, SD = 0.55

General Dentists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		1	1%
3	a canine substitution		15	19%
4	a natural incisor		61	79%
	Total		77	100%

Ave = 3.78, SD = 0.45

19. Canine substitution-All Respondents

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		1	1%
3	a canine substitution		136	98%
4	a natural incisor		2	1%
	Total		139	100%

Ave = 3.01, SD = 0.15

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		0	0%
3	a canine substitution		37	100%
4	a natural incisor		0	0%
	Total		37	100%

Ave = 3.0, SD = 0

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		1	4%
3	a canine substitution		25	96%
4	a natural incisor		0	0%
	Total		26	100%

Ave = 2.96, SD = 0.20

General Dentists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		0	0%
3	a canine substitution		74	97%
4	a natural incisor		2	3%
	Total		76	100%

Ave = 3.03, SD = 0.16

20. Canine substitution –All Respondents

#	Answer		Response	%
1	a resin modified bridge		7	5%
2	an implant		11	8%
3	a canine substitution		40	29%
4	a natural incisor		80	58%
	Total		138	100%

Ave = 3.40, SD = 0.84

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		3	8%
3	a canine substitution		17	47%
4	a natural incisor		16	44%
	Total		36	100%

Ave = 3.36, SD = 0.64

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		2	8%
2	an implant		1	4%
3	a canine substitution		9	35%
4	a natural incisor		14	54%
	Total		26	100%

Ave = 3.35, SD = 0.89

General Dentists

#	Answer		Response	%
1	a resin modified bridge		5	7%
2	an implant		7	9%
3	a canine substitution		14	18%
4	a natural incisor		50	66%
	Total		76	100%

Ave = 3.43, SD = 0.91

21. Natural lateral incisor –All Respondents

#	Answer		Response	%
1	a resin modified bridge		10	7%
2	an implant		14	10%
3	a canine substitution		4	3%
4	a natural incisor		111	80%
	Total		139	100%

Ave = 3.55, SD = 0.94

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		1	3%
2	an implant		0	0%
3	a canine substitution		1	3%
4	a natural incisor		35	95%
	Total		37	100%

Ave = 3.89, SD = 0.52

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		2	8%
2	an implant		5	19%
3	a canine substitution		2	8%
4	a natural incisor		17	65%
	Total		26	100%

Ave = 3.31, SD = 1.05

General Dentists

#	Answer		Response	%
1	a resin modified bridge		7	9%
2	an implant		9	12%
3	a canine substitution		1	1%
4	a natural incisor		59	78%
	Total		76	100%

Ave = 3.47, SD = 1.03

22. Canine substitution – All Respondents

#	Answer		Response	%
1	a resin modified bridge		1	1%
2	an implant		0	0%
3	a canine substitution		134	99%
4	a natural incisor		1	1%
	Total		136	100%

Ave = 2.99, SD = 0.19

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		0	0%
3	a canine substitution		36	100%
4	a natural incisor		0	0%
	Total		36	100%

Ave = 3.0, SD = 0

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		0	0%
3	a canine substitution		25	100%
4	a natural incisor		0	0%
	Total		25	100%

Ave = 3.0, SD = 0

General Dentists

#	Answer		Response	%
1	a resin modified bridge		1	1%
2	an implant		0	0%
3	a canine substitution		73	97%
4	a natural incisor		1	1%
	Total		75	100%

Ave = 2.99, SD = 0.26

23 RMB -All respondents

#	Answer	Response	%
1	a resin modified bridge	99	71%
2	an implant	33	24%
3	a canine substitution	0	0%
4	a natural incisor	7	5%
	Total	139	100%

Ave = 1.39, SD = 0.74

Orthodontists

#	Answer	Response	%
1	a resin modified bridge	20	54%
2	an implant	13	35%
3	a canine substitution	0	0%
4	a natural incisor	4	11%
	Total	37	100%

Ave = 1.68, SD = 0.94

Prosthodontists

#	Answer	Response	%
1	a resin modified bridge	21	81%
2	an implant	5	19%
3	a canine substitution	0	0%
4	a natural incisor	0	0%
	Total	26	100%

Ave = 1.19, SD = 0.40

General Dentists

#	Answer	Response	%
1	a resin modified bridge	58	76%
2	an implant	15	20%
3	a canine substitution	0	0%
4	a natural incisor	3	4%
	Total	76	100%

Ave = 1.32, SD = 0.68

24. Canine substitution –All Respondents

#	Answer		Response	%
1	a resin modified bridge		2	1%
2	an implant		9	6%
3	a canine substitution		29	21%
4	a natural incisor		99	71%
	Total		139	100%

Ave = 3.62, SD = 0.67

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		0	0%
3	a canine substitution		11	30%
4	a natural incisor		26	70%
	Total		37	100%

Ave = 3.70, SD = 0.46

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		2	8%
3	a canine substitution		6	23%
4	a natural incisor		18	69%
	Total		26	100%

Ave = 3.62, SD = 0.67

General Dentists

#	Answer		Response	%
1	a resin modified bridge		2	3%
2	an implant		7	9%
3	a canine substitution		12	16%
4	a natural incisor		55	72%
	Total		76	100%

Ave = 3.58, SD = 0.77

25. RMB –All Respondents

#	Answer		Response	%
1	a resin modified bridge		72	52%
2	an implant		13	9%
3	a canine substitution		0	0%
4	a natural incisor		53	38%
	Total		138	100%

Ave = 2.25, SD = 1.42

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		14	39%
2	an implant		5	14%
3	a canine substitution		0	0%
4	a natural incisor		17	47%
	Total		36	100%

Ave = 2.56, SD = 1.42

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		16	62%
2	an implant		2	8%
3	a canine substitution		0	0%
4	a natural incisor		8	31%
	Total		26	100%

Ave 2.0, SD = 1.39

General Dentists

#	Answer		Response	%
1	a resin modified bridge		42	55%
2	an implant		6	8%
3	a canine substitution		0	0%
4	a natural incisor		28	37%
	Total		76	100%

Ave = 2.18, SD = 1.42

26. Natural lateral incisor –All Respondents

#	Answer		Response	%
1	a resin modified bridge		9	7%
2	an implant		16	12%
3	a canine substitution		0	0%
4	a natural incisor		112	82%
	Total		137	100%

Ave = 3.57, SD = 0.94

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		1	3%
2	an implant		2	6%
3	a canine substitution		0	0%
4	a natural incisor		33	92%
	Total		36	100%

Ave = 3.81, SD = 0.67

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		2	8%
2	an implant		3	12%
3	a canine substitution		0	0%
4	a natural incisor		20	80%
	Total		25	100%

Ave = 3.52, SD = 1

General Dentists

#	Answer		Response	%
1	a resin modified bridge		6	8%
2	an implant		11	14%
3	a canine substitution		0	0%
4	a natural incisor		59	78%
	Total		76	100%

Ave = 3.47, SD = 1.01

27. RMB –All Respondents

#	Answer	Response	%
1	a resin modified bridge	135	97%
2	an implant	4	3%
3	a canine substitution	0	0%
4	a natural incisor	0	0%
	Total	139	100%

Ave = 1.03, SD = 0.17

Orthodontists

#	Answer	Response	%
1	a resin modified bridge	36	97%
2	an implant	1	3%
3	a canine substitution	0	0%
4	a natural incisor	0	0%
	Total	37	100%

Ave = 1.03, SD = 0.16

Prosthodontists

#	Answer	Response	%
1	a resin modified bridge	26	100%
2	an implant	0	0%
3	a canine substitution	0	0%
4	a natural incisor	0	0%
	Total	26	100%

Ave = 1.0, SD = 0

General Dentists

#	Answer	Response	%
1	a resin modified bridge	73	96%
2	an implant	3	4%
3	a canine substitution	0	0%
4	a natural incisor	0	0%
	Total	76	100%

Ave = 1.04, SD = 0.2

28. Natural lateral incisor –All Respondents

#	Answer		Response	%
1	a resin modified bridge		1	1%
2	an implant		6	4%
3	a canine substitution		0	0%
4	a natural incisor		129	95%
	Total		136	100%

Ave = 3.89, SD =0.48

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		1	3%
3	a canine substitution		0	0%
4	a natural incisor		35	97%
	Total		36	100 %

Ave = 3.94, SD = 0.33

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		0	0%
2	an implant		2	8%
3	a canine substitution		0	0%
4	a natural incisor		24	92%
	Total		26	100%

Ave = 3.85, SD = 0.54

General Dentists

#	Answer		Response	%
1	a resin modified bridge		1	1%
2	an implant		3	4%
3	a canine substitution		0	0%
4	a natural incisor		70	95%
	Total		74	100%

Ave = 3.88, SD = 0.52

29. RMB –All Respondents

#	Answer		Response	%
1	a resin modified bridge		101	74%
2	an implant		12	9%
3	a canine substitution		0	0%
4	a natural incisor		24	18%
	Total		137	100%

Ave = 1.61, SD = 1.14

Orthodontists

#	Answer		Response	%
1	a resin modified bridge		25	68%
2	an implant		4	11%
3	a canine substitution		0	0%
4	a natural incisor		8	22%
	Total		37	100 %

Ave = 1.76, SD = 1.23

Prosthodontists

#	Answer		Response	%
1	a resin modified bridge		21	81%
2	an implant		1	4%
3	a canine substitution		0	0%
4	a natural incisor		4	15%
	Total		26	100%

Ave = 1.50, SD = 1.10

General Dentists

#	Answer		Response	%
1	a resin modified bridge		55	74%
2	an implant		7	9%
3	a canine substitution		0	0%
4	a natural incisor		12	16%
	Total		74	100%

Ave = 1.58, SD = 1.11

30. Implant –All Respondents

#	Answer	Response	%
1	a resin modified bridge	21	15%
2	an implant	107	77%
3	a canine substitution	1	1%
4	a natural incisor	10	7%
	Total	139	100%

Ave = 2.0, SD = 0.67

Orthodontists

#	Answer	Response	%
1	a resin modified bridge	2	5%
2	an implant	32	86%
3	a canine substitution	1	3%
4	a natural incisor	2	5%
	Total	37	100%

Ave = 2.08, SD = 0.55

Prosthodontists

#	Answer	Response	%
1	a resin modified bridge	1	4%
2	an implant	23	88%
3	a canine substitution	0	0%
4	a natural incisor	2	8%
	Total	26	100%

Ave = 2.12, SD = 0.59

General Dentists

#	Answer	Response	%
1	a resin modified bridge	18	24%
2	an implant	52	68%
3	a canine substitution	0	0%
4	a natural incisor	6	8%
	Total	76	100%

Ave = 1.92, SD = 0.74

31. RMB –All Respondents

#	Answer	Response	%
1	a resin modified bridge	108	77%
2	an implant	23	16%
3	a canine substitution	0	0%
4	a natural incisor	9	6%
	Total	140	100%

Ave = 1.36, SD = 0.79

Orthodontists

#	Answer	Response	%
1	a resin modified bridge	23	62%
2	an implant	7	19%
3	a canine substitution	0	0%
4	a natural incisor	7	19%
	Total	37	100%

Ave = 1.76, SD = 1.16

Prosthodontists

#	Answer	Response	%
1	a resin modified bridge	21	81%
2	an implant	5	19%
3	a canine substitution	0	0%
4	a natural incisor	0	0%
	Total	26	100%

Ave = 1.19, SD = 0.40

General Dentists

#	Answer	Response	%
1	a resin modified bridge	64	83%
2	an implant	11	14%
3	a canine substitution	0	0%
4	a natural incisor	2	3%
	Total	77	100%

Ave = 1.22, SD = 0.58

32. Implant –All Respondents

#	Answer	Response	%
1	a resin modified bridge	9	6%
2	an implant	70	50%
3	a canine substitution	3	2%
4	a natural incisor	57	41%
	Total	139	100%

Ave = 2.78, SD = 1.06

Orthodontists

#	Answer	Response	%
1	a resin modified bridge	4	11%
2	an implant	18	50%
3	a canine substitution	1	3%
4	a natural incisor	13	36%
	Total	36	100%

Ave = 2.64, SD = 1.1

Prosthodontists

#	Answer	Response	%
1	a resin modified bridge	3	12%
2	an implant	13	50%
3	a canine substitution	1	4%
4	a natural incisor	9	35%
	Total	26	100%

Ave = 2.62, SD = 1.10

General Dentists

#	Answer	Response	%
1	a resin modified bridge	2	3%
2	an implant	39	51%
3	a canine substitution	1	1%
4	a natural incisor	35	45%
	Total	77	100%

Ave = 2.90, SD = 1.03

33. Canine substitution–All Respondents

#	Answer	Response	%
1	a resin modified bridge	1	1%
2	an implant	1	1%
3	a canine substitution	118	84%
4	a natural incisor	20	14%
	Total	140	100%

Ave = 3.12, SD = 0.41

Orthodontists

#	Answer	Response	%
1	a resin modified bridge	0	0%
2	an implant	1	3%
3	a canine substitution	36	97%
4	a natural incisor	0	0%
	Total	37	100%

Ave = 2.97, SD = 0.16

Prosthodontists

#	Answer	Response	%
1	a resin modified bridge	0	0%
2	an implant	0	0%
3	a canine substitution	24	92%
4	a natural incisor	2	8%
	Total	26	100%

Ave = 3.08, SD = 0.27

General Dentists

#	Answer	Response	%
1	a resin modified bridge	1	1%
2	an implant	0	0%
3	a canine substitution	58	75%
4	a natural incisor	18	23%
	Total	77	100%

Ave = 3.21, SD = 0.50

34. Natural lateral incisor –All Respondents

#	Answer	Response	%
1	a resin modified bridge	0	0%
2	an implant	4	3%
3	a canine substitution	3	2%
4	a natural incisor	133	95%
	Total	140	100%

Ave = 3.92, SD = 0.36

Orthodontists

#	Answer	Response	%
1	a resin modified bridge	0	0%
2	an implant	0	0%
3	a canine substitution	1	3%
4	a natural incisor	36	97%
	Total	37	100%

Ave = 3.97, SD = 0.16

Prosthodontists

#	Answer	Response	%
1	a resin modified bridge	0	0%
2	an implant	1	4%
3	a canine substitution	1	4%
4	a natural incisor	24	92%
	Total	26	100%

Ave = 3.88, SD = 0.43

General Dentists

#	Answer	Response	%
1	a resin modified bridge	0	0%
2	an implant	3	4%
3	a canine substitution	1	1%
4	a natural incisor	73	95%
	Total	77	100%

Ave = 3.91, SD = 0.40

35. Implant –All respondents

#	Answer	Response	%
1	a resin modified bridge	34	25%
2	an implant	101	73%
3	a canine substitution	0	0%
4	a natural incisor	3	2%
	Total	138	100%

Ave = 1.8, SD = 0.54

Orthodontists

#	Answer	Response	%
1	a resin modified bridge	7	19%
2	an implant	27	75%
3	a canine substitution	0	0%
4	a natural incisor	2	6%
	Total	36	100%

Ave = 1.92, SD = 0.65

Prosthodontists

#	Answer	Response	%
1	a resin modified bridge	6	24%
2	an implant	19	76%
3	a canine substitution	0	0%
4	a natural incisor	0	0%
	Total	25	100%

Ave = 1.76, SD = 0.44

General Dentist

#	Answer	Response	%
1	a resin modified bridge	21	27%
2	an implant	55	71%
3	a canine substitution	0	0%
4	a natural incisor	1	1%
	Total	77	100%

Ave = 1.75, SD = 0.52

41. Rank the following in order of importance when considering treatment for congenitally missing maxillary lateral incisors.

Prosthodontists

#	Answer	1	2	3	4	5	Responses
1	molar classification (Class I, II, III)	4	1	4	3	14	26
2	canine postion	11	10	2	2	1	26
3	Lip and facial profile	0	5	3	15	3	26
4	Maxillary central incisors position	4	7	8	3	4	26
5	Gingival display upon smiling	7	3	9	3	4	26
	Total	26	26	26	26	26	-

General Dentsits

#	Answer	1	2	3	4	5	Responses
1	molar classification (Class I, II, III)	14	10	6	9	34	73
2	canine postion	26	22	13	9	3	73
3	Lip and facial profile	9	9	25	20	10	73
4	Maxillary central incisors position	11	18	12	17	15	73
5	Gingival display upon smiling	13	14	17	18	11	73
	Total	73	73	73	73	73	-

Orthodontists

#	Answer	1	2	3	4	5	Responses
1	molar classification (Class I, II, III)	12	4	4	2	8	30
2	canine postion	6	13	5	6	0	30
3	Lip and facial profile	6	1	7	13	3	30
4	Maxillary central incisors position	2	5	6	4	13	30
5	Gingival display upon smiling	4	7	8	5	6	30
	Total	30	30	30	30	30	-

Appendix 3: IRB research approval

University of Maryland, Baltimore

Institutional Review Board

Phone: (410) 706-5037

Fax: (410) 706-4189

Email: hrpo@som.umaryland.edu

MEMORANDUM

Date: October 6, 2010

To: Justin Jergensen

From: University of Maryland, Baltimore

Institutional Review Board

RE: HP-00046773

Submission Date: 6/15/2010

Re: Treatment of Congenitally Missing Lateral Incisors- A Post-Treatment Aesthetic Evaluation

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This letter is to acknowledge that the UMB IRB reviewed the information provided and has determined that the submission does not require IRB review. This determination has been made with the understanding that the proposed project does not involve a systematic investigation designed to develop or contribute to generalizable knowledge **OR** a human participant.

Definitions –

<u>Research</u>: A systematic investigation, including research development, testing, and evaluation, designed to develop or contribute to generalizable knowledge **OR** Any experiment that involves a test article and one or more human subjects, and that either is subject to requirements for prior submission to the FDA under section 505(i) or 520(g) of the act, or is not subject to requirements for prior submission to the FDA under these sections of the act, but the results of which are intended to be submitted later to, or held for inspection by, the FDA as part of an application for a research or marketing permit. The term does not include experiments that are subject to the provisions of part 58 regarding nonclinical laboratory studies. Activities which meet either one of these definitions constitute research for purposes of this policy, whether or not they are conducted or supported under a program which is considered research for other purposes.

For VA Research, research is defined as the testing of concepts by the scientific method of formulating a hypothesis or research question, systematically collecting and recording relevant data, and interpreting the results in terms of the hypothesis or question. The Common Rule (38 CFR 16) defines research as a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalized knowledge.

<u>Human Participant</u> - According to DHHS, a human participant is a living individual about whom an Investigator (whether professional or student) conducting research obtains either: data through intervention or interaction with the individual or identifiable private information. These individuals could be patients, healthy volunteers, students, employees, and/or members of the community.

- **<u>Interaction:</u>** Includes communication or interpersonal contact between an Investigator or his/her research staff and the research participant or the participant’s private identifiable information.
- **<u>Intervention:</u>** This includes both physical procedures by which data are gathered (for example, venipuncture) and manipulations of the participant or the participant’s environment that are performed for research purposes.
- **<u>Private Information:</u>** Information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, medical records). Private information must be individually identifiable (i.e., the identity of the participant is or may readily be ascertained by the investigator or associated with the information).

For FDA regulated research, a human participant is an individual who is or becomes a participant in research, either as a recipient of the test article as a control, or if a device is used on their specimen sample. A participant may be either a healthy individual or a patient.

For VA Research, a human subject is a living individual about whom an investigator conducting research obtains data through intervention or interaction with the individual or through identifiable private information (38 CFR 16.102(f)). The definition provided in the Common Rule includes investigators, technicians, and others assisting investigators, when they serve in a "subject" role by being observed, manipulated, or sampled. As required by 38 CFR 16.102(f) an intervention includes all physical procedures by which data are gathered and all physical, psychological, or environmental manipulations that are performed for research purposes.

At this time, in accordance with the above information, it has been determined that ongoing UMB IRB oversight of this project is not necessary. If the proposed project should change, the IRB must be notified immediately to re-evaluate whether or not your project requires UMB IRB review and approval.

Please keep a copy of this letter for future reference. If you have any questions, please do not hesitate to contact the Human Research Protections Office (HRPO) at (410) 706-5037 or HRPO@som.umaryland.edu.

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