

Esthetic Outcome and Oral Health-Related Quality of Life after Restoration with Single Anterior Maxillary Implants

SUMMARY

Background/Aim: To evaluate the esthetic outcome of single implant restorations and the correlation of these esthetic results between patient satisfaction and oral health-related quality of life (OHRQoL). **Material and Methods:** 15 patients with single-tooth implants in the anterior maxilla region were included in this study. Patients were clinically followed to evaluate the esthetic outcomes of implant prostheses and photographs of the implant site were obtained using a digital camera. A researcher evaluated the photographs according to the pink esthetic score/white esthetic score (PES/WES) index. Patients were asked to complete a questionnaire including 13 questions to evaluate their satisfaction with the overall implant and restoration treatments using by visual analogue scale (VAS). OHRQoL was evaluated by patients with the questionnaire Oral Health Impact Profile-14 (OHIP-14). **Results:** The mean PES/WES was 13.6. In Ohip-14 questionnaire, the questions were answered 'never' generally. The mean VAS score was 9.01 ± 0.9 and ranged from 7.6 to 9.7. There was no correlation between VAS and PES/WES ($p = 0.484$), similarly, there was no correlation between OHIP-14 and PES/WES ($p = 0.763$). **Conclusions:** All of the implant restorations' PES/WES scores were clinically acceptable. Professionals evaluated the esthetic outcome more suspicious than patients. Patients were satisfied with the esthetic results.

Key words: Dental Implant, Dental Esthetics, Patient Satisfaction

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Introduction

Recent advances in osseointegration, high survival rates and success have increased the reputation of implant treatments^{1,2}. Although implant treatment is well-established and successful, it is not a sufficient perspective to evaluate only in terms of osseointegration³. While replacing a single missing tooth in the anterior maxilla with an implant, clinicians should not only rebuild function but also provide the esthetics⁴. Therefore, esthetic requirements should be particularly considered in the anterior zone.

Belser *et al.*⁵ proposed the pink esthetic/white esthetic score (PES/WES) to evaluate the esthetic outcome of implant restorations. The PES/WES pays attention both the surrounding soft tissue and crown

restoration of an implant placed in the anterior region⁵. There is a widespread agreement that PES/WES analysis becomes one of the standard assessment and demonstrates the qualification when considering the esthetic outcome of implant restorations in the anterior region⁶⁻¹¹.

Besides objective esthetic index evaluation, also the goal of patient satisfaction should be taken seriously. One of the subjective esthetic evaluation questionnaires is a visual analogue scale (VAS). VAS can provide sufficient data related to patient satisfaction^{5,12}.

Oral health-related quality of life (OHRQoL) should be evaluated with the questionnaire Oral Health Impact Profile (OHIP)¹³⁻¹⁵ to have information about patient's quality of life. OHIP-14 questionnaire is commonly used and demonstrates a reliable, valid and sensible results¹⁶.

Esthetics is subjective, therefore both patients' opinions and objective esthetic index should be considered when evaluating the esthetic outcomes¹⁷. Therefore, this study aimed to evaluate the esthetic outcome of single implant restorations and the correlation of these esthetic results between patient satisfaction and OHRQoL.

Material and Methods

The study was approved by the Non-Interventional Medicine Ethics Committee of Uşak University Faculty of Medicine with decision number 236-03/11.12.2019. This study conforms to the Declaration of Helsinki. The patients who were received single-tooth implants in the anterior maxilla region were selected. All patients who were accepted to participate the study signed an informed consent form

In this study, 15 patients with single-tooth implants were included. All the restorations type was metal-supported ceramic crown. The demographic data and distribution of implants according to the placement site is shown in Table 1.

Table 1. Demographic data and clinical characteristics

(n=15)	Patients
Mean age±SD	33.44±13.57
Male/female	9/6
Marital status(married/single)	6/9
Education (primary school/secondary school/ high school/university)	3/2/5/5
Implant site (CE/LA/CA)	4/5/5/1
Time in function (months)	12
(C: central, LA: lateral, CA: canine; SD: standard deviation)	

Each eligible patient's information was recorded (gender, age, oral hygiene, smoking habit, systemic diseases, parafunctional habit, gingival biotype, treatment protocol, type of the restoration, previous dental treatment).

Inclusion criteria were: the presence of a single-tooth implant reconstruction in the anterior maxilla with sufficient oral hygiene and following-up examinations, presence of natural teeth adjacent to both sides of the implant site in the anterior maxilla.

The exclusion criteria were uncontrolled systemic disease, parafunctional habits, multiple implants, acute

infection or active periodontal disease-related field, presence of a restoration or crown on the contralateral tooth, ridge lap implant prostheses, increased resorption of alveolar bone (>2mm), and combined hard/soft tissue grafting before implant placement.

Patients were clinically followed to evaluate the esthetic outcomes of implant prostheses and photographs of the implant site were obtained using a digital camera (Nikon D7000, Nikon Corporation, Tokyo, Japan). The photographs were obtained for each single tooth implant site and contralateral tooth site one from frontal and one from occlusal view by the same person. Photographs were then analyzed and evaluated on a calibrated computer with a high-resolution monitor.

To provide intra-examiner reproducibility and reliability, one prosthodontist performed first, second and third evaluation with an interval of 1 week. Cohen's kappa test was used to determine the agreement among each measurement.

The PES was focused on papilla, soft tissue level, soft tissue contour, alveolar process deficiency, soft tissue color, and soft tissue texture. The WES was focused on general tooth form, tooth contour, tooth color (hue and value), surface texture, and translucence.

The contralateral reference tooth was used to compare the single implant-supported tooth to assess esthetic outcomes. The 2-1-0 scoring system was used for each PES/WES variable (0= poorest, 1= moderate and 2= best).

For PES/WES analysis, score of 12 was considered the threshold of clinical acceptability and 20 was the maximum possible score. For PES analysis, the clinically acceptable value was considered 6 for peri-implant soft tissues; for WES analysis, the clinically acceptable value was considered 6.

OHRQoL was evaluated by patients with the questionnaire OHIP-14 which comprised 14-parts divided into 7 categories - functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. On a liker scale 0 referred never, 1 referred hardly, 2 referred occasionally, 3 referred fairly often, and 4 defined as "very often" a problem. Total OHIP-14 scores calculated from the responses and it ranged from 0 to 70 - lower scores meant better OHRQoL.

Patients were asked to complete a questionnaire including 13 questions to evaluate their satisfaction with the overall implant and restoration treatments (Table 2). The patients scored for each question with the help of the VAS scale, which ranges from 0 to 10. A score of 0 referred to not satisfied, while a score of 10 mentioned completely satisfied.

Table 2. Patient satisfaction questionnaire

	Very Satisfied	Fairly Satisfied	Hardly Satisfied	Not Satisfied	Don't Know
1. How satisfied are you with the crown shape?					
2. How satisfied are you with the crown color?					
3. How satisfied are you with the symmetry of the restoration with the contralateral?					
4. How satisfied are you with the alignment of the restoration with the other teeth?					
5. How satisfied are you with your smile?					
6. How satisfied are you with your gum shape?					
7. How satisfied are you with your gum color?					
8. How satisfied are you with the function of the restoration during eating?					
9. How satisfied are you with the restoration during talking?					
10. How satisfied are you with the ease of care of the restoration?					
11. How satisfied are you with the entire treatment?					
12. How satisfied are you with the time taking to finish the treatment?					
13. How satisfied are you with the cost?					

Results

Demographic data of patients and clinical characteristics of implants are shown in Table 1. A total of 15 patients (9 males and 6 females) who received a total of 15 maxillary single implants participated in this study. The age ranged from 28 to 65 years (mean \pm SD = 33.44 ± 13.57 years). Four implants were placed in the central incisor area, 5 implants were placed in the lateral

incisor area, 5 implants were placed in the canine area and 1 implant was placed in the first premolar area. The mean time in function was 12-months and ranged from 10 months to 24 months.

The median PES/WES was 15. The median PES and WES score was 7. The mean PES/WES was 13.6. The mean PES score was 6.56 and the mean WES score was 6.78. In 33.3% of the cases, complete mesial and distal papilla fill was achieved. The level of facial mucosa was excellent in %50 of the cases. %66 of the cases had good root convexity (Table 3).

Table 3. Mean, SD, median and details of PES/WES evaluation

	Esthetic score				Max.	Min.	Median	Mean	SD	Total PES mean
	0	1	2							
PES										
Mesial papilla	5	5	5	0	2	1	1	0.80		
Distal papilla	0	6	9	1	2	1	1.33	0.50		
Curvature of labial mucosa	2	7	8	0	2	1	1.22	0.66		
Level of labial mucosa	2	8	7	0	2	2	1.44	0.72		6.56
Root convexity, soft tissue color and texture	0	6	9	1	2	2	1.67	0.50		
WES										Total WES mean
Tooth form	0	7	8	1	2	2	1.56	0.52		
Tooth volume/outline	0	6	9	1	2	2	1.67	0.50		
Color(hue/value)	0	8	7	1	2	1	1.44	0.52		
Surface texture	0	9	6	1	2	1	1.33	0.50		6.78
Translucency	0	15	0	1	1	1	1.00	0		

SD, standard deviation; PES/WES, pink esthetic score/white esthetic score

Concerning OHIP-14 questionnaire, the questions were generally answered "never". 80-90 %of the participants answered that they never had functional limitations, 60% of the participants answered that they never had physical pain, 90% of them never had a physical disability, 60-70% of the participants answered

that they never had a psychological disability, 60-70% of the participants answered that they never had a social disability, and 90% never had a handicap. 40% of the participants answered that they never had psychological discomfort and 10-15% rarely had psychological discomfort (Figure 1).

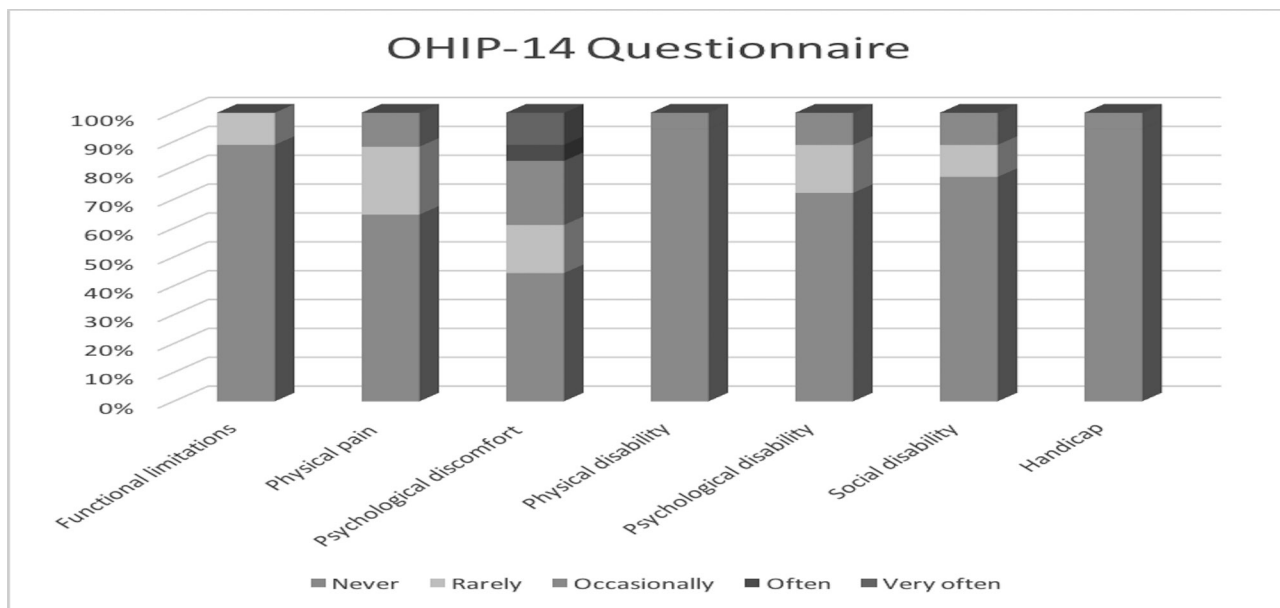


Figure 1. Oral health-related quality of life based on the OHIP-14

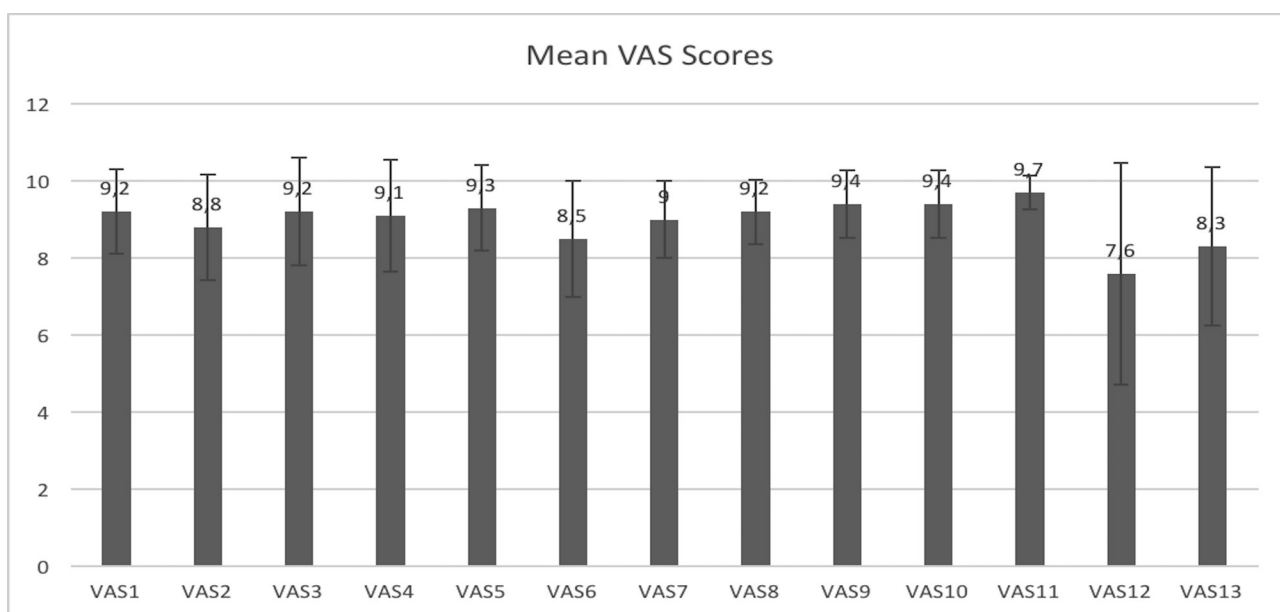


Figure 2. Patient satisfaction based on the 13 questions

The mean VAS score was 9.01 ± 0.9 (Table 4) and ranged from 7.6 to 9.7. Only Q2, Q6, Q12, and Q13 questions had scores under 9 (Figure 2).

Results of the t-test showed that there was no statistical significance in total OHIP-14 and VAS scores according to gender ($p = 0.507$ and $p = 0.670$) (Table 5). Also, there was no correlation between VAS and PES/WES ($p = 0.484$) (Table 4), as well as between OHIP-14 and PES/WES ($p = 0.763$) (Table 6).

Table 4. OHIP-14 and VAS score and comparison according to the gender

		Mean \pm SD	P-value*
Gender	Total OHIP-14 score	1.4 \pm 0.3	0.507
	Total VAS score	9.01 \pm 0.1	0.670

OHIP-14, Oral Health Impact Profile-14; VAS, visual analog scale.

*Independent samples T test (SD: standard deviation)

Table 5. VAS and Spearman's correlation between PES/WES and VAS score

Regional group	Spearman correlation coefficient	P-value*
PES	-0.177	0.648
WES	-0.528	0.144
Total PES/WES	-0.269	0.484

PES/WES, pink esthetic score/white esthetic score. * Spearman's rho correlation test

Table 6. OHIP-14 and Spearman's correlation between PES/WES and VAS score

Regional group	Spearman correlation coefficient	P-value*
PES	-0.181	0.640
WES	0.115	0.768
Total PES/WES	-0.118	0.763

OHIP-14, Oral Health Impact Profile-14; VAS, visual analog scale; PES/WES, pink esthetic score/white esthetic score.

* Spearman's rho correlation test

Discussion

All the implants met criteria of the success. No crestal bone loss was determined in the radiographic analysis and there was not an implant mobility, peri-implantitis, bleeding, and pain.

Oral photographs have been used for white and pink esthetic evaluation for the single-tooth peri-implant soft tissue and single-tooth implant-supported restorations^{5,18,19}.

Modified PES/WES was used for the assessment of the esthetic outcome of single-tooth implants based on Belser *et al.*⁵ study, as it was easier to apply it than the original one indicated by Fürhaser *et al.*²⁰. The mean total PES/WES was 13.6 and the threshold of clinical acceptability score 12 was considered in the present study. However, a total of 3 crowns scored below the threshold of clinical acceptability score, which means 20% among the all crowns. The highest score was 18 and the lowest score was 8. The mean total PES/WES was lower than scores reported by Angkaew *et al.*⁶ and Belser *et al.*⁵, although it was higher than score reported by Al-Dosari *et al.*¹⁸

In previous studies, there were controversial results in terms of WES scores. Angkaew *et al.*⁶ and Buser *et al.*¹² reported better WES scores (≥ 8) than Belser *et al.*⁵, Cho *et al.*⁸, and Mangano *et al.*⁹. The reason might be the difference between the technicians and their skill. The total WES score was 6.78 in the present study and slightly higher than the threshold of clinical acceptability.

The main factor that decreased the score was the lower translucency of metal-ceramic crowns.

The total PES score was 6.56 which was lower than the score that Belser *et al.*⁵ and Angkaew *et al.*⁶ obtained, and similar to Al-Dosari *et al.*¹⁸ obtained. However, it was slightly higher than the threshold of clinical acceptability. Both Lai *et al.*²¹ and Al-Dosari *et al.*¹⁸ reported that 60% of the cases had higher papilla scores. Unfortunately, in the present study, higher mesial and distal papilla scores obtained were obtained only in 33.3% of the cases. Similarly, to the present study, Belser *et al.*⁵ found higher scores for distal papilla in 30% of the cases. It has been reported that papilla formation is affected by the level of the proximal crestal bone²², and gingival biotype plays a key role in the recession of the mid-facial margin level^{6,23-25}. In the present study the biotype was mostly thin, and no crestal bone was observed. Cosyn *et al.*²⁶ reported that the level of facial mucosa was excellent in about 50% of the cases. Similarly, the level of facial mucosa was excellent in 50% of the cases. However, the curvature of facial mucosa was moderate, and 66% of the cases had good root convexity.

The esthetic is subjective and should be evaluated by clinician objectively. Previous studies have reported relation between the objective evaluation by clinician and subjective evaluation by patients^{3,6,8,17,19,27,28}.

OHIP-14 evaluation scores were lower, which indicated a good OHRQoL. Results of the OHIP-14 questionnaire were consistent to high patient satisfaction. The rates of patients who felt psychological discomfort were higher than other categories. It was more difficult to get used to the new appearance of the anterior region teeth, particularly in the early days. Besides, patients' esthetic outcome evaluation was more positive than dentist's evaluation, which was in consistent with previous studies²⁹.

In this study, high patient satisfaction with esthetic outcomes was obtained (mean; 9.01 ± 0.9). Pjetursson and Lang³⁰ reported that more than 90% of the patients were satisfied with the treatment. Al-Dosari *et al.*¹⁸ stated that 75% of the patients were satisfied with the treatment. Besides, there is no statistical difference between females and males in term of OHRQoL and satisfaction ($p = 0.507$ and $p = 0.670$).

Results of the study showed no correlation between total PES/WES evaluation performed by the dentist and VAS and OHIP-14 evaluation performed by the patient. Similarly, to the previous studies^{5,6}, patient VAS evaluation scores were higher than dentists. Cho *et al.*⁸ stated that dentists were more prone to be censorious than patients.

The increased duration of the control time with larger samples size should be considered in future studies.

Conclusions

For 80% of the implant restorations, PES/WES scores were clinically acceptable.

Professionals evaluated the esthetic outcome more suspiciously than patients.

Patients were satisfied with the esthetic results.

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