Single Implant-Supported Crowns in the Aesthetic Zone: Patient Satisfaction with Aesthetic Appearance Compared with appraisals by Laypeople and Dentists.

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Abstract

OBJECTIVE: To appraise the patients' satisfaction with aesthetic outcomes following an implant restoration in the anterior maxilla as compared to appraisals made by dentists and laypeople.

MATERIALS AND METHODS: Randomly selected patients (n=116) restored with an implant-retained crown in the anterior maxilla were invited to rate their satisfaction with aesthetic outcomes using a questionnaire containing 7 criteria, each graded from excellent to poor. Projected images of the patient smiles were appraised by dentists (n=8) and laypeople (n=6) using the same assessment criteria in a room setting. In addition, the laypeople judged the same cases on printed 10x15cm photographs in a separate setting. Jemt papilla scores, pink esthetic score (PES) and white esthetic score (WES) were assigned by the dentists. Differences in the levels of satisfaction between the patient, and appraisals by the dentists and the laypeople were compared using non-parametric statistical tests.

RESULTS: Patients' opinions of their aesthetic appearance following the placement of a single implant-supported crown in the aesthetic zone were in general very favorable. The laypeople were more critical than the dentists when the aesthetic outcomes were appraised on magnified images projected onto a screen. Laypeople became less critical when evaluating the aesthetic outcomes on printed photographs compared to appraisals on a screen. Patient satisfaction with their aesthetic appearance differed from dentists' and laypeople's appraisals.

CONCLUSION: Factors other than the actual aesthetic outcome itself appear to influence patients' satisfaction with their end results. Laypeople's appraisal is influenced by the magnification and method used for appraising the aesthetic outcomes.

Introduction

Restoring a single tooth edentulous space in the anterior maxilla with a dental implant was introduced in the early nineties (Jemt 1991). It rapidly became a mainstream treatment modality due to a documented high level of osseointegration and demonstrated excellent long-term functional success (Naert et al. 2002). Unlike in the past however, when meeting functional demands were sufficient, many patients today have greater expectations of their implant restoration. Hence, it may no longer be enough to simply restore the edentulous space with a functioning tooth. It has been suggested that patients today measure their final restoration using the contralateral natural tooth as the gold standard (Chang et al. 1999). In order to satisfy a patient's expectations, the clinician should strive to achieve an "ideal" aesthetic result by focusing on the subtle interplay between the implant and adjacent tooth position in the buccal-lingual, mesial-distal and apical-coronal dimension. The gingival parameters, such as soft tissue drape and ideal papillae form, should also be considered in order to enhance dental implant aesthetics. Much has been written on this topic, and proposals of theoretical parameters for aesthetic success have been forwarded (Kois 2001; Meijndert et al. 2007; Teughels et al. 2009). As a consequence, patients and clinicians alike have become much more aesthetically conscious with regard to implant-retained prosthetics.

This shift in aesthetic consciousness is also reflected in the tools and indices used today to determine implant success. The traditional criterion for success (Albrektsson et al. 1986), while still commonly used, falls short in aesthetically sensitive cases. As such, Smith & Zarb (1989) included in their criteria the necessity for an aesthetic appearance that both the patient and clinician find acceptable in order to have a successful result. Many indices have since been created to help quantify an aesthetic result (Furhauser et al. 2005;, Meijer et al. 2005;, Gehrke et al. 2008; Benic et al. 2012). One relatively recent index is the pink esthetic score/white esthetic score (PES/WES) (Belser et al. 2009), which seems to have gained popularity in clinical research publications.

Although much emphasis is placed on achieving aesthetic restorations, an area that requires further investigation is the relationship between the appearance of the

restored tooth and patient satisfaction. Moreover, how does the dental profession's aesthetic expectation of single tooth implant supported restoration compare to that of the patient's? Does the dental profession have lower standards with respect to aesthetic outcome compared to that of patients and laypeople, or is the profession more critical?

A systematic review has revealed that there is a lack of literature with respect to the topic of patient satisfaction covering single tooth implants in the aesthetic zone (den Hartog et al. 2008). Moreover, a computer-based study has suggested that laypeople are on average less critical of discrepancies in smile characteristics than dental professionals (Ker et al. 2008). Is this because patients are less aesthetically critical than dentists, or is it simply that patients do not notice the same level of detail? This topic warrants further investigation, as it would be beneficial to determine if patient satisfaction with their individual restorative result agrees with what the profession regards as a highly aesthetic outcome. It would also be valuable to further elucidate what constitutes a satisfactory aesthetic result. Might specific individual characteristics such as; colour match, overall shape of the restored tooth, and/or surface texture, be attributable to ideal dental aesthetics? What role does the gingival backdrop play when it comes to patient satisfaction? When restoring a single missing tooth in the aesthetic zone in a patient with gingival display, what is the basis for treatment recommendations? Is it the profession's obsession for an optimal aesthetic restorative outcome or is it the patient's desire for aesthetic perfection?

The aim of this study was to appraise to what extent patient satisfaction and awareness of aesthetic appearance following single tooth implant restoration in the aesthetic zone compared with dentists and laypeople's perceptions. Our null hypothesis was that there would be no difference in the level of patient satisfaction of a single tooth implant restoration in the aesthetic zone and an appraisal made by the laypeople as well as by the dentists.

Materials and Methods

This study refers to a patient population obtained through a Practice Based Research Network (PBRN) from Toronto, Canada, as well as from the graduate clinics of the

Faculty of Dentistry, University of Toronto. The project received approval by University of Toronto Research Ethics Board in 2008 (#23187).

Both general practitioners and specialists in the Toronto area that provide implant dentistry care were invited to join the practice based research network (PBRN). The PBRN members were asked to recall patients treated with single tooth implant restoration in the aesthetic zone adjacent to natural dentition.

To minimize sampling bias, specific instructions were provided to each member of the PBRN on how to obtain a random selection of patients from their own patient pool. Patients who met the inclusion/exclusion criteria (Table 1) were invited to participate in the study. Patients from private practice were advised that their dentist is part of a PBRN. They were informed that the data collected about their care, including photographs and radiographs were made unidentifiable. Table 2 summarizes the sample population.

At the follow up examination, all patients (n=116) were asked to respond to 7 questions to record the level of satisfaction with their restorative result represented in a 5-level Likert scale (Table 3).

In order to help increase the reliability of the patient's responses, a staff member who was not involved in the patient's care, presented the questionnaire to the patient. The objective was to minimize the potential influence of any interpersonal relationship the patient may have developed with staff members who were directly involved in their treatment. The patient was able to view his or her own restoration with the aid of a hand held mirror. No time limits were imposed; rather the patient was encouraged to take as much time as was necessary to accurately complete the survey. At the time the survey was recorded, the restorations were in function for a minimum of six months. Each patient was reminded which tooth had been replaced and thus which tooth was being evaluated.

Determination of Aesthetic Appearance by Dentists and Laypeople

Two groups of eight dentists and six laypeople, respectively, were asked to complete the same questionnaire as the individual patients (Table 3). Magnified images of the

patients' restoration photographs were projected onto a screen. The images included two photographs of the patient's full smile and a close up-photograph of the crown (Figure 1). Approximately one month following the initial appraisal, the laypeople were also asked to repeat the process changing the medium in which the images were presented from screen projection to 10x15 cm photographic semi-gloss paper.

The images included in Figure 1 were selected to aid the dentists and laypeople to accurately complete the survey without having the benefit of the patient being present for examination. Both groups were asked to focus on the photograph of the smile to evaluate the overall aesthetic appearance.

Jemt Index scores (Jemt 1997) were assigned to all mesial and distal papillae by two investigators (JF & MZ). Disagreements were solved by forced agreement. Inter- and intra-examiner reliability of Jemt score appraisals were established by 20 repeat measurements, which reached a Cohen's Kappa coefficient agreement of 0.90.

The PES/WES attempts to quantify an aesthetic result by dividing gingival and dental dimensions separately (pink and white) with a score of 0, 1 or 2 and then combining them for an overall score. The 5 pink parameters examined are mesial papilla, distal papilla, curvature of facial mucosa, level of the facial mucosa, and root convexity/soft tissue colour and texture. The 5 white parameters are tooth form, outline/volume, colour (hue/value), surface texture, and translucency/characterization. This can result in a maximum overall score of 20 points (10 for PES, 10 for WES). Clinical acceptability, however, is set at a score of 6 for either PES overall or WES overall scores. PES/WES scores were assigned for each of the 139 patients by primary investigator (JF).

Correlations between patient satisfaction and the aesthetic appraisals made by the dentist and the laypeople were plotted, and subjected to non-parametric Spearman correlation tests. Moreover, Wilcoxon Rank Sum tests were applied to test for statistical differences between the appraisal rankings made by the 8 dentists and the 6 laypeople. The tests were also used to assess whether patient satisfaction could be linked to the Jemt index scores and/or the PES-WES criteria scores. All statistical analyses were conducted using SPSS (version 19, SPSS Inc., Chicago, USA).

Results

Thirty-eight (33%) of the 116 participants originated from the University of Toronto clinics, while 78 (67%) had been treated by dentists who were members of the PBRN. The ratio of males to females was 53:47% (n=55, n=61) and the average age was 52 (SD=16) years (range from 20 to 85 years). The single tooth implant restorations had been in function on average 3.5 years when they were examined with a range of 1-18 years. The majority of the 138 implants were located in the central incisor area (63 implants), while implants in the lateral and cuspid areas accounted for 55 and 20 implants, respectively.

Patient satisfaction and appraisals by dentists and laypeople

The responses of the participants with regard to satisfaction were in general favorable; for the overall aesthetic appearance the majority reported that they considered this as “Excellent” (72 crowns, 52%) or “Very good” (45 crowns, 32%). Nineteen crowns were deemed as “Good” while 2 crowns were judged by their owners as having a “Fair” appearance. None of the patients scored their own result as “poor”. There were no differences between the level of satisfaction for any of the specific aesthetic criteria such as tooth color, shape and size as well as gum color, contour and fill as a function of gender (Figure 2) or age (Figure 3).

Both the laypeople and dentists scored for the majority of crowns the outcomes as excellent or very good. Moreover, when the laypersons were asked to view the images projected onto a screen and to evaluate the aesthetic outcomes, it was observed that the laypeople were generally more critical than the dentists. When these same images were printed on a 10x15 cm photographic paper, the laypeople became less critical (Table 4).

The complete range of Jemt Papilla Index scores was observed throughout the sample. The most predominant score was 2. (I.e. at least half the height but not up to the contact point). The other scores showed a normal distribution around a score of 2 on both the distal and mesial sides.

The PES/WES scores in this study were in all cases above 6, which are normally considered as being clinical acceptable, and the scores ranged between 7 and 20.

Association between patient satisfaction and appraisals by dentists and laypeople

In general, the patient's overall satisfaction scores and the appraisal scores made by the dentists and laypeople were not very much agreement (Figure 4). Moreover, the patients who rated their overall aesthetic appearance as "excellent" (left section, Figure 5) seldom obtained a comparable appraisal score by the dentists and the laypeople and the patients who judged their restorations as "very good" or "good" (centre and right section in Figure 5) obtained for about 50% of the cases higher appraisal scores by both the dentists and the laypeople. Hence, there was no correlation between the patient satisfaction scores and the laypeople and dentists appraisal scores. Figure 6 reveals some of these extreme variations between the patient satisfaction and the appraisals by the dentists and laypeople.

A significant positive correlation was observed between the overall appraisal scores amongst the laypeople and dentists (Spearman's rho=0.737, $p<0.01$) (Figure 7, left). However, Wilcoxon signed ranks test revealed that laypeople are more critical than dentists ($p <0.001$). Similarly, a significant positive correlation was observed between the overall appraisals that were made by using printed photographs and the ones that were made on the screen projections (Spearman's rho=0.817, $p<0.01$) (Figure 7, right). Wilcoxon signed ranks test revealed that the laypeople became significantly less critical in their appraisal scores when they appraised the projected photos ($p <0.001$).

An increased papilla fill as scored by the Jemt index seemed to have a positive relationship with patient satisfaction with gum fill, gum contour as well as overall patient satisfaction (Table 5). Interestingly, there seemed to be little difference whether a Jemt index score of 2 (at least half of the papilla) or 3 (complete fill of the papilla) was obtained.

When the Jemt scores for the dental papillae were compared to the PES papilla scores a normal distribution is noted with slight kurtosis toward no discrepancy when observing the PES papilla scores (Table 6).

The patient satisfaction scores did not correlate with the PES/WES scores. On the other hand, a significant positive correlation was observed between the PES/WES overall sum and the dentist (Spearman's rho=0.577, $p<0.01$) and laypeople appraisals (Spearman's rho=0.578, $p<0.01$) (Figure 8).

Discussion

For the current study, 116 patients were recruited from a PBRN consisting of 78 private practice and 38 institutional patients from the University of Toronto. With an approximate ratio 2:1 of private practice to institutional patients, this population sample provides observations that, the authors believe, have a high degree of external validity, as it may be considered representative of the general population seeking an implant restoration to replace a missing tooth in the aesthetic zone.

The predictability of single tooth replacement with a dental implant has allowed this treatment modality to become mainstream in contemporary dentistry. The sample population in this study is a testament to this observation as the vast majority of the implants have been in function for 10 years or less.

A limitation in the study protocol that would affect the level of agreement between patients, laypeople and dental professionals is that patients did not have the opportunity to view their own implant restoration in the same manner as laypeople and dentists did. Patients' observations may have been more consistent with laypeople if they had observed their restoration either projected on a screen or printed on photographic paper, as opposed to observing and evaluating their result using a handheld mirror. A further limitation in the study protocol may be related to the photography of the patient sample. Since the patients were part of a PBRN, they were photographed using different cameras in differing lighting conditions. Furthermore, aperture settings, white balance, ISO values and shutter speed were not controlled for. As such, some of the differences noted between the groups could potentially be partly due to the lack of calibrated image acquisitions.

One of the observations in this study was that the manner in which images were presented to the laypeople affected the way they evaluated the overall aesthetic outcome. When the images were magnified and projected on a screen, laypeople were more critical of the aesthetic outcome as compared to when the same images were reproduced on photo paper resulting in an image that was not magnified. A randomized crossover design having half the laypeople appraise the screen first and the second half photo groups could potentially have strengthened this study. A longer lag time between the two appraisal methods could have had an influence. The lag time between the tests in this study ranged from 30 to 40 days, which may have hypothetically have resulted in greater agreement between these groups than if longer time span had been employed. As well, the layperson may have been desensitized due to previous exposure to the images on a big screen and therefore became less critical when viewing the images printed on photographic paper.

There was no discernable difference between the level of satisfaction of male and female participants. This is supported in the literature (Heravi et al., 2011) although it goes against a common assumption that females, in general, have more discriminating views pertaining to aesthetics. As well, although one may assume that it would be more difficult to satisfy the aesthetic expectations of youthful individuals, it appears that there is very little difference in the level of satisfaction when comparing age groups.

The appraisals made by dentists and laypeople of an implant restoration in the aesthetic zone differed from each other as well as from the satisfaction scores of the actual patient. Poor agreement between patients and practitioners has been noted by others (Esposito et al. 2009;, Albashaireh et al. 2009;, Foulger et al. 2010). The results of this study are in agreement with previous reports which (Cardash et al. 2003; Moore et al. 2005) found that the laypeople perception and therefore their appraisal scores differed significantly depending on the manner in which the images were viewed. It is probable that where the circumoral region occupies a larger portion of the photo the observer may take cues from other facial features such as the eyes, nose, ears and overall facial structures, which when viewed in concert may skew the results and it has therefore been suggested that laypeople can more readily discern differences in smile aesthetics when presented with images that only show the oral region (Flores-Mir et al. 2004). It

has also been demonstrated that the opinion of dental aesthetics differs when retracted images showing only the oral region without the surrounding lip curtain where examined. (Kokich et al. 1999; Rosenstiel et al, 2000; Wolfart et al. 2005). This seems to suggest that viewing the face allows for a less critical view on smile aesthetics.

It was observed that an increased papilla fill as scored by the Jemt Index had a positive relationship with gum fill, gum contour as well as overall patient satisfaction. However, when Jemt scores were compared to PES papilla scores (mesial and distal), a normal distribution is noted with a slight kurtosis towards no discrepancy. The PES papilla scores differs from the Jemt Index in that the papillae is being compared to that of the contralateral tooth, and is not scored as a separate entity within the oral environment. As such, the mere presence or absence of papillae is not as crucial to its score as compared as whether or not a discrepancy exists with the contralateral papilla. As well, PES has 3 possible scores as compared to Jemt which has 5 possible scores. As such, central tendency bias would have a greater effect on PES. This could explain the skewed PES score results as compared to Jemt.

Some investigators have shown that laypeople and dental professionals can agree in their preference for the level of the gingival at the lateral incisor to be 0.5mm coronal to that of the central incisor (An et al. 2009). In contrast, others suggest that laypeople, orthodontists, and general dentists are not in agreement in noticing subtle changes in the gingival levels between central and lateral incisors (Kokich et al. 1999). It has been said that beauty is in the eye of the beholder. This is especially true when considering the highly subjective perceptions of colour and translucency in dental aesthetics (Nohly et al. 2002). Surface texture, the material used, and previous eye experience all play a part in the determination of an object's colour. (Wyszecki & Stiles, 1982). Individuals show variation in their ability to match colours, as well as inconsistency in colour perception from time to time (Johnston & Kao, 1989). Today clinicians seem to favour non-metallic alternatives in implant dentistry for the perceived aesthetic benefits. However, if other aesthetic parameters are not present, the material chosen for the fabrication of an implant crown per se does not ensure an optimal aesthetic result (Galluci et al. 2011).

A positive linear relationship was observed between the total overall PES/WES score and overall aesthetics as judged by all the dentists and laypeople (Figure 8). As such, PES/WES seems to be a valuable tool that will allow the clinician/researcher to quickly estimate what the average dentist / layperson will perceive concerning the overall aesthetics of an implant restoration. It did not appear, however, that any particular criteria involved in the PES/WES determination was in agreement with overall aesthetic scores, nor with the patients' satisfaction scores. Chang et al. 1999, underwent a study comparing single tooth implant restorations to its contralateral natural tooth. They found that on average the implant supported crown; was longer, was smaller in facial lingual width, had thicker facial mucosa, had a smaller distal papilla, was associated with a higher frequency of mucositis and bleeding on probing (BOP), as well as greater probing depths. In spite of these findings however, they also noted that patient satisfaction measured via VAS scoring had a median 96% satisfaction rating with a range of 70-100%. They also concluded that the observed differences between the implant crown and its contralateral tooth might be of minor importance for the satisfaction of the aesthetic outcome in most patients. The current study concurs with this conclusion. It was noted that there is little agreement between the individual component PES/WES criteria and overall satisfaction. PES/WES scores are based on how that particular dimension in question compares to its contralateral tooth. As such, any of the criteria of PES/WES could theoretically score high and be non-aesthetic as long as it closely resembles its contralateral. The opposite of this hypothesis can also be true.

Clinical Relevance

The results of this retrospective survey of patients who received a single tooth implant restoration in the aesthetic zone reaffirms that patient satisfaction is a concept which is multidimensional and very difficult to predict. Hakestam et al. (1997), concluded that patient satisfaction is an elusive concept that transcends the technical aspects of dental care. As well, patient satisfaction is a multidimensional experience that is impossible to distill into a single measurement. Newsome et al. (1999), found that satisfaction is

dependent on how patients perceive themselves in relation to the healthcare system. Also, it was found that patient satisfaction could not be predicted based on a simplistic comparison between expectations and perception. Mazurat et al. (2003), concluded that patient expectations can be more frequently met, resulting in increased satisfaction when patients understand all of the risks, benefits and alternatives to treatment. That is, a well-informed patient is a patient that is more easily satisfied. Sondell et al. , (2002) found that to help improve patient satisfaction, clear and realistic aesthetic goals should be outlined. In this context it is noteworthy to be aware that in the implant literature, there is great diversity with regard to parameters, methods and measurement units used for the assessment of aesthetics among clinical studies (Benic et al. 2012).

Conclusion

Within the limitations of this study, it was found that the aesthetic appraisal of an implant restoration in the aesthetic zone differs between laypeople, dentists and from that of the satisfaction of the actual patient. Laypeople's appraisal appears to be influenced by the method used for appraising the aesthetic outcomes. They seemed to be more critical of the aesthetic result when the images were projected and magnified on a screen as compared to printed on 10x15cm photographic paper. As well, PES/WES appears to have a positive linear relationship to dentist and laypeople overall aesthetic appearance scores.

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Table 1: Patient Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
• Patients with single implant tooth replacement in the aesthetic zone between the maxillary canines (13-23) with at least one natural adjacent tooth mesial or distal to the implants. • The final implant-supported crown restoration must have been in function for a period of at least 6 months. (Choquet et al. 2001)	• Patients who had soft tissue grafting prior to or in conjunction with implant surgery. • Patients who had adjunctive surgical procedures after insertion of final crown restoration. (I.e. further connective tissue or soft tissue grafting, hard tissue grafting, treatment of peri-implantitits, etc.) • Patients who are taking any medications known to affect or alter periodontal soft tissue dimensions. • Patients who had “ridge lap” type of prosthesis or pseudo-papilla regeneration made of pink acrylic or porcelain to artificially create the interproximal papillae.

Table 2: Summary of collected clinical data

	Faculty	PBRN	Total
Number of patients	38 Patients	78 Patients	116 patients
Number of implants	46 Implants	92 implants	138 implants

Table 3. Patient Questionnaire

What is your overall evaluation of your implant-supported crown for the following categories?

Question		Poor	Fair	Good	Very good	Excellent
Patient Overall Satisfaction	**n**	0	2	19	45	72
	%	0.0%	1.4%	13.8%	32.6%	52.2%
Patient Satisfaction with color	**n**	1	5	20	40	72
	%	100.0%	100.0%	100.0%	100.0%	100.0%
Patient Satisfaction with tooth shape	**n**	0	2	11	40	85
	%	0.0%	1.4%	8.0%	29.0%	61.6%
Patient Satisfaction with tooth size	**n**	1	4	13	40	80
	%	0.7%	2.9%	9.4%	29.0%	58.0%
Patient Satisfaction with gum color	**n**	0	9	15	47	67
	%	0.0%	6.5%	10.9%	34.1%	48.6%
Patient Satisfaction with gum contour	**n**	5	5	35	38	55
	%	3.6%	3.6%	25.4%	27.5%	39.9%
Patient Satisfaction with gum fill	**n**	3	15	22	33	65
	%	2.2%	10.9%	15.9%	23.9%	47.1%

Table 4. Patient overall satisfaction versus the appraisal scores made by the dentists and by laypeople (SD=Standard Deviation)

Overall Patient Satisfaction		Overall Satisfaction as reported by:		
		Laypeople (photo)	Laypeople (screen)	Dentists (screen)
Excellent	Mean	3.496	2.681	3.065
	N	72	72	72
	SD	0.6818	0.9059	0.7406
Very good	Mean	3.722	2.873	3.262
	N	45	45	45
	SD	0.6171	0.7984	0.6896
Good	Mean	3.642	2.779	2.942
	N	19	19	19
	SD	0.6769	0.7525	0.6987
Fair	Mean	3.450	2.550	3.150
	N	2	2	2
	SD	1.2021	1.4849	1.2021
Total	Mean	3.589	2.755	3.114
	N	138	138	138
	SD	0.6671	0.8537	0.7241

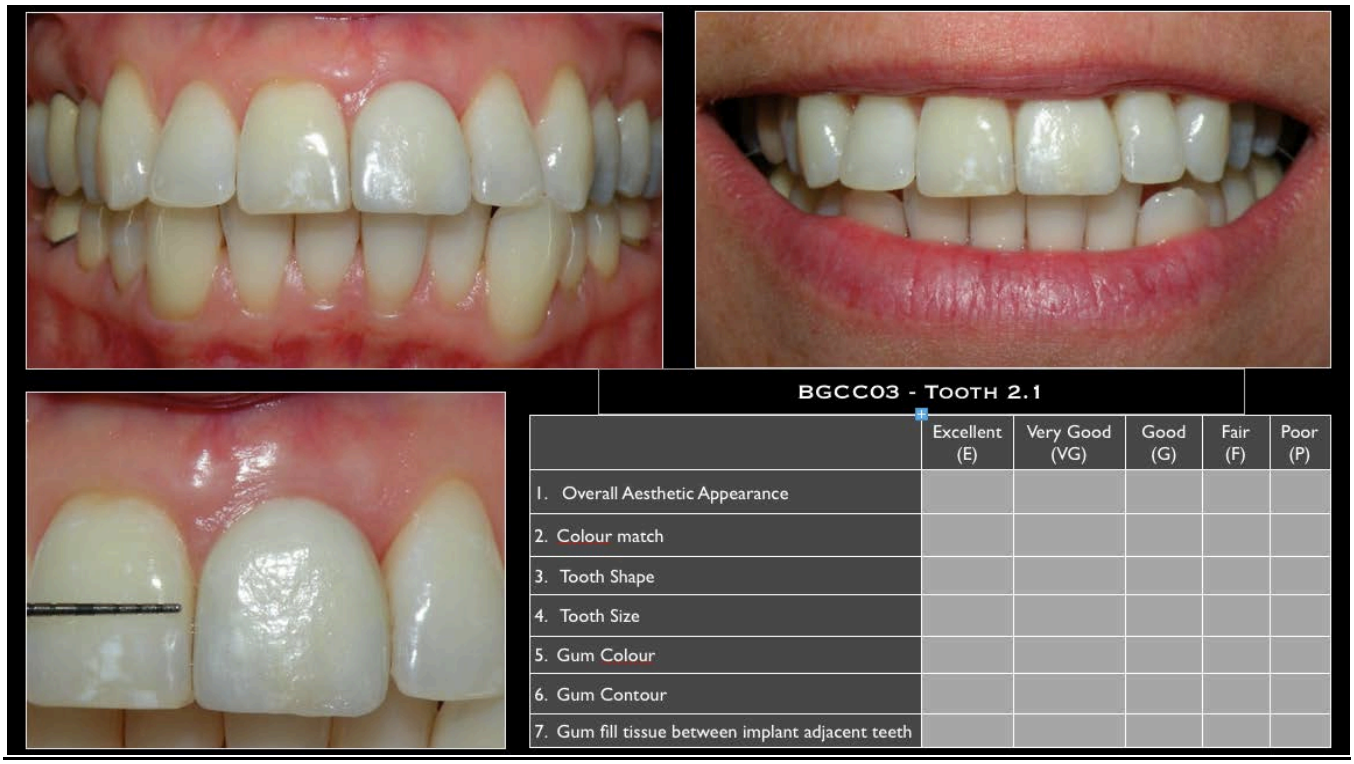
Table 5. Patient Satisfaction versus Jemt Papilla scores

Item		Jemt Score*				
		0	1	2	3	4
Patient overall satisfaction	Poor	0.0%	0.0%	0.0%	0.0%	0.0%
	Fair	50.0%	50.0%	0.0%	0.0%	0.0%
	Good	27.8%	27.8%	33.3%	11.1%	0.0%
	Very Good	11.4%	22.7%	45.5%	20.5%	0.0%
	Excellent	14.5%	33.3%	30.4%	21.7%	0.0%
Patient satisfaction with the gum contour	Poor	25.0%	25.0%	25.0%	25.0%	0.0%
	Fair	20.0%	20.0%	40.0%	20.0%	0.0%
	Good	14.7%	23.5%	38.2%	23.5%	0.0%
	Very Good	18.9%	35.1%	35.1%	10.8%	0.0%
	Excellent	13.2%	30.2%	34.0%	22.6%	0.0%
Patient satisfaction with the gum fill	Poor	66.7%	0.0%	0.0%	33.3%	0.0%
	Fair	35.7%	21.4%	35.7%	7.1%	0.0%
	Good	5.0%	40.0%	35.0%	20.0%	0.0%
	Very Good	27.3%	30.3%	33.3%	9.1%	0.0%
	Excellent	6.3%	28.6%	38.1%	27.0%	0.0%

Table 6. Jemt index scores versus PES scores (mesial and distal papilla)

Item		Jemt Score				
		0	1	2	3	4
PES papilla score (mesial papilla)	Major discrepancy	62.5%	25%	12.5%	0.0%	0.0%
	Minor discrepancy	14.3%	33.3%	41.3%	4.8%	6.3%
	No discrepancy	0%	10%	38%	44%	8%
PES papilla score (distal papilla)	Major discrepancy	37.5%	50%	0%	12.5%	0%
	Minor discrepancy	15.8%	26.3%	46.1%	6.6%	5.3%
	No discrepancy	2.2%	15.2%	39.1%	41.3%	2.2%

Figure 1. Layout of images viewed by dentists and laypeople



BGCC03 - Tooth 2.1

	Excellent (E)	Very Good (VG)	Good (G)	Fair (F)	Poor (P)
1. Overall Aesthetic Appearance					
2. Colour match					
3. Tooth Shape					
4. Tooth Size					
5. Gum Colour					
6. Gum Contour					
7. Gum fill tissue between implant adjacent teeth					

Figure 2. Level of Patient Satisfaction dichotomized for gender

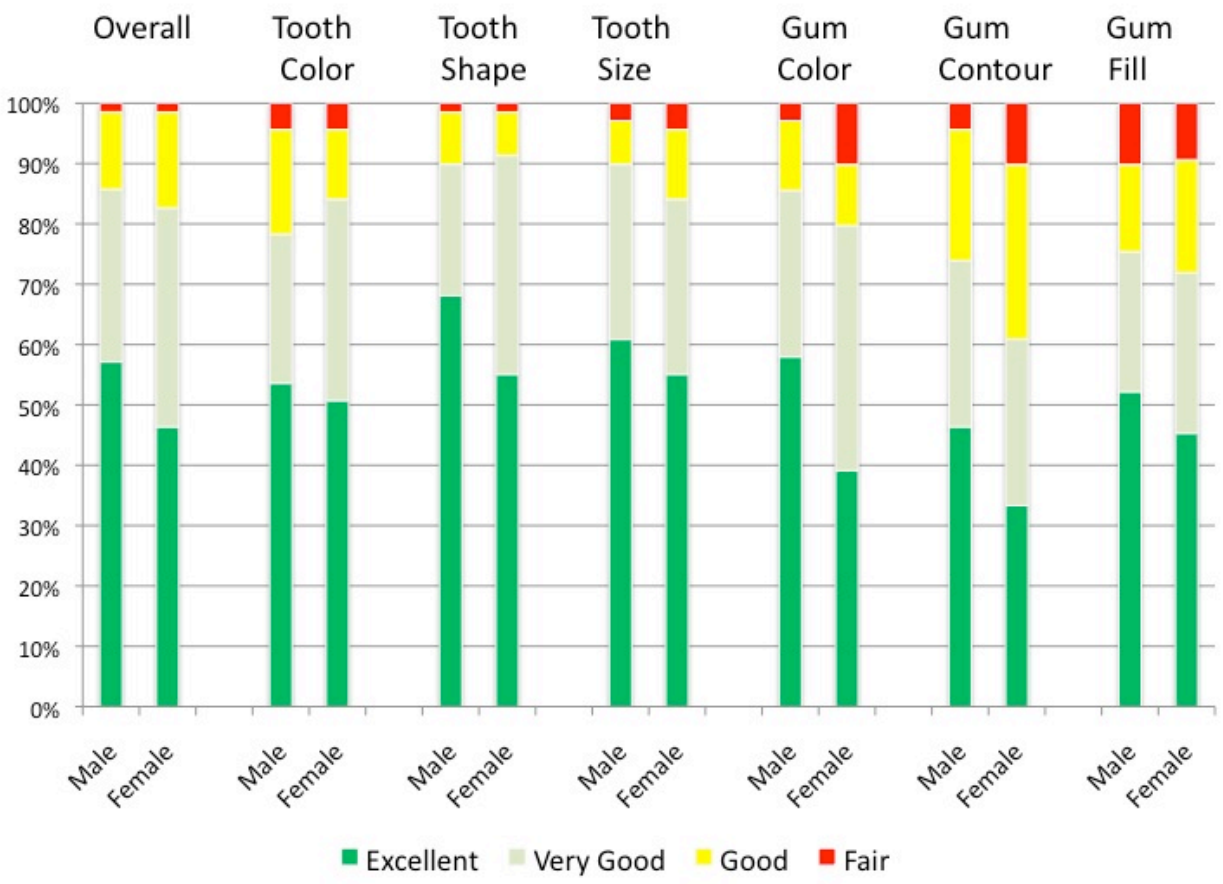


Figure 3. Levels of Patient Satisfaction categorized based on age groups

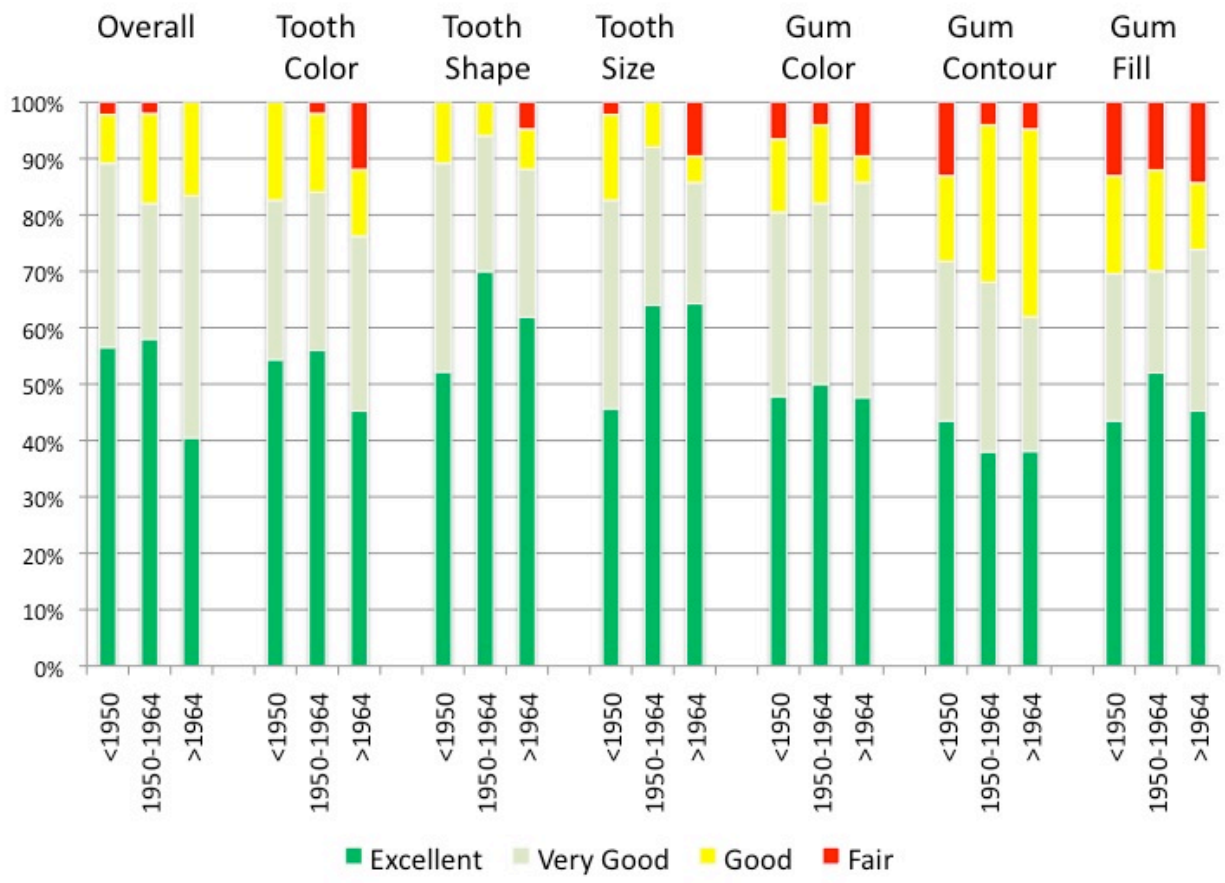
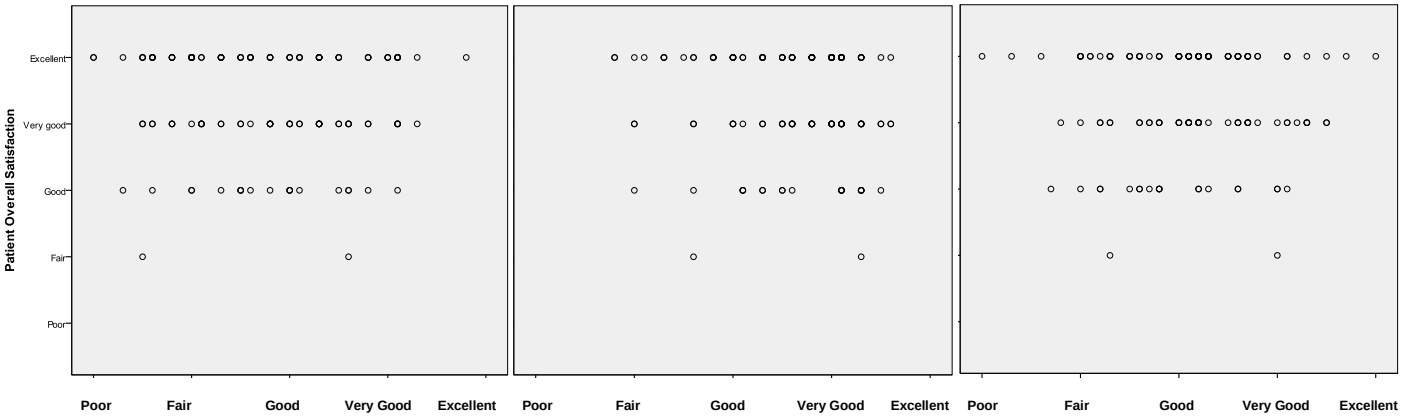


Figure 4. Patient satisfaction with overall aesthetic appearance (vertical) versus laypeople appraisal of overall aesthetic appearance based on having viewed images projected on a screen (left) or by having viewed printed images (centre) and versus dentists overall appraisal of overall aesthetic appearance (right)



Laypeople appraisal (screen)

Laypeople appraisal (printed image)

Dentist appraisal

Figure 5. Patient satisfaction of overall aesthetic appearance (blue horizontal lines), contrasted by appraisal scores, sorted from best to worse scores, made by dentists (red lines) and laypeople (green lines).

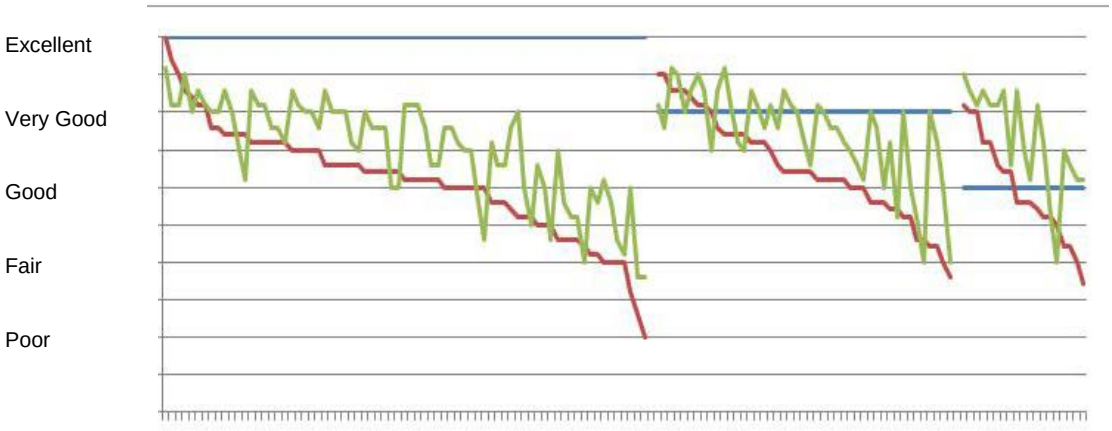


Figure 6. Extreme examples of what patients evaluated as excellent (left) and fair (right) overall aesthetic outcomes.

Figure 7. Scatterplots of the overall aesthetic appearance appraisal scores by the dentists versus laypeople (left) and laypeople upon use of projected versus printed photographs (right). (Diagonal line was added for illustrative purpose only)

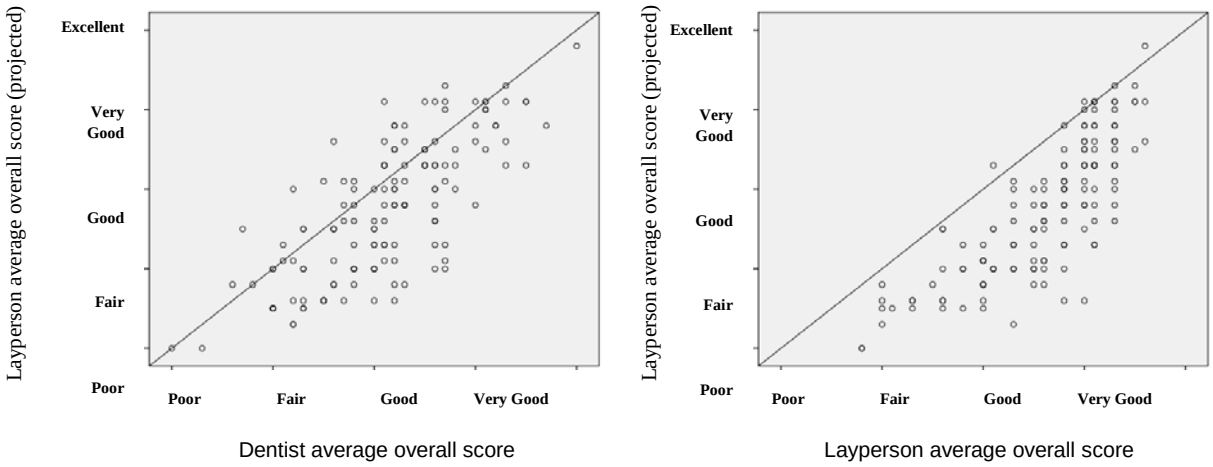


Figure 8. PES/WES scores versus laypeople average overall appraisal (projected on the screen) (left) and dentist average overall appraisal (right). (Diagonal line was added for illustrative purpose only)