

Implant success in patients with a history of chronic periodontitis

Martin Hagner¹, Christina Tietmann², Melanie Franke¹, Søren Jepsen¹, Frank Bröseler²

¹Department of Periodontology, Operative and Preventive Dentistry, University of Bonn, Germany, ²Private Periodontal Practice, Aachen, Germany

INTRODUCTION

As stated at the 6th European Workshop on Periodontology ¹ more information is needed on the effectiveness of implant therapy based on subjects recruited from private dental clinics. Higher susceptibility for peri-implantitis and peri-implant marginal bone loss was found for periodontal compromised subjects ^{2,3}.



OBJECTIVE

Thus, it was the aim of this retrospective study to analyze implant therapy outcomes in periodontitis susceptible patients of a private periodontal practice.

MATERIAL & METHODS

49 healthy and partially dentate patients (age: 37-78 years) with a history of treated chronic periodontitis and taking part in a maintenance program received a total of 112 bone level placed implants (Brånemark System®). 71 TiUnite® and 41 machined-surface implants were restored with fixed single crowns (Fig. 1-3).



Figure 1: Implant at insertion time.



Figure 2: Abutment connection at loading time.



Figure 3: Implant in service at 2 year follow-up.

Simultaneous alveolar ridge bone augmentation (BA) using bovine derived xenograft (Bio-Oss® Collagen) in combination with a resorbable collagen membrane (Bio-Guide®) was performed in conjunction with 42% of the implants. (Fig. 4-6).



Figure 4: Implant after BA at insertion time.



Figure 5: Abutment connection after BA at loading time.



Figure 6: Implant after BA in service at 2 year follow-up.

Radiographs were taken at insertion, abutment connection and yearly follow-ups (Fig. 1-6). Mean healing period (HP) was 9.5 months (range: 2-26 mths.), mean service period (SP) was 19.5 months (range: 3-59 mths.). Digitized radiographs were assessed by 2 blinded examiners, crestal bone loss was measured on mesial and distal aspects of each implant by ImageJ Software (National Institutes of Health, USA). Implant success was determined as: no pain or tenderness upon function, 0 mobility, no exudate history and radiographic bone loss from initial surgery <2 mm ⁵. Clinical parameters including probing depth (PD), bleeding on probing (BOP), keratinized mucosa width (KM) as well as implant length, implant diameter, crown-to-implant ratio (CIR) and implant surface were analyzed with respect to peri-implant bone loss in a multiple regression model with WALD statistics. Odds ratios (OR) were calculated for peri-implant bone loss (BL) ≥ 2 mm on the basis of implants and of patients.

RESULTS

No implant loss occurred during the observation period (OP). Mean bone loss was 1.51 mm (range: 0.0-4.2 mm / N = 112). 32 implants (28.6 %) showed ≥2.0mm bone loss of which 1.19 mm (range: 0.0–3.7 mm) occurred between insertion and loading. 21 patients (42.8 %) revealed one or more implant(s) with bone loss of ≥ 2.0 mm. The overall success rate was 71.4 % (Table 1), with significantly lower success for simultaneously augmented sites (BA) than implants without augmentation procedures (57.6 vs. 81.5 %) and significantly lower success for smokers than for non-smokers (40.9 vs. 80.0 %). Focussed on implant success ⁵, significant odds ratios were calculated for implants: (OR) 5.4 for smoking, (OR) 3.3 for (BA) and (OR) 4.8 for (KM) < 2 mm. On the patients level the odds ratio was (OR) 6.5 in smokers (Table 2).

Table 1: represents the overall success rate of implants with bone loss (BL) <2mm, subdivided in smokers, non-smokers, probing depth (PD) ≥5mm, <5mm, bleeding on probing (BOP+/-) bone augmentation (BA) and no bone augmentation. Prevalence of failure was calculated for patients who exhibited one or more implant(s) with bone loss of ≥2.0 mm.

	smoker	non-smoker	PD≥5mm	PD<5mm	BOP +	BOP -	BA	no-BA
Implants:	n=13	n=18	n=9	n=22	n=18	n=7	n=20	n=12
BL>2mm	(59.1 %)	(20.0 %)	(34.6 %)	(25.6 %)	(39.1 %)	(17.1 %)	(42.6 %)	(18.5 %)
Implants:	n=9	n=72	n=17	n=64	n=28	n=34	n=27	n=53
BL<2mm	(40.9 %)	(80.0 %)	(65.4 %)	(74.4 %)	(60.9 %)	(82.9 %)	(57.6 %)	(81.5 %)
Subjects:	n=7	n=14	n=7	n=11	n=13	n=5	n=16	n=5
BL>2mm	(77.8 %)	(35.0 %)	(41.2 %)	(34.4 %)	(48.1 %)	(41.7 %)	(57.1 %)	(23.8 %)
Subjects:	n=2	n=26	n=10	n=21	n=14	n=7	n=12	n=16
BL<2mm	(22.2 %)	(65.0 %)	(58.8 %)	(65.6 %)	(51.9 %)	(58.3 %)	(42.9 %)	(76.2 %)

Table 2: odds ratios calculated for bone loss (BL) ≥ 2.0 mm on basis of implants and on patients for local and systemic factors: OP: observation period, CIR: crown-to-implant ratio, BA: bone augmentation, KM: keratinized mucosa width, IS: implant surface

Odds ratios implant					
parameter	estimate	odds ratio	confidence interval	p-value	
age (years)	-0.0176	0.9826	0.9356	1.0318	0.4806
gender (male vs. female)	-0.0251	0.9752	0.3678	2.5855	0.9598
OP (days)	0.0003	1.0003	0.9996	1.0010	0.4239
smoking (smoker vs. non-smoker)	1.6860	5.3966	1.7746	16.4204	0.0030
CIR (mm)	-0.0228	0.9774	0.1801	5.3039	0.9789
IS (TiUnite® vs. machined)	0.1358	1.1455	0.4921	2.6664	0.7528
localisation (mandible vs. maxilla)	0.1001	1.1053	0.4229	2.8884	0.8382
BA (BA vs. no-BA)	1.1853	3.2716	1.2825	8.3457	0.0131
KM (<2mm vs. ≥2mm)	1.5656	4.7857	1.3304	17.2151	0.0165

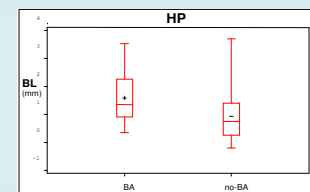
Odds ratios subject					
parameter	estimate	odds ratio	confidence interval	p-value	
age (years)	-0.0160	0.9842	0.9290	1.0425	0.5869
gender (male vs. female)	0.5869	1.7000	0.5416	5.3364	0.3633
OP (days)	0.0001	1.0001	0.9992	1.0010	0.8464
smoking (smoker vs. non-smoker)	1.8718	6.5020	1.1868	35.5872	0.0310

Generalized linear models were used to analyze various risk factors for the outcome of the implants, using a logistic or linear link depending on the type of the outcome variable. Generalized estimation equations were used to estimate the unknown correlation between implants in one patient for this analysis. For patient risk assessment, a patient case was considered as failure if at least one of the implants of the patient failed. The analysis then was done by simple logistic regression. All analyses were performed using SAS 9.2.

Table 3: p-values calculated for local and systemic factors leading to bone loss; Significance level: p < 0.05 HP: healing period, SP: service period, OP: observation period, BA: bone augmentation, KM: keratinized mucosa width, CIR: crown-to-implant ratio, IS: implant surface

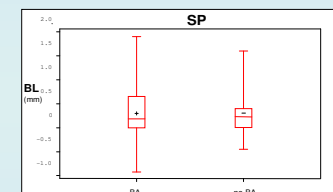
	gender	age	time	smoking	BA	KM	CIR	IS
HP	p=0.74	p=0.15	p=0.001	p=0.03	p=0.0001	p=0.25	-	p=0.48
SP	p=0.39	p=0.64	p=0.004	p=0.75	p=0.93	p=0.61	p=0.46	p=0.23
OP	p=0.96	p=0.29	p=0.049	p=0.036	p=0.0002	p=0.20	p=0.29	p=0.90

Regarding bone loss, a higher incidence existed for implants in smokers and for simultaneously augmented sites (BA) especially during the healing period (HP) (Fig. 7-10). A further significant factor for bone loss was loading time (Table 3).



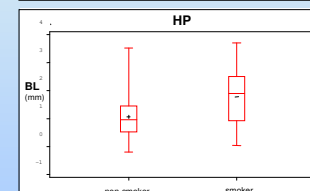
BA	N	mean	SD	min	median	max
BA	47	1.58766	0.84041	0.35	1.35	3.52
no-BA	65	0.92462	0.84628	-0.20	0.75	3.70
	112	1.20286	0.90204	-0.20	1.00	3.70

Figure 7: Boxplots present significantly higher bone loss (BL) during the healing period (HP) for augmented (n=47) and non-augmented (n=65) implants (p=0.0001).



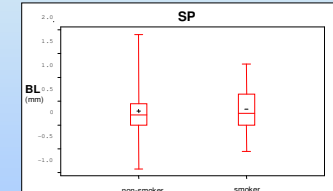
BA	N	mean	SD	min	median	max
BA	47	0.29957	0.55810	-0.92	0.190	1.9
no-BA	65	0.30698	0.41738	-0.45	0.229	1.6
	112	0.30388	0.47910	-0.92	0.227	1.9

Figure 8: Boxplots present no significant difference in bone loss (BL) during the service period (SP) for augmented (n=47) and non-augmented (n=65) implants (p=0.93).



smoking	N	mean	SD	min	median	max
non-smoker	90	1.06317	0.78860	-0.20	0.9500	3.52
smoker	22	1.77432	1.11330	0.04	1.8925	5.11
	112	1.20286	0.90204	-0.20	1.0000	3.70

Figure 9: Boxplots present significantly higher bone loss (BL) during the healing period (HP) for implants in smokers (n=22) than for implants in non-smokers (n=90).



smoking	N	mean	SD	min	median	max
non-smoker	90	0.29538	0.46809	-0.92	0.2125	1.90
smoker	22	0.33864	0.44947	-0.55	0.2500	1.28
	112	0.30388	0.47910	-0.92	0.2270	1.90

Figure 10: Boxplots present no significant difference in bone loss (BL) during the service period (SP) for implants in smokers (n=22) than for implants in non-smokers (n=90).

CONCLUSION

This study indicates that implant success in periodontitis susceptible individuals might be compromised. Implants in smokers revealed more bone loss than in non-smoking patients with periodontitis history. Sites with bone mineral augmentation at implant placement time showed higher amounts of peri-implant bone loss than non-augmented sites during the healing period.

Martin Hagner
Department of Periodontology,
Operative and Preventive Dentistry
Welschonnenstr. 17, 53115 Bonn
Germany
Email: martin.hagner@gmx.net

REFERENCES

- Lindhe & Meyle (2008) J Clin Periodontol; (Suppl. 8) 35: 282-285
- Schou et al. (2006) Clin Oral Imp Res; (Suppl. 2) 17: 104-123
- Van der Weijden et al. (2005) J Clin.Periodontol; 32(5): 506-511
- Fransson et al. (2005) Clin Oral Implants Res;16(4):440-6
- Misch et al. (2008) Implant Dent; 17(1):5-15.

ZAHNÄRZTLICHE PRAXIS
FÜR PARODONTOLOGIE



DR. FRANK BRÖSELER
DR. CHRISTINA TIETMANN
Krefelder Straße 73, 52070 Aachen, Germany
www.paro-aachen.de