

Implant Placement In The Esthetic Zone Associated With Augmentation Procedures

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Objectives

- Dental implants in the esthetic zone are considered the most difficult. Maxillary anterior single tooth replacement is a surgical treatment of high risk.
- This private practice study intends to check daily augmentation techniques in the esthetic zone and whether they remain stable long-term after minimum five years.
- A recommendation regarding a possible aesthetic augmentation technique may be derived.
- Observers' specialization and its effect on judging the situation is evaluated.

Patients and Methods

- Patients who had obtained an implant placement between 2003 and 2007 with Camlog® implants combined with augmentation procedures were screened based on certain performance criteria. The implants inserted should have been placed in the esthetic zone with only natural teeth as adjacent teeth and have been associated with hard and soft tissue augmentation procedures. The remaining patients with n=18 inserted implants were photographed during a follow-up.
- The photographs were scored by five rater groups of five persons each (orthodontists, oral surgeons, prosthodontists, general dentists and medically untrained people) using the Pink Esthetic Score (PES) according to Fürhauser et al.¹. The statistical analysis involves the comparison of the assessments of the five rater groups on the aesthetics after minimally five years post-implantation with regard to inter-rater reliability and comparison of long-term success of various augmentation techniques.

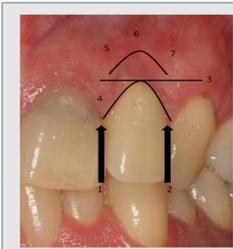


Fig 1: Seven variables were evaluated vs. a natural reference tooth: mesial papilla (1), distal papilla (2), soft-tissue level (3), soft-tissue contour (4), alveolar process deficiency (5), soft-tissue color (6) and texture (7). Using a 0 (lowest value) to 2 (highest value) scoring system (fig. 2-4), the maximum achievable PES was 14.

- The distribution of the PES data do not obey a normal distribution, all subsequent two-group comparisons were performed using the Mann-Whitney U-test (significance level $\alpha = 0.05$, two-sided).
- All statistical analyses were run on SPSS, Version 17.02.

References

1. Fürhauser R. Evaluation of soft tissue around single-tooth implant crowns: the pink esthetic score. Clin. Oral Impl. Res. 16, 2005; 639-644

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Results

1. Effect of specialization

- Between the dentists / non-dentists as well as between the orthodontists / oral surgeons was no significant difference in the PES estimate ($p = 0.324$ and $p = 0.978$; Table 1).
- In contrast, these four groups statistically differ significantly in their assessment of the PES group of the prosthodontists who rate the esthetic success significantly worse than the others (Table 1, last column).

PES	median	1. quartile	3. quartile	p-Value*	
				Comparison with dentists	Comparison with prosthodontists
Dentists	11	9	13	0,324	< 0,001
Non-dentists	12	9	13		< 0,001
Orthodontists	10	7	12	0,978	0,001
Oral surgeons	10	6	13		0,003
Prosthodontists	7	5	10		

* Mann-Whitney-U-test

Table 1: PES data of the rater groups and comparison

2. Distribution of the PES items in the rater groups

- Considering the seven PES-criteria, it became obvious that peri-implant soft tissue color was evaluated as worst (median 1 by all investigators except non-dentists) by all investigator groups.
- The soft tissue margin contour and soft tissue got the highest score (median 2 by all investigators except prosthodontists).



Fig.2: Highest PES
Highest score of all single-tooth implant crowns evaluated in a 66-year old male in place for 6 years.

Fig. 3: Medium PES
Intermediate value after 7 years of prosthetic loading.

Fig.4: Lowest PES
Lowest score of all valued implants. Same patient as in Fig 2 – contralateral tooth. Implantation was at one appointment.

3. Evaluation of different augmentation techniques

- Single use of guided tissue regeneration (GTR) technique (median 12, n=1), as well as a combination of an advanced flap, partial vestibuloplasty, autogenous bone chips, and a monocortical bone block (MCBB) in addition with a connective tissue graft (median 12, n=1) brought the best results (Fig. 5 (G) and (F)).
- Aesthetics were rated worst, if a MCBB was used together with autogenous bone chips, connective tissue graft and a GTR membrane technology (median 5, n=1).
- In total, 450 PES values were analyzed (25 investigators assessed 18 images). Of these, 14% were rated with the maximum score of 14 points.
- Augmentation techniques "D" and "I" were never scored with the highest possible score (Fig. 5 and 6).
- Also with regard to the augmentation soft tissue margin and soft tissue contour rated best. The color of the peri-implant soft tissue was evaluated worst. This corresponds to the analysis of the investigator groups.

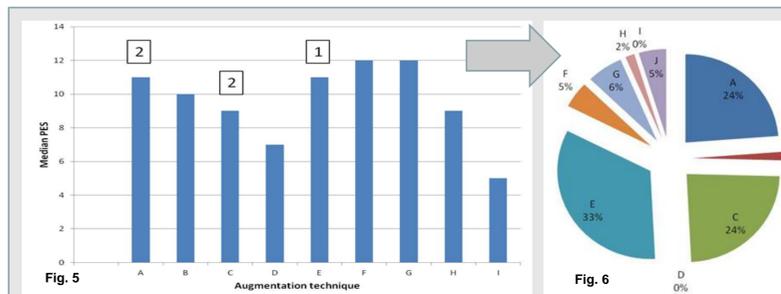


Fig. 5

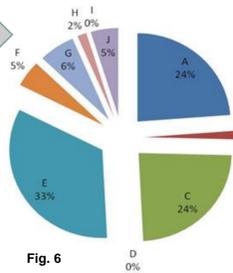


Fig. 6

Fig. 5: Augmentation after a minimum of 5 years (n=18 implants)

Fig 6: Augmentation techniques valued PES=14 (maximum score)

(A)Advanced flap, GTR, partial vestibuloplasty, autogenous bone chips
(B)Advanced flap, partial vestibuloplasty, autogenous bone chips
(C)Advanced flap, GTR, autogenous bone chips
(D)Advanced flap, GTR
(E)Advanced flap, autogenous bone chips
(F)Advanced flap, partial vestibuloplasty, autogenous bone chips, MCBB, connective tissue graft
(G)GTR
(H)GTR, partial vestibuloplasty, autogenous bone chips
(I)GTR, autogenous bone chips, MCBB, connective tissue graft
(J)GTR, partial vestibuloplasty, autogenous bone chips, free mucosal graft

Discussion

- All augmentation procedures are dependent on the given anatomical situations and following an individual indication.
- All pictures were judged without regard to sex, general medical history, periodontal diseases or smoking habits.
- Implant placement was in 2003-2007; there may be an obvious difference if the implant is 5 or nearly 10 years under prosthetic loading.
- Prosthodontists from university were clearly more critical than other observers. Faculty from university work under other conditions than dentists in private practice.

Conclusions

- Single use of GTR technique as well as a combination of an advanced flap, partial vestibuloplasty, autogenous bone chips, a MCBB and a connective tissue graft brought the best long-term results in aesthetics. Camlog® implants showed similar, stable results as shown in previous studies without augmentation procedures.
- The PES is able to show soft tissue alterations and can monitor objective outcomes of different surgical treatment plans.
- The complementary use of a MCBB and a partial vestibuloplasty should be recommended to receive long-term stability in aesthetics.