

Evaluating the results after dental implant surgery combined with demineralized freeze dried bone allograft VB KC-09.02

Truong Uyen Cuong

103 Military Hospital

Summary

Objective: To evaluate the results after dental implant surgery with demineralized freeze-dried bone allograft. **Subject and method:** On 51 patients with 137 implant were investigated at Oral and Dental Department of 103 Military Hospital from March 2011 to May 2016. **Result and conclusion:** Primary stability between 30 - 50N/cm² after the surgery was 55.5%. 100% patients had a pain after the surgery. The success rate in this study was 97.8%. The average of bone resorption before prosthetic dentistry was 0.596 ± 0.126 mm. Good results of rehabilitation improved from 74.4% to 84.6%. Results of recovering cosmetic reduced from 73.6% to 63.1%. Implant inflammation rate was from 8.8% to 25.6%.

Keywords: Implant, demineralized freeze-dried bone allograft.

1. Background

One of highly efficient fixed prosthesis methods is the replacement of teeth lost by direct implantation of artificial tooth roots on the jaw-bone in place of missing tooth. This method is also known as dental implant.

Despite being the modern techniques with many advantages, dental implant requires certain conditions, especially sufficient bone mass in place to cover and store the fixture. To resolve this problem, bone graft is considered a compulsory solution to increase the size of the bone for dental implant patients. Demineralized freeze dried bone allograft (DFDBA) VB KC-09.02 [1] is studied, handled, preserved at Department of Labo Tissue Bank in the National Institute of Burns Le Huu Trac and successfully

applied in many majors, including Dentomaxillofacial Speciality.

2. Subject and method

2.1. Subject

The thesis covers patients at the age of 20 and over suffering from tooth loss who were specified dental implant and demineralized freeze dried bone allograft VB KC-09.2 in one or two phases.

Selection criteria

Patients range from 20 years old who lose incisors or molars and have good health to qualify for surgery.

Surgical bone height of the posterior maxillary teeth area is less than 8mm, surgical bone height of the anterior maxillary and mandibular teeth area is at least 8mm and teeth loss distance is far enough to restore.

Exclusion criteria

Correspondence to: Truong Uyen Cuong - Oral and Dental Department, 103 Military Hospital

Email: uyencuong79@yahoo.com

Patients suffer from chronic diseases and in place, without being specified and unhealthy for surgery.

Pathology in head and neck: Patients are treated with radiation beam to the head and neck, suffer from dental periostitis, etc.

Time and location

The study was conducted from March 2011 to May 2016, in the Dentistry Department - 103 Military Hospital.

2.2. Method

Research design: The study was prospective, uncontrolled, applied clinical trial.

Implementing steps:

Conduct clinical examination and treatment planning.

Perform X-ray.

Evaluate bone quality, status and select surgical approach.

Perform pre-restoration treatment, jaw sampling and create surgical guide.

Bone graft implant technique.

2.3. Data collection method

Determination of pain status after implant.

Table 1. Based on research by Brodala et al [6]

Level	No pain	Mild pain	Moderate pain	Much pain
Symptom	No pain	Feeling fidgety and uncomfortable	Feeling painful but tolerable	Intolerable pain, pain relief measures must be used

Determining the level of bone loss and inflammation around the implant.

Determining the level of bone loss based on the CT conebeam film.

CT conebeam film accurately identifies the bone graft status, the level of bone loss around the implant in three dimensions of space.

Determining the level of bone loss based on the periapical film.

The degree of bone loss is the difference between the value of the original benchmark and the value of the current one.

Determination of inflammation around the implant.

Based on the research criteria of Mombelli and Lang (1992) [9]. Inflammation around the implant when the current bone loss level is greater than 3.1mm compared with the starting point bone loss, bleeding or pus at the time of examination.

Evaluating the status after prosthesis

Table 2. Evaluating the status after prosthesis

Criteria	Good	Medium	Bad
Function	Patients eat solid food. No pain, implant without wandering	Only eat normal and soft food. Implant without wandering.	Painful, don't chew. Wandering Implant from level 2 or more
Aestheticism	False teeth with harmonious color morphology like real teeth. Patients are satisfied.	False teeth with harmonious color morphology close to real teeth. Patients are acceptable.	False teeth with color morphology is not the same as real teeth. Patients are not satisfied.

Identifying a failed dental implant.

We rely on the standards of Albrektsson et al (1986) [3]. Implants are considered to be failed when there is one of the following phenomena:

Wandering implant can not withstand the force.

Patients have signs of pain or infection that can not be restored.

Do not meet cosmetic requirements, requiring removal.

3. Result

3.1. Preliminary stability level immediately after surgery

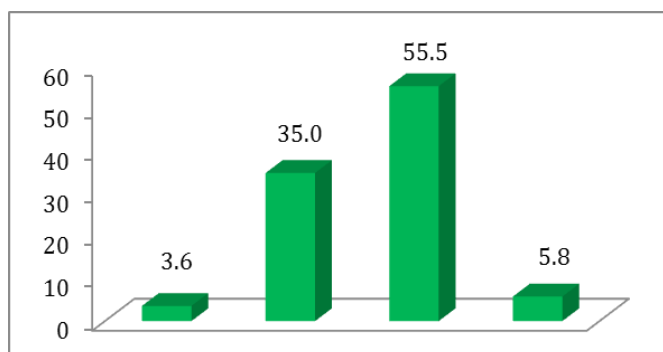


Figure 1. Preliminary stability level immediately after surgery

The preliminary stability level immediately after surgery focused mainly in the range from 30 - 50N/cm² with 76/137 cases, accounting for 55.5%.

3.2. Pain state after surgery

Table 3. Pain state after surgery

Location Condition	Incisor teeth (n = 49)		Posterior teeth						Overall (n = 137)	
			Maxillary (n = 50)		Mandible (n = 38)		Average (n = 88)			
	n	%	n	%	n	%	n	%	n	%
Mild pain	37	75.5	21	42	26	68.4	47	53.4	84	61.3
Medium pain	11	22.4	27	54.0	12	31.6	39	44.3	50	36.5
Serious pain	1	2.1	2	4	0	0	2	2.3	3	2.2
Overall	49	100	50	100	38	100	88	100	137	100

100% of patients after surgery for bone grafting dental implant had felt pain state with different levels from mild level to serious level. Mild pain state were primarily 61.3%, respectively. This condition occurred mostly in the front teeth with little and gentle intervention.

3.3. Implant stability level before restoration (ISQ index)

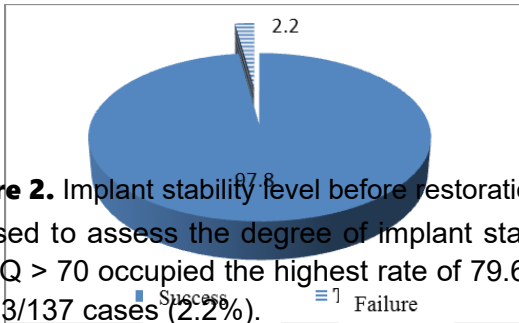
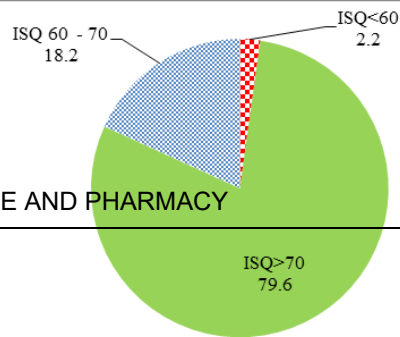


Figure 2. Implant stability level before restoration

ISQ is an objective index used to assess the degree of implant stability and is made during the time of placing a healing cap. ISQ > 70 occupied the highest rate of 79.6% in 109/137 cases and ISQ < 60 occupied the lowest rate in 3/137 cases (2.2%).

3.4. Success-failure rate

Figure 3. Success rate

There were 3/137 cases, accounting for 2.2%, failing to reach bone integration implant, wandering at the time of restoration that led to the situation of removal and deemed a failure. The success rate as of the restoration time was 134/137 cases, accounting for 97.8%.

3.5. Bone loss status

Table 4. Bone loss evaluation after restoration by time

Time	Close		Far		Average	
	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$
06 months	121	0.054 ± 0.265	121	0.049 ± 0.252	121	0.052 ± 0.259
12 months	97	0.074 ± 0.392	97	0.069 ± 0.375	97	0.071 ± 0.384
18 months	80	0.090 ± 0.473	80	0.085 ± 0.456	80	0.087 ± 0.465
24 months	65	0.093 ± 0.526	65	0.089 ± 0.510	65	0.091 ± 0.518

After the restoration, the level of bone loss increased over time. The bone loss occurred most frequently in about 6 - 12 months with the loss level of 0.12mm and occurred most rarely in about 18 - 24 months with the loss level of 0.05mm.

3.6. Rehabilitation results

Table 5. Function evaluation after restoration over time

Time	Good		Medium		Poor		Total		p
	n	%	n	%	n	%	n	%	
06 months	90	74.4	22	18.2	9	7.4	121	100	p _{a-bc} <0.01
2 months	78	80.4	16	16.5	3	3.1	97	100	
18 months	64	80	14	17.5	2	2.5	80	100	

24 months	55	84.6	10	15.4	0	0.0	65	100	
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At the time of research, the ability to restore good chewing power tended to increase over time as 74.4%, 80.4%, 80.0% and 84.6%.

3.7. Aesthetic recovery results

Table 6. Aesthetic recovery results were evaluated after restoration

Time	Good (a)		Medium (b)		Poor (c)		Total	
	n	%	n	%	n	%	n	%
06 months	89	73.6	19	15.7	13	10.7	121	100
12 months	70	72.2	23	23.7	4	4.1	97	100
18 months	50	62.5	26	32.5	4	5.0	80	100
24 months	41	63.1	21	32.3	3	4.6	65	100

Effective aesthetic restoration after the restoration always reached the highest rate. However, the level of effective aesthetic recovery over time tended to decrease from 73.6 - 63.1%.

3.8. Inflammation after restoration

Table 7. Inflammation after restoration over time

Time	Inflammation		No inflammation		Total	
	n	%	n	%	n	%
06 months	31	25.6	90	74.4	121	100.0
12 months	15	15.5	82	84.5	97	100.0
18 months	7	8.8	73	91.3	80	100.0
24 months	6	9.2	59	90.8	65	100.0
p	$p_{a-b} < 0.01$					

After the restoration, inflammation after the restoration tended to fall at the time of study corresponding to the rate of 25.6%, 15.5%, 8.8% and 9.2%.

4. Discussion

4.1. Preliminary stability level

In this study, preliminary stability level focuses mainly in the range of 30 - 50N/cm² with 76/137 cases, accounting for 55.5% and 48/137 cases, accounting for 35.0% of preliminary stability from 15 to under 30N/cm². Only 5/137 cases accounting for 3.6% had preliminary stability under 15N/cm², which had bone density D4 or large defect. 3 failed implant fell on the case with preliminary stability level less than <

15N/cm². The study conducted by Dorjpalam B et al (2013) [7] showed an increase in the torque force when bone density, cortical bone thickness increase and the torque force decreases when the placement is wider than the diameter of the implant.

4.2. Pain state after surgery

In this study, 100% of patients after surgery for bone grafting dental implant felt pain. Mild pain state was primarily 61.3% respectively. This condition occurred mostly in the front teeth with little and gentle intervention.

Medium pain state primarily appeared in the posterior maxillary teeth area because the patients must be subject to the external sinus lift, delivery of

wide gum tissues or in patients having bone D1 in need of bone drilling and pressing. To reduce pain, applying cold pack is an efficient measure and should be done right from the first hour after the surgery.

4.3. Implant stability level before restoration

Shortly after the implant, preliminary stability $\geq 30\text{N/cm}^2$ only accounted for 61.3% but at the time, the implant stability level to be measured through ISQ > 70 was found in 109/137 cases accounting for 79.6%. As such, the implant stability level tended to well up, which fit the study of Gómez-Polo M et al (2016) [8] when the high preliminary stability tended not to rise but the low preliminary stability low increased again from time to time.

ISQ from 60 - 70 appeared in 25/137 cases, accounting for 18.2% and ISQ < 60 appeared in 3/137 cases only, accounting for 2.2% - the implants were broken before restoration. Therefore, the implant stability level measured on ISQ machine was relatively accurate, and this is a reliable device that helps doctors evaluate the level of bone integration during clinical practice.

4.4. Success-failure rate

In the study, 3/137 cases were removed at the time of the restoration, making up 2.2%. The success rate was 97.8% (134/137 implants). This result was similar to the study of Acocella A et al (2010) with the success rate of 97.96%, Babbush CA et al (2015) [4] on 262 implants having calcium phosphosilicate transplant success rate at 98.1%.

4.5. Conditions after restoration

Level of bone loss after the restoration

Level of bone loss after the restoration in our study was $0.259 \pm 0.052\text{mm}$ at the time of 6 months, $0.071\text{mm} \pm 0.384\text{mm}$ at 12 months, $0.087\text{mm} \pm 0.465\text{mm}$ at 18 months and $0.091\text{mm} \pm 0.518\text{mm}$ at 24 months. However, in comparison with the time before restoration ($0.596 \pm 0.126\text{mm}$),

the level of bone loss after the restoration lessened significantly. This was in line with studies of Berglundh et al (2005) [5] on the experiment showing that the level of bone loss around the implant stood at the largest level in the healing stage and gradually reduced after restoration.

Functional state

The results of our study showed that the ability to recover well at 6 months, 12 months, 18 months and 24 months were 74.4%, 80.4%, 80.0% and 84.6%, respectively. In contrast, the lower and moderate functional recovery rates decreased by 7.4%, 3.1%, 2.5%, 0% and 18.2%, 16.5%, 17.5% and 15.4% respectively. Specifically, at the time of 24 months, we saw no case of poor functional recovery.

Aesthetic condition

In our study, the results of good aesthetic always occupied the highest rate at the time of the study. However, this rate was likely to decrease over the period of 6 months by 73.6%, 12 months by 72.2%, 18 months by 62.5% and 24 months by 63.1%. This result was in contrast to Dam Van Viet's study as the proportion increased from 73.2 to 80% [2]. This difference may be due to the fact that our study was conducted in both jaws and had larger grafted bone volume.

Inflammation

In our study, inflammation tended to decrease at 6, 12, 18, and 24 months of postoperative follow-up at 25.6%, 15.5%, 8.8%, and 9.2%, respectively. The rate of inflammatory after the restoration was reduced mainly because the patients after the implants were in good dental hygiene, tested every 6 months and applied measures to clean the plaque such as tooth extraction, polish.

5. Conclusion

Through the study of 51 patients with tooth loss treated dental implant with demineralized

freeze dried bone allograft VB KC-09.02 in the Dentistry Department – 103 Military Hospital from March 2011 to May 2016, we draw some conclusions:

Preliminary stability level immediately after the surgery from 30 - 50N/cm² was 55.5% and from 15 - 30N/cm² was 35.0%.

ISQ index > 70 occupied the highest rate at 79.6% and the lowest rate at 2.2%.

The success rate in the study was 97.8%.

The level of average bone loss after the restoration increased over time from 0.259 ± 0.052 to 0.091mm ± 0.518mm.

The results of good rehabilitation increased gradually at the time of study from 74.4 to 84.6%.

The level of effective aesthetic recovery over time tended to decrease from 73.6 - 63.1%.

Mucosal inflammation and implant inflammatory rate ranged from 8.8 - 25.6%.

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