A Two-Center Retrospective Analysis of Long-Term Clinical and Radiologic Data of TiUnite and Turned Implants Placed in the Same Mouth

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Purpose: The gradual shift from using implants with turned surfaces to implants with moderately rough surfaces has raised questions regarding the long-term behavior of the latter. The aim of the present retrospective study was to compare clinical and radiographic data of the two implant surfaces using the "same mouth" approach.
Materials and Methods: A total of 122 consecutive patients were treated with both turned and TiUnite implants; however, 26 of these patients could not be reached for follow-up and were excluded from the study. The remaining 96 patients received 257 turned and 243 TiUnite Brånemark System implants, not necessarily supporting the same constructions and not necessarily inserted during the same session. Data were collected up to 10 years of function. ***Results:*** During the first 6-year period, 18 turned implants and 1 TiUnite implant failed, resulting in implant cumulative survival rates (CSRs) of 93.0% and 99.1% for turned and TiUnite implants, respectively. During the following years, 1 turned and 3 TiUnite implants failed, resulting in CSRs of 90.3% and 96.6% for the two surfaces, respectively, a significant difference. A small but significant difference in mean bone level was seen between turned and TiUnite implants.
Conclusion: Implants with turned and TiUnite surfaces showed comparable clinical and radiographic data during the study period. The early implant failure rate, as well as the overall failure rate, were significantly reduced when using TiUnite implants.
Int J Prosthodont 2013;26:350–358. doi: 10.11607/ijp.3386

Until the year 2000, traditional Brånemark System implants were only of the turned surface design. With the introduction of the moderately rough TiUnite surface, a gradual shift toward its use took place. Initially, for a number of implant surgeons, only compromised sites, ie, regions with poor volume and poor bone texture, received the TiUnite implant, while the remaining implants placed in the same mouth were of the turned surface. The change was based on reports stating that the TiUnite surface produced osseointegration and stable conditions faster than the turned one.[1–4] A complete switch to the new surface was regarded as a considerable change since the turned surface had proven to function so well over decades.

During the years to come, clinical follow-up studies on the TiUnite implant surface appeared, demonstrating excellent early outcomes when used in compromised patient situations,[5] in combination with bone grafts,[6] and in a prospective multicenter study approach.[7] Today, a series of 5-year reports are available showing very encouraging results with the TiUnite surface.[8–11]

The purpose of this study was to retrospectively compare the outcome of turned and TiUnite implants inserted using the "same mouth" approach and followed for a period of up to 10 years.

Materials and Methods

Patients, Arches, and Implants

The study included 122 patients treated consecutively between March 2000 and December 2003 at two private implant centers in Italy; however, 26 patients were excluded since they were unavailable for follow-up. Therefore, 96 patients (54 women and 42 men) with a mean age of 59 years (range, 23 to 81 years) were available for follow-up examinations. The overall majority of patients were treated bilaterally in both arches. A total of 188 prosthetic constructions were inserted in 63 maxillae and 69 mandibles (Table 1).

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General health problems were sparse and are listed in Table 2. Smoking habits were reported for 95 individuals, of whom 53 were smokers and 7 were nonsmokers with a history of smoking (Table 2).

To be part of the study, each patient must have had treatment with both turned (Brånemark System, Nobel Biocare) and moderately rough oxidized surfaced (TiUnite, Nobel Biocare) implants between January 2000 and December 2003, albeit not necessarily inserted during the same session or supporting the same construction. A total of 500 implants were inserted, of which 257 were turned with a follow-up period of 4 to 10 years (mean, 7.3 years) and 243 were of the oxidized surface design with 4 to 9 years (mean, 7.5 years) of follow-up. The latter predominated in maxillae with 162 implants, whereas 81 implants were placed in mandibles. The corresponding figures for the turned implants had the opposite distribution with 79 and 178 for maxillae and mandibles, respectively. In all, 471 implants (246 turned and 225 TiUnite) were placed according to the two-stage protocol and 29 implants according to the one-stage protocol, of which 23 implants (8 turned and 15 TiUnite) were subjected to immediate loading. The distribution of implants with regard to tooth position and macrogeometry (Standard, MkII, MkIII, MkIV) in maxillae and mandibles are presented in Tables 3 and 4, respectively. The various implant macrogeometries used are illustrated in Fig 1.

Information on opposite arch dentition (natural or artificial) was recorded and is shown in Table 5.

Table 1 Number of Prosthetic Constructions per Type and Arch

Type	Maxilla	Mandible
Full arch	6	8
Partial	65	70
Single tooth	15	24

Table 2 Smoking Habits and Reported Diseases and Therapies

	n	%
Smoking		
Nonsmoker	35	36.5
Smoker (> 10 cigarettes/day)	53	55.2
Previous smoker	7	7.3
Unknown	1	1.0
Reported diseases and therapies		
None	91	94.8
Diabetes type 2	2	2.1
Osteoporosis	1	1.0
Aggressive periodontitis	1	1.0
Immunosuppressive therapy	1	1.0

Treatment Protocol

Clinical and radiographic preoperative data were obtained using standard protocols,[12,13] whereby available jaw bone quality and quantity were recorded according to the Lekholm and Zarb classification[14] (Table 6).

Surgical placement of implants also followed standard protocols as described by Adell et al[12] and Widmark et al.[15] A sinus elevation/bone augmentation procedure was performed in 24 patients, comprising 10 turned and 25 TiUnite implants. During implant insertion, 12 turned and 5 TiUnite implants in 11 patients exhibited fenestrations/dehiscences, of which one of each implant type were placed in relation with a graft. In the majority of cases (471/500), connection of abutments[12] was executed after healing periods of 3 to 6 months in mandibles and maxillae, respectively. A limited number of implants were immediately loaded. No significant difference in distribution of loading protocols between the two groups was seen (P = .262; Pearson chi-square test).

Fabrication of fixed prostheses followed the guidelines as previously described.[16,17] Where reported, provisional fixed screw-retained acrylic resin prostheses were used. The overall majority of final prostheses were screw-retained and of the porcelain-fused-to-metal (PFM) type.

Marginal bone levels were recorded at implant insertion and at ≥ 6 years of follow-up, and marginal bone remodeling between time points was calculated. Radiographic examinations were not consistently used at implant placement; therefore, only a limited number of implants had bone level data at implant insertion. All radiographic assessments were performed by an independent radiologist at Gothenburg University, Gothenburg, Sweden. The radiologist was not involved in the clinical part of the investigation and was blinded to the treatment groups. Radiographic data comparing bone levels (means of mesial and distal registrations) in relation to the implant-abutment junction, at implant insertion/abutment connection, and at ≥ 6 years of follow-up are presented in Table 7. Calculated bone remodeling based on these two measurements is shown in Table 8.

Clinical examinations included registrations of plaque, condition of the mucosa, and mucosa recession. All clinical measurements were carried out by

Table 3 Implant Positions*

	Maxilla															
	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
TiUnite	3	7	19	25	25	7	2	4	2	3	5	12	17	18	10	3
Turned	1	3	2	7	9	2	5	3	3	3	4	13	9	10	3	2
Total	4	10	21	32	34	9	7	7	5	6	9	25	26	28	13	5
	Mandible															
	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
TiUnite	0	9	15	8	4	2	2	2	1	0	4	10	10	10	4	0
Turned	0	13	26	22	15	7	6	2	5	4	2	17	24	25	8	2
Total	0	22	41	30	19	9	8	4	6	4	6	27	34	35	12	2
Grand total																

*FDI tooth-numbering system.

Table 4a Implant Types*

	TiUnite		Turned	
Type	Maxilla	Mandible	Maxilla	Mandible
Standard	0	0	38 (4)	74 (6)
MkII	0	0	6 (2)	28 (3)
MkIII	117 (1)	80 (1)	23	76 (3)
MkIV	45 (2)	1	12 (1)	0

*No. of failed implants is within parentheses.

Table 4b Implant Dimensions*

		TiUnite		Turned	
Diameter	Length (mm)	Maxilla	Mandible	Maxilla	Mandible
NP					
3.3 mm	10	0	0	0	1
	11.5	0	0	1	0
	13	0	1	1	0
	15	1	1	3	0
Total		1	2	5	1
RP					
3.75/4 mm	7	6	5	2 (1)	12 (1)
	8.5	8	8	7	19
	10	24	10	9	35 (5)
	11.5	19	10	6 (1)	18
	13	41 (1)	10	21 (2)	28 (1)
	15	32	14	11	27 (2)
	18	10	10	9	18 (1)
	20	0	0	0	1
Total		140 (1)	67	65 (4)	158 (10)
WP					
5.0/5.5 mm	6	0	0	0	1 (1)
	7	5	1	2 (1)	3
	8	0	0	0	1
	8.5	3 (1)	3	2	2
	10	6 (1)	5 (1)	3 (1)	7 (1)
	11.5	3	3	0	1
	12	0	0	2 (1)	2
	13	3	0	0	2
	15	0	0	0	0
	18	1	0	0	0
Total		21 (2)	12 (1)	9 (3)	19 (2)
Grand total		162 (3)	81 (1)	79 (7)	178 (12)

NP = narrow diameter; RP = regular diameter; WP = wide diameter.
*No. of failed implants is within parentheses.

the same operator. Follow-up data are presented in Table 9. Probing pocket depth was performed at ≥ 6 years of follow-up on vestibular and palatal/lingual surfaces with the distribution as shown in Table 10.

Statistical Analyses

Life tables of implant cumulative survival rates (CSRs) were calculated for the two implant groups (Table 11). The log rank test was used to compare survival between the groups. Significance testing of follow-up variables was done on the patient level, ie, mean values for each patient and surface type were calculated and compared for continuous variables (bone levels, bone remodeling, and pocket probing depth), whereas median values for each patient and surface type were calculated and compared for ordered categorical variables (plaque, mucosa, and soft tissue recession). The Wilcoxon signed rank test for paired data was used to compare variables between groups. All significance tests were two-tailed, and the level of significance was set to 5%.

Results

During the first 6 years of follow-up, 18 turned implants and 1 TiUnite were lost, resulting in 6-year CSRs of 93.0% and 99.1%, respectively (Table 11). During the following years, 1 turned and 3 TiUnite implants failed, revealing CSRs of 90.3% and 96.6%, respectively, up to 10 years of follow-up (Table 11). The difference between turned and TiUnite implants was significant (P = .005). The 23

Anterior	Posterior	Total
23	139	162
20	59	79
43	198	241

Anterior	Posterior	Total
11	70	81
26	152	178
37	222	259
80	420	500

Table 5 Opposing Dentition*

	TiUnite		Turned	
	n	%	n	%
Fixed partial denture on implants	75	64.7	56	56.0
Fixed partial denture on teeth	13	11.2	16	16.0
Crown on implant	0	0	1	1.0
Crown on tooth	0	0	2	2.0
Denture	2	1.7	3	3.0
Natural tooth	26	22.4	22	22.0
Total	116		100	

*Not reported for all implants.

Fig 1 Implant macrogeometries.

failures were lost in 18 patients, 10 in maxillae and 13 in mandibles, with the distribution as presented in Table 12.

The majority of failures occurred in molar regions (12/23), of which 5 implants were of the regular platform type (ie, ø = 3.75 to 4.0 mm) and 7 were wide-platform implants (ø = 5.0 mm) (Table 12).

Bone qualities 2 and 3 and bone quantities B and C predominated among the treated patients (Table 6), and most of the failures occurred in bone assigned quality 3 (14/23) and quantity C (13/23), respectively. Out of the 18 patients presenting with failed implants, 10 were active smokers (Table 12).

Fourteen implants were replacements for implants that failed during the inclusion period. None of these 14 replacement implants (4 turned and 10 TiUnite) failed.

Available data on marginal bone levels at ≥ 6 years of follow-up in 91 patients (448 implants: 228 turned and 220 TiUnite) showed a significant difference (P = .006) in favor of the TiUnite implants, ie, –1.86 mm for TiUnite implants versus –2.13 mm for turned implants. Mean values and frequency distributions are shown in Table 7. Calculation of marginal bone loss for a limited number of implants (31 turned and 31 TiUnite) where baseline radiographs were available disclosed a similar pattern, ie, –1.96 mm and –1.55 mm for turned and TiUnite implants, respectively, but failed to show any significant difference between the implant types (P = .418). Mean values and frequency distributions are shown in Table 8.

The clinical parameters plaque accumulation, mucosa health, and mucosa recession, evaluated at ≥ 6 years of follow-up, revealed similar or close to identical outcomes (P > .221, Table 9). Probing pocket depths on palatal/lingual surfaces showed a minimal but significant difference (P = .015) in favor of turned implant sites, whereas no differences (P = .373) were seen on vestibular surfaces (Table 10). Peri-implantitis was registered in 4 patients (4.2%), comprising 10 implants (2.0%), with an overrepresentation of TiUnite implants, ie, 9 versus 1. None of the implants that exhibited fenestrations or dehiscences during placement failed.

Table 6 Bone Quality and Bone Quantity*

	Bone quality				
Bone quantity	1	2	3	4	Total
TiUnite					
A	0	2	5	2	9
B	0	42	66	24	132
C	0	21 (1)	31 (3)	16	68 (4)
D	0	3	14	7	24
E	0	1	4	1	6
Not reported	0	0	4	0	4
Total	0	69 (1)	124 (3)	50	243 (4)
Turned					
A	0	3	2	6	11
B	0	63	62 (5)	12 (1)	137 (6)
C	0	42 (6)	36 (3)	6	84 (9)
D	3	6 (1)	10 (2)	4	23 (3)
E	0	0	2 (1)	0	2 (1)
Total	3	114 (7)	112 (11)	28 (1)	257 (19)

*No. of failed implants is within parentheses.

Table 7 Mean Marginal Bone Levels (mm)*

	TiUnite n (%)	Turned n (%)
Implant insertion		
Mean	−0.35	−0.47
SD	1.61	1.00
n	36	37
2.1 to 3.0	2 (5.6)	0 (0)
1.1 to 2.0	4 (11.1)	1 (2.7)
0.1 to 1.0	6 (16.7)	11 (29.7)
0	4 (11.1)	5 (13.5)
−1.0 to −0.1	10 (27.8)	11 (29.7)
−2.0 to −1.1	7 (19.4)	5 (13.5)
−3.0 to −2.1	2 (5.6)	4 (10.8)
−4.0 to −3.1	0 (0)	0 (0)
< −4.0	1 (2.8)	0 (0)
≥ 6 years		
Mean	−1.86	−2.13
SD	1.16	1.13
n	220	228
> 3.0	1 (0.5)	0 (0)
2.1 to 3.0	0 (0)	0 (0)
1.1 to 2.0	1 (0.5)	1 (0.4)
0.1 to 1.0	4 (1.8)	1 (0.4)
0	0 (0)	0 (0)
−1.0 to −0.1	31 (14.1)	23 (10.1)
−2.0 to −1.1	104 (47.3)	96 (42.1)
−3.0 to −2.1	52 (23.6)	74 (32.5)
−4.0 to −3.1	19 (8.6)	19 (8.3)
< −4.0	8 (3.6)	14 (6.1)

SD = standard deviation.
*The average of mesial and distal levels was calculated for each implant site. Mean of all readable implant sites are presented in table. Negative bone level numbers indicate bone levels apical to the reference point (implant-abutment junction).

Table 8 Mean Marginal Bone Remodeling (mm)*

Implant insertion to ≥ 6 years	TiUnite n (%)	Turned n (%)
Mean	−1.55	−1.96
SD	1.75	1.13
n	31	31
2.1 to 3.0	2 (6.5)	0 (0)
1.1 to 2.0	1 (3.2)	0 (0)
0.1 to 1.0	2 (6.5)	0 (0)
0	0 (0)	0 (0)
−1.0 to −0.1	5 (16.1)	6 (19.4)
−2.0 to −1.1	6 (19.4)	9 (29.0)
−3.0 to −2.1	11 (35.5)	11 (35.5)
−4.0 to −3.1	2 (6.5)	4 (12.9)
< −4.0	2 (6.5)	1 (3.2)

SD = standard deviation.
*Bone remodeling was calculated for each side of the implant (mesial and distal) separately, as the difference between bone levels at two time points. The average of mesial and distal remodeling was then calculated for each implant site. Means of all readable implant sites are presented in table. Negative bone remodeling numbers indicate bone loss.

Table 9 Clinical Follow-up Parameters for Implants Followed for ≥ 6 Years*

	TiUnite n (%)	Turned n (%)
Plaque		
No plaque	80 (85.1)	63 (70.8)
Plaque	14 (14.9)	26 (29.2)
Total	94	89
Mucosa		
Healthy mucosa (no sign of erythema)	75 (79.8)	63 (70.8)
Slight inflammation	15 (16.0)	25 (28.1)
Purulent exudates	4 (4.3)	1 (1.1)
Total	94	89
Soft tissue recession† (mm)		
≤ 1.0	196 (89.5)	200 (87.7)
1.1 to 2.0	17 (7.8)	22 (9.6)
2.1 to 3.0	5 (2.3)	4 (1.8)
3.1 to 4.0	1 (0.5)	0 (0)
4.1 to 5.0	0 (0)	2 (0.9)
Total	219	226

*Parameters not reported for all implants.
†Distance from crown margin to lowest soft tissue border.

Discussion

The 6-year outcome of the two groups of implants showed a significantly higher survival for the TiUnite implants (99.1%) compared with the turned (93.0%). However, this difference decreased somewhat during the following years, and at the end of the study period, the CSRs were 96.6% for TiUnite versus 90.3% for turned implants, with the majority of failed implants (19/23) having a turned surface. Noticeable at > 9 years of follow up is the heavy impact one failed turned implant had on the CSR, which decreased from 93.0% to 90.3% (Table 11). The turned implants that failed were mainly registered as early losses. This is an outcome in accordance with previous reports[10,18] demonstrating far more early failures among the turned compared to TiUnite implants. In the Jemt et al[10] study, this early failure rate difference leveled out during the following phase of functional loading, ie, after prosthesis placement, which is also in alignment with the present study.

Failures predominated in the molar regions (12/23), and it is tempting to assume that this was due to the frequent use of regular-platform implants (5/12) in regions of high masticatory forces. However, none of these implants were used to support a single molar but instead were placed as one of 2 to 5 implants supporting fixed partial dentures with a better load distribution. No typical pattern was seen with regard to failures and implant length, albeit with short implants (< 10 mm) sparsely represented among the failures, ie, only 5 failures out of 90 (5.6%) short implants placed. Such findings, showing high survival rates for the short implants, have been presented before.[19–21]

The overall majority of failures in relation to the estimated bone quality were found in bone classes assigned values 2 and 3 (22/23), not unexpected since 419 of 500 implants were placed in such bone. Of the 78 implants inserted in bone of poor texture (quality 4), only one implant failed during the study period. This is in contrast to the 5-year outcome on turned implants in quality 4 bone presented by Jaffin and Berman,[22] but in accordance with later reports.[5,7,19,20,23,24]

This study has its shortcomings in terms of insufficiently obtained baseline radiographs,

Table 10 Pocket Probing Depth (mm) for Implants Followed-up for ≤ 6 Years

	TiUnite		Turned	
	Vestibular n (%)	Palatal/lingual n (%)	Vestibular n (%)	Palatal/lingual n (%)
Mean	2.53	2.79	2.51	2.59
SD	0.82	0.97	0.97	0.82
n	215	212	224	222
0 to 0.9	0 (0)	0 (0)	1 (0.4)	0 (0)
1.0 to 1.9	17 (7.9)	9 (4.2)	24 (10.7)	16 (7.2)
2.0 to 2.9	120 (55.8)	108 (50.9)	128 (57.1)	118 (53.2)
3.0 to 3.9	63 (29.3)	56 (26.4)	54 (24.1)	70 (31.5)
4.0 to 4.9	10 (4.7)	30 (14.2)	12 (5.4)	15 (6.8)
5.0 to 5.9	5 (2.3)	9 (4.2)	2 (0.9)	2 (0.9)
6.0 to 6.9	0 (0)	0 (0)	1 (0.4)	1 (0.5)
7.0 to 7.9	0 (0)	0 (0)	1 (0.4)	0 (0)
8.0 to 8.9	0 (0)	0 (0)	1 (0.4)	0 (0)

SD = standard deviation.

Table 11 Life Table Analyses

Time period (y)	Implants	Failed	Not followed*	CSR (%)
TiUnite				
Insertion				
to 1	243	0	0	100
1 to 2	243	0	0	100
2 to 3	243	0	0	100
3 to 4	243	0	0	100
4 to 5	243	0	3	100
5 to 6	240	1	15	99.6
6 to 7	224	1	56	99.1
7 to 8	167	0	89	99.1
8 to 9	78	2	64	96.6
9 to 10	12	0	112	96.6
10	0	–	–	–
Turned				
Insertion				
to 1	257	15	0	94.2
1 to 2	242	3	0	93.0
2 to 3	239	0	0	93.0
3 to 4	239	0	0	93.0
4 to 5	239	0	1	93.0
5 to 6	238	0	7	93.0
6 to 7	231	0	48	93.0
7 to 8	183	0	87	93.0
8 to 9	96	0	62	93.0
9 to 10	34	1	26	90.3
10	7	–	–	–

*The latest recorded patient follow-up occured in this time period.

Table 12 Specification of Failed Implants

Center/ patient no.	Implant position*	Implant type	Dimensions (mm)	Time to failure (y)	Quality/ quantity	Smoker	Sinus augmentation	Dehisc. / fenestr.	Type of restoration
TiUnite (n = 4)									
1/23	22	MkIII	3.75 × 13	8.5	2/C	Yes	No	No	Partial
1/40	36	MkIII	5.0 × 10	5.7	3/C	Yes	No	No	Partial
1/44	26	MkIV	5.0 × 8.5	8.4	3/C	No	No	No	Partial
	27	MkIV	5.0 × 10	6.6	3/C	No	No	No	Partial
Turned (n = 19)									
1/03	14	Standard	5.0 × 12	0.4	3/B	Yes	No	No	Partial
1/18	38	Standard	3.75 × 7	9.9	2/D	Yes	No	No	Partial
1/20	35	Standard	4.0 × 10	0.3	3/B	No	No	No	Partial
1/31	42	Standard	4.0 × 18	0.4	2/C	No	No	No	Full arch
	32	MkII	4.0 × 15	0.4	2/C	No	No	No	Full arch
1/39	46	MkII	5.0 × 6	0.3	2/C	No	No	No	Partial
2/01	26	Standard	5.0 × 7	0.2	2/C	No	No	No	Full arch
2/05	25	MkII	3.75 × 13	0.3	3/C	Yes	No	No	Partial
	26	Standard	4.0 × 11.5	0.2	3/E	Yes	Yes	No	Partial
2/11	25	Standard	3.75 × 7	1.0	3/D	Yes	No	No	Full arch
2/19	36	MkII	5.0 × 10	0.6	4/B	Yes	No	No	Single
2/30	37	Standard	4.0 × 10	0.3	3/C	No	No	No	Single
2/37	17	MkIV	5.0 × 10	0.0	3/D	Yes	Yes	No	Partial
2/45	46	MkIII	3.75 × 10	0.0	2/C	Yes	No	No	Partial
	47	MkIII	3.75 × 10	0.0	2/C	Yes	No	No	Partial
2/51	34	Standard	3.75 × 15	1.0	3/B	Yes	No	No	Partial
	35	Standard	3.75 × 13	1.6	3/B	Yes	No	No	Partial
2/54	11	MkII	3.75 × 13	0.6	3/C	No	No	No	Single
2/55	45	MkIII	3.75 × 10	0.2	3/B	Previous	No	No	Partial

*FDI tooth-numbering system.

ie, at implant insertion. Only 16 patients with 62 implants were followed with baseline and ≥ 6-year follow-up radiographs, thus providing data for measurements of marginal bone resorption. This is unfortunate since it would have been of interest to compare many of the involved implants over time. Nonetheless, the small number of measurements did not show any significant differences in bone loss between turned and TiUnite implants. This is in agreement with Fröberg et al,[25] who could not see any difference in marginal bone level between turned and TiUnite implants over a period of 18 months. In this study, marginal bone level registrations were performed at ≥ 6 years of follow-up, providing one-time data on 228 turned and 220 TiUnite implants. A small but significant difference in bone level was seen in favor of the TiUnite implants. A trend toward a similar outcome of marginal bone levels was also seen in a 5-year study by Friberg and Jemt.[9] Since all implants were placed with the implant-abutment junction at bone level, it can be assumed that marginal bone level at time of follow-up is correlated to bone resorption (in this study a strong correlation [$r = 0.540$, $P < .001$] was seen). Thus, the current data are in contrast with other studies reporting similar bone remodeling values for turned and moderately rough surface implants or, most frequently, showing better outcomes for turned implants.[10,26,27]

No specific adverse events were reported for any of the implant surfaces in terms of the clinical parameters mucosa recession, probing depth, and plaque accumulation, although there were more TiUnite implants with pus after 6 or more years, ie, four versus one for the turned implants. Another five TiUnite implants presented with peri-implantitis symptoms during the study period, revealing a total prevalence of 4.2% and 2.0% for patients and implants, respectively. This is in alignment with studies using the same diagnostic criteria, ie, bleeding on probing together with presence of pus and ongoing bone resorption,[28,29] but far from those using different inclusion criteria and claiming much higher prevalence figures (for review see Lindhe and Meyle[30]).

Conclusion

The present retrospective investigation, conducted at two private implant centers in Italy, showed very encouraging results on implant survival, marginal bone response, and soft tissue conditions up to 10 years of follow-up. However, lack of consistency in follow-up routines was a weakness of the study, as well as the low number of baseline radiographs. Nonetheless, the current report brings additional clarity to how the turned and the moderately rough surface TiUnite implants behave in the same mouth over long periods of time during clinical function. Minor differences do exist, such as the more favorable early implant failure rate and fewer failed implants overall for the TiUnite implants.

Acknowledgment

This study was been supported by Nobel Biocare (grant no. 2009-811).

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