

Effects of Implant-Abutment Connection Design on Peri-Implant Bone Level



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Purpose

To investigate the effects of external, internal, and Mores taper implant-abutment connections on peri-implant bone levels prior to and after loading of dental implant, by conducting a clinical analysis and comparison.

Materials & Methods

Digitized, standardized, and classified the periapical x-ray data were collected from China Medical University Hospital Dental Department during the period of 2002 to 2010. The software of Image J (NIH, Bethesda, MD, USA) were used to measure the bone loss (bone level change; difference of vertical bone defect; Δ VBD) prior to and after the loading of dental implants.

Implants used in this study:

Three types of implant systems were placed at the bone level..

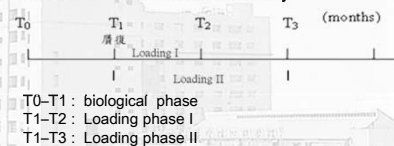
- External hex connection: Branemark (Brånemark System TMMK IV TiUnite®, Nobel Biocare, Sweden)
- Internal octagon connection: Cowellmedi (Sub. Atlas Cowellmedi Co., Busan, South Korea)
- Morse taper connection: ANKYLOS (Ankylos® plus Implant, Friadent, Mannheim, Germany)

Table 1. Average age at time of placement

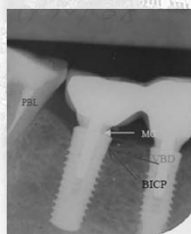
年齡	Implant type(Mean \pm SD)		
	Branemark(n=22)	Ankylos(n=17)	Cowell(n=19)
年齡	47.09 \pm 10.09	42.72 \pm 13.51	50.73 \pm 9.40

SD : Standard Deviation

Table 2. Time schedule of the study



- Observe the bone loss of these three types of implant systems during the period of biological phase (4 months after surgery T0-T1).
- Observe the bone loss of these three types of implant systems during the periods of loading phase I (3 months after loading T1-T2) and loading phase II (6 months after loading T1-T3).



MG : micro-gap
BICP : Bone to implant contact point
PBL : peri bone level
VBD : the distance between MG and BICP
 Δ VBD : bone loss(bone level change)

Fig 1. Definition of reference point for measuring bone loss

The study protocol was reviewed and approved by the Institutional Review Board (IRB) of China Medical University Hospital (CMUH).CMUH IRB No.:DMR101-IRB-1-078.

Results

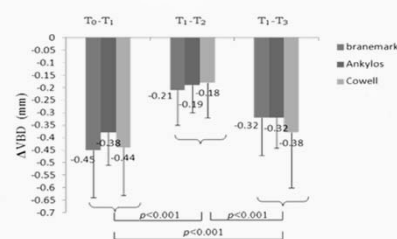


Figure 2. Comparing of peri-implant bone loss between different implant systems and between various time phase intervals

Table 3. Peri-implant bone loss at different time phase intervals on three implant systems

	T0-T1		T1-T2		T1-T3	
	n	mean: sd	n	mean: sd	n	mean: sd
Branemark	27	-0.45 0.19	22	-0.21 0.13	16	-0.32 0.19
Ankylos	36	-0.38 0.14	25	-0.19 0.11	26	-0.32 0.14
Cowell	33	-0.44 0.15	29	-0.18 0.12	24	-0.38 0.22

SD: Standard deviation

Table 4. Model effect test for peri-implant bone loss

	Wald test	df	p-value
Implant type	2.12	2	0.350
Time phase	180.83	2	<0.001

Table 5. Post hoc for comparing peri-implant bone loss between implant systems by using Bonferroni test

(I) Implant type	(J) Implant type	mean difference(I-J)	SE	P-value
Branemark	Ankylos	-0.03	0.03	0.896
Branemark	Cowell	0.01	0.03	>0.999
Ankylos	Cowell	0.04	0.03	0.506

Table 6. Post hoc for comparing peri-implant bone loss between different time phase intervals by using Bonferroni test

(I) Time Phase	(J) Time Phase	mean difference(I-J)	SE	P-value
T0-T1	T1-T2	-0.22	0.02	<0.001
T0-T1	T1-T3	-0.07	0.02	<0.001
T1-T2	T1-T3	0.14	0.02	<0.001

Conclusions

- During the biological phase, between implant placement and occlusal loading, there was no statistical significance in peri-implant bone loss among these three types of implant-abutment connections.
- During loading Phase I, 3 to 5 months after loading, there was no statistical significance in peri-implant bone loss among these three types of implant-abutment connections.
- During loading Phase II, 6 to 8 months after loading, there was no statistical significance in peri-implant bone loss among these three types of implant-abutment connections.
- Comparing the bone losses among time phases, i.e., biological phase, loading phase I and loading phase II, the analysis showed statistical significance in each time phase pair.
- In this experiment, values of Δ VBD (bone loss) obtained during the biological phase were greater than those obtained in loading phases for all three types of implant-abutment connections.