

Original Article

One Piece Dental Implants in Esthetic Zone

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Abstract

Objectives: Recently, one-piece dental implants are widely used to replace missing teeth. This study aimed to evaluate the esthetic satisfaction of patients treated with one-piece dental implants in the esthetic zone using a special technique to enhance gingival recontouring and provide an optimum emergence profile.

Methods: Twenty patients with single missing maxillary or mandibular teeth were enrolled in the study (25–50-year age group). A flame-shaped bur was used to create a sulcus around the implant abutment; the sulcus was then filled with flowable composite resin and allowed for seven days to recontour the gingival tissue. Esthetic satisfactions of the patients were evaluated two weeks and six months after the placement of the permanent crown using subjective and objective methods.

Results: The esthetic assessment after 14 days and after six months using the objective method Pink Esthetic Score / White Esthetic Score (PES / WES) index showed that 85% to 90% of the cases received PES and WES mean values of 6 or more, which is the threshold of clinical acceptability. Regarding the subjective method using the Visual Analogue Scale (VAS) index. After 14 days, the total means value for all the questions was (7.19), and the results after six months were (7.25). There was a statistically non-significant difference between the two-time intervals in both objective and subjective methods ($P < 0.05$).

Conclusions: It has been concluded that one-piece dental implants can be successfully used in the esthetic zone after the special gingival recontouring technique.

Keywords: *One-piece dental implants, Esthetic zone, Gingival recontouring.*

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Introduction

In the past, the dentist was obliged to use sound teeth as abutments for replacing a missing tooth or more. Systematic reviews of previous papers demonstrated that fixed tooth-supported partial dentures have structural and biologic complications occurring relatively long after permanent cementation of the prostheses⁽¹⁾.

Necessarily, osseointegrated dental implants were invented to overcome most of the problems associated with the limitations of fixed partial dentures. Dentistry and oral rehabilitation faced a turning point as such osseointegrated dental implant was developed and progressed.

Many authors demonstrated that the two-stage procedure with a submerged healing period may not be necessary for the last few decades. High success rates can be achieved when dental implants are placed with an immediate prosthetic loading protocol without compromising osseointegration⁽²⁾. However, flap lifting during implant may lead to dehiscence and inflammation in the incision site, and bone loss, pain, or edema around the implant may be caused^(3,4).

Eliminating the micro gap between the implant and the abutment is considered one of the most important advantages in one-piece implants (OPI)s that reduces marginal bone loss. Moreover, they are placed in a one-stage surgery, avoiding further intervention on the soft and bone tissues⁽⁵⁾.

Patients' satisfaction with the esthetic outcome is challenging in the implant-supported restorations of anterior teeth. As a result, many factors must be taken into consideration during treatment planning. Practitioners who provide implant restorations should be aware of the multidimensional aspects of patients' satisfaction with their implant treatment, giving particular attention to patient acceptance of dental implant ability to restore esthetics and function⁽⁶⁾.

A 10-year longitudinal study demonstrated that one-piece narrow-diameter implants could predictably restore missing mandibular incisors and maxillary lateral incisors with limited marginal bone loss⁽⁷⁾. However, to confirm the advantage of OPIs over two-piece implants regarding the ability to minimize marginal bone loss, other studies are required.

After surgical implant placement, peri-implant tissue remodeling is a continuous process that continues through the restoration process. It has been documented in the literature that a biological tissue width forms around the platform of implants at the time of

restoration^(8,9). In 2013 a study performed by kutkut and his co-authors using custom implant abutments made of titanium and zirconium; found that fabrication of a provisional restoration on the definitive abutment will ensure esthetic restoration. Moreover, they documented that peri-implant soft tissue stability should be achieved before the final modifications of the finish line on the definitive abutment and the final abutment level impression⁽¹⁰⁾.

Since OPIs became more and more popular and few reports focused on their esthetic outcome in the esthetic zone, this study aimed to investigate the esthetic satisfaction level of single dental implant therapy in the esthetic zone using OPIs after performing soft tissue contouring for a group of patients who visited a private dental clinic in Erbil. Iraq.

Patients and methods

Twenty patients with single missing maxillary or mandibular anterior teeth (one maxillary central incisor, seven maxillary lateral incisors, one maxillary first premolar, ten mandibular incisors, and one mandibular canine) were selected to be used in the study with age group 25-50 years. Ethical clearance from the college of dentistry/Hawler Medical University was taken. All steps involved in the treatment study were clarified to the patients, and with the consent of the patients, the study was further carried. Diagnostic impressions using alginate impression material were made to fabricate study casts from type 3 dental stone.

The one-piece dental implants used in this study were MONO-IMPLANT special design Swiss implants. Implants were placed in the anterior maxillary or mandibular region with adequate bone support. The duration of the study was from 1/3/2019 to 1/9/2020, including esthetic scoring of both time intervals, after 14 days and after six months.

Selection criteria

The study participants were medically fit with age between (25 and 50 years) and can return for postoperative follow-up. Pregnant, Smokers and patients with any systemic disease or any oral pathological conditions were excluded from the study.

Surgical procedure and gingival recontouring

After administrating appropriate local anesthesia, one piece of dental implants was placed in healed sites by a maxillofacial surgeon performing a flapless technique. A Fine, red, flame-shaped diamond bur (# 243, 2.0 mm Diameter, 5.0 mm Length) from Shofu Dental Corp was used to create a sulcus around the implant abutment; the

sulcus was then filled with flowable composite resin for seven days to recontour the gingival tissue and provide more esthetic emergence profile of the future crown (Figure 1). A temporary crown from the composite resin was directly built intra-orally over the abutment covering the flowable composite using a transparent celluloid crown. To prevent postoperative pain and infection, the patients were kept on medication for one-week, postoperative instructions and Follow-up visits were kept and given.

Impression technique, and crown cementation

One week following the surgical placement of the implant, the patient returned for implant restoration. After administering appropriate topical and local anesthesia, the temporary crown with the flowable composite was removed, adequate gingival tissue was developed all around the implant abutment. Any needed abutment preparations and modifications were performed intraorally under high vacuum suction; the abutment finishing line is checked, which was 1-2 mm below the gingival margin. One stage putty-wash impression technique was performed by injecting light-bodied polyvinyl siloxane (PVS, 3M ESPE, USA) impression material around the abutment's finishing line preloaded adequate size stock tray with heavy body PVS impression material inserted into the mouth and placed over the light body. After complete polymerization, the impression is removed and evaluated mimic to crown and bridge impressions. Inter-occlusal record, color shade selection, and impression of the opposite arch are made and sent to the laboratory for permanent crown fabrication. A temporary crown made from composite resin is directly fabricated intra-orally.

After three days, the temporary crown was removed. The permanent crown was evaluated, and the contacts and occlusion are adjusted as needed then cemented on the definitive abutments with permanent luting cement.

Evaluation of esthetic satisfaction

Two methods were used to assess the esthetic outcome of the treatments, firstly an objective method Pink Esthetic Score/White Esthetic Score (PES/WES) index⁽¹¹⁾ and secondly a subjective method Visual Analog Scale (VAS) using patients' answers to five questions⁽¹²⁻¹⁴⁾. Two-time intervals, 14 days and six months after placement of permanent crowns, were selected to assess esthetic outcomes for both methods.

PES/WES index

A prosthodontist assigned a score of 2, 1, or 0 to each parameter (Tables 1 and 2). Hence, the best possible PES score was 10, which represented a close match of the conditions of the soft tissues around the implant abutment, and the highest WES score was ten which represented a close match of the clinical single tooth crown compared to the respective features present at the contralateral natural tooth present on the opposite side. The threshold of clinical acceptability was set at 6 for the PES and WES.

VAS analysis

It is a subjective method using patients' answers to the following five questions⁽¹⁵⁾:

1. How do you feel about the shape of your new implant tooth?
2. How do you feel about the color of your new implant tooth?
3. How do you feel about the shape of the gum that is around your new implant tooth?
4. How do you feel about the color of the gum that is around your new implant tooth?
5. What is your overall satisfaction with the new implant tooth?

The patients were guided to score the answers from 0 (worst possible result) to 10 (best possible result) to assess their esthetic satisfaction; a mean score was calculated for each patient based on their answers.

Statistical analysis

Data were collected and analyzed according to the inclusion and exclusion criteria. The statistical analysis was performed using Statistical Analysis for Social Sciences (SPSS) version 26.0 (IBM Corp, NY, USA). The type of statistical analysis was determined according to the normality of the data. Chi-square test and Fisher's exact test were utilized between the two-time intervals for each parameter in PES and WES indices, Wilcoxon signed-rank test used to compare the mean values of PES, WES, and VAS indices, significance value used was $p\text{-value} \leq 0.05$.



Figure 1: Creation of a gingival sulcus around the implant and filling with flowable composite to provide adequate emergence profile of the permanent crown.

Table 1: Assessment criteria – PES.

Parameter	Absent	Incomplete	Complete
Mesial papilla	0	1	2
Distal papilla	0	1	2
	Major discrepancy	Minor discrepancy	No discrepancy
The curvature of facial mucosa	0	1	2
Level of facial mucosa	0	1	2
Root convexity/ soft tissue color and texture	0	1	2

Table 2: Assessment criteria – WES.

Parameter	Major discrepancy	Minor discrepancy	No discrepancy
Tooth form	0	1	2
Tooth volume / outline	0	1	2
Tooth color (hue/value)	0	1	2
Surface texture	0	1	2
Translucency	0	1	2

Results

A total of 20 (11 male and nine female) patients restored with a single implant in the anterior maxilla and anterior mandible using one-piece dental implants. None of the implants were associated with suppuration, mobility, pain, or infection.

Esthetic satisfaction after gingival recontouring was scored by subjective and objective methods in two-time intervals, 14 days and six months after cementation of the permanent crown.

PES / WES index

In this study, the mean PES recorded after 14 days was 6.85 (SD \pm 1.424). The mean WES was calculated as 6.85 (SD \pm 1.089), which translated into an acceptable esthetic outcome. 17 of the implants (85%) received a PES of 6 or above, and 18 of them (90%) received a WES of 6 or above. The threshold of clinical esthetic acceptability was set at 6 for the PES and WES ⁽¹⁶⁾.

The data results after six months for mean PES value was 7.00 (SD \pm 1.338), and for mean WES value was 6.80 (SD \pm 1.824), which was still within the clinical acceptance of the esthetic outcome, 18 of the implants (90%) received a PES and a WES of 6 or above. Statistically, there was no significant difference in esthetic satisfaction between the two-time intervals. Detailed results for each parameter in PES/WES analysis are given in table (1); statistical analysis showed a non-significant difference between the two-time intervals for all parameters.

Statistical analysis using Wilcoxon signed-rank test (Table 4) for mean PES value showed non-significant difference between two weeks esthetic score and six months esthetic score (P= 0.903), for mean WES value statistical analysis between the same time intervals also showed a non-significant difference (P=0.878)

VAS index

Patients' esthetic satisfaction by a subjective method using the VAS index showed more than acceptable esthetic scores for each question in the questionnaire. Regarding the results, after 14 days maximum mean

value was (7.3) for question no.5, "What is your overall satisfaction with the new implant tooth?" while the minimum mean value (6.95) was for the scores of question no.2 "How do you feel about the color of your new implant tooth?". The results after six months showed the same or higher mean values than after 14 days, with the maximum mean value for question no.5 and the minimum value for question no.2. Mean values for each question and the total mean and standard deviations for the VAS index are given in table (5).

After 14 days, the total VAS mean value for all the questions was 7.19 (SD \pm 1.0125), and the results after six months were 7.25 (SD \pm 0.737). According to Wilcoxon signed-rank test, even patients' esthetic satisfaction was better after six months, but Statistical analysis showed a non-significant difference between the two time intervals (P-value > 0.84).

Table 3: Detailed results of each parameter in PES and WES indices.

	After 14 days				After six months			
	Esthetic scores				Esthetic scores			
PES	Zero	One	Two	Total	Zero	One	Two	Total
Mesial papilla	1	11	8	20	1	11	8	20
Distal papilla	1	10	9	20	1	10	9	20
Curvature of facial mucosa	0	12	8	20	0	14	6	20
Level of facial mucosa	0	12	8	20	0	12	8	20
Root convexity/ soft tissue color and texture	0	14	6	20	0	9	11	20
	Esthetic scores				Esthetic scores			
WES	Zero	One	Two	Total	Zero	One	Two	Total
Tooth form	2	7	11	20	2	7	11	20
Tooth volume / outline	0	14	6	20	0	13	7	20
Tooth color (hue/value)	0	9	11	20	0	8	12	20
Surface texture	0	9	11	20	0	12	8	20
Translucency	1	18	1	20	0	16	4	20

Table 4: Statistical analysis for PES and WES mean values.

	After 14 days (Mean \pm SD)	After 6 months (Mean \pm SD)	P- Value	Significance
Total PES	6.8500 \pm 1.424	7.00 \pm 1.338	0.903	Non-sig.
Total WES	6.8500 \pm 1.089	6.80 \pm 1.824	0.878	Non-sig.

Table 5: Mean values for each question and the total mean and standard deviations for the VAS index.

No.	Question	VAS Mean		P-value
		After 14 days	After 6 months	
1.	How do you feel about the shape of your new implant tooth?	7.25	7.25	
2.	How do you feel about the color of your new implant tooth?	6.95	7.1	
3.	How do you feel about the shape of the gum that is around your new implant tooth?	7.2	7.3	
4.	How do you feel about the color of the gum that is around your new implant tooth?	7.25	7.25	
5.	What is your overall satisfaction with the new implant tooth?	7.3	7.35	
	Total Mean	7.19 (SD±1.0125)	7.25 (SD±0.737)	0.844 Non-sig.

Discussion

In the literature, there are little data about one-piece implant treatment in the esthetic zone. Still, there is a strong suggestion in the literature that soft tissue around implant-abutment connections can be sculpted through provisional restoration contours to provide optimum esthetic outcomes^(10,17); in the present study, gingival recontouring around one-piece implants in the esthetic zone produced an acceptable esthetic satisfaction for more than 85% of the treated patients. The results of this study were in agreement with Katkut and his co-authors, who concluded that peri-implant soft tissue stability around provisional restoration ensures optimum esthetic outcomes⁽¹⁸⁾.

In this study, both objective and subjective methods are used to assess esthetic outcomes of the implant restorations because, objectively, the esthetic zone is any dentoalveolar segment that is visible upon full smile but subjectively, the esthetic zone can be defined as any dentoalveolar area of esthetic importance to the patient⁽¹⁹⁾. The patient's subjective assessment regarding esthetic satisfaction is regarded as one of the most important parameters as a criterion to measure the success of dental implants⁽²⁰⁾, both methods illustrated adequate esthetic satisfaction this confirms the fact that patients' judgment for dental implant esthetic evaluation is as important as dentists and their viewpoints should be taken in consideration when planning and assessing dental implants in the esthetic zone.

The results of this study showed that OPIs in the esthetic zone provided adequate esthetic outcome both after 14 days and after six months scoring in both objective and subjective indices; this could be returned to the adequate

and healthy soft tissue built around the implants after gingival recontouring that provided a long-lasting sufficient emergence profile; these results agreed with another study on OPIs performed by Carenci F.(21) concluded that OPIs are reliable devices for oral rehabilitation in the premolar areas.

Conclusion

It can be concluded that one-piece dental implants can be successfully used in the esthetic zone and provide adequate esthetic outcomes after the specific gingival recontouring intervention.

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