

Other reported cases

1. Three case examples of one-piece type implant that showed bone regeneration with their installations

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Yoshiki Nakano

Introduction

Here, three success examples are presented where AQB one-piece type implants were installed to the area of resorbed mandible due to marginal and apical periodontitis, and achieved new bone generation with its excellent osteoconductive property.

Case 1

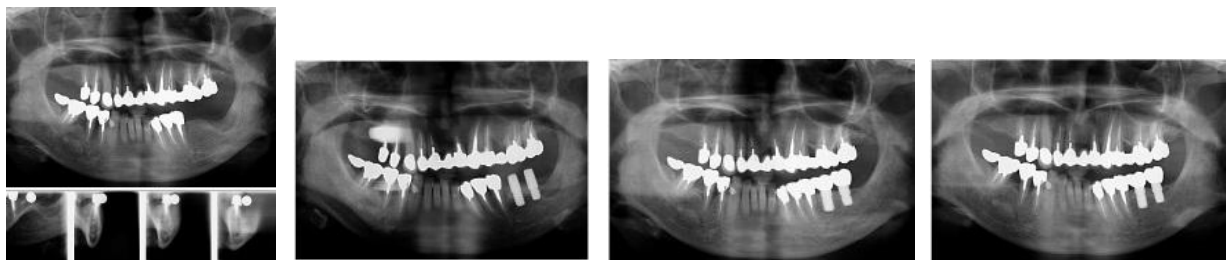
Patient: 60 years old

Chief complaint: Cannot chew on the molars strongly

Subject area: No. 30 and 31

Primary medical examination: June 2004

Medical history: None



1-1. Before surgery

1-2. Implantation

1-3. One year later

1-4. 1½ year later

Treatment process

- June 2004 Removal of bridge that had been placed on No. 29, 30, 31 (No. 29 and 31 as anchors), after which No. 31 was extracted as well as the infected granulation tissues.
- October 2004 Orthopantomogram, parallel and transverse tomography were used to evaluate the No. 30 and 31 states for implantation. A wide area of transparency and downgrowth was observed at the No. 31 position. The distal section of No. 29 was shown to have vertical bone absorption.
- November 2004 Implant types 5MS and 5SM of AQB one-piece implants were planted as was originally planned to the area corresponding to No. 30 and 31. Implantation was successful.
- January 2005 All-ceramic crown was fitted onto the No. 30 and 31 implants
- November 2005 No transparency in No. 30 and 29 were visible from the radiograph, confirming new bone generation to have occurred.

Case 2

Patient: 62 years old female (same patient as in Case 1)

Subject area: No. 20

First medical examination: February 2007



2-1. Before surgery

2-2. Implantation

2-3. 10 months later

Treatment process

- March 2007 Removal of bridge on No. 13, 14, 15 (No. 13 and 14 were anchors), extraction of No. 13 tooth, and curettage to remove the infected granulation tissues before applying the Teruplug for hemostasis.
- June 2007 Orthopantomogram, parallel and transverse tomography were used to evaluate the No. 13 site for implantation.
- July 2007 AQB one-piece implant, 5SM, was installed into the area corresponding to No. 29 tooth undergoing the standard procedure. The implantation was successful. The radiograph showed transparency in the bone surrounding the implant.
- May 2008 Evidence of newly generated bone surrounding the implant with X-ray radiography.

Case 3

Patient: 58 year old female

Chief complaint: Inflammation of the gum

Subject area: No. 30

First medical examination: May 2004

Medical history: None



3-1. First medical examination

3-2. Before surgery

3-3. Implantation



3-4. 7 months later

3-5. one and nine months later

3-6. 3 years later

- July 2004 Extract No. 30, and perform curettage to remove infected granulation tissues
- December 2004 AQB one-piece implant was installed to the site that corresponded to No. 30 with the standard procedure. The implantation was successful. Significant bone transparency could be observed with the radiograph.
- February 2005 No. 30 implant was fitted with a metal crown applied with hybrid ceramics on the front.
- July 2005 Transparency of the bone surrounding the implant is still observed from the radiograph but is lessened from the state before.
- January 2008 Transparency of the bone surrounding the implant had disappeared, confirming bone regeneration to have occurred.

Summary

The excellent osteoconductivity of AQB implant led to vast improvements in the regeneration of the bone when it was applied to areas that had been affected with bone resorption. This has also contributed to improvements in the health of neighboring teeth.

2. Two case examples in which one-piece type implants were applied to multiple teeth loss in the maxilla

Tome-Nakada-Sato Dental Clinic
Toshirou Sato

Introduction

We report here two cases in which one-piece type implants were installed to multiple teeth loss in the maxilla, and their progresses after immediate loading were observed.

Case1

Patient: 53 year old male
Subject area: No. 2 to 13 and 15
Smoking history: 20 cigarettes/ day, for roughly 30 years
Others: None

Treatment progress

On March 23rd 2008, 9 implants (of which for sizes, refer to Table 1-8) were installed to the maxillary jaw under anesthesia. Straight after which, the temporary crown (Fig. 1-4) were fitted with adhesives (EZ cement). Since the request by the patient was 'to be able to regain the original occlusion', we attempted to meet his needs. With no particular complaint made with regards to the implanted structure, important cautionary points for after implantations were instructed such as eating only soft food, to observe the progress made after immediate loading. With no apparent problems, and with the knocking sound turning to a more duller sound (Fig. 1-5), the impression was taken in early May, and was able to place a three-piece bridge, three months after the surgery (Fig. 1-6, 1-7). From the PVT (periostest) as shown in Table 1-8, as well as the clinical evaluations showed that the degree of biointegration on May 23rd, was thought to have been firmly established. The progress after the latest surgery on July 22nd, has been proven to be favorable, along with good level of patient satisfaction.



1-1
Feb 23rd – before surgery



1-2
Feb 25th – After surgery



1-3
Cast model and
old denture



1-4
Temporary crown fabricated
from the old denture



1-5
April 23rd – 2 months
after surgery



1-6
Prosthesis



1-7
May 23rd – 3 months
after surgery

PVT \ Size	3LM	3LM	T3MM	T4MM	T3MM	T3MM	T3MS	T4SS	T46S
May 23 (3 months)	1	1	0	-3	3	1	-1	-2	-3
June 26 (4 months)	1	0	0	-4	1	0	0	-1	-4
July 22 (5 months)	1	1	0	-3	2	0	1	-2	-3

1-8. Sizes used and the Periotest results

Case 2

Patient: 73 year-old male

Subject area: No. 2 to 15

Smoking history: 20 cigarettes/ day, for roughly 50 years

Medical history: 1992, Total gastrectomy due to stomach cancer

August 2007, Pharyngeal cancer excision under general anesthesia

Treatment progress

April 4th 2008, conducted ten implants installation to the maxilla under anesthesia, (for size, refer to Fig. 2-8). Since sufficient alveolar bone width was available, the implantations to No. 3 and 4, as well as to No. 9 to 13 were conducted without formation of a flap (Fig. 2-4). With favorable primary stability achieved, as with Case 1, the implants were immediately fitted with temporary crowns (Fig. 2-6), and the progress was observed. There were nevertheless three instances whereby the temporary crown had to be re-fitted with temporary packing and suturing including the two times due to the instability of the crown, in the period till 20th April. On 23rd April, the temporary crown was removed due to the patient complaining of pressure pain and discomfort in No. 7 to 10 region, especially on the No. 10 position. Upon uncovering the area underneath, remnants of the temporary pack cement 4×2 mm was found in between No. 10 implant and the gingiva, which was swiftly removed. The mobility of No. 7 implant was thought to have been due to the natural loosening therefore the implants placed on the No. 7 to 10 positions were screwed tightly before the placement with the temporary crown for the last time.

The impression for No. 4 to 8 was taken on the June 4th, followed by superstructure placement on June 21st. Having confirmed the absence of any discomfort, superstructure was also placed onto No. 9 to 13 on June 24th (Fig 2-7). Currently, on July 22nd, no discomfort has been felt at the No. 10 position, favorable clinical progress has been made and the patient has been pleased with the outcome.



Apr 1st – Before surgery

Apr 4th – After surgery

Apr 1st – Oral cavity

Apr 4th – After surgery



Apr 4th – Temporary crown

Apr 4th – After temporary crown placement

June 24th – After superstructure placement

PVT \ Size	3LM	3LM	T3MM	T4MM	T3MM	T3MM	T3MS	T4SS	T46S
May 23 (3 months)	1	1	0	-3	3	1	-1	-2	-3
June 26 (4 months)	1	0	0	-4	1	0	0	-1	-4
July 22 (5 months)	1	1	0	-3	2	0	1	-2	-3

2-8. Sizes used and the Periotest results

Summary

There are many advantages to using AQB one-piece type implants to multiple tooth losses. The idea was to reconstruct the original occlusal relationship accurately by immediately loading with the temporary crown casted with the copy denture with the occlusal plane. This would subsequently lead to a condition whereby the cleaning would be simple for both the patient and the practitioner to maintenance a sufficient level of hygiene, and would enable superstructure to be placed in approximately 3 months, with added indications from periotest results.

I would like to increase the number of clinical examples and consider their treatment progresses from now on.

3. Two examples in which early masticatory recovery could be achieved with the application of socket-lift technique, to a case with a presence of vertical bone deficiency in the molars that had reached the maxillary sinus floor

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Mitsuru Sugisawa
Tokyo West Tokushukai Hospital
Tsuguo Sano
Hisatoshi Matsumoto

Introduction

We report here two examples where early masticatory recovery could be achieved with the application of socket-lift procedure to facilitate the implantation of one-piece T-type implant to a case where the vertical bone width from the alveolar ridge to the maxillary sinus floor had been 1 to 2 mm. The socket-lift procedure is one that does not apply any bone graft, and limits the degree of surgical invasion by lifting the sinus floor manually.

Case 1 – Heavily affected with periodontitis.

This case was presented with bone resorption affecting the right and left maxillary molars, and the length of the bone from the alveolar to the maxillary sinus floor to be 2 mm.

Patient: 53 year-old female

First medical examination: June 2007

Chief complaint: Difficult to eat due to the lack of molar teeth

Medical history: None

Present medical history: Periodontitis affecting overall structures, resulting in looseness of teeth,

■ Image featuring the state of oral cavity and panoramic radiograph at the time of first medical examination



■ Implantation to the right maxillary molars

[Method]



First, perforate with guide-drill and spiral-drill, followed by end-mill reamer to elevate the sinus floor slowly with the hands for AQB T-type implantation.



Implant T-5MM and T5Ms



Dental radiograph at implantation

The state of oral cavity when taking impression of the right maxillary molars (two months later)



In the dental radiograph taken 2 months after the implantation, newly generated bone formation can be seen in the implant surroundings.

■ **State of the oral cavity when placing the superstructures to the right maxillary molars**



Dental radiograph 6 months after the superstructure placement

[Methods]

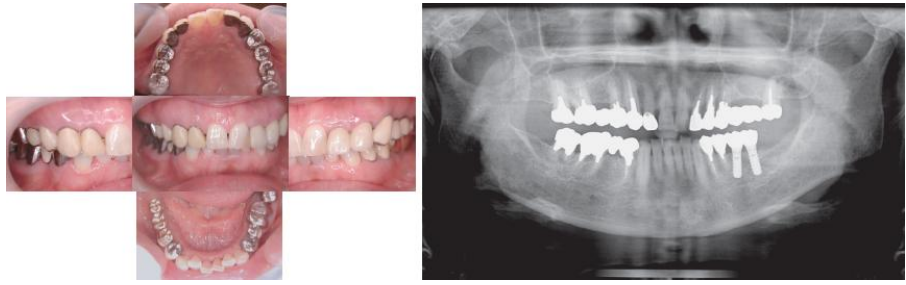


Pictures drawn by Leon Sakuma

Case 2 – A case of vertical bone deficiency where the length from the left maxillary sinus to the alveolar bone is merely 1 mm

Patient: 63 year-old female
 First medical examination: December 1999
 Chief complaint: Moving of the left maxillary molars
 Medical history: None
 Present medical history: Satisfactory level of oral hygiene

■ Image featuring the state of oral cavity and panoramic radiograph at the time of first medical examination



■ During implantation to the left maxillary molar region



(Above) Images of the top left of the oral cavity.

Implant was inserted by perforating through the bone with sole use of spiral drill. The schneiderian membrane can be seen from the implant cavity.



State of the oral cavity at suture 4MS, 4SS, T4SS type implants used Temporarily stabilized after surgery Dental X-ray taken at implantation Impression taken 2 months later

■ State of the oral cavity during the superstructure placement to the left maxillary molars



Discussion and conclusion

- To cases where the width of the bone from the alveolar crest to the maxillary sinus floor were significantly deficient, with merely 1 to 2 mm in length, AQB one-piece T-types were placed facilitated with socket-lift procedure. Here, two cases are presented where bone integration was able to be achieved 2 months after the operation to such conditions, and quick masticatory recovery was achieved after the superstructure placement.
- It is vital to stabilize the T-type implants so that no external forces are applied during their consolidation stages. It is therefore recommended to temporarily connect the implant structures with adjacent implants or teeth that are already firmly stabilized.
- The success of this treatment was thought to be due to the technique that was used to manually lift

the schneiderian membrane carefully that aided the rapid bone integration due to osteoinduction to attract the osteoblast and bone augmentation in the space between the implant body and the schneiderian membrane as well as the periosteum.

- In comparison to the sinus-lift, socket-lift technique has the advantages of shorter healing time and less invasion to the maxillary sinus, therefore it is thought to be an effective method for masticatory recovery for the maxillary molars.

4. Implantation method using the ridge expansion osteotomy – application to the maxillary anterior region

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Yukiyasu Kishimoto
Matsumoto Dental Clinic
Yasugi Matsumoto

Introduction

The majority of the cases in which the teeth have been extracted from the maxillary anterior region due to significant effects from periodontal diseases and apical periodontitis have the tendency to become narrower. There are cases where implantations to these positions can become complex, and may require GBR technique, veneer graft or distractions. These procedures are highly invasive therefore can become highly stressful for the patients. To overcome these issues, we have been utilizing the ridge expansion osteotomy (REO) that was published by Summers in 1994, to facilitate implantations to the narrowed alveolar ridge of the maxillary anterior region in our clinic. With its relatively low degree of surgical invasion, this has so far been a success, thus the technique will be introduced here.

■ The past treatment plan for implantation to narrowed alveolar ridge of the maxillary anterior region

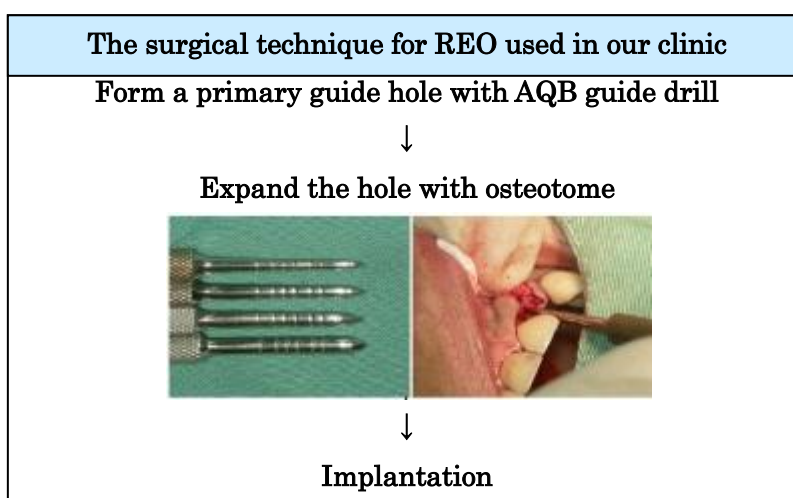


Selecting implants that are long and thin



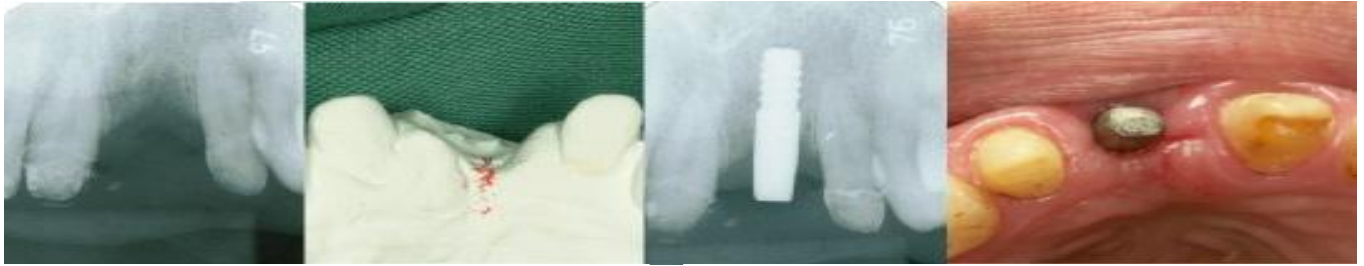
But these frequently resulted in implant fractures

Implants with diameters ≥ 4 mm are required for solo implantation to the maxillary anterior region. REO has been applied for this reason.



Case 1

Case where prosthesis was placed after the dental pulp treatment but fell out without any force. Implantation was conducted to another area at the same time, and the bone graft was extracted from the cavity at the same time.



Alveolar bone resorption can be seen before surgery

Labial alveolar ridge is largely resorbed

Approximately 2 months after implantation

The contouring of the labial alveolar ridge can be seen during the placement of the superstructure.



The state 1½ years after the superstructure placement.

This resulted in successful outcome with favorable estheticism.

Case 2

An example of failure after apicotomy. Implantation was conducted to another region simultaneously, and the bone graft was extracted from this constructed cavity to facilitate the implantation.



At the primary medical examination, the bone resorption of the apical lateral wall and the traces from the apicotomy are evident

A month after the extraction

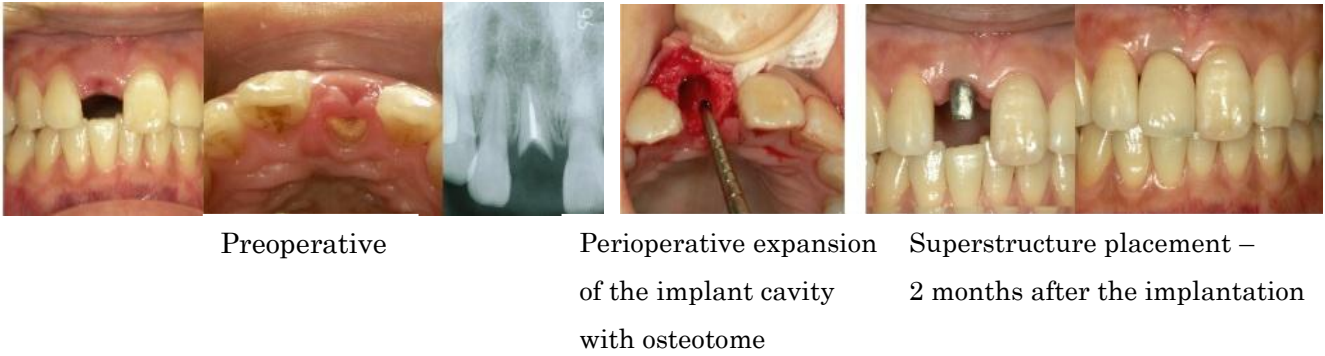
The labial aspect of the alveolar ridge – a clear indentation in the alveolar ridge can be seen



1⅓ years since implantation

Case 3

A case example where immediate loading was applied



Preoperative

Perioperative expansion of the implant cavity with osteotome

Superstructure placement – 2 months after the implantation

Case 4

An example in which REO and socket-lift procedures were utilized after the extraction of fractured tooth with apical lesion



Preoperative

16 days after the extraction

Superstructure placement – 3 months after the implantation

Case 5

A case whereby REO and elevation of nasal cavity floor were applied concomitantly



Preoperative

13 days after the extraction

Implantation – 1 1/2 months after the extraction

2 1/2 months after the implantation

Superstructure placement

Superstructure placement

Pros of REO	Cons of REO
<ul style="list-style-type: none"> • Does not require specialized tools • Simple operative procedures • Limited degree of surgical invasion 	<ul style="list-style-type: none"> • It is unreliable means to achieve estheticism, which must be explained to the patient preoperatively.

Summary

- REO is a technique that has minimal surgical intervention and relatively simple implant treatment. However, the problem remains with the possibility of not achieving an esthetic outcome, and

therefore requires preoperative explanation.

- The spectrum of the cases that it can be indicated for can be widened with the concomitant application of bone graft, GBR, socket-lift, and nasal cavity floor elevations.
- Can be applied to immediate loading cases
- Although the above examples have all been conducted with using one-stage method, the application of two-stage types could be the key to gaining esthetic outcome.

5. An example where one-piece type implant was placed into the right mandibular central incisor after the extraction of residual cyst

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Yasuhito Suzuki

Yuko Suzuki

Akira Okamoto

Niwa Ken

Introduction

The main issue often associated with implant treatment is resorption of alveolar bone. This is particularly prevalent with the two-piece type implant with its design of the joint between the fixture and the abutment to be placed under the gingival margin. The use of one-piece type could solve this problem, but it was thought that its application with GBR technique to a case with significant bone resorption was thought to be a difficult problem in itself.

Here we present a successful case whereby AQB one-piece type was installed into the anterior region concurrently with the extraction of large cyst in the same area.

Case example:

Patient: 42 years-old male

To the right mandibular central incisor position that had been extracted at the previous clinic, a residual cyst, size of the head of a thumb had been left. At the same time as extracting the cyst, AQB one-piece type implant was installed to remodel this position.

The treatment plan for implantation to an area with significant bone deficiency typically requires the bone to recover first, and then the implant placement to achieve a favorable outcome. However, it was thought that by employing HA coated implant, and concomitantly using GBR, early bone integration would be possible and would lead to improvements in patient's QOL.

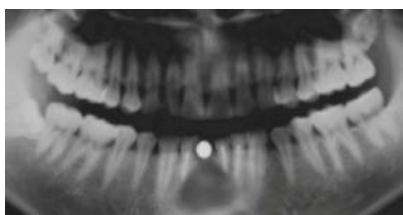


Fig. 1 Vacant area left after the extraction of cyst



Fig. 2 Indentation in the gum profile

Treatment plan

With the use of panoramic radiograph and study model, the treatment outline was explained to the patient. The patient had requested placement of permanent prosthesis thus the pros and cons of implant treatment were explained to gain patient consent.

In accordance with the treatment plan, the cyst was extracted on November 2006 after applying a mucoperiosteal flap under local anesthesia (Fig. 3, 4).



Fig. 3 Vacant area containing residual cyst



Fig. 4 Cyst extracted

The layer of surrounding bone that was suspected of being infected was milled (Fig. 5) before placing the implant, 4LM for trial placement (Fig. 6). The titanium mesh, 0.1 mm in thickness, was trimmed to match the deficient area. The vacant space that was created upon cyst removal was filled with amalgamate paste consisting of 1 ml of DFDBA (LifeNet Health, use of which had been given consent to by the patient) and 0.4 g of HA (Zimmer Dental, Inc.) added with patient's blood. The treated area was finally covered with the prepared titanium mesh and with non-absorbable membrane – Cytoplast® (Osteogenics Biomedical) that corresponded to the size of the titanium mesh, to be fixed onto the bone surface with Bone Tack (ACE Surgical Supply, Inc.).

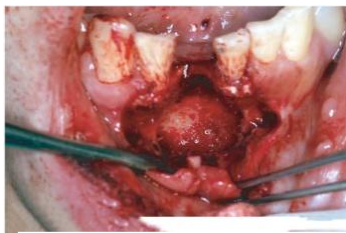


Fig. 5 Area of vacancy where a layer of bone has been removed

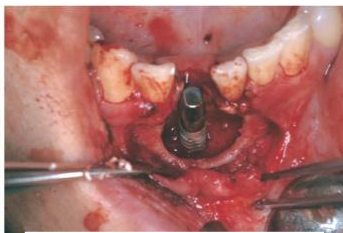


Fig. 6 Trial implant placement



Fig. 7 suitably fitted implant

The detached mucoperiosteal flap was sutured closed after it was restored to its original position (Fig. 8). The condition was examined by taking postoperative dental radiograph (Fig. 9), and then the procedure was completed with administration of antibiotics and analgesics to the patient.



Fig. 8 Wound closure with mattress suture

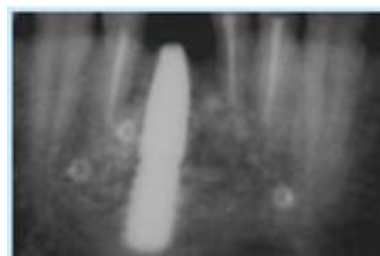


Fig. 9 Postoperative radiograph

The treatment area was washed the next day, and the suture was removed two weeks later. The wound was found to have healed four weeks after the operation (Fig. 10). After 12 weeks, the GBR subjected area was considered to have stabilized, therefore the titanium mesh and non-absorbable membrane was removed (Fig 11, 12), completing the secondary procedure by preparing the gum that surrounded the portion of the implant that was left exposed.



Fig. 10 State of the gum 4 weeks after the operation



Fig. 11 Membrane before its removal



Fig. 12 The bone that has been fully filled out can be observed

The state of the gum had been shown to have stabilized three weeks after the secondary surgery (Fig. 13) therefore surgical crown elongation was conducted to the top of the implant in preparation for the prosthesis (Fig. 14). The provisional crown was fitted onto the implant to wait for the healing of the treated area to be completed.



Fig. 13 The top of the implant that is slightly exposed



Fig. 14 Surgical crown elongation

The epithelial tissues of the gum was shown to be in favorable condition two weeks later therefore the impression was taken using personalized tray and silicon impression agent. A working model was fabricated with ultra-hard plaster, which was then set up on the average value articulator (Dental Hoby, Shofu Dental Co.) to be trialed.

Since the patient's occlusal form had been edge-to-edge bite, the prosthesis was fabricated by applying Rocatec treatment (3M) to the platinum-gold alloy frame (Fig. 15), to which sinfony composite was applied for esthetics (Fig. 16) instead of metal bonding resin, to avoid attrition of the antagonistic teeth. The fabricated superstructure was fixed with glass ionomers, and the residual cement on the gingival margin was removed as much as possible under infiltration anesthesia.

The patient was satisfied with the outcome as the attached superstructure showed no significant differences with the natural teeth in terms of the structural appearance and color tone, and the indented cervical region restored (Fig. 17).



Fig. 15 Metal frame that has undergone Rocatec treatment



Fig. 16 Synfony applied on the working model



Fig. 17 Superstructure that merges in with the overall structural appearance

Conclusion

Implantation is usually difficult to be applied to cases with large bone deficiency such as the example presented here. However, by using tools such as titanium mesh and with simultaneous implantations, shortening of the implant treatment is possible. The downside to this in the long-run is the risk of exposure of the fixture due to constriction of the augmented bone, leading to loss of osseointegration and indentation of the gum as a result. We considered that the risk would be amplified with the use of two-piece type implant with the microgap, therefore one-piece type was chosen for this case instead. Healthy bones resided in the surroundings of the indented area and therefore was thought that the bone would heal relatively well in comparison to other techniques such as veneer grafts. The edge-to-edge bite of the patient indicates that the occlusal adjustment must be conducted with extreme caution therefore the follow-up has been conducted regularly every 12 weeks.

The elevated mucoperiosteal flap was restored to its original position for it to be closed with mattress suture (Fig. 8). The postoperative panoramic radiograph was taken (Fig. 9) and the implant treatment was completed by prescribing the patient with antimicrobial agent and anti-inflammatory agent to prevent complications such as infection and pain.

6. A case of thinning maxillary molar alveolar bone which has been subjected with concomitant application of Piezosurgery and bone compression with socket-lift procedure

Ajimu Watanabe Dental Office

Naoshi Watanabe

Introduction

The implantation to thinning alveolar bone of the maxillary molars often requires maxillary sinus floor elevation. Sinus-lift or socket-lift procedures are indicated for this type of case, often choosing socket-lift considering the degree of surgical invasion on the patient. However, the major drawback of this procedure is that the most important step, the elevation of the floor is done blinded, thus lacking the accuracy factor. The widely applied socket-lift with osteotome is often caused problems such as sense of pain and discomfort from the hammering; and resulting in postoperative swelling and pain. Additionally, for those less experienced practitioners, the risk of perforation of the sinus membrane cannot be overlooked.

In an attempt to reduce the aforementioned risks, Piezosurgery (will be referred to as Pierzo) was conducted to the right hand side, and socket-lift procedure was conducted with bone compression kit to the left hand side to a patient with thinning alveolar bone of the maxillary molars. The two procedures are compared and discussed in the following sections.

Case 1

Patient: 51 year-old male

Chief complaint: Spontaneous pain to No. 19, 20. Wanted to be able to chew again.

First medical examination: March 2008

Medical history: None

Family medical history: None



Panoramic radiograph at the time of first medical examination

Current medical history and current state

On 2nd March 2008, the patient came to visit the clinic due to spontaneous pain arising in No 19 and 20 positions from acute case of periodontal disease. The partial floor denture for the maxilla (No. 13 to 15, and 2 to 7 free-end removable dentures), fabricated by the previous clinic, had not been used, for he had been dissatisfied with the esthetics and functionality of it. Additionally, the previous clinic had explained that implantation to these positions would be difficult due to the extreme thinness of the maxilla, and ad caused the patient to give up.

In explaining that with the use of HA coated AQB implants, the implantation could be possible, he requested implant treatment therefore the treatment was initiated once the preprosthetic surgery had

been completed.

Preoperative plan

Implant will be inserted to No. 13, 14 and No. 3, 4, 5.

The distance from the alveolar ridge to the maxillary sinus floor from the CT scan and panoramic radiograph were:

1. 2.2 – 4.5 mm for No. 13, 14 → Socket-lift procedure with Piezosurgery
2. \geq 12 mm for No. 4, 5 → Implantation with the standard procedure
3. Approx. 5 mm for No. 3 → Socket-lift procedure with Bone compression kit (Microtec Medical Holdings, Inc.)

Fixture used: AQB Implant 4102 \times 5

Bone graft agent: β -TCP (OSferion, Olympus Corporation) & Minopen (minocycline hydrochloride powder)

Details of the technique

June 9th 2008 Socket-lift procedure with Piezosurgery to No. 13, 14 (Fig. 2)

1. To No. 14 (roughly 2.2 mm from the maxillary sinus floor to the alveolar ridge) Piezosurgery was conducted to break through the cortical bone of the sinus floor immediately after marking with the round bar (Fig. 3).
2. To No. 13 (roughly 4.5 mm from the maxillary sinus floor to the alveolar ridge) Piezosurgery was attempted, but due to the thickness of the bone, it was difficult to breakthrough so guide-drill was used primarily till reaching 4 mm, then applied Piezo for a second attempt.
3. Bone graft agent [β -TCP (OSferin) and minopen] was applied with AQB osteotome (Fig. 4). Width of the cavity was gradually increased from 2.5 to 3.5 mm, and the structure was smoothed with the end-mill reamer (diameter 3.75 mm).
4. The No. 13 appeared to have achieved primary stability therefore was implanted using the standard protocol.
5. The primary stability in No. 14 position appeared difficult to be achieved along with the risk of subsidence into the maxillary sinus, therefore the 4102 fixture was implanted placed with a 5 mm cover cap (Fig. 5).



Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

The postoperative state

Presented with a light nose bleed, but had stopped by the next day.

Pain or swelling was not observed (Fig. 6)

Bone compression kit (Microtec Medical Holdings, Inc.) (Fig. 7)

1. Form a cavity till reaching 1 mm from the cortical bone of the maxillary sinus floor with Compress screw that has a drill as its tip (Fig 8).
2. Break the cortical bone of the maxillary sinus by using sinus screw with its tip shaped as an osteotome (Fig. 9).
3. Elevate the maxillary sinus floor by filling bone graft with sinus screw.
4. Increase the diameter of the sinus screw accordingly with the diameter of the fixture used.



Fig. 7



Fig. 8



Fig. 9

July 6th 2008, Socket-lift procedure with bone compression kit to No. 3, 4, 5

1. Implant cavity was constructed for positions No. 4 and 5.
2. Bone compression was applied to No. 3 (approx. 6 mm from the alveolar ridge to the maxillary sinus floor) with the following steps.
 - ① Implant cavity was formed till reaching the cortical bone of the maxillary sinus with AQB guide-drill (Fig. 10)
 - ② The cavity diameter was expanded with the compress screw #2 (2.0 mm diameter tip), #3 (2.4 mm diameter tip) from the Bone compression kit.
 - The distance from the base of the cavity and the cortical bone of the maxillary sinus was 1 mm.
 - ③ The cortical bone of the sinus floor was broken though with 3 mm diameter sinus screw (Fig. 11).
 - ④ Bone graft agent [β -TCP (OSferin) and minopen] were gradually filled in three batches using the 3 mm diameter sinus screw, (Fig. 12).
 - ⑤ Conducted step④ three times with 3.5 mm sinus screw, and smoothed out the cavity wall with 3.5 mm diameter end-mill reamer.
 - ⑥ Implantation was conducted undergoing the standard protocol confirming that 10 mm of AQB alarm gauge would fit into the cavity (Fig. 13)

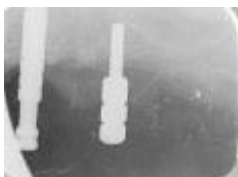


Fig. 10



Fig.11



Fig. 12



Fig. 13

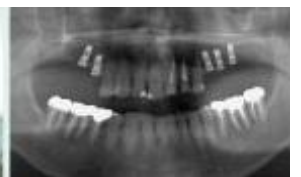


Fig. 14

Postoperative state

No nose bleeds or the pain had receded by the next morning.

The postoperative panoramic radiograph confirmed that the maxillary sinus floor to have been elevated

(Fig. 14).

The plan from present is to go onto prosthesis placement after an observation period of 3 to 4 months.

Discussion comparing the two surgical techniques

1. Degree of surgical invasion

Pierzosurgery is a method to hammer through the sinus floor with an osteotome, but for this example, since it had been a greenstick fracture, and the thickness of the bone was merely 2 to 3 mm, the patient did not feel any discomfort or pain from the hammering.

On the other hand, the degree of surgical invasion from using bone compression kit is relatively small as the elevation is conducted with wrench and screw. However, it was found to be more time consuming than the former technique.

2. Sense of breaking through the cortical bones of the maxillary sinus floor

It is hard to say either of them have distinct signs.

With Pierzo, it has been described as having a sense of fall through, but this has not always been apparent. While milling the bone, the pitch of the ultrasound shifts to a higher note as it is transferred from the palatal side to the cortical bones of the sinus floor, thus this change might also be an effective for determining the point of breakthrough.

On the contrary, point of breakthrough using the Bone compression kit is not at all audible while elevating with the wrench and screw. Therefore the breaking point was confirmed with the use of dental radiograph when the screw was inserted to 6 to 7 mm meniscus markings. In other cases, however, there have been instances where a sudden loss of resistance is felt. This could also be said to be the sense of breaking through the cortical bone. The risk of perforation of the maxillary sinus membrane is considered to be relatively low since the elevation is conducted via the hand held ratchet wrench instead of a hammer.

3. Comparison of the two techniques

The time that it takes to breakthrough the cortical bone is shorter with Pierzo, but due to the indistinctive nature of breakage signs, it is necessary to be aware of the changes in the milling sounds. The milling with Pierzo is by ultrasounds which is said to only affect the hard tissues, therefore was thought no to be damaging to the sinus membrane. However, there have been reports in other examples using ultrasounds that have resulted in postoperative nose bleeds therefore it must have had sequential effect in some way. In addition to the fact that the meniscus markings on the tip of the drills are difficult to see, milling should be conducted with upmost care to avoid perforating the membrane.

Since the elevation with bone compression kit is conducted manually with a wrench, the risk of membrane perforation is thought to be relatively low. However, as with the Pierzo method, the sense of breakthrough is not extremely noticeable, it is vital to confirm with dental radiograph during the procedure (multiple checks may be necessary for some cases) therefore inevitably lengthening the treatment time.

There have been instances in the past whereby the bone was so weak and thin (Class III to IV under the Lekholm & Zahb classification) that the torque force could not be gained to break through the sinus cortical bone resulting in idling of the screw. Fortunately, the bone was able to be broken though on the

second hammering with the osteotome therefore the degree of invasion could be minimized.

Conclusion

Socket-lift method is an indispensable tool for clinical practice with implants, but there are many aspects that are largely dependent on the experiences of the practitioner, therefore cannot be said to be a highly reliable method.

To minimize the risks and to increase the reliability of the procedures, it is thought extremely effective to master a number of procedures, and understand the pros and cons of each to be able to differentiate accordingly to their indications.

7. Application of one-piece implant to a case after the extraction of keratocystic odontogenic tumor that had arisen in the wisdom tooth of the left mandible

Oral and Maxillofacial Surgery, Nasu Chuo Hospital
Yasuo Watanabe

Background

Under 1992 WHO classification, keratocystic odontogenic tumor had been classified as a type of cyst with the name odontogenic keratocyst. However in 2005, the WHO histological classification for odontogenic cyst was revised and the odontogenic keratocyst from the past classification that had the keratinized epithelial lining on the cyst became known as keratocystic odontogenic tumor to be managed as one of the benign tumors.

The present case example is one where keratocystic odontogenic tumor that had developed close to the wisdom tooth on the left mandibular was extracted, and the wound was left open.

The bone augmentation and repair of the treated area was confirmed a year and two months later, in preparation for AQB one-piece type implant placement to reconstruct the occlusal form. This resulted in improved QOL of the patients.

Case 1

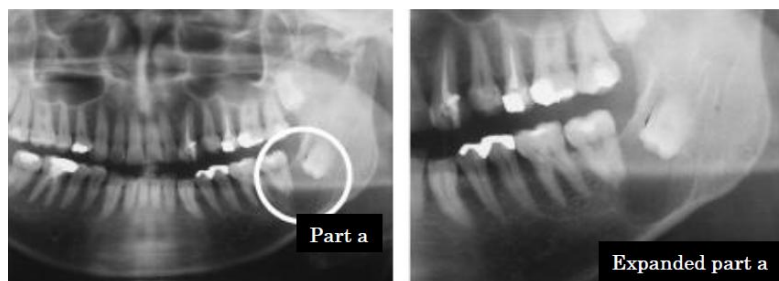
Patient: 42 year-old male

First medical examination: March 2005

Chief complaint: Swelling in the gingiva, surrounding the left mandibular molars

Medical history: Allergic rhinitis

Present medical history: On March 2005, the patient became conscious of the swelling of the gum in the left mandible and bad breath, and went to visit the nearby dental clinic for a consultation. A shadow the size of a chicken egg became evident with analysis of the X-ray radiograph, from the apical region of the mandibular second molar to the mandibular ramus on the left, and was referred to our clinic for further inspection.



Panoramic radiographs at the time of first medical examination



CT scanned images at the time of first medical examination

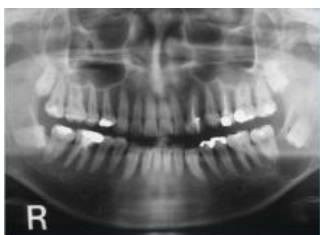
Facial features: Swelling in the left corner of the mandible

State of the oral cavity: Swelling in the left mandibular molar region

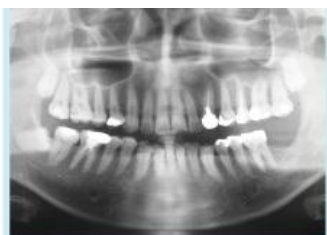
Image analysis: A shadow the size of a chicken egg was found from the left mandibular second molar to the mandibular ramus that included the wisdom tooth. A portion of bone on the labial side was found to have been resorbed due to the pressure exerted.

Treatment procedure

- March 2005 First medical examination at our clinic
Panoramic radiograph: A shadow the size of a chicken egg was found from the left mandibular second molar to the mandibular ramus that included the wisdom tooth.
CT scanned image: confirmed a portion of the bone on the labial side to have been resorbed with pressure.
Clinical evaluation: odontogenic keratocyst
- March 2005 Operation
The lesion that was present on the left mandibular second molar to the mandibular ramus was extracted, and the wound was left open.
Histopathological finding: Keratocystic odontogenic tumor
- March 2006 Panoramic radiography:
Pathological condition – relapse was absent, and confirmed bone recovery with augmentation.
- June 2006 Implantation
- August 2008 Superstructure placement
- July 2009 Treatment outcome is still under observation.



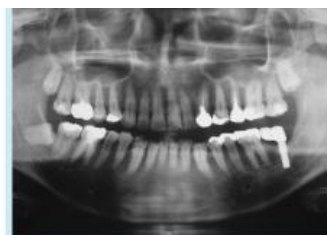
Panoramic radiograph taken at the first examination



Panoramic radiograph of the state a year and 2 months after the cyst extraction



Panorama radiograph at the time of implantation



Panoramic radiograph 2 years after superstructure placement



8. Application of PRGF (plasma rich growth factor) as a technique for alveolar bone regeneration for implant treatment

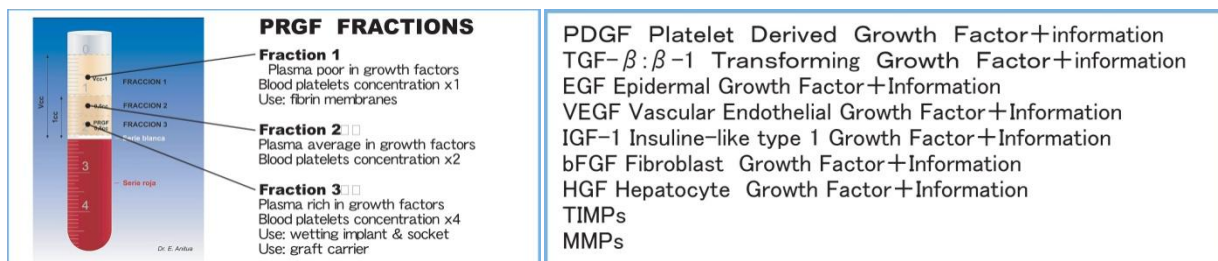
Sato Dental Clinic
Dr. Fumiaki Sato

Introduction

The PRGF method that has been developed by Dr Eduardo Anituan (Biotechnology institute, Spain) is a viable means for implant treatment and is distinct from PRP method as this method can be applied to periodontal bone regeneration without damaging the signaling growth factor is transferred around the body residing in the blood platelets.



Extracted patient's venal blood preoperatively. Separate with the specialized centrifuge for 8 minutes, $460 \times g$ 1800 rpm into Fractions 1, 2 and 3 to be extracted individually with transfer pipette.



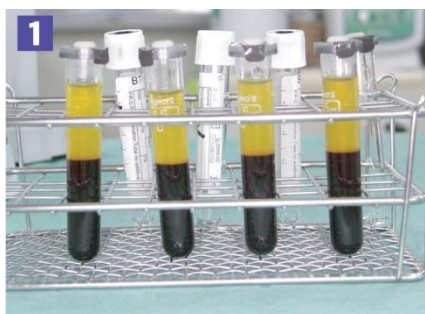
A case where maxillary sinus floor elevation was no longer required with the application of PRGF system

Patient: 54 year-old male

Implant treatment was planned to the maxillary right first molar and the second molar after extracting the second molar tooth since it had been severely affected with periodontal disease and periodontal inflammation and had fractured root.

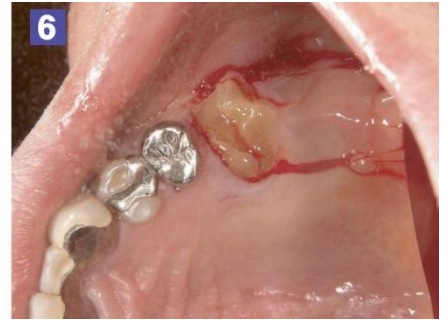
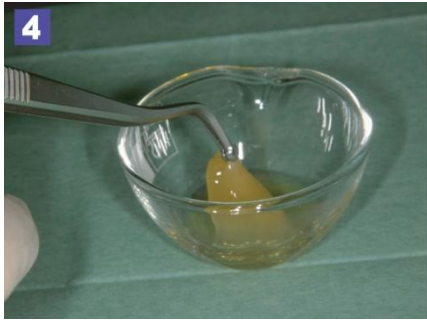
Fibrin clot pre-prepared with the PRGF system was filled into the extraction cavity (bone graft agent was not used) at the same time as the extraction of the first molar.

Sufficient amount of bone regeneration was confirmed three months later, and AQB implant treatment was conducted under the standard protocol without the elevation of maxillary sinus floor.

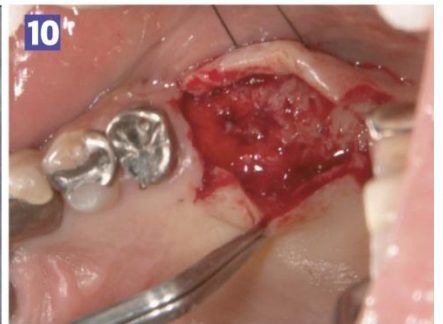


1. 20 ml of patient's venal blood had been collected – after fractionation with the centrifuge
2. Right maxillary molar – decided to be extracted as it had been severely affected with bone resorption and with a fractured root.

3. The alveolar bone resorption profile can be confirmed – extracted on April 14th 2008.



- 4. Consists of growth factor that has been prepared with the PGRF system. Extracted and prepared the fibrin membrane from the blood plasma collected from the patient right before tooth extraction.
- 5. Fibrin clot in its gel-form prepared with extracts from Fraction 3.
- 6. Fibrin clot in its gel-form prepared with extracts from Fraction 2.



- 7. Fibrin membrane in its gel-form prepared with extracts from Fraction 1 was used to fill the treatment area. Bone grafting agents were not used.
- 8. The distance from the alveolar ridge to the maxillary sinus floor was calculated to be 3.8 mm from the CT scan taken before the extraction.
- 9. Alveolar bone regeneration can be confirmed from the CT scan taken on June 27th 2007.
- 10. Alveolar bone regeneration can be seen with incision and detachment of the mucoperiosteal flap.



- 11. The presence of alveolar bone can be seen after the formation of implant cavity for AQB 5102 type.
- 12. Fixture type 5102 implanted, type 5082 also implanted to the second molar region – July 15th 2008.
- 13. CT scan was taken immediately after the operation on the same day. Fixture was inserted without elevating the maxillary sinus floor (used AQB 5102).

Advantages of PRGF system

There are two means in which to apply the growth factors derived from platelet α granule contained in the blood taken from patient's own vein, for tissue regeneration – PRGF and PRP techniques.

1. With the PRGF method the centrifugation only requires a single spin at low rotational speed, therefore does not damage the platelets that are sensitive to heat.
2. The white blood cells that act to inhibit the platelets are removed with the PRGF method.
3. The reaction mixture of PRGF consists of and activates viscous proteins, similar to fibrins, required as the scaffold for regeneration.

The bone regeneration (augmentation) is achieved with these properties of PRGF.

Conclusion

The tissue regeneration is accelerated by insertion of growth factor and fibrin membrane, extracted with PRGF method from own peripheral blood, and conducting this simultaneously with tooth extraction.

With the application of this method, the alveolar bone quantity (height, width) can be maintained, and the fixture can be inserted to cases that would normally require elevation of the maxillary sinus floor.

In addition, it can also be applied to those cases in which the distance to the mandibular canal is shortened with the extraction of mandibular tooth. This would allow safe insertion of the fixture.

9. Clinical co-development in the application of β -TCP beads to jaw bone regeneration

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Outline

The use of β -TCP has currently been approved in the field of orthopedics but unfortunately not in the field of craniocervical. We report here of the clinical co-development that was conducted with ADVANCE Co., Ltd., for β -TCP beads to be applicable to jaw bone regeneration.

The use of β -TCP beads was approved by the ethics committee of Chiba medical center, restricted to be applied to cases treated with AQB implants with the aim of jaw bone augmentation. The clinical co-development is still being continued.

Material

β -TCP beads (manufactured by ADVANCE Co., Ltd.)

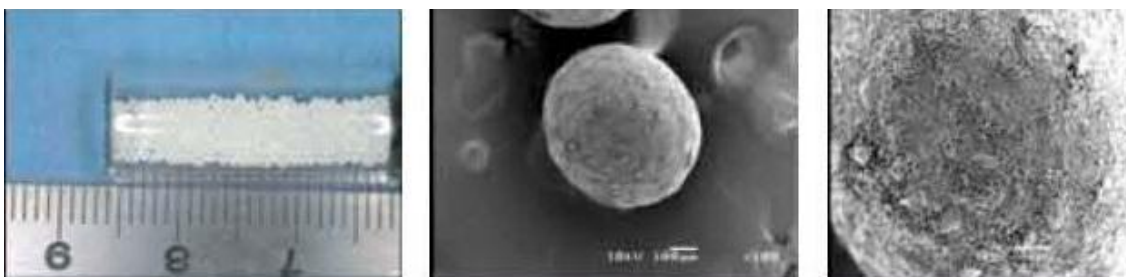
Generic name: β -Tricalcium phosphate

Molecular formula: $\text{Ca}_3(\text{PO}_4)_2$

Molecular weight: 310.18

External appearance, molecular diameter: white granular, 500 to 700 μm

Porosity: approx. 30%



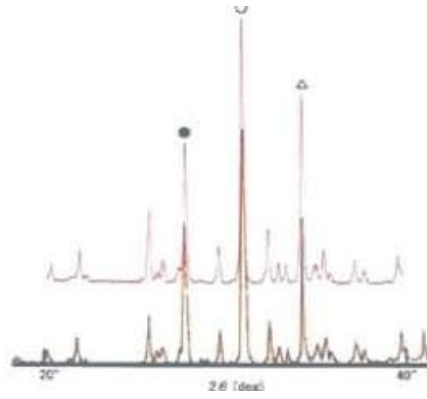
β -TCP analysis

① Powdered X-ray diffraction apparatus (XRD)

Top: β -TCP beads

Bottom: OSferin (Olympus Corporation)

The three distinctive peaks that are a characteristic of β -TCP were shown. Both samples showed the same diffraction peaks thus confirming that the crystal structures to be the same.



② Energy Dispersive X-ray Fluorescence Spectrometer

Analysis Device: JED2140

Accelerating voltage	30.0KV
Take-off angle	35.0 degree
Effective time	100 seconds

Elements	Weight (%)	Atomic weight (%)
O	38.8	59.60
P	16.1	12.79
Ca	45.1	27.61
	100	100.00

The samples were analyzed with the X-ray fluorescence spectrometer attached to the scanning electron microscope to detect the characteristic X-ray that emerged from the sample irradiated with electron beam. The resulting element distribution confirmed β -TCP to be a highly pure form.

Case 1 - β -TCP beads were applied on the surface to increase the alveolar bone width

Patient: 53 year-old female
 Subject area: The right mandibular molars (corresponding to No. 18, 19)



Preoperative image The state before application of beads The state after application of beads Three months after application Five months after application of beads. Three months after implantation



- Seven months after application of beads
 Five months and one month after the implantations
 - Fourteen months after application of beads
 Twelve months and eight month after the implantations

Three more similar cases were conducted to the patients listed below:

Case 2: 32 year-old female, to the left mandibular molars, No. 30, 31.

Case 3: 63 year-old male, right mandibular molar, No. 19.

Case 4: 39 year-old female, right maxillary anterior tooth, No. 9.

Case 2 – A case in which β -TCP beads were subjected to the extraction cavity which had not healed

Patient: 67 year-old male

Subject area: Right mandibular molars (corresponding to No. 19)



Preoperative

State before beads application

State after beads application

Three months after application of beads

Five months after application of beads
A month after implantation



Nine months after application of beads

Five months after application of beads

Twelve months after application of beads, and 8 months after implantation

A similar case:

Case 6: 67 year-old male, right maxillary molar, No. 14.

Result

① Cases where the alveolar cortical bones were augmented

The β -TCP beads applied to the area where the bone surface was not surgically pre-treated, became tangled with the periosteal fibers, and were not absorbed even when a period of 14 months had passed in some case examples. However, there were no evidence of postoperative infections, and its tissue biocompatibility was thought to be relatively low.

② Cases where the beads were applied to the extraction cavity that were not healing well

The bonding with the bone was confirmed 4 months after the application of β -TCP beads. At 9 months, the beads had been absorbed gradually becoming replaced by bone, and by 12 months, the bone structure had been developed to the extent that it could be thought of as a portion of the bone ridge.

Discussion

The β -TCP beads (approx. 30% porosity) was confirmed to be an effective artificial bone graft material

that could be safely applied to the oral cavity from the absence of postoperative infection. However there were still unknown factors that were needed to be clarified due to the inexperience, such as the absorption time of the beads (some cases took 12 months) or for the replacement with bone.

To provide answers to these queries, more absorbable beads with increased porosity (up to 50%) predicted to have sufficient strength was newly developed. By increasing the number of cases with this technique, we are planning to elucidate the characteristics of the β -TCP in terms of the operating strength, absorption time and replacement of bone and in comparison to the beads that was used in this investigation.

The efficacy of β -TCP beads in the implant treatment was affirmed from the current clinical co-development, and has acted as a driving force in accelerating the rate of the development in preparation for the clinical trials in order to gain approval to be readily available for general implant treatment.

10. Fabrication of superstructure with Cadim 105 (CAD/CAM)

Hoshi Dental Clinic
Haruo Hoshi

Introduction

The prosthesis treatments with CAD/CAM and implant treatment are the most advanced technology at present.

The summary of the methods to apply Cadim 105 system CAD/CAM (ADVANCE Co., Ltd.) to fabricate the superstructure of the AQB one-piece implant are presented in the subsequent sections.

Materials and methods

1) Cadim system

The CAD 025 system consists of part for taking measurements, CAD that can operate and modify the measured form, and CAM that mechanically process the material.

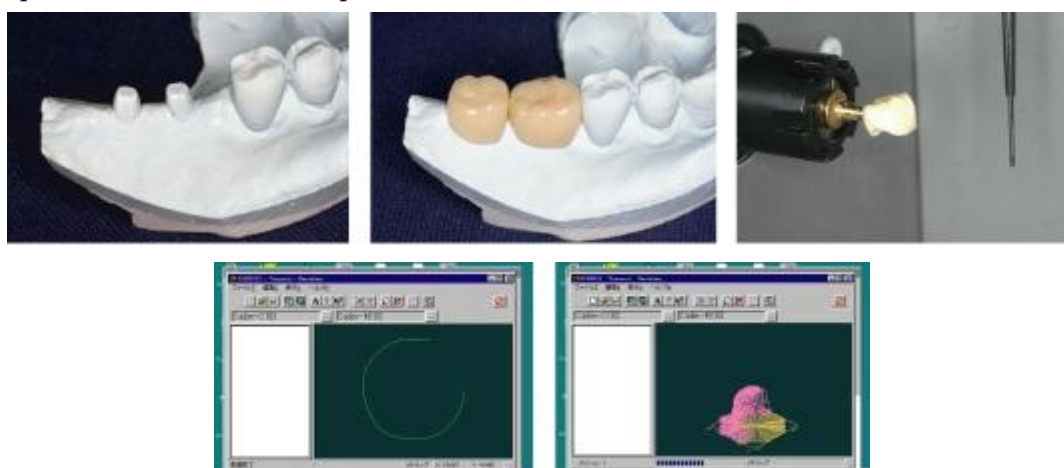
There are various sizes of ceramic blocks that can be used are provided to be applicable to different teeth, anterior, canines or molar teeth. The blocks that are in use are chosen to have properties that are as close to the natural teeth as possible.

Material	Flexural strength (MPa)	Pressure (yield) strength (MPa)	Vickers Hardness
Enamel of natural teeth	80-90	200-442	270-366
Cadim Bioceramics	90-100	400-500	280-380

Table 1 – properties of the blocks

2) Measuring the model

Construct the pattern with resin. Measure the pattern with Cadim 105. First, measure the highest expanded region in 2D mode then measure the three-dimensional form in its 3D mode, before analyzing the occlusal plane and the abutment plane.



3) Mechanical milling

From the measured occlusal plane and abutment plane data, construct a target model on computer, attaching a collar where necessary, to enable it to calculate the cutting path with respect to this model. This information is transferred to the controller to operate the cutting machine.



Case examples

Patient: 53 year-old male
 Medical history: No systemic conditions needed to note

The patient came to the clinic having recognized his masticatory dysfunction with the fracturing of the partial denture to the right mandibular teeth, No. 18, 19. He complained of the difficulty in placement/displacement of the denture and chewing with the denture. No. 18, 19 teeth, on the right side of the mandible, had been lost. In accordance with the patient's request, the implant was inserted into the vacant positions to improve the masticatory functions.



The all-ceramic crown as the superstructure was fabricated using the standard impression imaging procedure, and using the Cadim 105 (ADVANCE Co., Ltd) with the aforementioned procedure.



Conclusion

The spectrum of dental treatments required by the patients has widened. The need for estheticism and biocompatibility are needless to say, but also the shorter treatment periods, and their cost effectiveness have increasingly become the norm. There are several advantages of using CAD/CAM systems such as all ceramics restorations are possible at a much lower cost than it had been in the past, or the fact that the treatments are possible to be conducted the next day in some cases, due to the rapid fabrication process. Further transformations in the system, as well as the materials can be expected. In addition, along with the strong demand for estheticism in the current practice, the popularity of all-ceramic crown can be expected to increase in the future.

