

Chapter 8: Long-term observations of implant treatments

1. Five case examples of AQB implants that were installed more than ten years ago

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It has been 15 years since the AQB implants were introduced into the market. I have been installing AQB implants since their clinical trial stages while practicing in the Dental surgical unit in Mitsui Memorial Hospital. There are currently many examples where more than 10 years have passed and that have continued to retain favorable conditions.

Here a selection of examples is presented.

[Case 1].

Patient: 73 year-old male

Main complaint: Requested implant replacement of the missing teeth

Treatment progress: The patient was referred from another clinic. He had already been treated with implants to the positions No. 2 to 5, as well as to No.31 and had been placed with superstructures.

Medical history: Pulmonary tuberculosis, left submandibular gland had been extracted due to left sialolithiasis of the submandibular gland.

Ten years has passed since the implant installation, but no presences of inflammations in the surrounding mucosa, mobility of implants or alveolar bone resorption have been observed, and satisfactory progress has been made thus far. In addition, the 5 implants placed into the left maxilla and mandible that have been installed for 12 years have also shown stability over the years. The natural teeth No. 8 and 9 that were connected to implants have not yet shown any alveolar bone resorption, ankylosis, or disuse atrophy.



Image-1: The state of oral cavity at the first medical examination

Image-2: The current state (May 2009), 10 years after the installation.

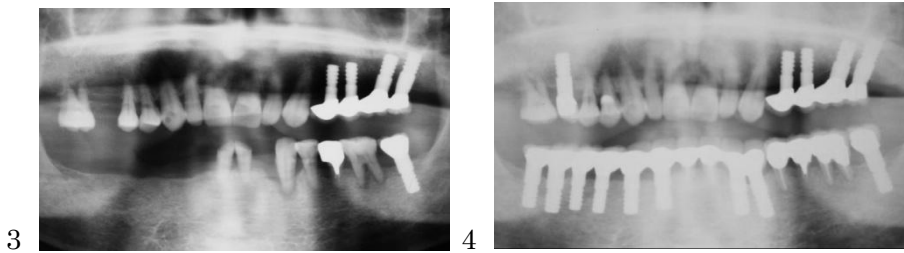


Image-3: Panorama radiograph at the first medical examination

Image-4: Panorama radiograph 10 years after surgery (May 2009)

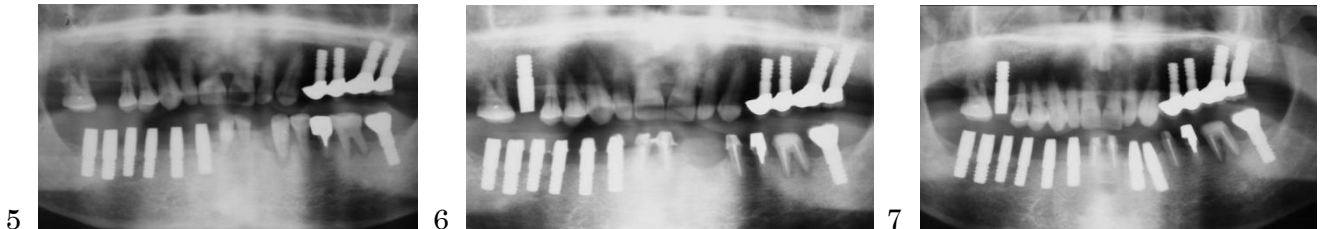


Image-5: AQB implants were installed to the 18 to 23 positions. (5MM to No. 18,19 and 4MM to No. 20 to 23).

Image-6: Installation of 5MM to No. 14 three months later.

Image-7: Installation of 4MM to No. 26 and 27.

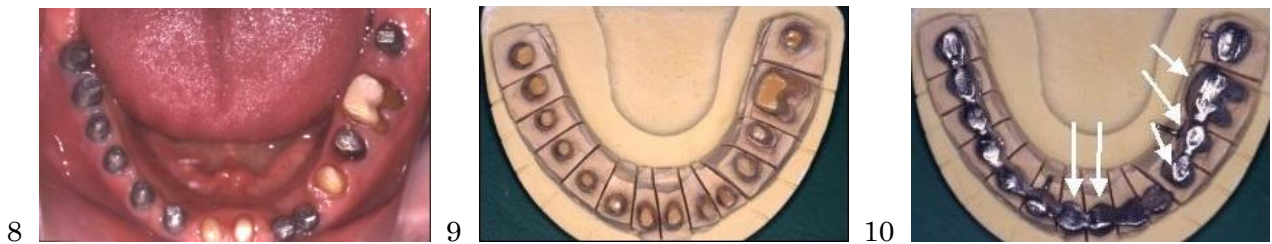


Image-8,9,10: No. 8 and 9 are natural teeth. In principle, they should not be connected to the implants, but due to the bone resorption from periodontal disease, and slight movement of the implants, it was deemed best to connect these together.



Image-11: Panorama radiograph a year later

Image-12: Panorama radiograph 3 years later

Image-13: Panorama radiograph 5 years later

[Case 2.]

Patient: 63 year-old female

Main complaint: Patient requested to continue the dental treatment, and to replace the missing teeth with implant prosthesis

Treatment progress: Came to this clinic with the request to continue dental treatment, the implants, complete with the superstructures were placed into the positions No. 13 to 15.

Medical history: Nothing to note

A period of 10 years has passed since the implant installation, but no complications such as inflammation in the surrounding mucosa, mobility of implants, alveolar bone resorption have been observed, with satisfactory progress. In addition, 11 years has passed since the 3 implants were installed by the previous clinic, and the progress appears to be satisfactory.

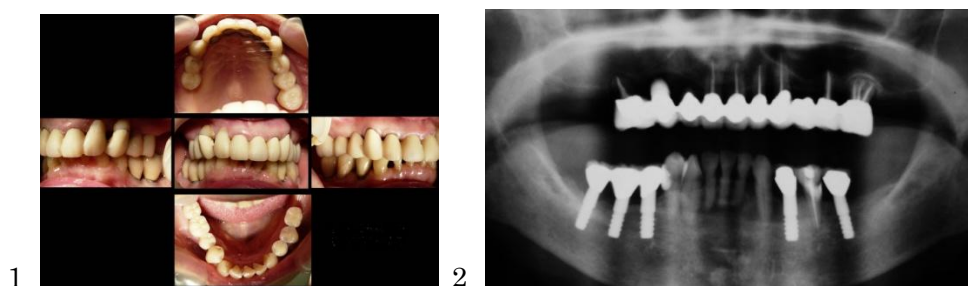


Image-1: State of the oral cavity 10 years after the implant surgery (May 2009).

Image-2: Panorama radiograph 10 years after the implant surgery (May 2009).

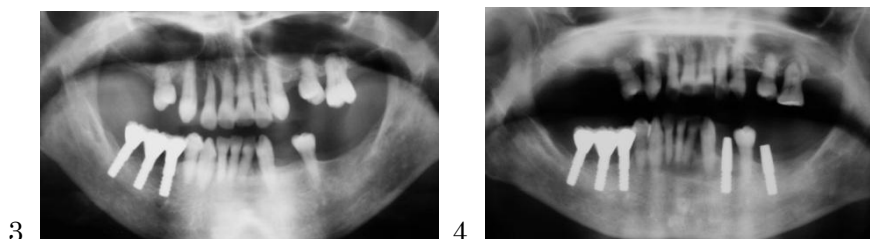


Image-3: Panorama radiograph at the first medical examination.

Image-4: 4MM and 4MS were installed to the positions No. 5 and 7, respectively.

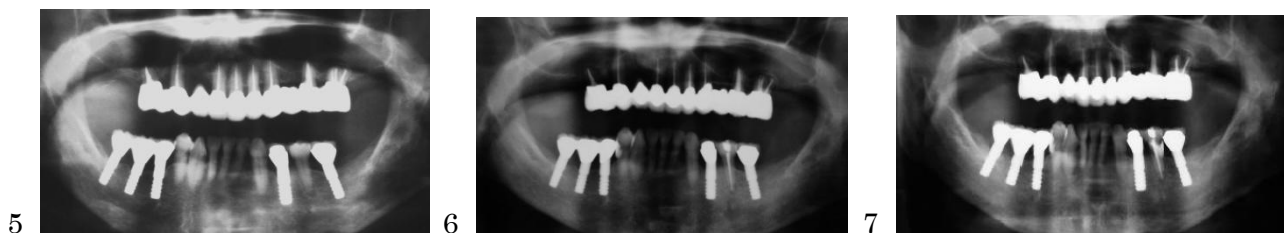


Image-5: Panorama radiograph a year after surgery

Image-6: Panorama radiograph 3 years after surgery.

Image-7: Panorama radiograph 5 years after surgery.

[Case 3].

Patient: 50 year-old male

Main complaint: Requested implant treatment to the missing teeth.

Treatment progress: Came to this clinic with the request to place implants from the previous clinic where the usual dental treatments were being conducted.

Medical history: Gout

A period of 10 years has passed since the implant installation, but no complications such as inflammation in the surrounding mucosa, motion of the implants, alveolar bone resorption have been observed. It is not necessarily the case that in an oral cavity that consists of both implants and natural teeth, the implants are more likely to be affected by inflammation of the gingival tissues surrounding the implant structures from conditions such as peri-implantitis. In such cases, where progressive periodontal disease has affected the whole of the oral cavity, even the looseness of natural teeth can subject excessive amount of occlusal pressure on the implants leading to serious problems. This is the reason for which regular occlusal check-up should be conducted regardless of the presence of noticeable symptoms.

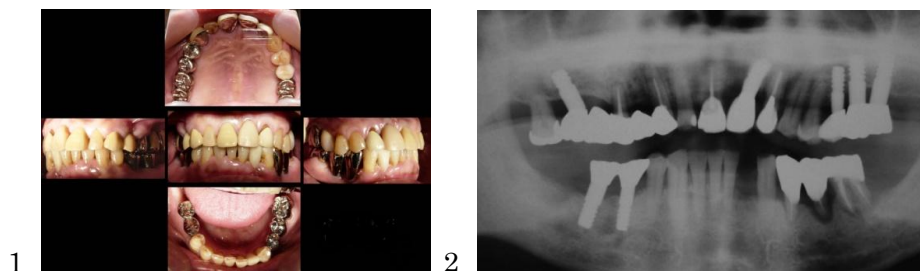


Image-1: Image of the oral cavity 10 years after the installation (May 2009).

Image-2: Panorama radiograph 10 years after the installation (May 2009).

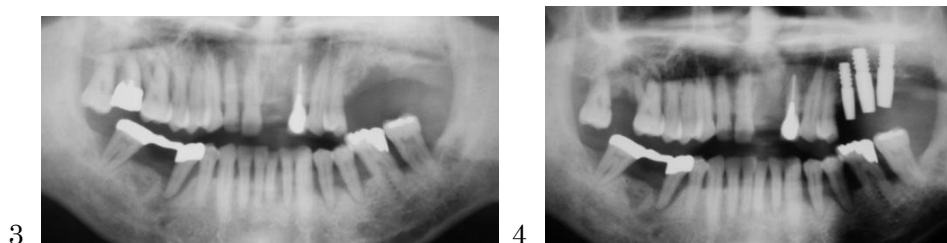


Image-3: Panorama radiograph at the first medical examination.

Image-4: Installed 5MM, 5MM, 4MS to positions No. 2, 3, 4.



Image-5: Installed 4MM, 5MS, 4MS to positions No. 8, 19, 20.

Image-6: Panorama radiograph 3 years later.

Image-7: Installed 5SM to No. 15, 5 years later.

[Case 4.]

Patient: 64 year-old female

Main complaint: Requested implant treatment to replace the missing teeth, and treatment to the anterior teeth.

Treatment progress: Came to this clinic with the request to place implants from the previous clinic where the usual dental treatments were being conducted.

Medical history: Nothing to note

The teeth in the maxillary premolar and molar regions except in the right maxillary premolars had already been lost, therefore presented with the flared-out of the anterior teeth, and could observe the loose motions of the remaining maxillary premolars. These were thus removed and were placed with prosthetics while the implants were installed primarily to the maxillary molars on the right and the left sides. After the extraction wound had healed, implants were installed to the right maxillary premolars in conjunction with GBR. A satisfactory outcome has been achieved even after 10 years.

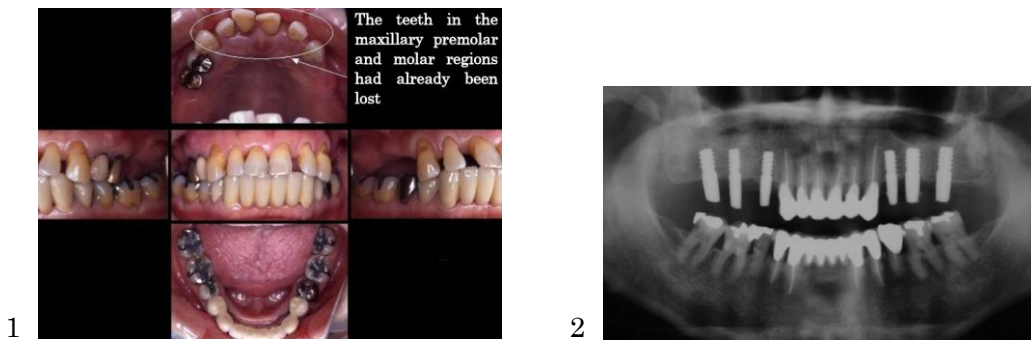


Image-1: Images of the oral cavity at the first medical examination.

Image-2: Panoramic radiograph at the implantation stage.



Image-3: No. 12 and 13 were extracted. To allow these positions to heal, the implants were installed primarily to No. 18 and 19 positions

Image-4: The implant body was exposed on the buccal side due to the narrowness of alveolar bone width at No. 12 position.

Image-5: Applied the bone fragments derived from the drilling to the exposed area.



Image-6,7: The resorbable membrane was cut out with a circular knife, and covered the implant and the bone grafted area on the buccal side.

Image-8: The state after suture.

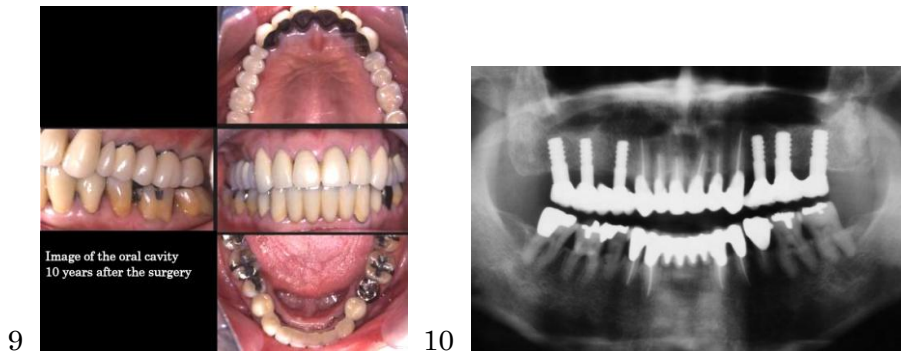


Image-9: Image of the oral cavity 10 years after the surgery (May 2009).

Image-10: Panorama radiograph 10 years after the surgery (May 2009).



Image-11: Panorama radiograph a year after installation.

Image-12: Panorama radiograph 3 years after installation.

Image-13: Panorama radiograph 5 years after installation.

[Case 5.]

Patient: 30 year-old female

Main complaint: Requested implant treatment to replace the missing teeth

Treatment progress: Came to this clinic for implantation, from the previous clinic where the usual dental treatments were being conducted.

Medical history: Nothing to note

The state 12 years since the implantation shows a satisfactory outcome with no inflammation surrounding the implant structure. The implant to No. 3 position was conducted in conjunction with socket-lift technique, 10 years ago. The radiographic image confirms the bone augmentation around the implant body, even though bone filling agents were not applied after the elevation of maxillary sinus floor. Such observation can be shown in the cases where a sufficient primary stability has been achieved, with no damages done to the schneiderian membrane.

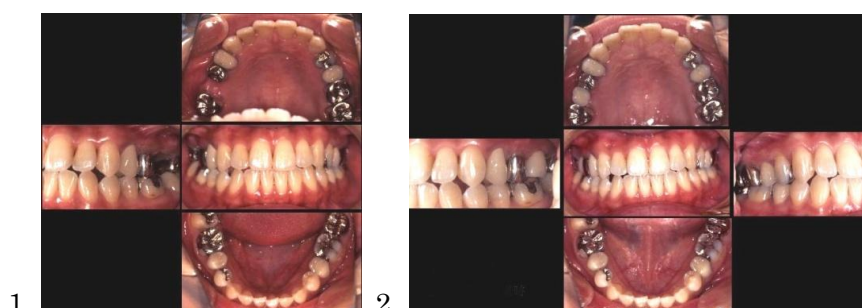


Image-1: Images of the oral cavity at the first medical examination

Image-2: Images after the placement of the superstructure, two months after installation



Image-3: Panorama radiograph a year later (No. 3 extracted).

Image-4: Panorama radiograph 2 years later (No. 3 extracted).

Image-5: Panorama radiograph 3 years later.

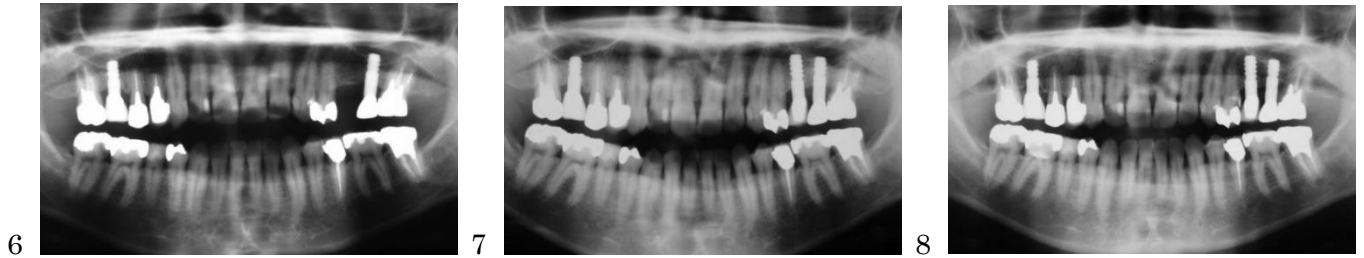


Image-6: Panorama radiograph 5 years later (3 years after No. 3 installation).

Image-7: Panorama radiograph 10 years later (8 years after No. 3 and a year after No. 4 installation).

Image-8: Panorama radiograph 12 years later (10 years after No. 3 and 3 years after No. 4 installation).

Conclusion

During the time period when the AQB implants were introduced into the market, the two-piece type dominated the dental implant market and the idea of hydroxyapatite coating were perceived poorly due to accounts of bone resorption to be associated with them. The implants in the market at that time required six to nine months before the placement of superstructure. AQB implants, one-piece type, with HA coating were introduced in the height of these circulating reports therefore were inevitably subjected to numerous skepticisms from general clinicians. One-piece types are not necessarily more prone to infections than its counterpart, and the HA coating layer was in actual fact, recrystallized, to produce a highly pure form of hydroxyapatite, therefore bones were not subjected to resorption, and could gain interaction with the bone roughly in a space of two months, ready for superstructure placement. Thus the treatment could be complete around two months. The various clinical studies have confirmed satisfactory outcome, and the use of AQB implants have become widely spread and have been applied by various general clinicians.

The factors that determine the implant treatment prognosis have been said not to be heavily dependent on the potential that the AQB implant has itself, but on the occlusal form, and occlusal force applied to the superstructures. The five cases that have survived the period of 10 years since it was implanted were presented here.

2. Three case examples of long-term AQB implant installation

Director of Kyroyama Oral and Maxillofacial Surgery Clinic
Yushiro Kuroyama

AQB implant systems introduced the one-piece and two-piece types in 1994 and 2002, respectively. The cases presented here are examples where each type of implants was installed on the year or on the following year after its release into the market. It has been 14 years since the one-piece type, and 7 years since the two-piece type were first installed, each of which have indicated satisfactory progress up to now.

Case 1: One-piece implant installed for 14 years and 9 months

Patient: 37 year-old female

First medical examination: August 1994

Medical history: No. 30 tooth had been extracted 20 years ago due to dental caries and the extraction socket was left untouched.

Present medical history: None



Image-1,2: Image of the oral cavity at the first medical examination

Image-3: Panorama radiograph at the first medical examination



Image-4: Panorama radiograph taken to evaluate whether the depth of the implant cavity could be increased with the alarm gauge.

Image-5: Panorama radiograph at the time of implant installation.

Image-6: Image 2 weeks after the implant installation.



Image-7: Dental radiograph after the placement of the superstructure

Image-8: Image after the placement of the superstructure.

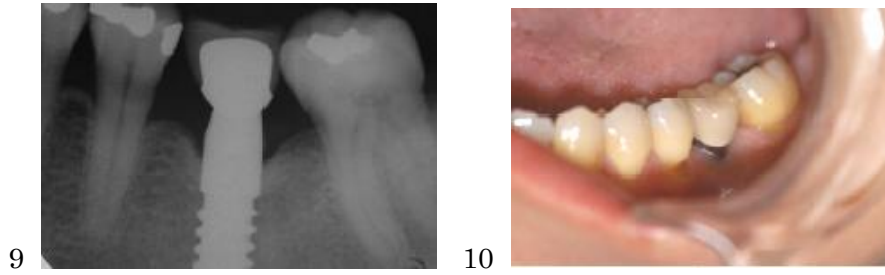


Image-9: Dental radiograph 14 years and 9 months after the placement of the superstructure

Image-10: Image of the oral cavity 14 years and 9 months after the placement of the superstructure.

Case 2: One-piece type installed for 14 years.

Patient: 58 year-old male

First medical examination: July 1994

Medical history: Loss of teeth that resulted from a traffic accident when 23 years of age, with fracture to the mandible.

Present medical history: None



Image-1: Image of the oral cavity

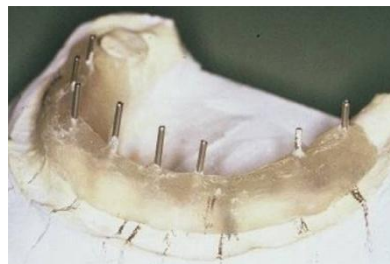
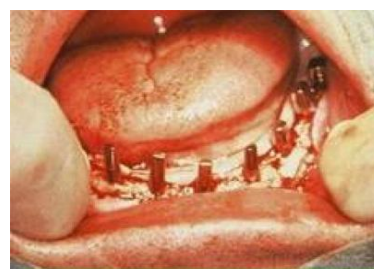


Image-2: Study model (for planning implant treatment)



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Image-3,4: Perioperative image.



Image-5: Placement of abutments



Image-6: Bite check



Image-7,8: Placement of the superstructure.

Image-9: The image of the oral cavity 14 years after the superstructure placement (The opposing maxillary teeth had to be placed with full artificial denture).

Case 3: Two-piece type installation conducted in conjunction with sinus-lift with platelet rich plasma (PRP) application, 7¼ years later

Patient: 62 year-old female
 First medical examination: January 2002
 Medical history: No. 3 to 5 teeth lost (periodontal disease)
 Present medical history: none

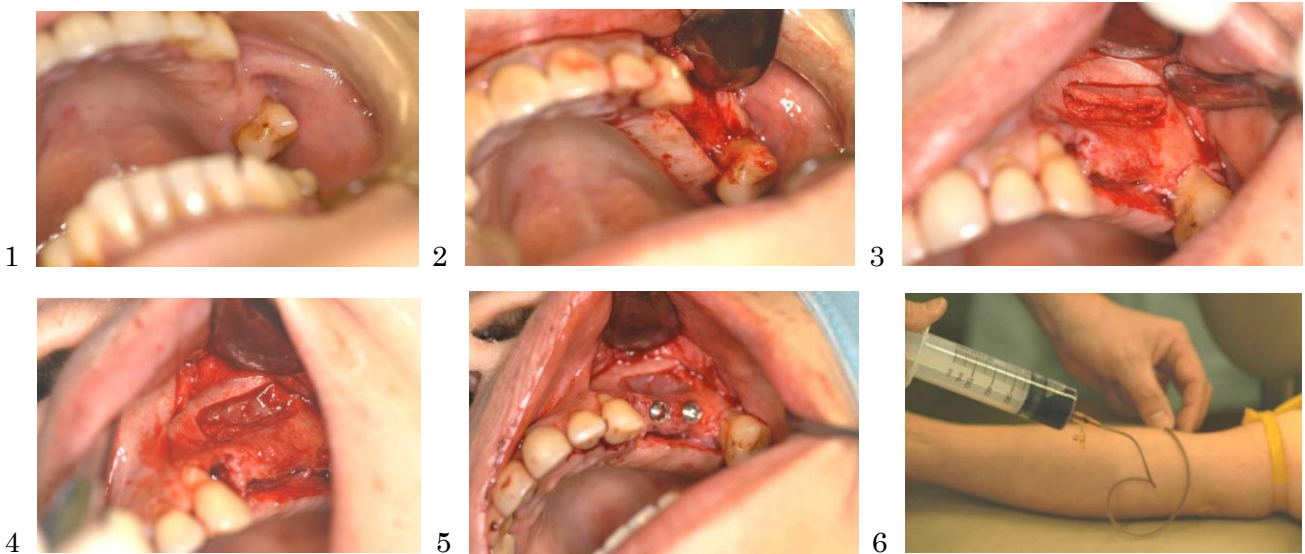


Image-1: Image of the oral cavity

Image-2,3,4,5: Images taken during the sinus-lift procedure.

Image-6: Blood collected prior to surgical procedures



Image-7: Fractionation of blood plasma with a specialized centrifuge machine specific for PRP.

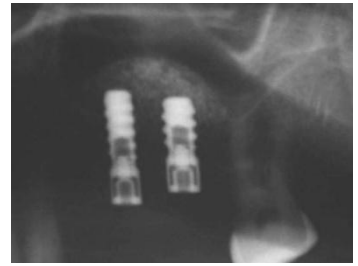
Image-8: A combined preparation of PRP, allograft bone, and β -TCP, (will be referred to as PRP filling agents)



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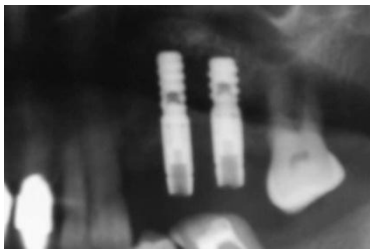


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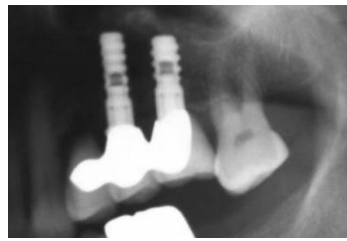
Image-9: Apply PRP filling agent to the subjected area of sinus-lift.

Image-10: The state after the lateral walls of the maxillary sinus has been recovered.

Image-11: Panorama radiograph after the fixture installation



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Image-12: Open flap surgery, conducted 5 months after the primary surgery, for the abutment placement.

Image-13: Panorama radiograph 7¹/₄ years later.

Image-14: Image of the oral cavity 7¹/₄ years later.

Conclusion:

The three examples that I have presented have all been installed soon after their introduction into the market, and therefore these are a representative of long-term cases of AQB implants. The one-piece type was regarded to have a high risk of bacterial infections, but its 14 years survival rate have proven otherwise. The long-term installation of implants of the past have shown downgrowth of the alveolar bone to be a common complication, however, in this case example, no such symptoms were seen. It is suggestive of the effect of recrystallized coating to be inhibitory to the downgrowth.

In the two-piece type examples, the implants have been firmly installed with the application of sinus-lift procedures. It is considered best to use two-piece implant to gain reliable osseointegration where the floor of the maxillary sinus is thin and fragile. The issues of screw loosening or fractures are of concern however in using the two-piece types. In this example, there was no evidence of these types of issues in the radiograph, with no loose movement of the superstructure. This long-term survival rate can be thought to be owing to the screw design of the AQB two-piece type implants, the smooth octagonal lock (SOL system).

3. Three case examples of AQB one-piece type implants installed for more than 17 years

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The clinical trials of AQB one-piece type implants began on November 1988 in dental surgery unit of Mitsui Memorial hospital. It has been 19 years since the first implant was installed. It is rare to find a case example in other implant systems that have been observed for this amount of time, therefore this was thought to be a valuable example as the implant survival and its treatment outcomes.

The following points were concluded from the radiograph observations:

- ① No vertical bone resorption in those surrounding the implant
- ② The transparency of the surrounding bone has lessened significantly

Case 1: One-piece type to the left mandibular molar, 18 years ago

Patient: 43 year-old female

Period of implantation: June 1991

Main complaint: Requested implant installation to the left mandibular molars

Medical history, family history: None

Present medical history: No. 31 extracted 7 years previously, and No. 30 had been extracted before that. The patient came to the clinic with a request for implant treatment, as the sense of discomfort with previously placed denture had persisted.

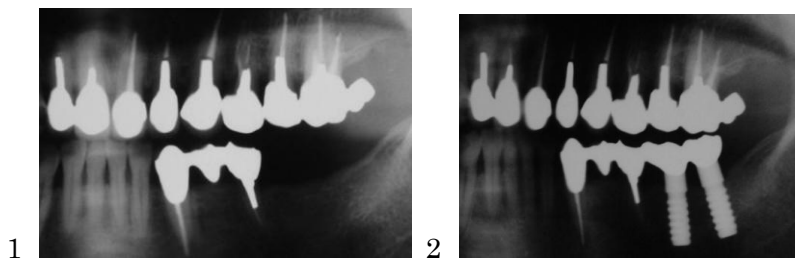


Image-1: Panorama radiograph before surgery. 5MS AQB one-piece types were installed to No. 30 and No.31 positions. The primary stability was achieved, and the procedure was completed with the superstructure, platinum-gold alloy crown, placement 4 months later.

Image-2: Panorama radiograph 3 years after the surgery. A slight downgrowth can be seen, but is not significant.

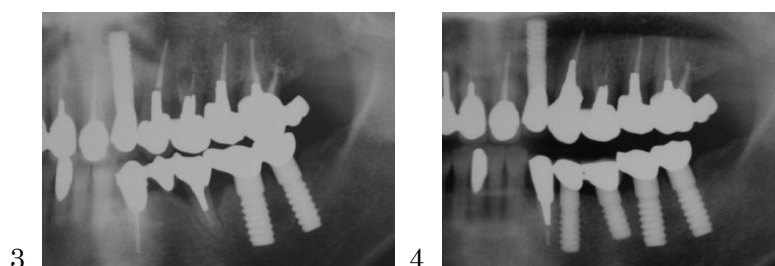


Image-3: Panorama radiograph after a course of 8 years. 4ML implant was placed at the position No. 7 after it was extracted as it was deemed not able to be preserved due to fracture in the root.

Image-4: Radiograph taken 14 years later. No. 29 tooth was extracted due to its root fracture, and was replaced with 4MS AQB one-piece type implant.

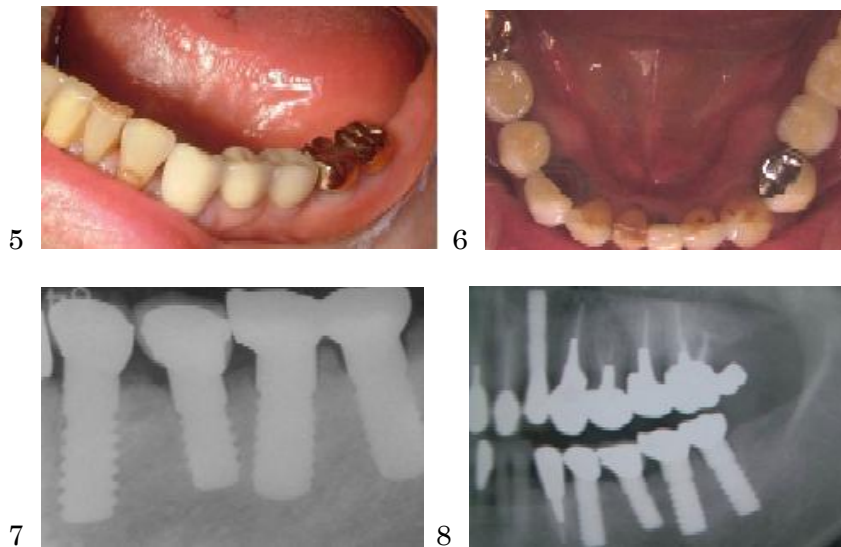


Image-5,6,7,8: Images of the oral cavity photographs and radiographs, 18 years post-surgery. No presence of bone resorption in any of the bone structures surrounding the implant.

Case2: One-piece implant to the maxillary anterior region – 17 years, 5 months ago

Patient: 49 year-old female

Period of implantation: January 1992

Main complaint: Request implant to the maxillary anterior region

Medical history, family history: None

Present medical history: Artificial denture had been placed on the maxilla, 10 years ago, but came to the clinic recommended by a friend, for implant treatment.

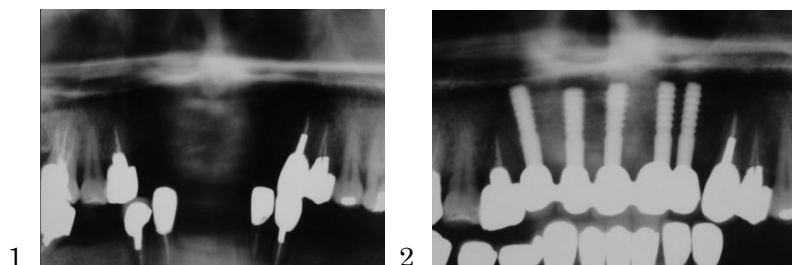


Image-1: Panorama radiograph before surgery. Five 3LL AQB one-piece types were installed to positions No. 6 to 11, January 16th 1992. Subsequently placed with connected metal-bonded crown 4 months later

Image-2: Panorama radiograph 7 years since the installation

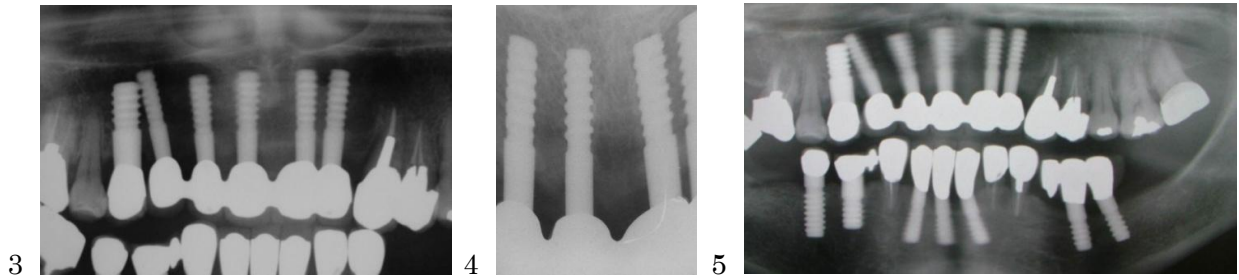


Image-3: Panorama radiograph 14 years after the surgery. No. 12 tooth was extracted due to its root fracture. 5LM AQB one-piece type was placed.

Image-4: Dental radiograph 17 years after the installation.

Image-5: Panorama radiograph 17 years after the installation.

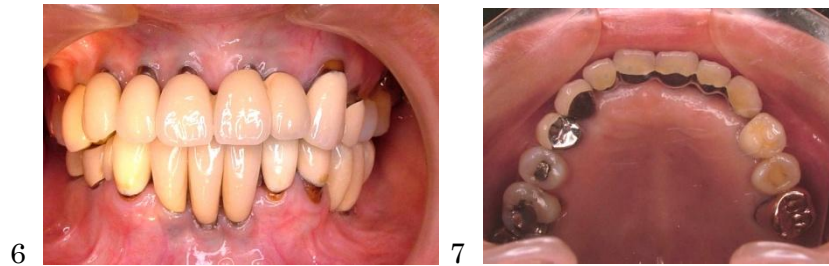


Image-6,7: Image of the oral cavity 17 years after the installation. A slight exposure of the gold rim from the gingival constriction can be seen, but without any sign of bone resorption.

Case 3: One-piece type implant to the right mandibular molar region, 18 years ago

Patient: 48 year-old female

Date of implant installation: 29th August 1991

Main complaint: Request for implantation to the right mandibular molar region

Medical history, family history: None

Present medical history: No. 18 tooth was extracted 10 years previously, and artificial denture had been applied, but came to the clinic to be replaced with implant prosthesis, due to discomfort.

Three 5MS AQB one-piece type implants were installed separately to No. 20, 21 and 22 respectively. The primary stability was shown to be satisfactory, and connected gold alloy crown was placed four months later to complete the prosthetic treatment.



Image-1: Panorama radiograph at the time of prosthetic placement.

Image-2: Panorama radiograph 9 years after the installation. 5SS AQB one-piece type implant was placed to No. 2 and 3 positions, and completed with the placement of the final prosthesis of metal-bonded crown.

Image-3: Panorama radiograph, 17 years later. No bone resorption in any of the implant body

surroundings can be observed.



Image-4,5,6: The state of the oral cavity 17 years later.

4. Observation of AQB one-piece type implants installed 13 to 19 years ago

Director of Kinebuchi Dental Clinic

Takao Kinebuchi

I have been applying AQB one-piece type implants since their clinical trials stages, and have continued its usage throughout the practice. A few examples have been selected and presented here to demonstrate the potential of AQB implants.

Case 1: AQB implant 6mm diameter that has been 19 years since the period of clinical trials

Patient: 50 year-old female

First medical examination: June 1988

Main complaint: Sensitivity to coldness - right maxillary premolars

Medical history: Heart valve replacement surgery

Primary treatment plan: General dental treatment

Secondary treatment plan: Implant treatment to replace No. 30 and 31 missing teeth.

Treatment progress:

The first clinical trials conducted at the Mitsui Memorial Hospital in Facility 1, where the implant 6 mm diameter that was the prototype was installed to No. 30 and 31 positions. If they were to be named under the current classifications, 6SS and 6MS were installed to No. 30 and 31 respectively (Image-3,4). The tool kit that are currently available had not yet been developed at the time, and had used the Apaceram tool kit that had been developed by Asahi Optical Co., Ltd (now, under Hoya corporation) in 1983. The bone was extracted as a cylinder form by punching the mucoperiosteal flap using a trephine bur, without applying an incision. The installation was conducted in a rough manner, by using bone cutting forceps to fix the abutment and then forcing the fixture into the jaw bone by rotating. The impression taking was conducted 3 months later, followed by fitting the metal-bonded crown (Image-5,6). A satisfactory condition has been maintained with regular dental treatments and AQB check-ups (Image-7 to 14). The AQB implant with 6 mm diameter has retained a generally fit state.

Evaluation:

It was one of the earliest examples of using the trephine bur, and even though the HA coating layer can be expected not to have been completely covered within the bone structure, significant bone resorption cannot be observed. The increased bone density of the implant surroundings after the two, three years period after installation is a fine characteristic of bio-integration.

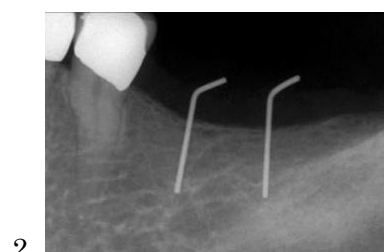


Image-1,2: Image and a radiographic image at the time of a boring check before implant installation (06.07.1989). The patients undergoing implant surgery for the first time should be examined for their bone quality and the distance to the mandibular canal. The use of the boring test can be an effective means to evaluate these.

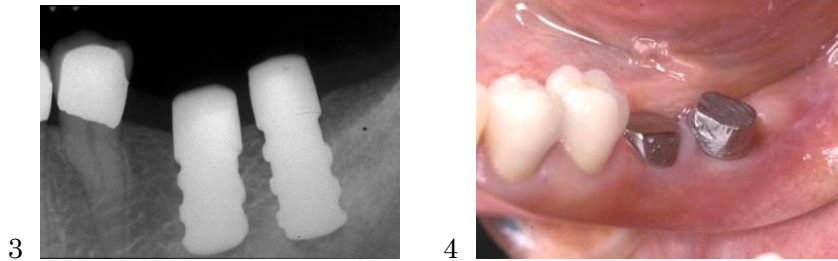


Image-3: Dental radiograph after the installation of 6SS and 6MS implants (07.10.1989).

Image-4: The state a month after the surgery (08.10.1989). The abutment can be seen to be full of scratches, as it was screwed into the jaw roughly held by the bone cutting forceps.

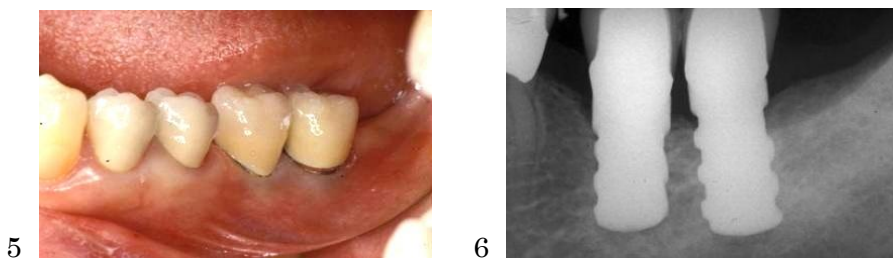


Image-5,6: Photograph and radiograph after the placement of metal-bonded single crowns (10.25.1989). The implant cavity was constructed using trephine bur. Since incision was not applied, the HA coating layer can be expected to have been left exposed.

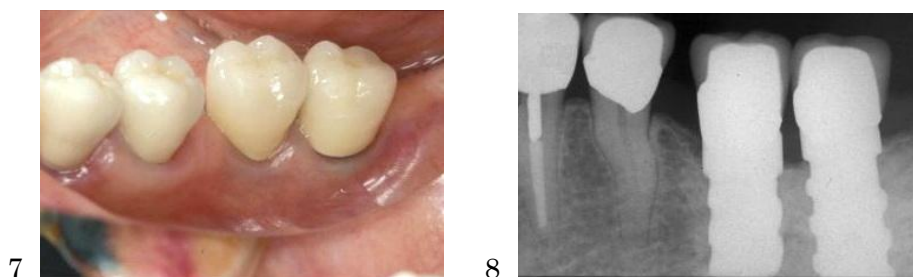


Image-7,8: Photograph and radiograph featuring the state 3 years later (08.12.1992). An increase in the bone density can be seen in this period.

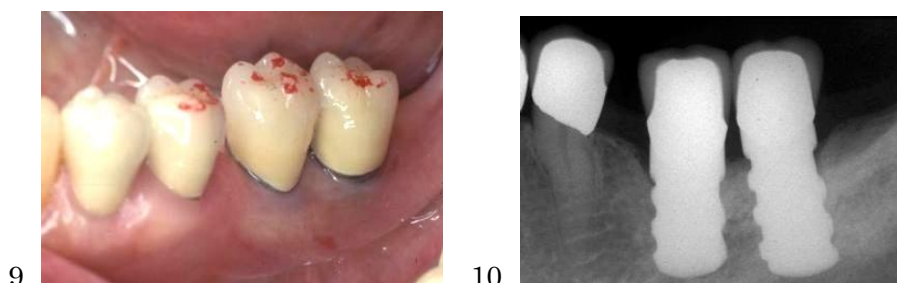


Image-9,10: Photograph and radiograph featuring the state 8 years later (07.28.1997). Generally, an increase in the bone density can be observed but with no modifications to the bone morphology.

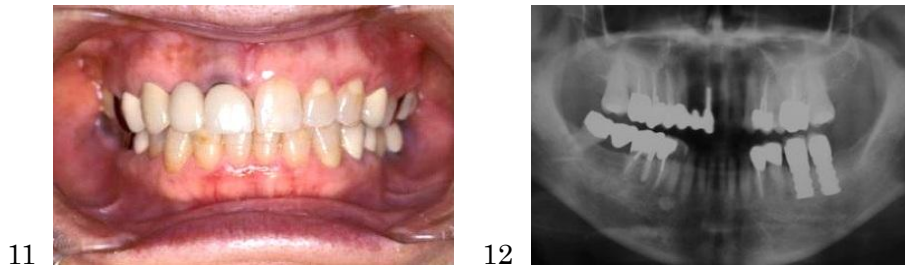


Image-11,12: Photograph and panoramic radiograph featuring the state 11 years later (07.17.2000). The majority of the natural teeth are shown to have remained, and are able to withstand strong occlusal forces.

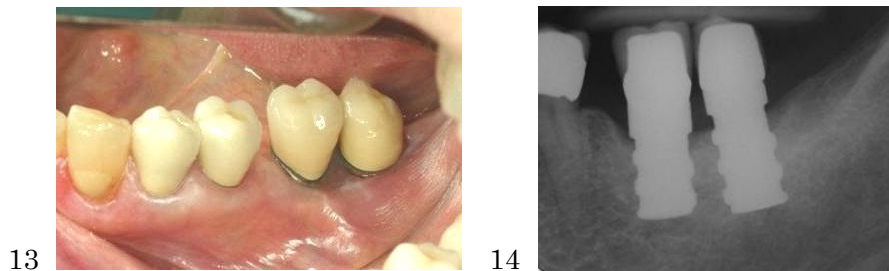


Image-13,14: Photograph and radiograph featuring the state about 19 years later (05.19.2008). The condition of the bone shows a slight deterioration but shows stability.

Case 2: Installation of 5MM one-piece type AQB to the mandibular distal position that lacked three teeth – 19 1/2 years ago

Patient: 62 year-old female
 First medical examination: October 1981
 Date of implant installation: December 1st 1989
 Main complaint: Cannot chew due to looseness in the connected crown prosthesis.
 Medical history: None
 Primary treatment plan: General dental treatment including No. 18 to 20 tooth extractions.
 Secondary treatment plan: Implant installation to the positions No. 18 to 20 lacking teeth.

Treatment progress:

The patient underwent usual dental treatment and extraction of No. 18 to 20 teeth in November 1981, and then a metal based plate denture was applied at this position in July 1982. This denture was used for three years.

The patient primarily came to the clinic with abnormal symptoms in the root apex. As a part of the treatment, implants were planned to be installed to the area that lacked teeth (Image-1,2,3). Three 5MM implants to No. 18 to 20 positions were installed using the Apaceram tool kit as in the Case 1, extracted the bone in a cylindrical form below the position of the mucoperiosteal flap punched out with a trephine bur, without the application of an incision. The implant was installed into this area (Image-4,5). The impression was taken three months later, followed by the platinum-gold alloy crown placement to No. 19 and 20 positions, and a metal-bonded crown to No.18 position (Image-6,7). The progress after the surgery had been noted with undergoing the usual dental treatments and regular AQB follow-up for eleven years will December 2000, with a satisfactory outcome (Image-8 to 24). The patient stopped visiting our clinic

due to ill health, but has been reported by a member of her family that there have not been any problems with its use, which has been 15 years since its installation. Currently, after 19 1/2 years, a satisfactory progress has been maintained (Image-25 to 27).

Evaluation:

The first clinical trial conducted at the Mitsui Memorial Hospital in Facility 1 where the implant body had been refined with its screw forms becoming close to the market-release version. Bone resorption in an inverted conical shape surrounding the implant structure can be observed for the initial installation period of a few years due to surgical intervention. But the images show the increase in the bone density of the alveolar crest and those surrounding the implants. In the radiographs taken close to the ten years mark, there are images that show bone augmentation to the alveolar crest. With biointegration, implant becomes part of the bone through interactions. Where the force is exerted on the physiological structure via the implant body, it can be thought that the bone structure has prepared itself to withstand this force up to a certain level. In observing the series of radiographs taken over the years, it makes one speculate the presence of biological mechanism that meets this.



Image-1,2,3: Boring check, before surgery (11.06.1989)

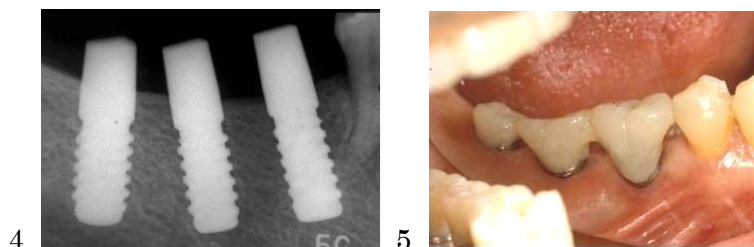


Image-4: Dental radiograph 10 days after the installation (12.11.1989).

Image-5: The image 20 days after the installation (12.21.1989). Instability of the primary settlement in No. 19 implant was fixed with a connective temporal resin.

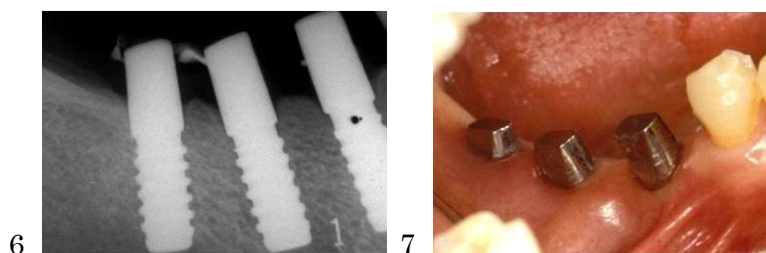


Image-6,7: Photograph and radiographic images 3 months after the installation. The impression was taken after the removal of the temporal crown structure (03.09.1990). A slight cortical bone resorption in the area surrounding the implants can be observed that resulted from the forces of surgical intervention at the time of implant cavity construction. This was not a progressive one.

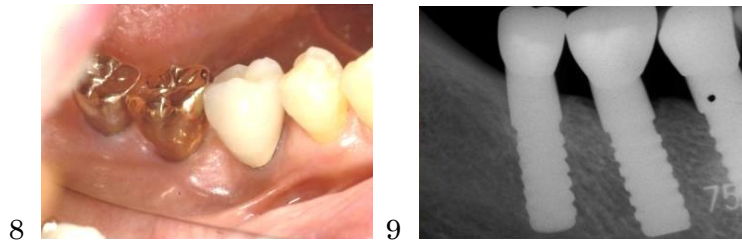


Image-8,9: Photograph and dental radiograph 5 months after the installation (05.07.1990). At the clinical trials, the superstructure prosthesis was all in a form of single crown structures to differentiate each implant installed.

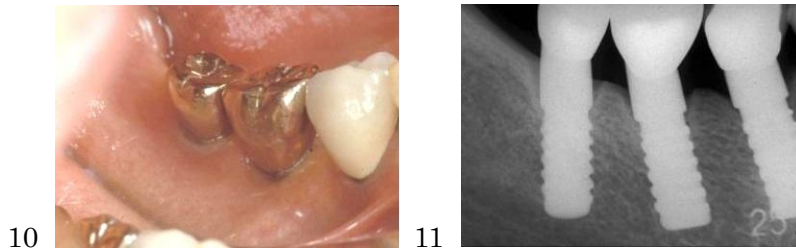


Image-10,11: Photograph and dental radiograph a year after the installation (12.06.1990). The condensation of the alveolar crest bone can be seen from this point.

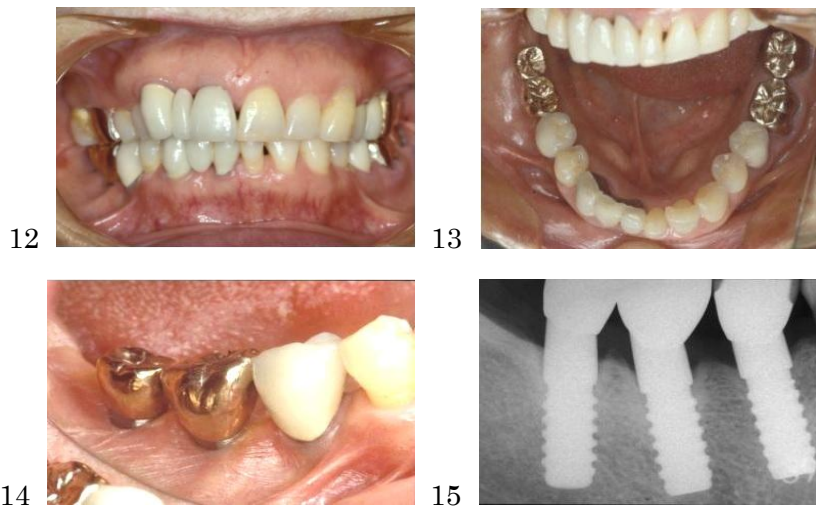


Image-12,13,14,15: Images taken 3 years after the installation (12.14.1992) shows progressive bone condensation, in the alveolar crest and in the structures around the implant body.

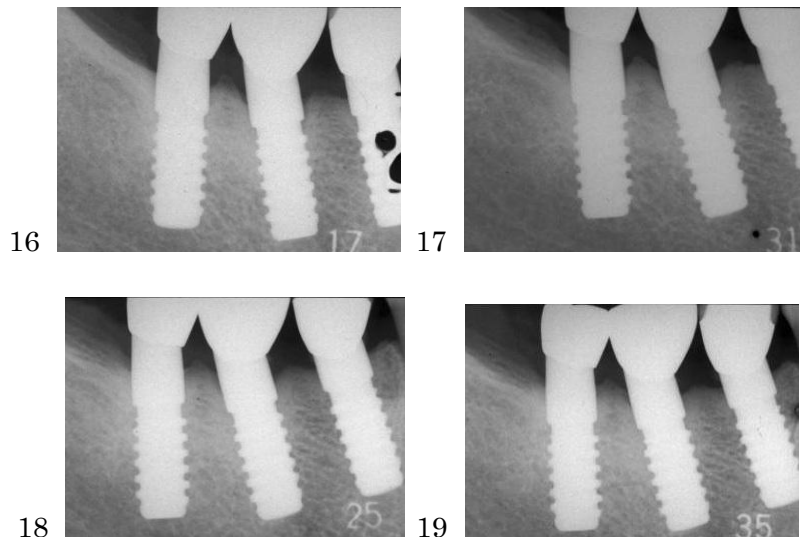


Image-16: Dental radiograph of the state 4 years later (12.29.1993).

Image-17: Dental radiograph of the state 5 years later (12.02.1994).

Image-18: Dental radiograph of the state 6 years later (12.15.1995).

Image-19: Dental radiograph of the state 7 years later (11.28.1996).

In between the images of the 4 and 7 years, the additional bone development in the area of the bone subjected to surgical intervention at the time of implant cavity construction can be observed.



Image-20,21,22: The state ten years later (12.02.1999). Majority of the natural teeth have remained, and strong occlusal force is acted on the implant prosthesis of No. 18 to 20 positions. An additional bone development has shown further progress in the alveolar crest.

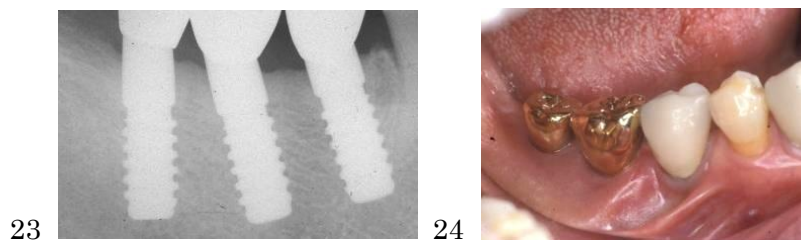


Image-23,24: The state 11 years later (12.28.2000). The alveolar bone region has become even, with the additional bone development, and an increase in the bone density around the implant structure can be evident.

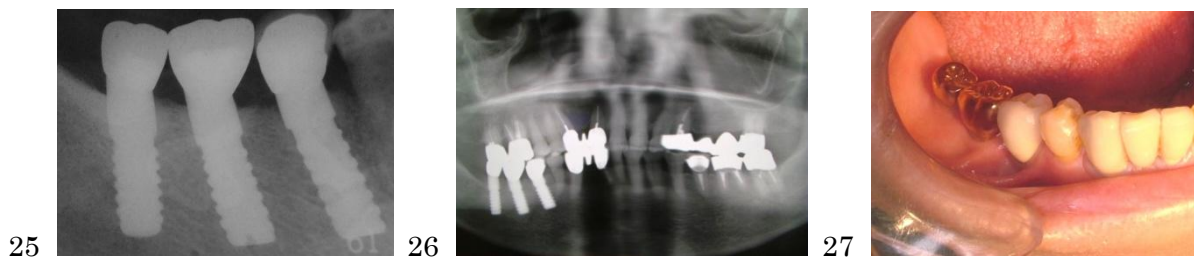


Image-25,26,27: Photographic and radiographic images 19 years after the surgery. No signs of bone resorption can be seen.

(Photos provided by Dr Yasuhiko Tsuyama, Mitsui Memorial Hospital)

Case 3: The progress of nine implants installed to the maxilla and mandibular molar region on both sides for 11 to 12 years.

Patient: 65 year-old female

First medical examination: April 1975

Main complaint: Osteomyelitis on No. 6 position

Medical history: none

Primary treatment: After conducting the standard dental treatments, perform the treatments as required for the space of 20 years.

Secondary treatment: Implant installation to No. 19, 20; No. 30, 31, and then to No. 3, 4, 5, in this order from 1996.

Tertiary treatment: Implant installation to No. 12 and 13 positions that were newly lost.

The period of implant installation: February 2nd 1996 to 4th June 1997.

Treatment progress:

She was a patient from the Mitsui Memorial Hospital, and had been visiting the hospital for the standard dental treatment for 20 years from April 1975 to 1995 (Image-1). A plate denture had been placed on the mandibular molar region to both sides, but had not been used for a while. She wanted to correct her denture before retiring, therefore started the AQB implant treatment. On February 2nd 1992, two implants, 5MM and 5MS were implanted to the positions No. 19 and 20 with missing teeth, followed by 5MM and 5SS to No. 30 and 31 positions in February 19th 1996. On May 7th 1996, gold alloy crowns were fitted onto the implants installed to both sides simultaneously. The occlusal support was achieved in the molar region. Then the 5MM, 4MM, 4MM were installed to the positions No. 3, 4, 5 lacking teeth (Image-2,3,4), on October 3rd 1996. The patient was then transferred to our clinic, for the placement of the gold alloy crowns onto the implants on May 7th 1997 (Image-5,6). The final installation was conducted on June 4th 1997 to No. 12 and 13, both 4MM on the 4th June 1997 (Image-7), and placed the gold alloy crown structures on the August 20th 1997 (Image-8). This is the 13th year since achieving occlusal support with implants in the maxilla and mandible on right and left sides of the molar region. The radiograph shows there are no bone resorption to be present and thus showing good progress (Image-9 to 23).

Evaluation:

This is a case where the occlusion is formed by the implant prosthesis on molars of both the upper and lower jaws. Since the mandible consists of cortical bone, single crown prosthetics can be fitted provided that 5 mm diameter AQB implant can be inserted, but, implantations to the maxilla needs further considerations as it is made of cancellous bone.

Particularly with example, the occluding teeth in the molar region were both implants on the upper and lower mandible, therefore the prosthesis on the maxilla were be connected. This consideration might have been the key to its long-term success.



Image-1: Panorama radiograph before starting the implant treatment (12.28.1994).

Image-2,3,4: The state after the patient was transferred to our clinic from Mitsui Memorial hospital, having undergone implant installation and superstructure placement to No. 19, 20, 30,31 and to No. 3, 4, 5 (14.12.1997).

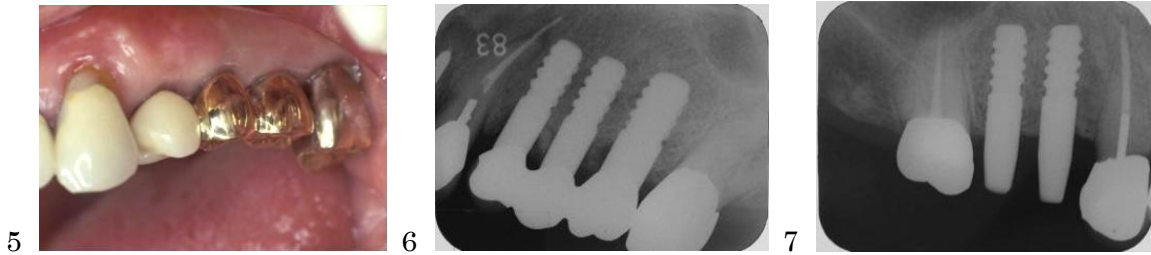


Image-5,6: Image at the time of connected crown placement (06.04.1997), with the dental radiograph.

Image-7: Dental radiograph at the time of installation of 4MM implant to No. 12 and 13 positions (06.04.1997).

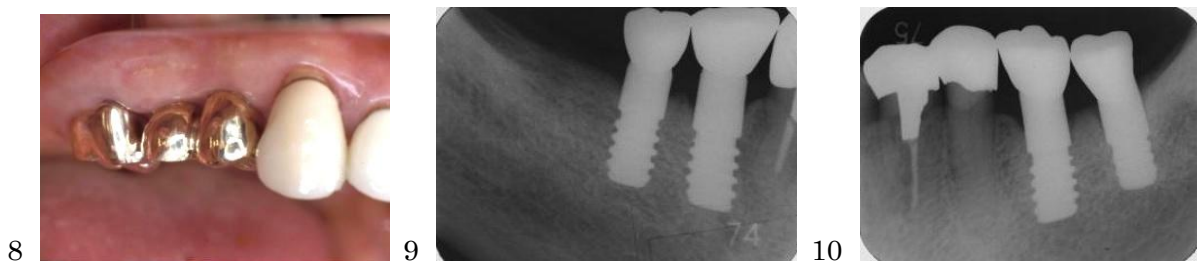


Image-8: Image after the placement of connected crown to No. 12 and 13 positions (08.26.1997).

Image-9,10: Dental radiograph 2 years after the installation to the both sides of the mandibular molar region (01.26.1998). Increase in the bone density of those surrounding implant structures and the alveolar crest can be observed.

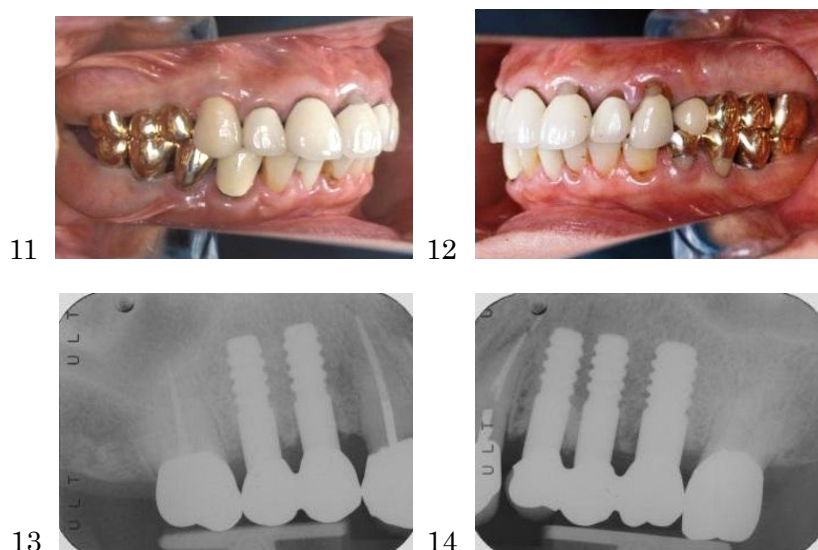


Image-11,12,13,14: Photographs and dental radiographs 5 years after the installation to No. 12 and 13, and 6 years after the installation to No. 3, 4, 5.



Image-15,16,17,18,19: The state, 10 to 11^{1/2} years after the surgery. Occlusal support at the molar region has been established.

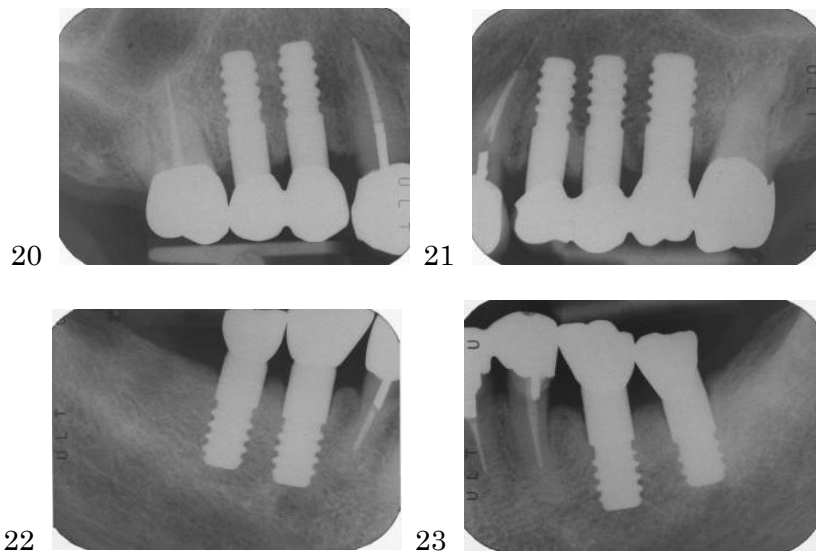


Image-20,21,22,23: Dental radiograph, 10 to 11^{1/2} years after the surgery (08.10.2007). Upon achieving bio-integration, the bone density of the surrounding structures of the implant and the alveolar crest increase. In this case example, a clear increase in the bone density of the structure between the implant bodies can be observed in the maxillary premolar regions.

Case 4: Two implants were installed to the mandibular edentulous jaw canines to act as anchors, which has been used for 13 years

Patient: 64 year-old female

First medical examination: April 1995

Main complaint: Bilateral angular stomatitis, vitilego on the left mandible.

Medical history: None

Primary treatment: Fabrication of full denture for both maxilla and mandible with a fit. Left alveolar crest leukoplakia excision.

Secondary treatment: Implant to No. 22 and 27 and place single crowns onto these in 1996, and fabricate a partial floor denture. The full mandibular denture that had become unstable due to alveolar bone resorption was replaced by a partial denture to be applied to a more stabilized region. This was intended as a solution to reduce the risk of relapse of leukoplakia that acted as the induction factor for the destabilization of the full artificial denture.

Treatment progress:

This was a Mitsui Memorial Hospital patient undergoing drug treatment for vitilego which was not showing any sign of improvements. Therefore well fitted full dentures were placed on both the maxilla and mandible (08.05.1995) and conducted leukoplakia excision on the left buccal mucosa (10.26.1996). A progressive crestal bone resorption was evident on both the jaws, with the increasing difficulty in retaining the stability of the mandibular denture. By implanting in place of canines, and with the placement of the crown to be used as the anchoring teeth, the idea was that the stability of the dentures would improve, as well as acting as a preventative measures for the relapse of leukoplakia (Image-1,2). The 4LL implants were installed to positions No. 22 and 27 (03.28.1996), and the floor of the artificial denture corresponding to this position was curved out in a U-shape (Image-3 to 6) and was trialed during a meal. Two months later, impression image was taken (05.31.1996) (Image-7,8,9), and placed with a metal-bonded crown attached with a mesiodistal rest.

The patient was then transferred to our clinic, for the fabrication of partial dentures with gold plated floor to cover the area excluding No. 22 and 27 implants. A rigid metal plate rest was designed to be hooked onto No. 22 and 27, and to support the occlusal force by these two AQB implants (06.14.1996) (Image-10,11). The 12 years till the AQB follow-up in April 2008 have been stable (Image-12 to 23). The denture has gained stability with the support provided by the installed implants. With no friction on the mouth floor, or relapse of leukoplakia, it is a successful case example in which it has survived 13 years with satisfactory progress.

Evaluation:

This is case whereby implants were installed to place the mandibular canine teeth with the aim to stabilized by acting as an anchor for the artificial denture. The metal bonded crown was set above the gingival margin, but with the gingival constriction in three to four years, the metal exposure on the cervical region had been increased, but no bone resorption could be observed. The rigid lingual rest is thought to be working well, even though the complete occlusal force has been supported by the two implant bodies. This is thought to be possible since the long version of the implant, 4LL, was selected, to

be inserted deep into the cortical bone close to the lower margin of the mandibular body.

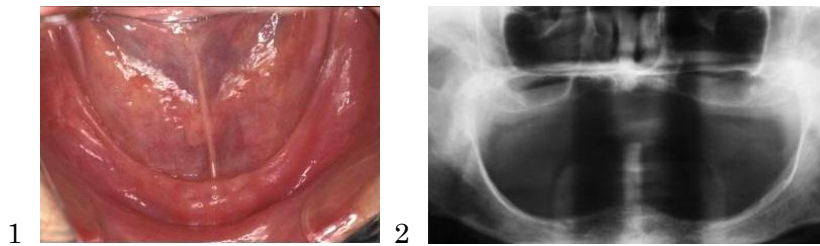


Image-1,2: Image of the edentulous jaw, and a panoramic radiograph before surgery (02.09.1996). The installation to the region distal to the mental foramen was not possible due to the short distance to the mandibular canal. The implant installation to No. 22 and 27 positions were planned.

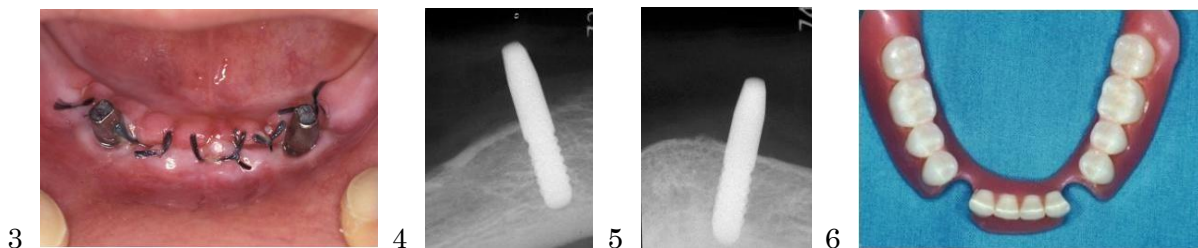


Image-3,4,5,6: Images taken at the time of suture (04.03.1996). A continuous alveolar ridge incision was applied to examine the state of the bone, with considerations to the future possibility of installation to positions No. 23 and 26. The tip of the implant was inserted till reaching the cortical bone to the level close to the lower margin of the mandibular canal, acting as a bicortical anchorage resulting in a firm installation. As one-piece implant is used, the denture that had been used in the past was used for the period till the bone integration was achieved, the position corresponding to the implants to No. 22 and 27 were curved out in a U-shape.



Image-7,8,9: At the time of impression taking, 2 months later (05.31.1996). The placement of prosthesis to edentulous jaw is complicated as there is nothing to mark the orientation of the implant insertion. The implantation to the anterior mandible should be inserted in a more upright position, but a slight adjustment at the time of preparation should be adequate to solve this issue.

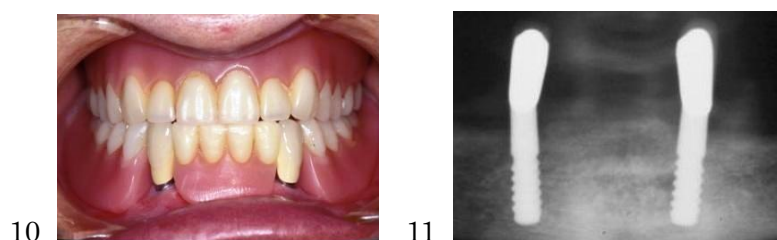


Image-10,11: Placement of the metal bonded crown after 2 1/2 months (06.15.1996). At the time, it was usual to place the crown margin above the gingival margin. Panoramic radiography was chosen for confirmation since the dental radiography was difficult to capture the whole length of the

implant to its tip.

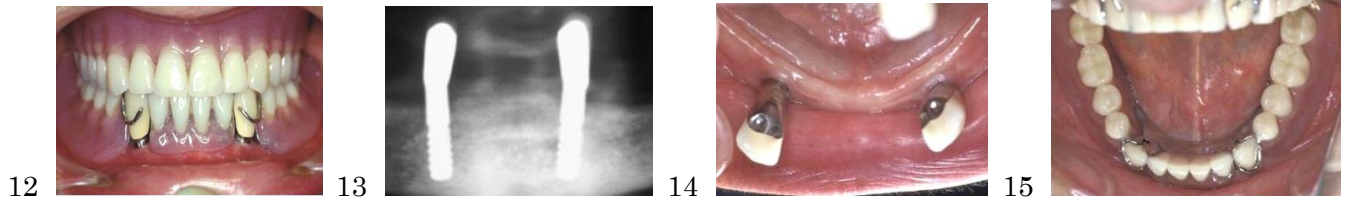


Image-12,13,14,15: Images taken eight months later (02.12.1997), replaced by the metal floor denture to both the maxilla and mandible, with its rigid rest hooked onto No. 22 and 27 implants for the occlusal force to be supported by these two.



Image-16,17,18: Four years later (02.25.2002), the mucosa surrounding the implants was shown to have constricted in comparison to when the alveolar mucosa was covered with a plate denture. For this reason, the degree of titanium metal exposed appeared to have increased, and it is not a result of bone resorption.

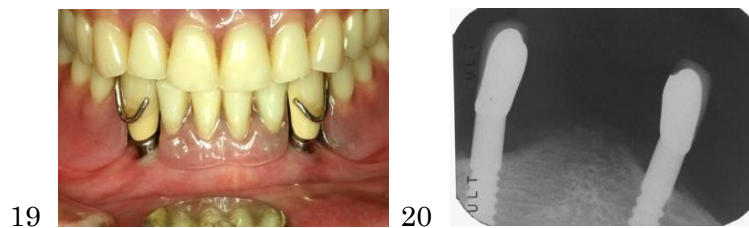


Image-19,20: Ten years later (04.21.2006). No structural changes can be seen to the surrounding mucosa since the observation 6 years ago. The alveolar crest has been confirmed by the dental radiograph that it is closely packed with the cortical bone structure, and showing stability.



Image-21,22,23: 12 years later (04.30.2008). There have not been any major issues with the prosthesis, apart from the fracturing of the clasp on the labial side, and had been simply repaired. The prosthetics, the dentures to the maxilla and mandible as well as the two implants are shown to be in good condition.

Chapter 8: Long-term observations of implant treatments

5. Five case examples of AQB implants that were installed more than ten years ago

Director of Tokyo Kagawa Dental Clinic
Toshiaki Miyazawa

It has been 15 years since the AQB implants were introduced into the market. I have been installing AQB implants since their clinical trial stages while practicing in the Dental surgical unit in Mitsui Memorial Hospital. There are currently many examples where more than 10 years have passed and that have continued to retain favorable conditions.

Here a selection of examples is presented.

[Case 1].

Patient: 73 year-old male

Main complaint: Requested implant replacement of the missing teeth

Treatment progress: The patient was referred from another clinic. He had already been treated with implants to the positions No. 2 to 5, as well as to No.31 and had been placed with superstructures.

Medical history: Pulmonary tuberculosis, left submandibular gland had been extracted due to left sialolithiasis of the submandibular gland.

Ten years has passed since the implant installation, but no presences of inflammations in the surrounding mucosa, mobility of implants or alveolar bone resorption have been observed, and satisfactory progress has been made thus far. In addition, the 5 implants placed into the left maxilla and mandible that have been installed for 12 years have also shown stability over the years. The natural teeth No. 8 and 9 that were connected to implants have not yet shown any alveolar bone resorption, ankylosis, or disuse atrophy.



Image-1: The state of oral cavity at the first medical examination

Image-2: The current state (May 2009), 10 years after the installation.

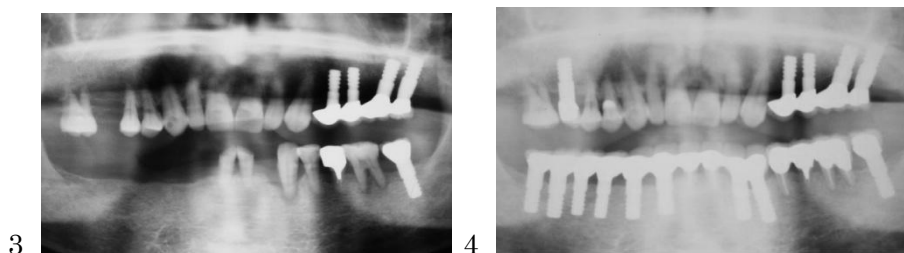


Image-3: Panorama radiograph at the first medical examination

Image-4: Panorama radiograph 10 years after surgery (May 2009)

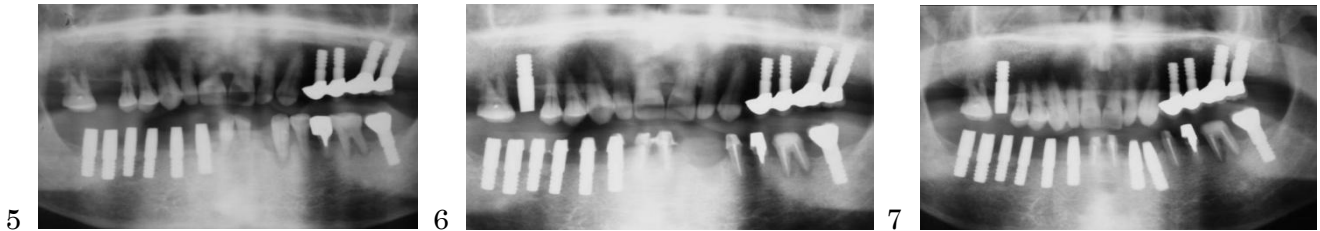


Image-5: AQB implants were installed to the 18 to 23 positions. (5MM to No. 18,19 and 4MM to No. 20 to 23).

Image-6: Installation of 5MM to No. 14 three months later.

Image-7: Installation of 4MM to No. 26 and 27.

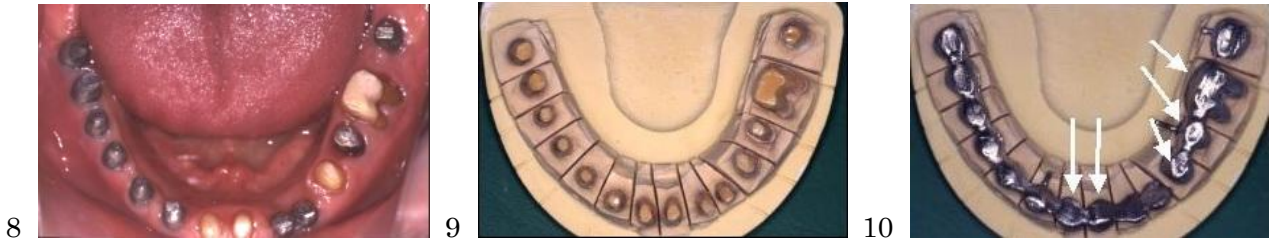


Image-8,9,10: No. 8 and 9 are natural teeth. In principle, they should not be connected to the implants, but due to the bone resorption from periodontal disease, and slight movement of the implants, it was deemed best to connect these together.

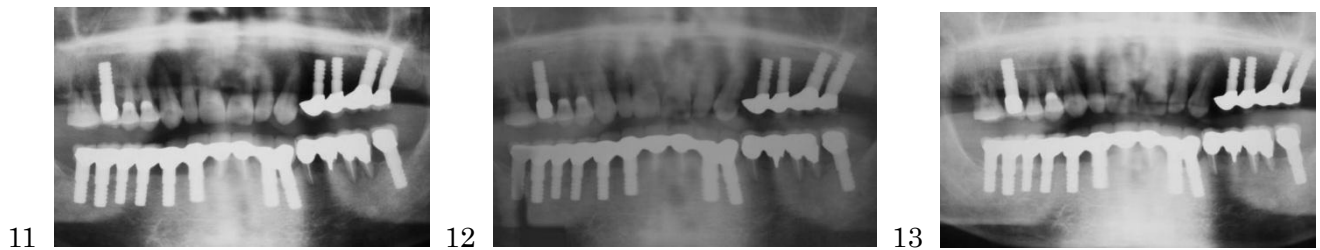


Image-11: Panorama radiograph a year later

Image-12: Panorama radiograph 3 years later

Image-13: Panorama radiograph 5 years later

[Case 2.]

Patient: 63 year-old female

Main complaint: Patient requested to continue the dental treatment, and to replace the missing teeth with implant prosthesis

Treatment progress: Came to this clinic with the request to continue dental treatment, the implants, complete with the superstructures were placed into the positions No. 13 to 15.

Medical history: Nothing to note

A period of 10 years has passed since the implant installation, but no complications such as inflammation in the surrounding mucosa, mobility of implants, alveolar bone resorption have been observed, with satisfactory progress. In addition, 11 years has passed since the 3 implants were installed by the previous clinic, and the progress appears to be satisfactory.

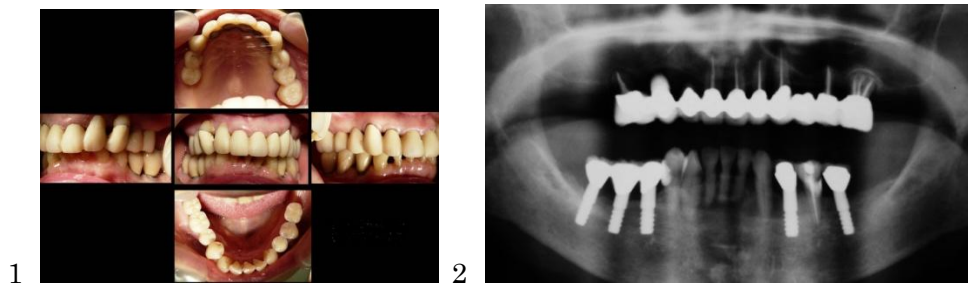


Image-1: State of the oral cavity 10 years after the implant surgery (May 2009).

Image-2: Panorama radiograph 10 years after the implant surgery (May 2009).

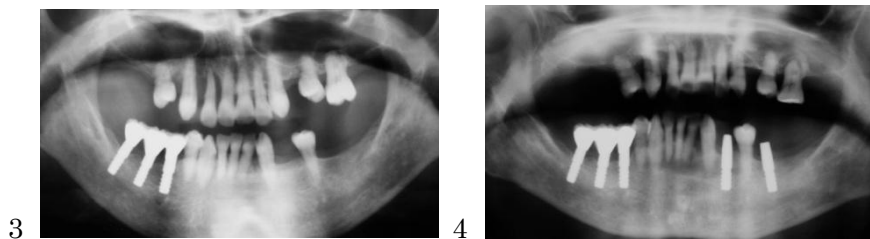


Image-3: Panorama radiograph at the first medical examination.

Image-4: 4MM and 4MS were installed to the positions No. 5 and 7, respectively.

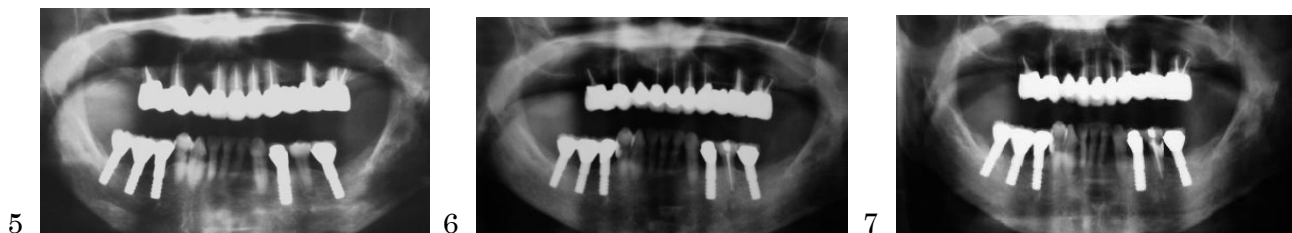


Image-5: Panorama radiograph a year after surgery

Image-6: Panorama radiograph 3 years after surgery.

Image-7: Panorama radiograph 5 years after surgery.

[Case 3].

Patient: 50 year-old male

Main complaint: Requested implant treatment to the missing teeth.

Treatment progress: Came to this clinic with the request to place implants from the previous clinic where the usual dental treatments were being conducted.

Medical history: Gout

A period of 10 years has passed since the implant installation, but no complications such as inflammation

in the surrounding mucosa, motion of the implants, alveolar bone resorption have been observed. It is not necessarily the case that in an oral cavity that consists of both implants and natural teeth, the implants are more likely to be affected by inflammation of the gingival tissues surrounding the implant structures from conditions such as peri-implantitis. In such cases, where progressive periodontal disease has affected the whole of the oral cavity, even the looseness of natural teeth can subject excessive amount of occlusal pressure on the implants leading to serious problems. This is the reason for which regular occlusal check-up should be conducted regardless of the presence of noticeable symptoms.

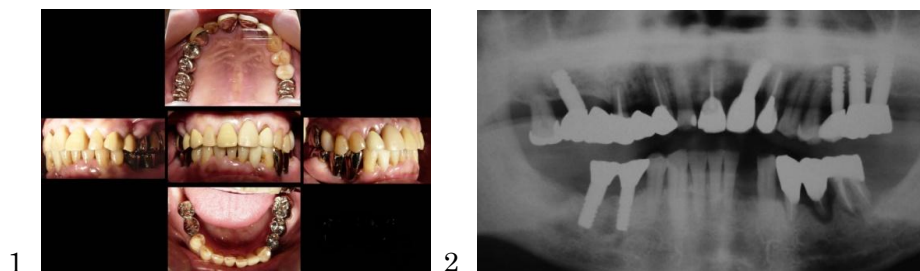


Image-1: Image of the oral cavity 10 years after the installation (May 2009).

Image-2: Panorama radiograph 10 years after the installation (May 2009).

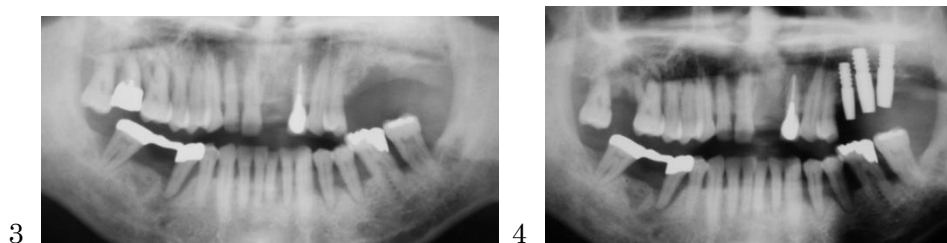


Image-3: Panorama radiograph at the first medical examination.

Image-4: Installed 5MM, 5MM, 4MS to positions No. 2, 3, 4.



Image-5: Installed 4MM, 5MS, 4MS to positions No. 8, 19, 20.

Image-6: Panorama radiograph 3 years later.

Image-7: Installed 5SM to No. 15, 5 years later.

[Case 4.]

Patient: 64 year-old female

Main complaint: Requested implant treatment to replace the missing teeth, and treatment to the anterior teeth.

Treatment progress: Came to this clinic with the request to place implants from the previous clinic where the usual dental treatments were being conducted.

Medical history: Nothing to note

The teeth in the maxillary premolar and molar regions except in the right maxillary premolars had already been lost, therefore presented with the flared-out of the anterior teeth, and could observe the loose motions of the remaining maxillary premolars. These were thus removed and were placed with prosthetics while the implants were installed primarily to the maxillary molars on the right and the left sides. After the extraction wound had healed, implants were installed to the right maxillary premolars in conjunction with GBR. A satisfactory outcome has been achieved even after 10 years.

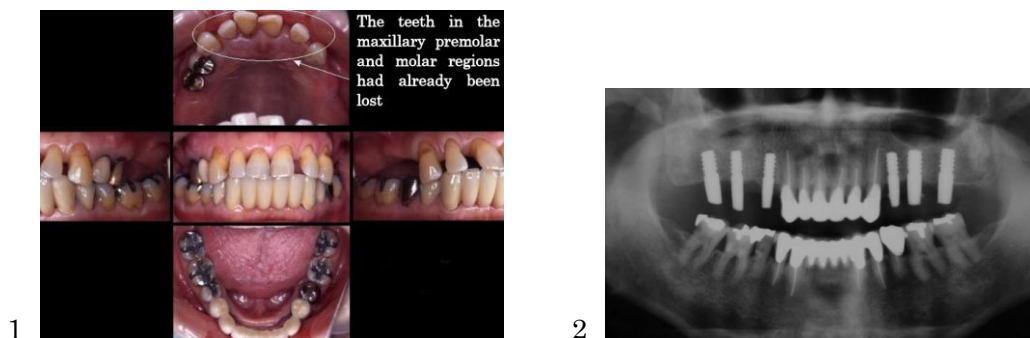


Image-1: Images of the oral cavity at the first medical examination.

Image-2: Panoramic radiograph at the implantation stage.



Image-3: No. 12 and 13 were extracted. To allow these positions to heal, the implants were installed primarily to No. 18 and 19 positions

Image-4: The implant body was exposed on the buccal side due to the narrowness of alveolar bone width at No. 12 position.

Image-5: Applied the bone fragments derived from the drilling to the exposed area.



Image-6,7: The resorbable membrane was cut out with a circular knife, and covered the implant and the bone grafted area on the buccal side.

Image-8: The state after suture.

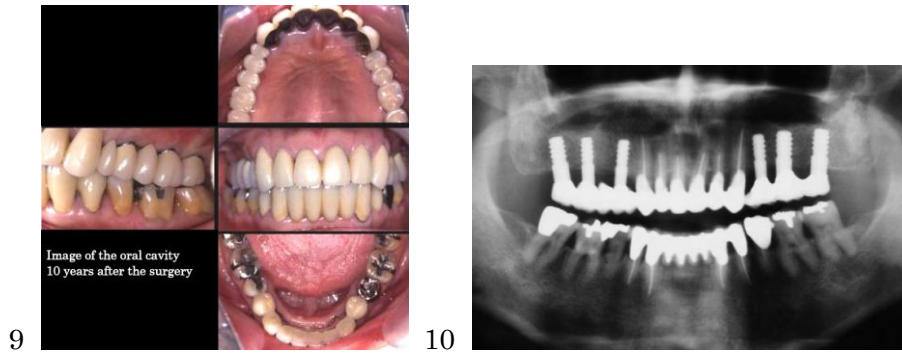


Image-9: Image of the oral cavity 10 years after the surgery (May 2009).

Image-10: Panorama radiograph 10 years after the surgery (May 2009).

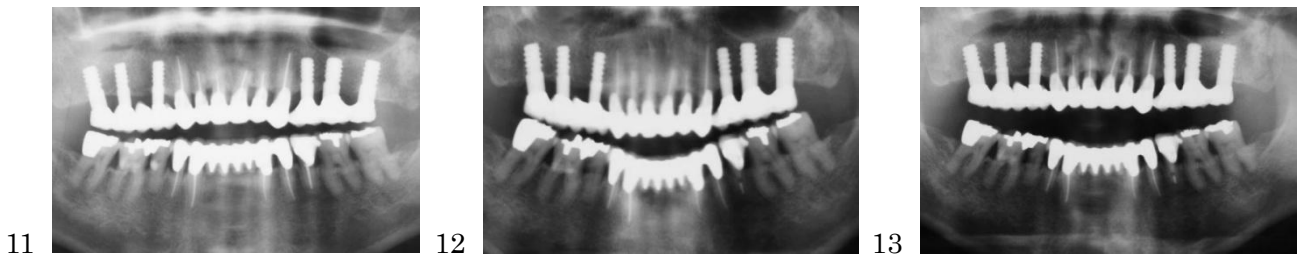


Image-11: Panorama radiograph 1 year after installation.

Image-12: Panorama radiograph 3 years after installation.

Image-13: Panorama radiograph 5 years after installation.

[Case 5.]

Patient: 30 year-old female

Main complaint: Requested implant treatment to replace the missing teeth

Treatment progress: Came to this clinic for implantation, from the previous clinic where the usual dental treatments were being conducted.

Medical history: Nothing to note

The state 12 years since the implantation shows a satisfactory outcome with no inflammation surrounding the implant structure. The implant to No. 3 position was conducted in conjunction with socket-lift technique, 10 years ago. The radiographic image confirms the bone augmentation around the implant body, even though bone filling agents were not applied after the elevation of maxillary sinus floor. Such observation can be shown in the cases where a sufficient primary stability has been achieved, with no damages done to the schneiderian membrane.

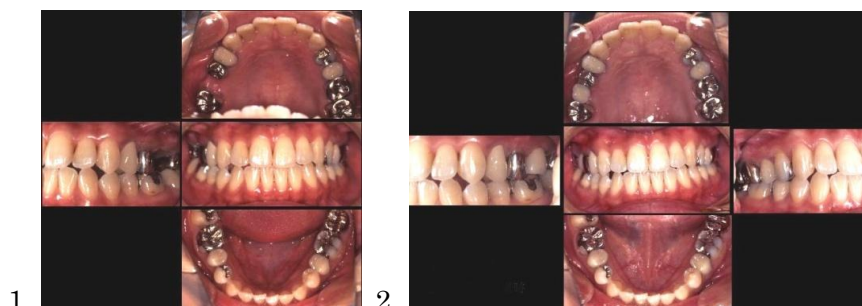


Image-1: Images of the oral cavity at the first medical examination

Image-2: Images after the placement of the superstructure, two months after installation



Image-3: Panorama radiograph a year later (No. 3 extracted).

Image-4: Panorama radiograph 2 years later (No. 3 extracted).

Image-5: Panorama radiograph 3 years later.

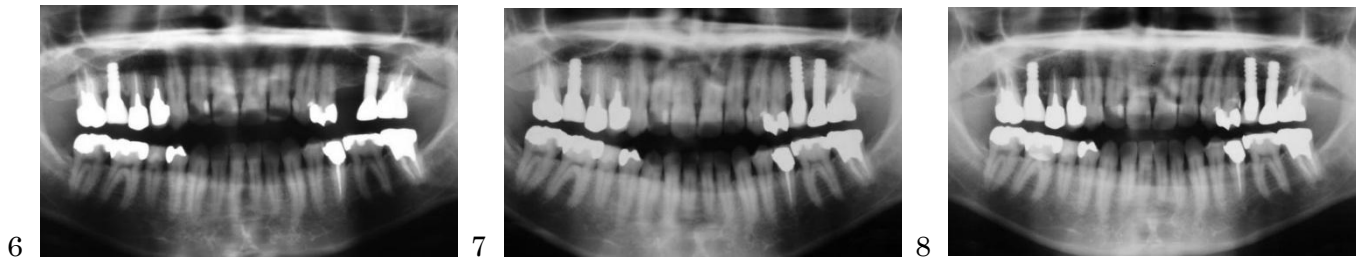


Image-6: Panorama radiograph 5 years later (3 years after No. 3 installation).

Image-7: Panorama radiograph 10 years later (8 years after No. 3 and a year after No. 4 installation).

Image-8: Panorama radiograph 12 years later (10 years after No. 3 and 3 years after No. 4 installation).

Conclusion

During the time period when the AQB implants were introduced into the market, the two-piece type dominated the dental implant market and the idea of hydroxyapatite coating were perceived poorly due to accounts of bone resorption to be associated with them. The implants in the market at that time required six to nine months before the placement of superstructure. AQB implants, one-piece type, with HA coating were introduced in the height of these circulating reports therefore were inevitably subjected to numerous skepticisms from general clinicians. One-piece types are not necessarily more prone to infections than its counterpart, and the HA coating layer was in actual fact, recrystallized, to produce a highly pure form of hydroxyapatite, therefore bones were not subjected to resorption, and could gain interaction with the bone roughly in a space of two months, ready for superstructure placement. Thus the treatment could be complete around two months. The various clinical studies have confirmed satisfactory outcome, and the use of AQB implants have become widely spread and have been applied by various general clinicians.

The factors that determine the implant treatment prognosis have been said not to be heavily dependent on the potential that the AQB implant has itself, but on the occlusal form, and occlusal force applied to the superstructures. The five cases that have survived the period of 10 years since it was implanted were presented here.

6. Three case examples of long-term AQB implant installation

Director of Kyroyama Oral and Maxillofacial Surgery Clinic
Yushiro Kuroyama

AQB implant systems introduced the one-piece and two-piece types in 1994 and 2002, respectively. The cases presented here are examples where each type of implants was installed on the year or on the following year after its release into the market. It has been 14 years since the one-piece type, and 7 years since the two-piece type were first installed, each of which have indicated satisfactory progress up to now.

Case 1: One-piece implant installed for 14 years and 9 months

Patient: 37 year-old female

First medical examination: August 1994

Medical history: No. 30 tooth had been extracted 20 years ago due to dental caries and the extraction socket was left untouched.

Present medical history: None



Image-1,2: Image of the oral cavity at the first medical examination

Image-3: Panorama radiograph at the first medical examination



Image-4: Panorama radiograph taken to evaluate whether the depth of the implant cavity could be increased with the alarm gauge.

Image-5: Panorama radiograph at the time of implant installation.

Image-6: Image 2 weeks after the implant installation.



Image-7: Dental radiograph after the placement of the superstructure

Image-8: Image after the placement of the superstructure.

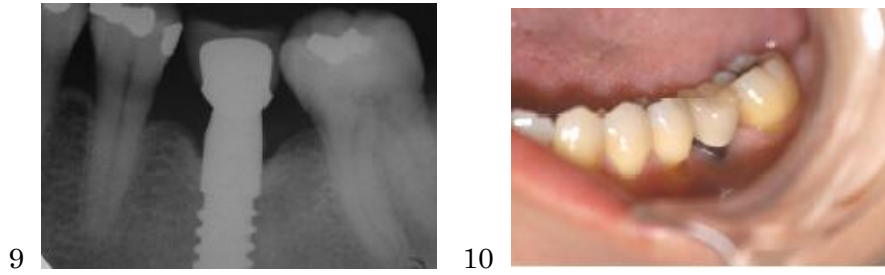


Image-9: Dental radiograph 14 years and 9 months after the placement of the superstructure

Image-10: Image of the oral cavity 14 years and 9 months after the placement of the superstructure.

Case 2: One-piece type installed for 14 years.

Patient: 58 year-old male

First medical examination: July 1994

Medical history: Loss of teeth that resulted from a traffic accident when 23 years of age, with fracture to the mandible.

Present medical history: None



Image-1: Image of the oral cavity

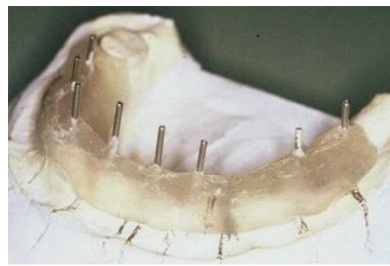
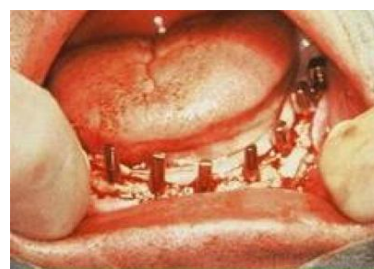


Image-2: Study model (for planning implant treatment)



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Image-3,4: Perioperative image.



Image-5: Placement of abutments



Image-6: Bite check



Image-7,8: Placement of the superstructure.

Image-9: The image of the oral cavity 14 years after the superstructure placement (The opposing maxillary teeth had to be placed with full artificial denture).

Case 3: Two-piece type installation conducted in conjunction with sinus-lift with platelet rich plasma (PRP) application, 7¼ years later

Patient: 62 year-old female
 First medical examination: January 2002
 Medical history: No. 3 to 5 teeth lost (periodontal disease)
 Present medical history: none

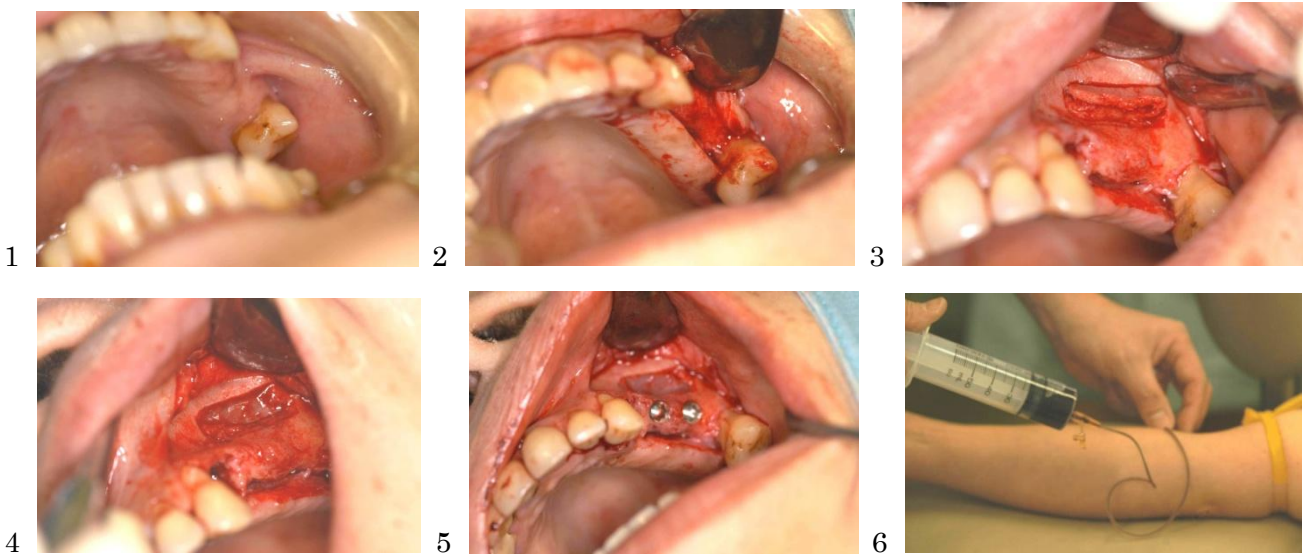


Image-1: Image of the oral cavity

Image-2,3,4,5: Images taken during the sinus-lift procedure.

Image-6: Blood collected prior to surgical procedures



Image-7: Fractionation of blood plasma with a specialized centrifuge machine specific for PRP.

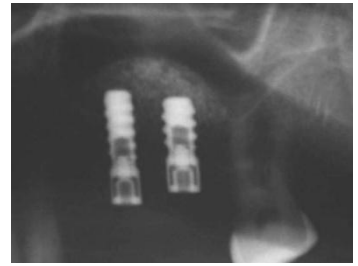
Image-8: A combined preparation of PRP, allograft bone, and β -TCP, (will be referred to as PRP filling agents)



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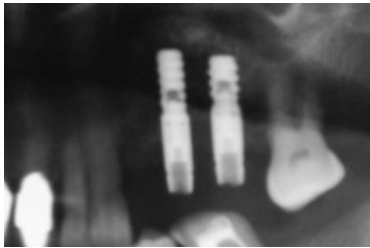


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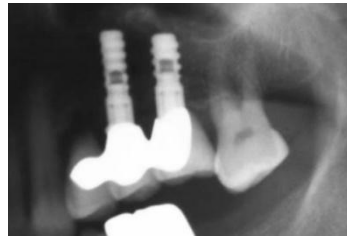
Image-9: Apply PRP filling agent to the subjected area of sinus-lift.

Image-10: The state after the lateral walls of the maxillary sinus has been recovered.

Image-11: Panorama radiograph after the fixture installation



12



13



14

Image-12: Open flap surgery, conducted 5 months after the primary surgery, for the abutment placement.

Image-13: Panorama radiograph 7¹/₄ years later.

Image-14: Image of the oral cavity 7¹/₄ years later.

Conclusion:

The three examples that I have presented have all been installed soon after their introduction into the market, and therefore these are a representative of long-term cases of AQB implants. The one-piece type was regarded to have a high risk of bacterial infections, but its 14 years survival rate have proven otherwise. The long-term installation of implants of the past have shown downgrowth of the alveolar bone to be a common complication, however, in this case example, no such symptoms were seen. It is suggestive of the effect of recrystallized coating to be inhibitory to the downgrowth.

In the two-piece type examples, the implants have been firmly installed with the application of sinus-lift procedures. It is considered best to use two-piece implant to gain reliable osseointegration where the floor of the maxillary sinus is thin and fragile. The issues of screw loosening or fractures are of concern however in using the two-piece types. In this example, there was no evidence of these types of issues in the radiograph, with no loose movement of the superstructure. This long-term survival rate can be thought to be owing to the screw design of the AQB two-piece type implants, the smooth octagonal lock (SOL system).

7. Three case examples of AQB one-piece type implants installed for more than 17 years

General Manager of Department of Dentistry, Oral and Maxillofacial Surgery, Mitsui Memorial Hospital

Yasuhiko Tsuyama

Director of Tokyo Central Dental Clinic

Hiroshi Takarada

Director of Kinebuchi Dental Clinic

Takao Kinebuchi

The clinical trials of AQB one-piece type implants began on November 1988 in dental surgery unit of Mitsui Memorial hospital. It has been 19 years since the first implant was installed. It is rare to find a case example in other implant systems that have been observed for this amount of time, therefore this was thought to be a valuable example as the implant survival and its treatment outcomes.

The following points were concluded from the radiograph observations:

- ① No vertical bone resorption in those surrounding the implant
- ② The transparency of the surrounding bone has lessened significantly

Case 1: One-piece type to the left mandibular molar, 18 years ago

Patient: 43 year-old female

Period of implantation: June 1991

Main complaint: Requested implant installation to the left mandibular molars

Medical history, family history: None

Present medical history: No. 31 extracted 7 years previously, and No. 30 had been extracted before that. The patient came to the clinic with a request for implant treatment, as the sense of discomfort with previously placed denture had persisted.

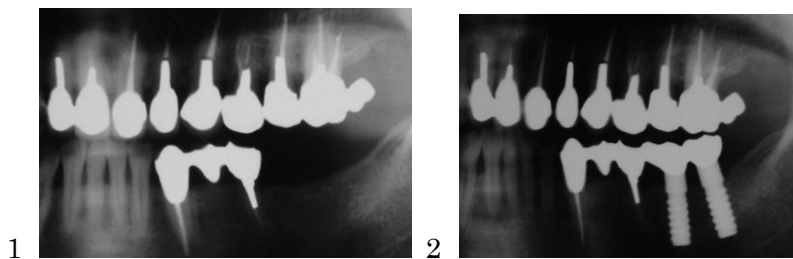


Image-1: Panorama radiograph before surgery. 5MS AQB one-piece types were installed to No. 30 and No.31 positions. The primary stability was achieved, and the procedure was completed with the superstructure, platinum-gold alloy crown, placement 4 months later.

Image-2: Panorama radiograph 3 years after the surgery. A slight downgrowth can be seen, but is not significant.

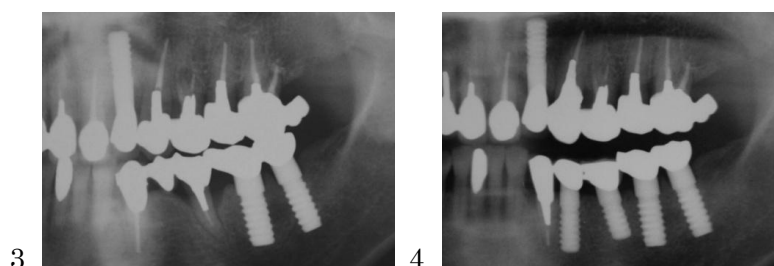


Image-3: Panorama radiograph after a course of 8 years. 4ML implant was placed at the position No. 7 after it was extracted as it was deemed not able to be preserved due to fracture in the root.

Image-4: Radiograph taken 14 years later. No. 29 tooth was extracted due to its root fracture, and was replaced with 4MS AQB one-piece type implant.

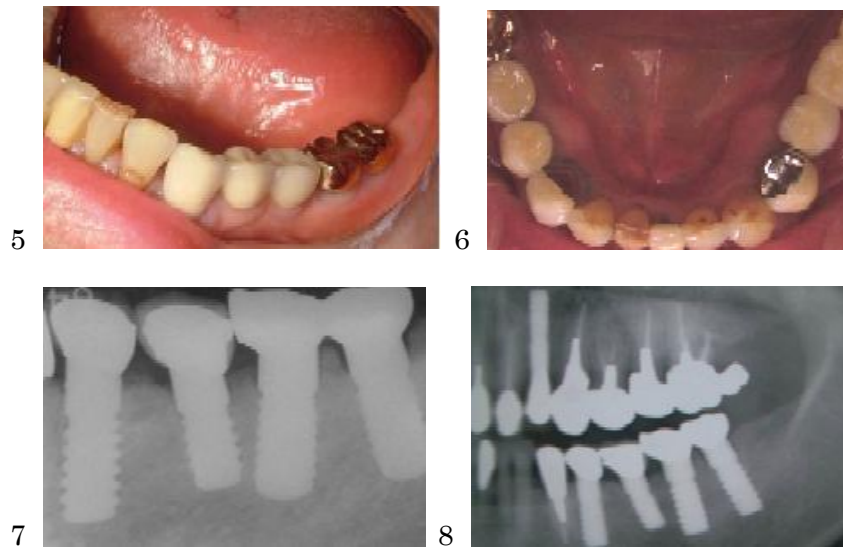


Image-5,6,7,8: Images of the oral cavity photographs and radiographs, 18 years post-surgery. No presence of bone resorption in any of the bone structures surrounding the implant.

Case2: One-piece implant to the maxillary anterior region – 17 years, 5 months ago

Patient: 49 year-old female

Period of implantation: January 1992

Main complaint: Request implant to the maxillary anterior region

Medical history, family history: None

Present medical history: Artificial denture had been placed on the maxilla, 10 years ago, but came to the clinic recommended by a friend, for implant treatment.

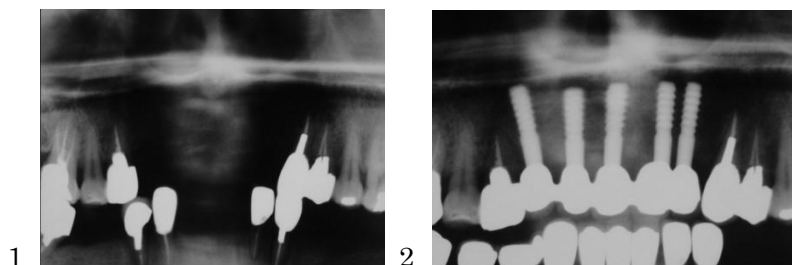


Image-1: Panorama radiograph before surgery. Five 3LL AQB one-piece types were installed to positions No. 6 to 11, January 16th 1992. Subsequently placed with connected metal-bonded crown 4 months later

Image-2: Panorama radiograph 7 years since the installation

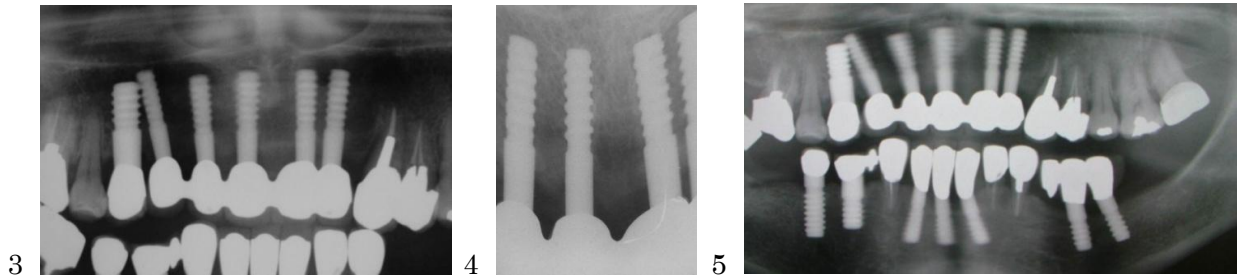


Image-3: Panorama radiograph 14 years after the surgery. No. 12 tooth was extracted due to its root fracture. 5LM AQB one-piece type was placed.

Image-4: Dental radiograph 17 years after the installation.

Image-5: Panorama radiograph 17 years after the installation.

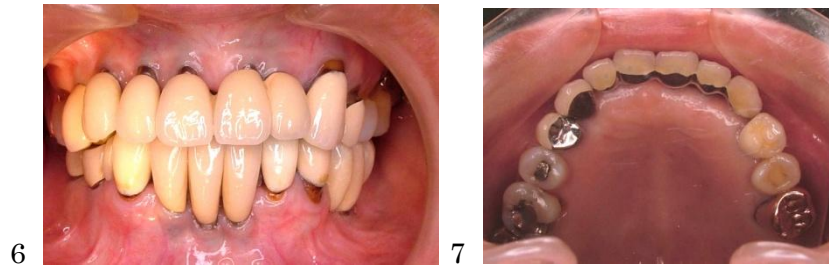


Image-6,7: Image of the oral cavity 17 years after the installation. A slight exposure of the gold rim from the gingival constriction can be seen, but without any sign of bone resorption.

Case 3: One-piece type implant to the right mandibular molar region, 18 years ago

Patient: 48 year-old female

Date of implant installation: 29th August 1991

Main complaint: Request for implantation to the right mandibular molar region

Medical history, family history: None

Present medical history: No. 18 tooth was extracted 10 years previously, and artificial denture had been applied, but came to the clinic to be replaced with implant prosthesis, due to discomfort.

Three 5MS AQB one-piece type implants were installed separately to No. 20, 21 and 22 respectively. The primary stability was shown to be satisfactory, and connected gold alloy crown was placed four months later to complete the prosthetic treatment.



Image-1: Panorama radiograph at the time of prosthetic placement.

Image-2: Panorama radiograph 9 years after the installation. 5SS AQB one-piece type implant was placed to No. 2 and 3 positions, and completed with the placement of the final prosthesis of metal-bonded crown.

Image-3: Panorama radiograph, 17 years later. No bone resorption in any of the implant body

surroundings can be observed.



Image-4,5,6: The state of the oral cavity 17 years later.

8. Observation of AQB one-piece type implants installed 13 to 19 years ago

Director of Kinebuchi Dental Clinic

Takao Kinebuchi

I have been applying AQB one-piece type implants since their clinical trials stages, and have continued its usage throughout the practice. A few examples have been selected and presented here to demonstrate the potential of AQB implants.

Case 1: AQB implant 6mm diameter that has been 19 years since the period of clinical trials

Patient: 50 year-old female

First medical examination: June 1988

Main complaint: Sensitivity to coldness - right maxillary premolars

Medical history: Heart valve replacement surgery

Primary treatment plan: General dental treatment

Secondary treatment plan: Implant treatment to replace No. 30 and 31 missing teeth.

Treatment progress:

The first clinical trials conducted at the Mitsui Memorial Hospital in Facility 1, where the implant 6 mm diameter that was the prototype was installed to No. 30 and 31 positions. If they were to be named under the current classifications, 6SS and 6MS were installed to No. 30 and 31 respectively (Image-3,4). The tool kit that are currently available had not yet been developed at the time, and had used the Apaceram tool kit that had been developed by Asahi Optical Co., Ltd (now, under Hoya corporation) in 1983. The bone was extracted as a cylinder form by punching the mucoperiosteal flap using a trephine bur, without applying an incision. The installation was conducted in a rough manner, by using bone cutting forceps to fix the abutment and then forcing the fixture into the jaw bone by rotating. The impression taking was conducted 3 months later, followed by fitting the metal-bonded crown (Image-5,6). A satisfactory condition has been maintained with regular dental treatments and AQB check-ups (Image-7 to 14). The AQB implant with 6 mm diameter has retained a generally fit state.

Evaluation:

It was one of the earliest examples of using the trephine bur, and even though the HA coating layer can be expected not to have been completely covered within the bone structure, significant bone resorption cannot be observed. The increased bone density of the implant surroundings after the two, three years period after installation is a fine characteristic of bio-integration.

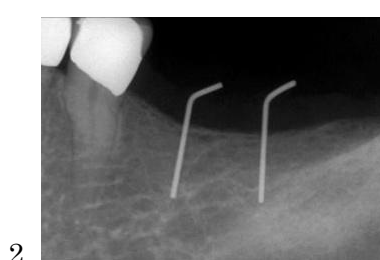


Image-1,2: Image and a radiographic image at the time of a boring check before implant installation (06.07.1989). The patients undergoing implant surgery for the first time should be examined for their bone quality and the distance to the mandibular canal. The use of the boring test can be an effective means to evaluate these.

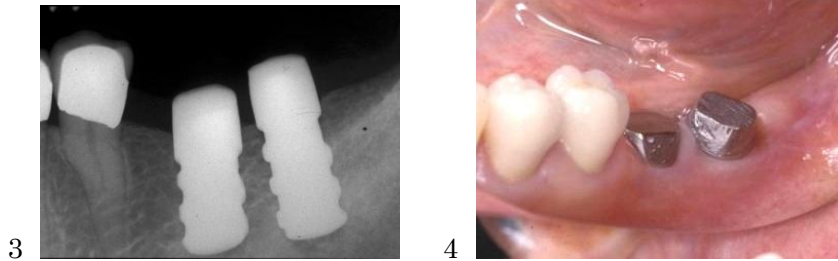


Image-3: Dental radiograph after the installation of 6SS and 6MS implants (07.10.1989).

Image-4: The state a month after the surgery (08.10.1989). The abutment can be seen to be full of scratches, as it was screwed into the jaw roughly held by the bone cutting forceps.

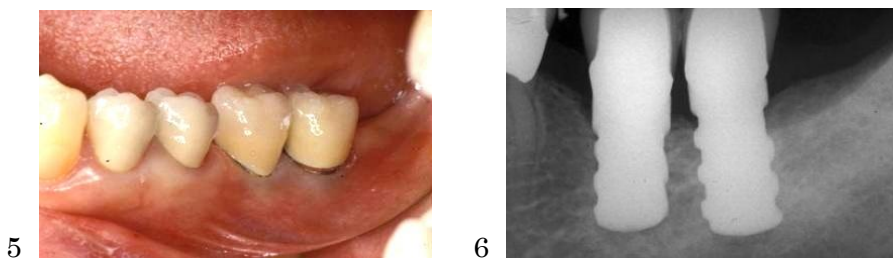


Image-5,6: Photograph and radiograph after the placement of metal-bonded single crowns (10.25.1989). The implant cavity was constructed using trephine bur. Since incision was not applied, the HA coating layer can be expected to have been left exposed.

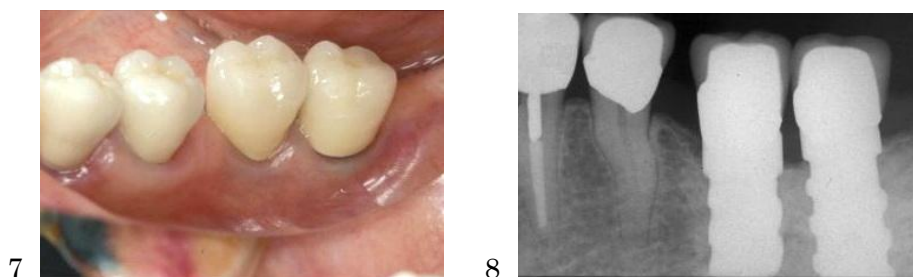


Image-7,8: Photograph and radiograph featuring the state 3 years later (08.12.1992). An increase in the bone density can be seen in this period.

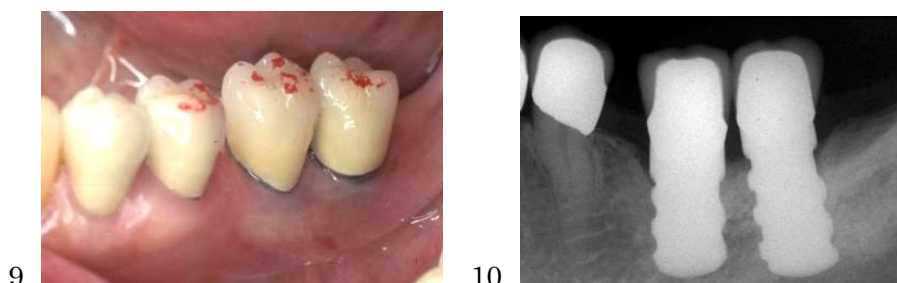


Image-9,10: Photograph and radiograph featuring the state 8 years later (07.28.1997). Generally, an increase in the bone density can be observed but with no modifications to the bone morphology.

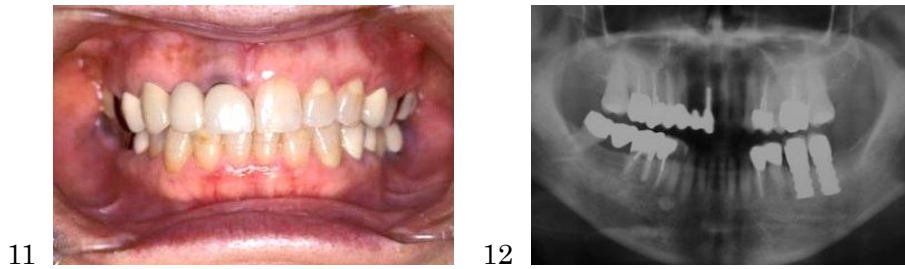


Image-11,12: Photograph and panoramic radiograph featuring the state 11 years later (07.17.2000). The majority of the natural teeth are shown to have remained, and are able to withstand strong occlusal forces.

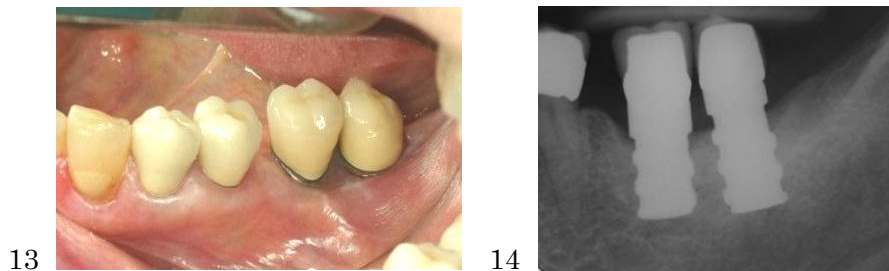


Image-13,14: Photograph and radiograph featuring the state about 19 years later (05.19.2008). The condition of the bone shows a slight deterioration but shows stability.

Case 2: Installation of 5MM one-piece type AQB to the mandibular distal position that lacked three teeth – 19 1/2 years ago

Patient: 62 year-old female
 First medical examination: October 1981
 Date of implant installation: December 1st 1989
 Main complaint: Cannot chew due to looseness in the connected crown prosthesis.
 Medical history: None
 Primary treatment plan: General dental treatment including No. 18 to 20 tooth extractions.
 Secondary treatment plan: Implant installation to the positions No. 18 to 20 lacking teeth.

Treatment progress:

The patient underwent usual dental treatment and extraction of No. 18 to 20 teeth in November 1981, and then a metal based plate denture was applied at this position in July 1982. This denture was used for three years.

The patient primarily came to the clinic with abnormal symptoms in the root apex. As a part of the treatment, implants were planned to be installed to the area that lacked teeth (Image-1,2,3). Three 5MM implants to No. 18 to 20 positions were installed using the Apaceram tool kit as in the Case 1, extracted the bone in a cylindrical form below the position of the mucoperiosteal flap punched out with a trephine bur, without the application of an incision. The implant was installed into this area (Image-4,5). The impression was taken three months later, followed by the platinum-gold alloy crown placement to No. 19 and 20 positions, and a metal-bonded crown to No.18 position (Image-6,7). The progress after the surgery had been noted with undergoing the usual dental treatments and regular AQB follow-up for eleven years will December 2000, with a satisfactory outcome (Image-8 to 24). The patient stopped visiting our clinic

due to ill health, but has been reported by a member of her family that there have not been any problems with its use, which has been 15 years since its installation. Currently, after 19 1/2 years, a satisfactory progress has been maintained (Image-25 to 27).

Evaluation:

The first clinical trial conducted at the Mitsui Memorial Hospital in Facility 1 where the implant body had been refined with its screw forms becoming close to the market-release version. Bone resorption in an inverted conical shape surrounding the implant structure can be observed for the initial installation period of a few years due to surgical intervention. But the images show the increase in the bone density of the alveolar crest and those surrounding the implants. In the radiographs taken close to the ten years mark, there are images that show bone augmentation to the alveolar crest. With biointegration, implant becomes part of the bone through interactions. Where the force is exerted on the physiological structure via the implant body, it can be thought that the bone structure has prepared itself to withstand this force up to a certain level. In observing the series of radiographs taken over the years, it makes one speculate the presence of biological mechanism that meets this.



Image-1,2,3: Boring check, before surgery (11.06.1989)

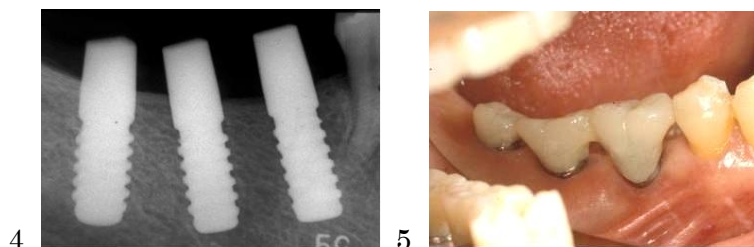


Image-4: Dental radiograph 10 days after the installation (12.11.1989).

Image-5: The image 20 days after the installation (12.21.1989). Instability of the primary settlement in No. 19 implant was fixed with a connective temporal resin.

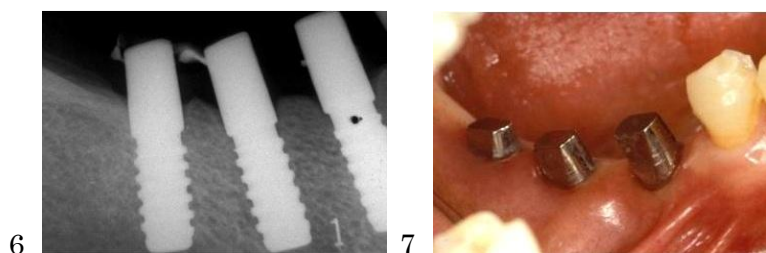


Image-6,7: Photograph and radiographic images 3 months after the installation. The impression was taken after the removal of the temporal crown structure (03.09.1990). A slight cortical bone resorption in the area surrounding the implants can be observed that resulted from the forces of surgical intervention at the time of implant cavity construction. This was not a progressive one.

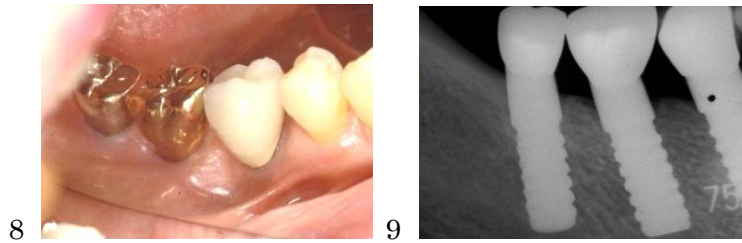


Image-8,9: Photograph and dental radiograph 5 months after the installation (05.07.1990). At the clinical trials, the superstructure prosthesis was all in a form of single crown structures to differentiate each implant installed.

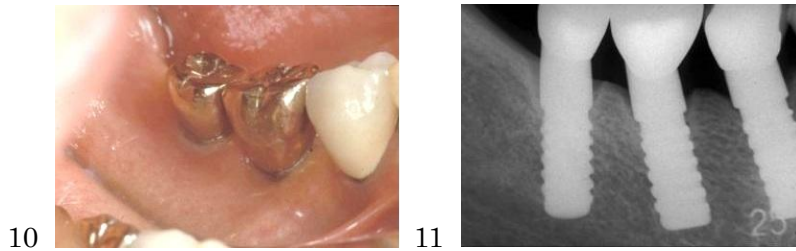


Image-10,11: Photograph and dental radiograph a year after the installation (12.06.1990). The condensation of the alveolar crest bone can be seen from this point.

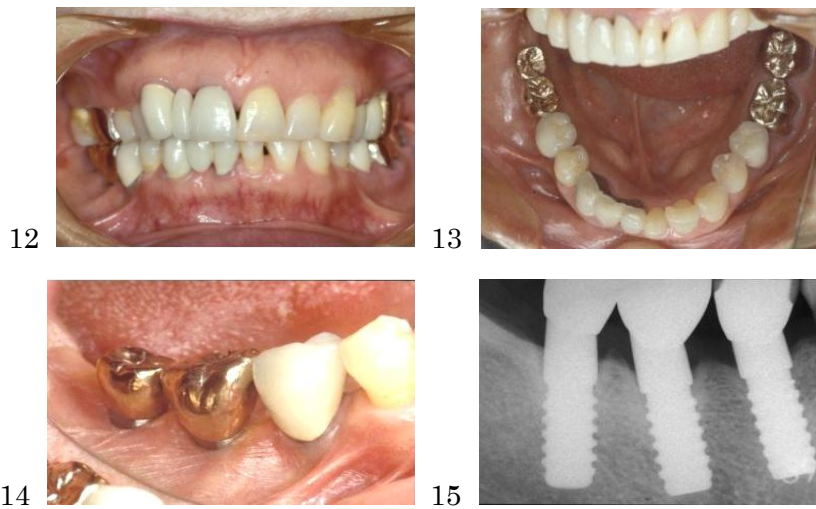


Image-12,13,14,15: Images taken 3 years after the installation (12.14.1992) shows progressive bone condensation, in the alveolar crest and in the structures around the implant body.

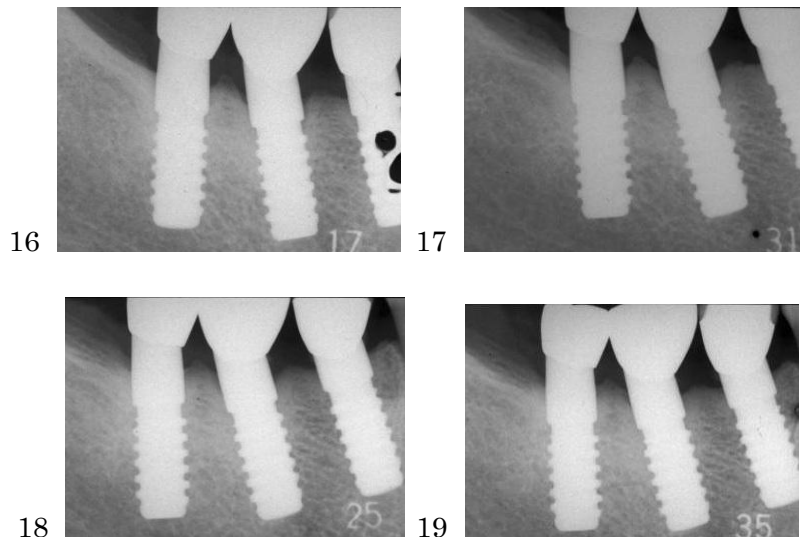


Image-16: Dental radiograph of the state 4 years later (12.29.1993).

Image-17: Dental radiograph of the state 5 years later (12.02.1994).

Image-18: Dental radiograph of the state 6 years later (12.15.1995).

Image-19: Dental radiograph of the state 7 years later (11.28.1996).

In between the images of the 4 and 7 years, the additional bone development in the area of the bone subjected to surgical intervention at the time of implant cavity construction can be observed.



Image-20,21,22: The state ten years later (12.02.1999). Majority of the natural teeth have remained, and strong occlusal force is acted on the implant prosthesis of No. 18 to 20 positions. An additional bone development has shown further progress in the alveolar crest.

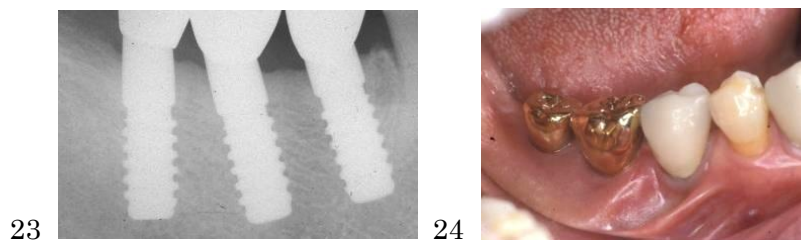


Image-23,24: The state 11 years later (12.28.2000). The alveolar bone region has become even, with the additional bone development, and an increase in the bone density around the implant structure can be evident.

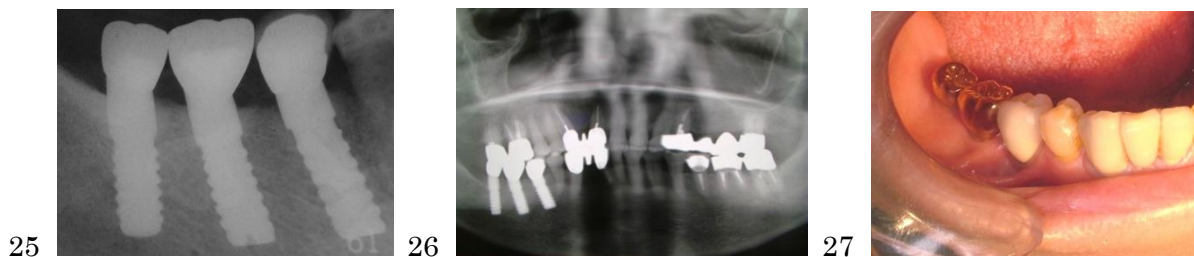


Image-25,26,27: Photographic and radiographic images 19 years after the surgery. No signs of bone resorption can be seen.

(Photos provided by Dr Yasuhiko Tsuyama, Mitsui Memorial Hospital)

Case 3: The progress of nine implants installed to the maxilla and mandibular molar region on both sides for 11 to 12 years.

Patient: 65 year-old female

First medical examination: April 1975

Main complaint: Osteomyelitis on No. 6 position

Medical history: none

Primary treatment: After conducting the standard dental treatments, perform the treatments as required for the space of 20 years.

Secondary treatment: Implant installation to No. 19, 20; No. 30, 31, and then to No. 3, 4, 5, in this order from 1996.

Tertiary treatment: Implant installation to No. 12 and 13 positions that were newly lost.

The period of implant installation: February 2nd 1996 to 4th June 1997.

Treatment progress:

She was a patient from the Mitsui Memorial Hospital, and had been visiting the hospital for the standard dental treatment for 20 years from April 1975 to 1995 (Image-1). A plate denture had been placed on the mandibular molar region to both sides, but had not been used for a while. She wanted to correct her denture before retiring, therefore started the AQB implant treatment. On February 2nd 1992, two implants, 5MM and 5MS were implanted to the positions No. 19 and 20 with missing teeth, followed by 5MM and 5SS to No. 30 and 31 positions in February 19th 1996. On May 7th 1996, gold alloy crowns were fitted onto the implants installed to both sides simultaneously. The occlusal support was achieved in the molar region. Then the 5MM, 4MM, 4MM were installed to the positions No. 3, 4, 5 lacking teeth (Image-2,3,4), on October 3rd 1996. The patient was then transferred to our clinic, for the placement of the gold alloy crowns onto the implants on May 7th 1997 (Image-5,6). The final installation was conducted on June 4th 1997 to No. 12 and 13, both 4MM on the 4th June 1997 (Image-7), and placed the gold alloy crown structures on the August 20th 1997 (Image-8). This is the 13th year since achieving occlusal support with implants in the maxilla and mandible on right and left sides of the molar region. The radiograph shows there are no bone resorption to be present and thus showing good progress (Image-9 to 23).

Evaluation:

This is a case where the occlusion is formed by the implant prosthesis on molars of both the upper and lower jaws. Since the mandible consists of cortical bone, single crown prosthetics can be fitted provided that 5 mm diameter AQB implant can be inserted, but, implantations to the maxilla needs further considerations as it is made of cancellous bone.

Particularly with example, the occluding teeth in the molar region were both implants on the upper and lower mandible, therefore the prosthesis on the maxilla were be connected. This consideration might have been the key to its long-term success.



Image-1: Panorama radiograph before starting the implant treatment (12.28.1994).

Image-2,3,4: The state after the patient was transferred to our clinic from Mitsui Memorial hospital, having undergone implant installation and superstructure placement to No. 19, 20, 30,31 and to No. 3, 4, 5 (14.12.1997).

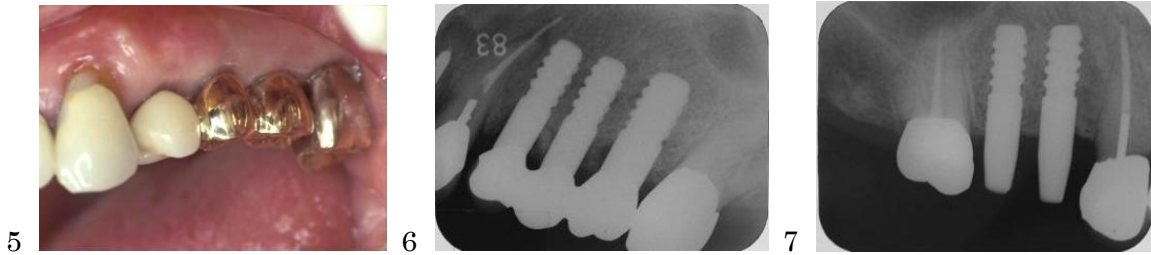


Image-5,6: Image at the time of connected crown placement (06.04.1997), with the dental radiograph.

Image-7: Dental radiograph at the time of installation of 4MM implant to No. 12 and 13 positions (06.04.1997).

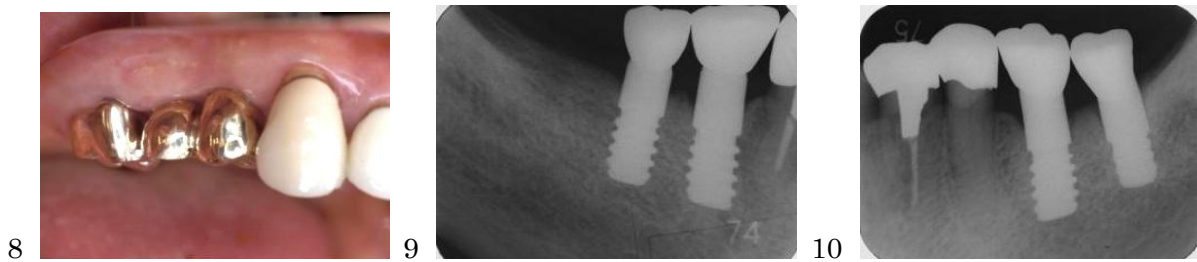


Image-8: Image after the placement of connected crown to No. 12 and 13 positions (08.26.1997).

Image-9,10: Dental radiograph 2 years after the installation to the both sides of the mandibular molar region (01.26.1998). Increase in the bone density of those surrounding implant structures and the alveolar crest can be observed.

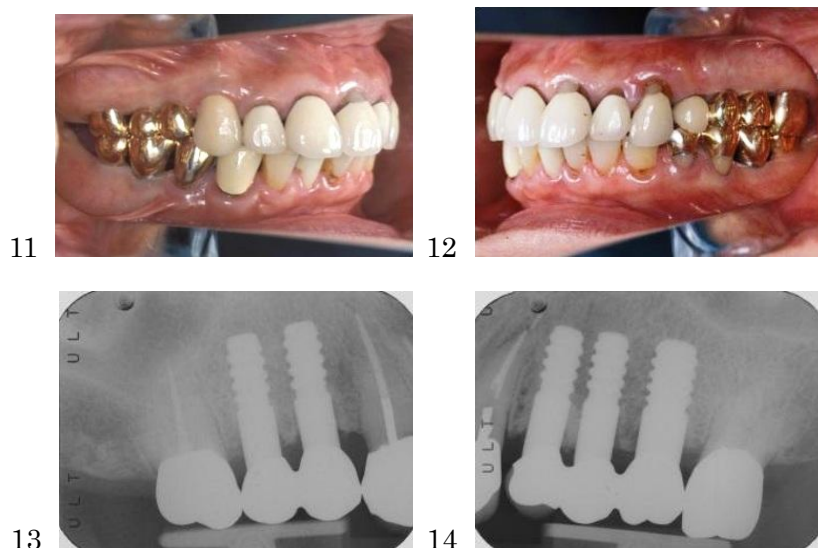


Image-11,12,13,14: Photographs and dental radiographs 5 years after the installation to No. 12 and 13, and 6 years after the installation to No. 3, 4, 5.



Image-15,16,17,18,19: The state, 10 to 11^{1/2} years after the surgery. Occlusal support at the molar region has been established.

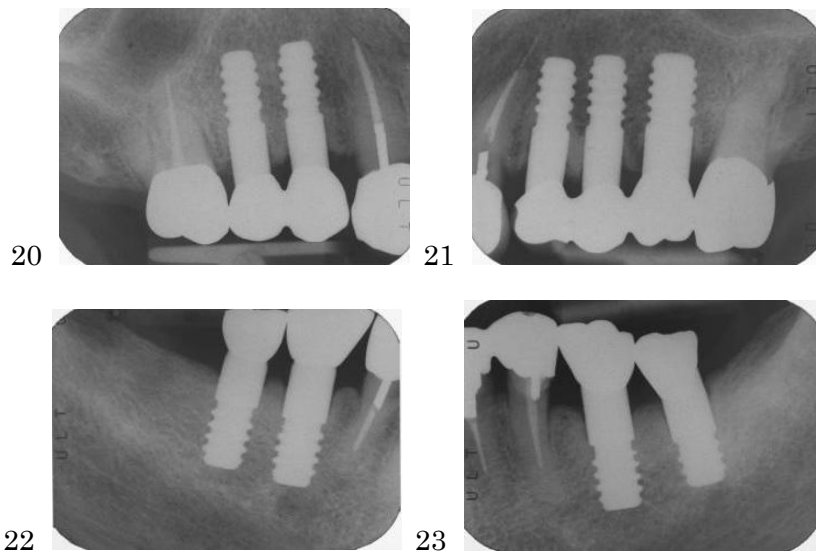


Image-20,21,22,23: Dental radiograph, 10 to 11^{1/2} years after the surgery (08.10.2007). Upon achieving bio-integration, the bone density of the surrounding structures of the implant and the alveolar crest increase. In this case example, a clear increase in the bone density of the structure between the implant bodies can be observed in the maxillary premolar regions.

Case 4: Two implants were installed to the mandibular edentulous jaw canines to act as anchors, which has been used for 13 years

Patient: 64 year-old female

First medical examination: April 1995

Main complaint: Bilateral angular stomatitis, vitilego on the left mandible.

Medical history: None

Primary treatment: Fabrication of full denture for both maxilla and mandible with a fit. Left alveolar crest leukoplakia excision.

Secondary treatment: Implant to No. 22 and 27 and place single crowns onto these in 1996, and fabricate a partial floor denture. The full mandibular denture that had become unstable due to alveolar bone resorption was replaced by a partial denture to be applied to a more stabilized region. This was intended as a solution to reduce the risk of relapse of leukoplakia that acted as the induction factor for the destabilization of the full artificial denture.

Treatment progress:

This was a Mitsui Memorial Hospital patient undergoing drug treatment for vitilego which was not showing any sign of improvements. Therefore well fitted full dentures were placed on both the maxilla and mandible (08.05.1995) and conducted leukoplakia excision on the left buccal mucosa (10.26.1996). A progressive crestal bone resorption was evident on both the jaws, with the increasing difficulty in retaining the stability of the mandibular denture. By implanting in place of canines, and with the placement of the crown to be used as the anchoring teeth, the idea was that the stability of the dentures would improve, as well as acting as a preventative measures for the relapse of leukoplakia (Image-1,2). The 4LL implants were installed to positions No. 22 and 27 (03.28.1996), and the floor of the artificial denture corresponding to this position was curved out in a U-shape (Image-3 to 6) and was trialed during a meal. Two months later, impression image was taken (05.31.1996) (Image-7,8,9), and placed with a metal-bonded crown attached with a mesiodistal rest.

The patient was then transferred to our clinic, for the fabrication of partial dentures with gold plated floor to cover the area excluding No. 22 and 27 implants. A rigid metal plate rest was designed to be hooked onto No. 22 and 27, and to support the occlusal force by these two AQB implants (06.14.1996) (Image-10,11). The 12 years till the AQB follow-up in April 2008 have been stable (Image-12 to 23). The denture has gained stability with the support provided by the installed implants. With no friction on the mouth floor, or relapse of leukoplakia, it is a successful case example in which it has survived 13 years with satisfactory progress.

Evaluation:

This is case whereby implants were installed to place the mandibular canine teeth with the aim to stabilized by acting as an anchor for the artificial denture. The metal bonded crown was set above the gingival margin, but with the gingival constriction in three to four years, the metal exposure on the cervical region had been increased, but no bone resorption could be observed. The rigid lingual rest is thought to be working well, even though the complete occlusal force has been supported by the two implant bodies. This is thought to be possible since the long version of the implant, 4LL, was selected, to

be inserted deep into the cortical bone close to the lower margin of the mandibular body.

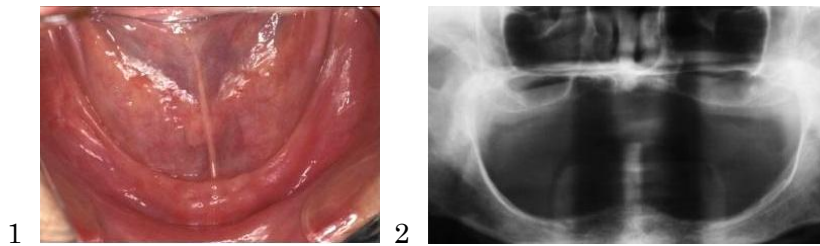


Image-1,2: Image of the edentulous jaw, and a panoramic radiograph before surgery (02.09.1996). The installation to the region distal to the mental foramen was not possible due to the short distance to the mandibular canal. The implant installation to No. 22 and 27 positions were planned.

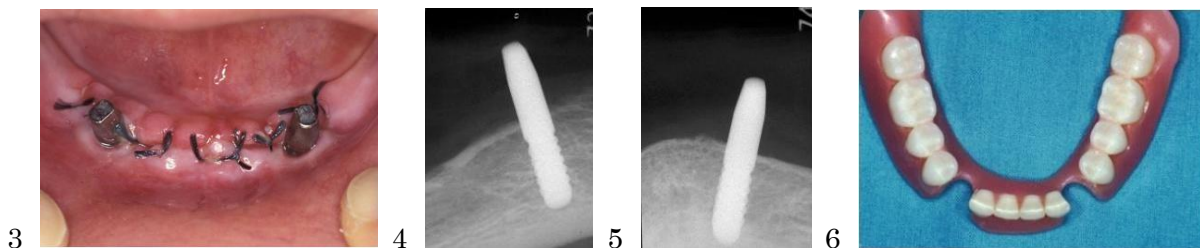


Image-3,4,5,6: Images taken at the time of suture (04.03.1996). A continuous alveolar ridge incision was applied to examine the state of the bone, with considerations to the future possibility of installation to positions No. 23 and 26. The tip of the implant was inserted till reaching the cortical bone to the level close to the lower margin of the mandibular canal, acting as a bicortical anchorage resulting in a firm installation. As one-piece implant is used, the denture that had been used in the past was used for the period till the bone integration was achieved, the position corresponding to the implants to No. 22 and 27 were curved out in a U-shape.



Image-7,8,9: At the time of impression taking, 2 months later (05.31.1996). The placement of prosthesis to edentulous jaw is complicated as there is nothing to mark the orientation of the implant insertion. The implantation to the anterior mandible should be inserted in a more upright position, but a slight adjustment at the time of preparation should be adequate to solve this issue.

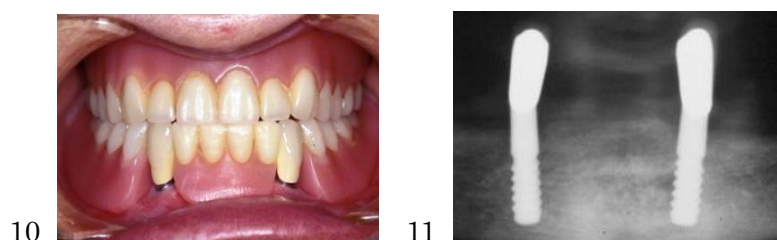


Image-10,11: Placement of the metal bonded crown after 2 1/2 months (06.15.1996). At the time, it was usual to place the crown margin above the gingival margin. Panoramic radiography was chosen for confirmation since the dental radiography was difficult to capture the whole length of the

implant to its tip.

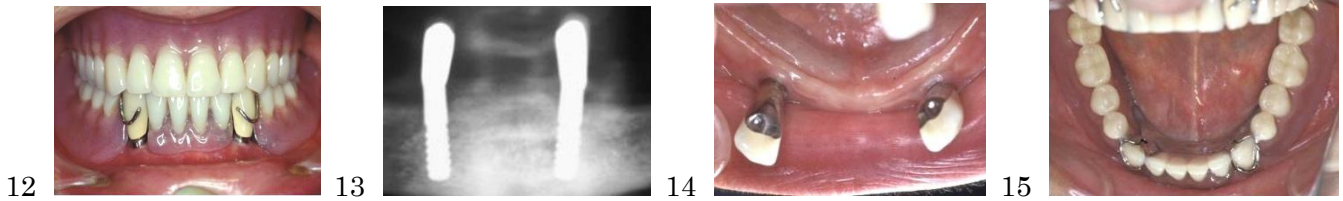


Image-12,13,14,15: Images taken eight months later (02.12.1997), replaced by the metal floor denture to both the maxilla and mandible, with its rigid rest hooked onto No. 22 and 27 implants for the occlusal force to be supported by these two.



Image-16,17,18: Four years later (02.25.2002), the mucosa surrounding the implants was shown to have constricted in comparison to when the alveolar mucosa was covered with a plate denture. For this reason, the degree of titanium metal exposed appeared to have increased, and it is not a result of bone resorption.

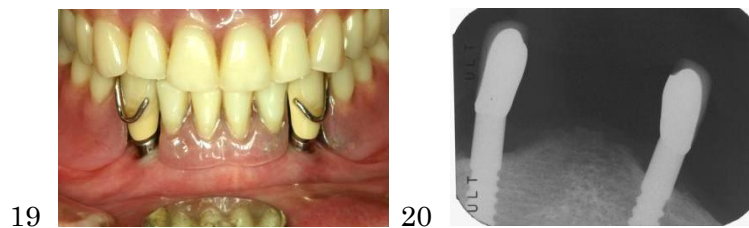


Image-19,20: Ten years later (04.21.2006). No structural changes can be seen to the surrounding mucosa since the observation 6 years ago. The alveolar crest has been confirmed by the dental radiograph that it is closely packed with the cortical bone structure, and showing stability.



Image-21,22,23: 12 years later (04.30.2008). There have not been any major issues with the prosthesis, apart from the fracturing of the clasp on the labial side, and had been simply repaired. The prosthetics, the dentures to the maxilla and mandible as well as the two implants are shown to be in good condition.