

## Chapter 4- Postoperative management

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In implant treatment, the emphasis is often placed on the installation techniques, but the importance of postoperative management should not be forgotten. This is of particular significance after the installation of one-piece types, therefore the explanation to the patients and the confirmation of the coherence to the management from the view point of implant preservation are vital. The understanding of the complications that can arise such as bone rejection, and their management, can have a significant effect on the subsequent outcome of the treatment. The stance of the practitioner to inspect the patient conditions in detail during the postoperative management acts to build a mutual relationship based on trust with the patient.

The aim with which to conduct postoperative monitoring acting as a surgeon is discussed in this chapter.

### I. Protecting the implant

#### A. Protecting the one-piece type

The implant body of one-piece type is left exposed from the gingivae once the operation is completed for the first time. The prognosis is largely influenced by its preservation techniques. If occlusal force is applied on the implanted body whether without realizing, a characteristic bone resorption is known to result, as shown by the radiographic account as shown in Fig. 3-4-1. A bone resorption featured as an inverse triangle towards the cervical region of the implant body is evident here. The implant body has been noted to fall out in approximately two weeks time once such bone state is created, if not treated (methods for which will be mentioned later in this section). It is therefore of particular importance to warn the patient not to chew with the implanted region, and actually check that they have not been doing so. From the past experiences, four to eight weeks have been adequate as the consolidation period before the forces can be reapplied, but it is largely dependent on the degree of primary stability or the occlusal force of the individual. In conducting the pull-out strength test, the bonding strength was reported to rapidly increase in the space of eight weeks therefore the consolidation period of eight weeks may be adequate for those surgeons with less experience.



Fig. 3-4-1 Absorbed state of the bone where external force was exerted straight after implantation

There are cases where the patient applies forces unconsciously, including touching with the tongue; resting the cheek on palm of the hand; tooth brushing the implant body, and all these can inhibit the implant from stabilizing. Implant body should be fixed to other structures where these occurrences are predicted. As an example, the implant, fixed onto the adjacent teeth with the application of Superbond is

shown in Fig.3-4-2. Where there is a request for the placement of temporary crown directly after the installation, a method is present to fix the implant body by fabricating provisional tooth with immediate loading resin (Fig. 3-4-3). This method is particularly effective for regions in which the esthetics is important, such as the anterior regions of the maxilla. The placement at this position should be conducted once establishing centric occlusion and protrusive occlusion as well as sufficient amount of clearance. The patients must be warned not to chew in this region. Alternatively, as displayed in Fig. 3-4-4, a celluloid protective mouth-shield can be inserted as a guard to protect the inserted structures. With respect to the anterior teeth, if these provisional structures are fabricated prior to installation, it can be effective in protecting the implant body as well as achieving an aesthetic recovery (Fig. 3-4-5,6).



Fig. 3-4-2 Fix implant with adjacent natural teeth with Superbond



Fig. 3-4-3 When equipping false tooth right after implanting, ensure sufficient clearance



Fig. 3-4-4 Cellulose mouthpiece



Fig. 3-4-5, 6 - The fabrication of provisional structures before the implant installation can be effective in the protection and for an aesthetic recovery, especially for the anterior teeth region.

### B. Protecting the two-piece type

The insertion of the fixture of the two-piece type results in a fully covered state of the implant body, therefore the preservation measures are often neglected. It is essential not to ignore the fact that micro-motion is conveyed through the gingivae to the implant body. This is such an influential factor that after bone augmentation procedures such as sinus-lift to the case where there is a deficiency in the vertical height of the bone in conjunction with the installation of two-piece type; or where the two-piece type implant installation was facilitated by the GBR method, the implant body can be protected from the micro-movement with the placement of titanium plate.

There are artificial dentures, temporary dentures and plaster types to the protection bed. Direct transmission of the micro-movement can be prevented in using any of these types by creating a space around the planting cavity. The closed state after the two-piece type insertion to the anterior mandible, in conjunction with the GBR technique is featured in Fig. 3-4-7. A temporary crown was subsequently placed and fixed with adjacent teeth with Superbond for protection and aesthetic recovery purposes (Fig. 3-4-8).



Fig. 3-4-7-a,b,c Two-piece type implantation to the anterior mandible with GBR technique

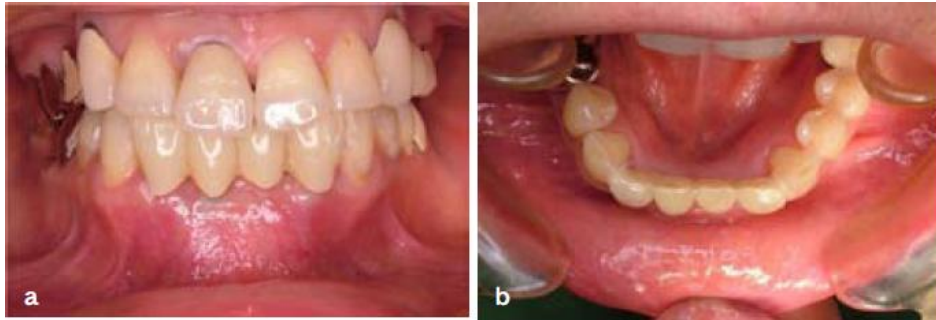


Fig. 2-4-8-a,b Placement of a temporary crown

## II. Infection control and countermeasure

It is an impossible task to avoid the invasion of the resident florae in the oral cavity or the foreign microbes into the implant cavity. Therefore the administration of suitable antibiotics is essential for the prevention of infection.

The complete closure of the fixture of the two-piece two-stage type within the cavity creates a highly favorable environment for the proliferation of the anaerobic bacteria. Therefore first-line antibiotics that also cover the anaerobic bacteria are often selected. The implant bodies of two-piece one-stage or one-piece type, on the contrary, are left exposed from the gingivae surface thus are often considered as an open wound. In clinical practice however, the gingivae flap is stitched up closely around the implant body, therefore these should also be considered as a closed wound. Thus the first-line antibiotic covering anaerobes should also be administered for the one-stage types.

Temporary bacteremia has been shown to occur in the procedures such as tooth extraction. Since implant treatment is also associated with this type of surgery, there are cases where preoperative course of antibiotics may also be required. The administration of 2 g aminobenzylpenicillin (ABPC, ampicillin) an hour before the surgery has been recommended by the American Heart Association (AHA) for a number of underlying diseases. There are no standard guidelines set in Japan, but following the AHA guideline is recommended. The body temperature and the systemic condition of the patients must be examined postoperatively. If the fever-like symptoms persist, there is a possibility of bacterial endocarditis, therefore consider consulting the medical doctor and administration of antibiotics.

There are no clarified period of administration, and have often been derived from the past clinical experiences. Generally, it is administered for the week till the stitch removal. Assess whether a correct dosage has been administered relative to patient's body weight, and that the patient has been compliant with the course prescribed. In the follow-up, in addition to inspect patient compliance with the oral medication, obtain the time of administration also. If the instruction is to be taken after each meal, it is

important not to lengthen the time period between dinner and breakfast, and it may be required to ask the patients to delay their dinner slightly.

The efficacy of the course of antibiotics should be derived from the local examination. Symptoms arising within five days of implant installation such as redness, swelling or pain, are an indication of postoperative infection. The antibiotic therefore is ineffective therefore consider changing it to another agent. The most effective means would be to identify the causative agent with a bacterial culture test and administer the antibiotic agent that is specific for it. But since the identification procedure takes a fair amount of time, administer another group, such as changing the agent to macrolides where cephem antibiotics were being administered previously. It is ineffective to continue with the same antibiotics or of the same group. If the oral agents are not sufficient, antibiotic infusion may also be required as an adjunct.

### **III. Pain management**

In the AQB implant installation, it is vital to bury the recrystallized HA coated layer within the bone structure. Mucoperiosteal flap formation is essential since this confirmation can only be done visually with the surgeon's eyes. The formation of the flap can consequently result in accumulation of blood effusion in between the flap and the bone, therefore slight swelling and pain are inevitable. The problem arises where the patients try to manage this pain with ice to the space between the implant body and the buccal mucosa. Alongside touching the implant body with the tongue, such actions can act as the external forces, consequently preventing the interaction to be achieved with the bone. The importance of pain management with considerations to the administration of analgesics is therefore a vital part of the postoperative therapy.

The first-line analgesic in the clinical practice is the non-steroidal anti-inflammatory drug (NSAIDs). Prostaglandins which are the stimuli for pain are often contained within the exudates therefore the administration of NSAIDs, a synthetic inhibitor, act rapidly to deliver effective inhibitory effect. NSAIDs have been associated to have various side effects therefore its use in some of the conditions, as stated in Table 3-4-1, this should be done with caution. It is contra-indicated in asthmatic patients and in those individuals who are undertaking a course of new quinolone. The second-line agent is acetoaminophen (non-pyrine type), but its action is less effective than NSAIDs.

The manner of administration, whether it is a regular intake or a single internal use, is often determined by the level of invasiveness of the surgical procedure. For instance, a single intake is sufficient for installation of one-piece type, but for the formation of extensive mucoperiosteal flap, with concomitant application of bone graft, or sinus-lift procedures, a regular intake is necessary.

Where the oral drug is insufficient to derive at an optimum effect, a concomitant administration of suppositories may be effective. As a common side effect of analgesia, gastric discomfort has often resulted, therefore concomitant use of stomach medicine should be considered. The sense of pain varies largely among the individuals. Paying attention to patient's complaints and insuring them of the safety can have similar effects to the pharmacological analgesic action.

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| <ol style="list-style-type: none"> <li>1. Asthmatic patients (Contraindication to aspirin included asthma patients)</li> <li>2. Concomitant use with new quinolone</li> <li>3. Gastroduodenal ulcer patients</li> <li>4. Nephropathy patients (Dialysis patient)</li> <li>5. Early pregnancy and late pregnancy</li> <li>6. For use in infants and elderly</li> <li>7. Patients who are taking anticoagulants</li> </ol> |
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Table 3-4-1 Precaution for use of NSAIDs

#### **IV. Management of postoperative bleeding and subcutaneous bruising**

The source of the bleeding in implant treatment should be determined, whether it is from the bone or the gingivae. The agent that is often used in clinical practice to distinguish between the two is 2% xylocaine with epinephrine. Administer this agent to the bleeding area with infiltration anesthesia, and apply pressure for five minutes with alginate impression agent, as illustrated in Fig 3-4-9. If the bleeding stops with this process, the source can be identified to be of the gingival origin. This can be treated by simply stitching up the bleeding area. If the source is from the area surrounding the implant body, the bleeding can be stopped by stitching to close the gap between the gingivae and the implant body. If the bleed does not stop, suspect the bleeding or bleeding tendency to be sourced from the bone. This should be managed with the use of hemostatic plaster as featured in Fig 3-4-10-a, and pressurize the area with this plaster as well as with the periodontal pack (Fig.3-4-10-b) for two to three days.

In the past clinical practice, in the patients who had been undertaking a course of oral anticoagulants or anti-platelet therapy were temporarily discontinued prior to the implant surgery but in the recent years the continuous administration of these agents have been recommended. The reasons for this change can be due to the reports of, firstly, the risk of triggering myocardial infarction or stroke by the discontinuation of the systemic intake of these agents, and secondly, that local hemostasis is still possible by conducting a suitable measure, even with the concomitant administration of the drug agents.

The bleeding from the oral cavity is mixed with saliva therefore appear to be more than the actual blood volume and can trigger anxiety in patients. Such explanation may be relevant for the patient to relax, as well as effectively managing the hemostasis.

There have been cases of patients presenting with subcutaneous bruising on the face or the neck in the three to five days following the surgical procedure. This has been observed after an extensive application of gingival periosteal flap in procedures such as sinus-lift or bone augmentation, which indicate the transfer of blood from one location to the other. It is often found at a location away from the where the surgery was conducted, which can make the patient worried. The presentation of the subcutaneous bruising around the optical sockets after the sinus-lift procedure to both sides is shown in Fig. 3-4-11-a. The condition of the patient seven days after the surgery is shown in Fig. 3-4-11-b. The subsidence of the bruise on the face can be observed, but a large subcutaneous bruise has presented on the neck region. Generally, these types of bruising eventually turn to a yellow color and disappear in the space of roughly three weeks.



Fig. 3-4-9 Apply infiltration anesthesia and then apply pressure for approximately five minutes with alginate impression agents.

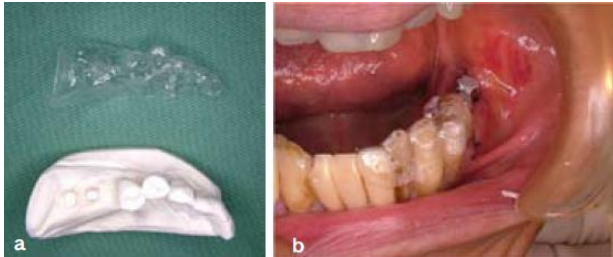


Fig. 3-4-10-a,b When the bleeding or bleeding tendency is suspected to be originating from the bone, fabricate hemostasis plaster (a), and pressurize the area with hemostasis plaster and

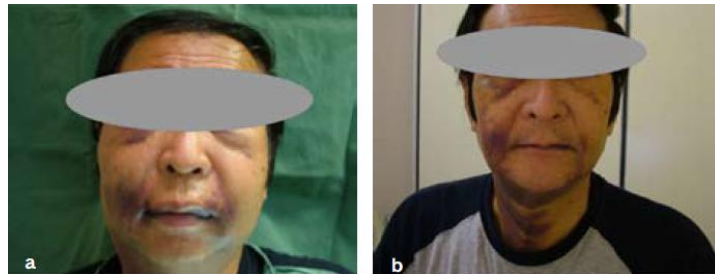


Fig 3-4-11-a,b physiological observation after performing sinus-lift procedures on the both sides. Subcutaneous bleeding bruising has manifested around the orbital sockets and on the corners of the mouth.

- a. Two days after the sinus-lift procedures conducted on the both sides.
- b. Seven days after the sinus-lift procedures conducted on the both sides.

## V. Management of inferior alveolar nerve paralysis and mental nerve paralysis

Both inferior alveolar nerve paralysis and mental nerve paralysis are complications of implant surgery that should be avoided the most. The treatment outcome resulting in these complications can consequently damage the relationship with the patient that had been built on trust, and can even lead to filing for a lawsuit. The complete recuperation from the nerve damages is often complicated but recovery of its functions is possible up to a certain degree. It is important to swiftly get onto the subsequent surgical intervention facilitated by the specialist organizations.

### A. The cause and clinical conditions

Factors that can be accounted for the cause include: direct injury from the drilling; pressure exerted by the implant body; or the pressure exerted by the development of hematoma. The most important amongst these is the damage from the drilling as a complete recovery from this is difficult. A direct injury to the nerves is often thought to result in abnormal bleeding or significant pain, but these symptoms are rare.

The common clinical symptoms of paralysis are dependent on the extent of injury, and vary from the

sense of numbness or tingling in the lower lip or in the skin of the chin. The sensing and the complaining of these symptoms vary among the individuals therefore the region of the numbness, the type, and the degree of these symptoms should be recorded in the medical records.

### **B. Clinical evaluation of the injury**

In the evaluation of the sensory disturbances, both quantitative analysis and audit of the patient's subjective symptoms should be included and be judged as a whole. It is recommended to combine a quantitative and one with high reproducibility in the evaluation of sensory perception. There are static quantitative sensory testing (QST, Fig.3-4-12), and two-point discrimination testing as the typical examples, which are both effective in the evaluation of the degree of recovery over a period of time.

The audit of the subjective symptoms should be recorded over the course of the treatment using check sheet of subjective symptoms, alongside taking photography of the area of the sensory disturbances (Fig. 3-4-13).



Fig. 3-4-12 Quantitative sensory testing with Semmes-Weinstein monofilaments



Fig. 3-4-13 Photograph featuring the area of neuroparalysis. After cyst extraction from the tooth root of left mandibular canine. SW Pressure Aesthesiometer 4.74

### **C. Treatment of the injury**

The therapeutic intervention for the damages has not yet been established, and the reality is that they are being treated by combining the methods as mentioned below.

#### **1. Pharmacotherapy**

The most frequently used are the combination therapy of Vitamin B12 and ATP. With regards to the combined administration of these drugs and the treatment course have been a subject of debate, but in author's facilities, both these agents are administered for the course of three to six months.

Steroidal agents can be administered as an alternative. The objective of this is to ease the pressure exerted on the nerves by reducing the swelling inside of the mandibular canal. Administrations of up to three days have been recommended. The only concern is the side effects of this group such as the gastric disturbances or menstrual irregularities. Therefore before prescribing the course, a consultation with a medical doctor who is experienced with the use of steroids would be desirable.

#### **2. Surgical intervention**

There are two arguments for the methods to solve the issue that has been created by the implant body. First, observe for any improvements in the symptoms resulting from the relieving the applied pressure on the mandibular canal by elevating the implant body by 1 to 2 mm above the canal (Fig. 3-4-14). This method is considered to be most effective for the cases where the probability of the damage is less likely to be the direct drilling injury, and more likely to be from the pressure exerted by the implant body. However, in the case of AQB implant, this method is not recommended, as the elevation of the implant body can consequently expose the recrystallized coating.

Second argument is to “remove the implant as soon as possible”. The objective of this is to relieve the continuously applied pressure from the hematoma or the aberrant bone fragments, with the removal of the implant body.

With regards to the neurectomy procedures, nerve anastomosis or nerve graft can be considered as a therapeutic option but the complete recovery even with these procedures is considered extremely rare.

### 3. Other therapeutic interventions

Laser surgery and acupuncture have been conducted as a method to accelerate the regeneration process by increasing blood flow to the area. The patient with inferior alveolar nerve paralysis, undergoing acupuncture therapy is featured in Fig. 3-4-15. A complete recovery from nerve paralysis that resulted from implant installation has not yet been experienced with acupuncture therapy. So far, it has only been effective for the reduction of the area of paralysis.

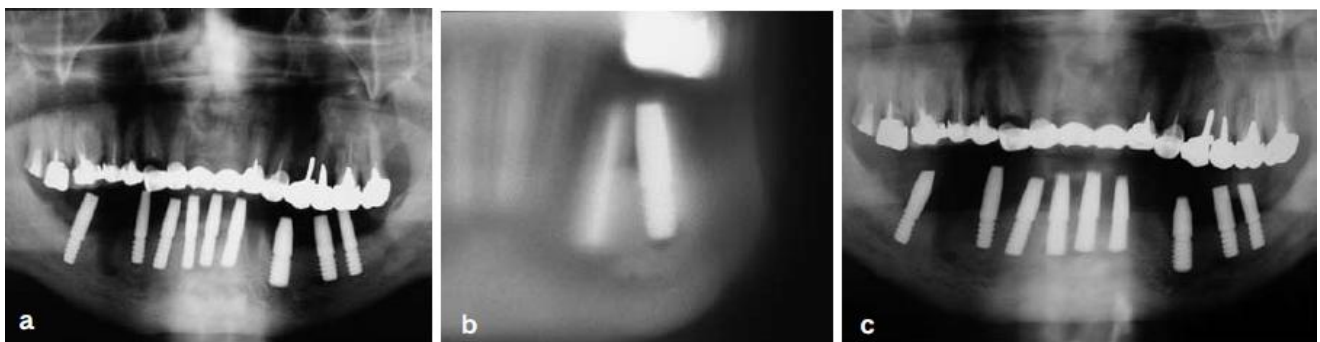


Fig. 3-4-14-a,b,c. Elevation of the implant body by 2 mm as a countermeasure for the damage to the mandibular canal.

- a. Preoperative panoramic radiograph
- b. Preoperative dental radiograph
- c. Postoperative panoramic radiograph

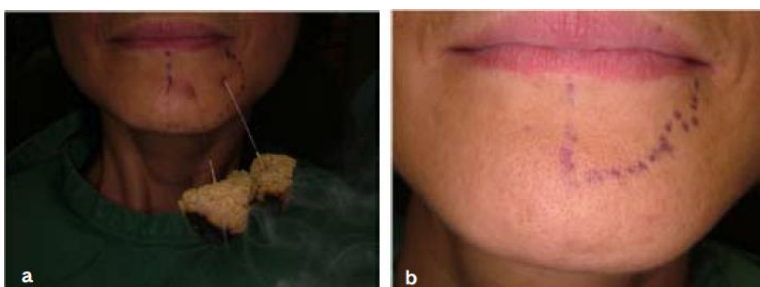


Fig. 3-4-15-a,b Images featuring the patient undergoing acupuncture for a case of inferior alveolar nerve paralysis.

### D. Preventative measures for the injury

The key to preventing any damage caused on the nerves lies in the identification of the exact location of



the mandibular canal before the procedure, as well as its orientations and their variations. Recent findings indicated that the inferior alveolar neuromuscular bundle to branch into two in the area close to the distal position of the secondary molars. Therefore the surgical procedures should be conducted with the awareness of these two branches (Fig. 3-4-16).

Conflicting views exist on the anterior loop of the mandibular canal, but the implant body is recommended to be installed with the distance of at least 5 mm away from the mental foramen. The surgical procedures in the area proximate to the mental foramen should be conducted with the upmost care, especially as any pressure applied or any shifts in the mental nerve can be detrimental to the structure.

There are several studies conducted with respect to the distance required in between the base of the implant body and of the mandibular canal, but in clinical practice, this has been said to be largely dependent on the skills of the surgeon. From the past experiences, the implant should be installed at a distance 2 mm away from the alveolar canal and 5 mm away from the mental foramen in order to avoid inducing nerve paralysis.

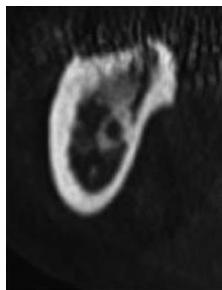


Fig. 3-4-16 Radiograph illustrating the branching of the inferior alveolar neurovascular bundle into two in the vicinity of the distal positions of the second molars.

## VI. Removal of the suture and postoperative follow-up

The timing of the stitch removal differs in the nature of each clinical progress. It is often conducted when the wound no longer shows any separation clinically, and the suture thread can be seen to be loosening out from the tissues. With regards to the one-piece type, the stitching of the mucosa surrounding the implant body, it is usually removed roughly a week later. If the suturing has been applied too tightly, partial necrosis of the gingivae is known to result (Fig. 3-4-17), in which case, the stitches should be removed earlier, for example five days after the implantation. The type of the suture thread is also important to be considered. For example, food becomes stuck to the silk thread but this can be avoided with the use of nylon thread, thus the latter may be more suitable when leaving the threading attached for more than a week to ensure that stability is achieved.

The thread should be removed after exposing those sections of the string that was incorporated within the mucosa above the gingivae surface, and taking measures to prevent its re-insertion back into the tissue structure.

During the healing period (from the time of installation till the removal of the stitches), the patient should visit for a check-up, every other day, for the inspection of the operated region, and the cleaning of the implant body. This should provide the patient with the sense of security. The monitoring the patient progress should consequently improve the installation techniques of the surgeon. The follow-up after the stitch removal should be conducted once a week.



Fig. 3-4-17 Partial necrosis is known to result from applying too much tension on the threading.

## VII. Patient consultation

The most effective methods to explain postoperative management to the patient would be to provide them with the information in a written form (Fig. 3-4-18). The explanations are usually to be given three times. The first is generally done before the implant treatment, but detailed explanation should be avoided at this stage and adopt a style to explain gradually with the progress of the treatment. The second is given before the installation of the implant. The explanation at this stage should be given in detail aided by the information in the written form. The third explanation is given after the end of the implant surgery. Avoid giving repetitive information and conduct the consultation with checking the compliancy of the patient to the things that had been asked of them. When giving explanations to the patients, the practitioners should be aware that the overload of information at any of the stages can lead to increased sense of fear and anxiety towards the implant treatment itself.

The explanation document should be itemized to maximize the understanding by the patient and accept the terms. The examples of the headings should include: postoperative progress and their precautions; medication counseling; instruction for the follow-up; plaque control; and response to emergency.

<p><b>5. Preoperative preparation</b></p> <p>&lt;Preparation few days before surgery&gt;</p> <p><b>Appointment</b></p> <p>Make the appointment with consideration to the fact that there is a possibility of the face becoming swollen for a week after the surgery.</p> <p><b>Physical condition</b></p> <p>Ensure you have been fully rested for 2 to 3 days before the surgery to be in good condition without fatigue.</p> <p>Make sure your physical condition is best on the day of surgery. It is still possible to perform the surgery even if your condition is slightly poor, but will be postponed in case of fever.</p> <p><b>Mandibular range of motion</b></p> <p>Implantation will be difficult with a trismus. Provided that width of three fingers (the index finger, the second finger and the third finger) can be inserted vertically it should not be a problem. If you have difficulties opening the mouth widely, please inform your doctor beforehand.</p> <p><b>Regular medicine</b></p> <p>The pharmacological effects of some drugs are unfavorable for surgical interventions, such as the medicines for arteriosclerosis (e.g. warfarin) that acts to thin the blood and slows down the hemostasis, which needs to be dealt with before the surgery.</p> <p>With regards to some of the medicines for diabetes mellitus, antipsychotic agents, nonsteroidal anti-inflammatory drugs and oral contraceptives, there are agents that may be better stopped</p>	<p>&lt;On the day of the surgery, Before the surgery&gt;</p> <p><b>Appointment</b></p> <p>Please avoid being late or cancel your appointment as much as possible since the period for one surgery can take up to ten different treatments.</p> <p><b>Clothes</b></p> <p>Please come prepared with clothes that are both relaxing and one you would not mind getting dirty.</p> <p><b>Make-up</b></p> <p>Please do not wear make-up below your nose as the face will need be disinfected.</p> <p>Please remove polish off the nails of the right index and middle ger.</p> <p><b>Meal</b></p> <p>There are no food intake restrictions, and breakfast is allowed. If you have been given preoperative medications, please take them as directed by the doctor.</p> <p><b>Cleaning</b></p> <p>Brush your teeth more thoroughly than usual and shave.</p> <p>&lt;Right before surgery&gt;</p> <p><b>Toilet</b></p> <p>Please come having been to the toilet. The surgical procedures can take a longer time than it was initially planned.</p>
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<p>before surgery. Please notify your doctor of your current treatment details.</p> <p>This is particularly important if you are taking medicines for osteoporosis, because these medicines can cause necrosis of the bone after the surgery. Please be sure to inform your doctor about this. Make sure you undergo surgery once the medications for osteoporosis have been stopped.</p> <p>&lt;The day before surgery&gt;</p> <p>Pain</p> <p>The surgery is performed under anesthesia, so it is usually painless. If the given anesthetic is not effective, another anesthetic will be provided. You never need to bear the pain, so please do not afraid to receive the surgery. If you still feel uneasy, the general anesthetic will be given (¥200, 000 will be added to your bill).</p> <p>Fitting with the bone</p> <p>Some of patients are concerned as to “ What if the implant will not fix well...”, but if the implant treatment is unsuccessful, the surgery will be performed again for no additional fee (replantation surgery). All of the current implant systems have been proven to have high performance and you can consider the failure rate, where the implant does not integrate with the bone, to be less than 5%.</p> <p>Harm</p> <p>Titanium is highly biocompatible therefore titanium implant can become safely integrated with the bone without causing any harm to the body.</p> <p>Stories of unsuccessful treatments in the past</p> <p>Implants have been applied for the past 20 years, but materials and forms of implants in the past were vastly different from those in current use and success rates were low. For example, the implants made of artificial sapphire had problems with integrating with the bone and blade implants had issues with its removal if any complications occurred. The present implants have been shown with high performance with reduced possibilities of failure, thus it is possible to remove and install implants even if complications are to arise.</p> <p>If you know someone who had a bitter experience with the past implant systems, know that these are completely different from the implants used at present, which have high efficacy and are rarely problematic.</p>	<p>Hair</p> <p>If you have long hair, do not tie your hair in a way that would restrict your head movement.</p> <p>&lt;During the surgery&gt;</p> <p>Time of surgery</p> <p>The surgery usually takes 15 – 30 minutes to place one implant. Some patients think about the surgery throughout the process, but it is better to think about other things to avoid fostering anxiety. It is possible to listen to music if you have a tendency to become anxious, so do not hesitate to ask if it may help you to relax.</p> <p>Taste</p> <p>The salty taste will persist during operation from the physiological saline solution.</p> <p>Touch</p> <p>The anesthesia can make you feel painless, but not your sense of touch. For example, the anesthetic effect is working, it may still be possible to sense milling of the bone or cutting into the gum. Individuals who have a fear for such can confuse this sensation with pain, but understand that is not the case.</p> <p>Tongue</p> <p>If your tongue is large or it is positioned high in relation to the teeth, the tongue can be obstructive to the surgical procedure. It will be pressed down to help us perform operation, so do not try to move your tongue.</p> <p><b>6. Points of caution for the 7 – 10 days after the operation</b></p> <p>Postoperative care</p> <p>After the operation, it is necessary to avoid applying external force to the implant for it to integrate with the jawbone more rapidly. Foods such as rice gruel/porridge are recommended and avoid biting with the implant site for 7 – 10 days after the operation.</p> <p>Swelling can occur 3 - 4 days after the surgery, but will disappear again in 4 – 5 days. It can be cooled with a wet towel placed in a refrigerator, and put this next to the swelling. Do not press the implant site with force. A course of painkillers, antibiotics and stomach medication will be prescribed, please take them as advised by the doctor or the pharmacist. Allow at least 3 hours in between taking the painkillers.</p> <p>Please gargle after an every meal and before sleeping with the prescribed mouthwash. Your saliva may be mixed with blood for the first couple of days after the surgery, but gargling too much is not recommended to help the healing.</p> <p>Some patients who dislike taking medications stop taking them if their conditions do not appear serious. Please follow the directions from your doctor and be sure to take medicine since these have been prescribed for a reason such as antibiotics for protecting the wound from the bacterial invasion.</p>
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Fig. 3-4-18-a An example of explanation document 1 (From Yonezawa Dental Clinic in Tokushima Prefecture)

<p>-Bleeding</p> <p>Postoperative notes of caution are the same as those at the tooth extraction. Avoid doing things that will increase your heart rate increase such as having a bath, drinking alcohol or exercising because will cause bleeding. Taking a shower should not be a problem. Please do not gargle too much. The mechanism of the stop in bleeding is that it first solidifies by forming a jelly-like plug similarly to a scab. This will be removed if you gargle with</p>	<p><b>10. Cleaning of implant</b></p> <p>With the placement of the superstructure (artificial crown), the plaque becomes more easy to attach to implant. Therefore plaque control becomes a vital component of the aftercare. You will be given instructions on how to conduct interdental brushing, dental flossing, in addition to normal tooth brushing.</p> <p><b>11. Cases where any problems occur in implant treatment</b></p>
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<p>too excessively. If this is repeated, with the scab coming off every time, the wound becomes less likely to heal and bleeding will not stop. Try not to think about it.</p> <p>Removal of suture thread Suture thread will be removed within 7 – 10 days after the surgery but continue to avoid biting at the implant site and eat tender foods.</p> <p><b>7. Notes until 2 months after placement</b> 1 – 2 months period after the placement is the most crucial. Please continue to avoid biting at the implant site and do not press the implant with a tongue or fingers. People have a habit of applying his/her tongue to the position that is of concern, and this is done unconsciously. However, this will obstructive the integration of the implant to the bone. It does not mean that the implant is not compatible with the tongue, but the problem lies in continuing to touch the implant. It does not become an issue if the tongue merely touches it, but it becomes so when this develops into a habit, and then preventing the implant from integrating with the bone. Be aware of the tongue habit. In addition, please eat tender foods as much as possible.</p> <p><b>8. Integration/Superstructure (artificial tooth)</b> The period needed for integration is usually 1½ – 6 months for the implant to integrate with the bone. The superstructure (artificial tooth) will be placed once determining that the integration has occurred, and the implantation has been successful. The patients who have been placed with the superstructure immediately after implantation (such as all-in-4 treatment) are recommended to continue with the liquid food for a month. The implant structure is narrower than that of natural teeth therefore do not expect the outcome to be exactly the same as before. Since the thinness of the root, food tends to get stuck in between the spaces therefore we will advise you to utilize the interdental toothbrush. Due to the titanium structure of the implant, these are not subjected to dental caries but the oral hygiene is still essential to maintain as it can still be affected by periodontal disease. It becomes difficult to maintain implant if the necessary level of oral hygiene is not retained after the placement of the superstructure. The conditions may appear to be stable, but once you neglect the oral care, you may lose the tooth you just gained. Do not neglect the oral care even if it appears healthy.</p> <p><b>9. Periodical examination after the treatment finishes (recall)</b> The aftercare is imperative in the implant treatment. Please visit the clinic for the follow-up. We will call you in for a medical check-up a week, a month, 3 months and 6 months after the superstructure placement. At this session, the orthopantomography, dental photograph and intraoral photograph will be taken properly and the doctor will inspect for presence of bone resorption, conditions of the gingiva, teeth and implant for any rubor, tumor, retraction, drainage, dolor, bleeding, tartar, pocket depth, mobility and other abnormal findings. After this, provided there were no abnormal symptoms, the follow-up period will be every 6 months. In this session, the areas and structures other than the site of implant will also be under inspection, such as the conditions of the dentin, periodontal tissues and occlusion. These will then be compared to the postoperative results.</p>	<p>At the time of the implant surgery At the time of implant operation, in spite of the preoperative examinations, the jaw bone at the site of implantation is inadequate. Please be aware that the operation may be stopped or bone augmentation procedure will be needed as an additional procedure (additional fee).</p> <p>Until 2 months after the surgery In principle, there should not be any movement with the implant. Where oppressive pain or movement have been noted with the implant at 1 – 2 months after implantation, it can be assumed that integration with the bone have not been successful due to osteogenesis in the implant surroundings have not taken place for a reason or another. In such cases, the progress will be observed for another 1 – 2 months with the placement of temporary crown to determine whether the superstructure can be attached or whether another procedure, removal/re-implantation will be necessary. In such cases, the next surgery should not be prolonged with the expectation that the condition will be improved for the sake of future surgeries. The limit for such observation period is 6 months after the implantation.</p> <p>In cases where any problems occur after the end of implant treatment Please contact us immediately if the artificial tooth attached to the implant comes off or is damaged. In addition, please contact us immediately if any problems arises with your own natural teeth (for example, a crown come off or a tooth is shaky), so that any alterations to the overall occlusion can be adjusted to avoid putting excessive pressure on the implant.</p> <p><b>12. Implant treatment expense</b> Implant treatment is not covered by your health insurance therefore it will be a private treatment and will have to be paid by yourself. We ask that you pay at the time of ① examination, ② implant placement surgery and ③ attachment of the artificial tooth. You will not have to pay if the surgery is stopped because of the shortage of the bone of the placement site or other issues that arose during the procedure. If the treatment has been interrupted on your terms, please understand that the expense up to that point will not be refunded.</p>
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Fig. 3-4-18-b An example of explanation document 2 (From Yonezawa Dental Clinic in Tokushima Prefecture)

## **A. Postoperative progress and points of precaution**

The treatment course is explained from the installation to the placement of the superstructure by separating the contents into three: the period in between the installation and the stitch removal; period in between the stitch removal and the placement of the superstructure; period after the superstructure placement.

### **1. The period in between the installation and the stitch removal**

The most important point to bear in mind during this period is to avoid becoming in contact with the implant body. Avoid chewing with and to occlude with the implanted area is one, but the avoidance of any application of external factors should not be forgotten. The patient should be told to avoid touching the implant body with the tongue or rest the side of the cheek on their hand. The suture is removed roughly within a week, during which time the cleaning of the implant body should be done by a professional. The instructions for the pharmacotherapy, such as the regular intake of antibiotics, the efficacy of analgesics, and their side-effects should be given. In addition, their compliancy to the prescribed course should be checked at each check up, as well as providing instructions in case of night time bleeding and contact details for emergency.

### **2. The period in between the stitch removal and the superstructure placement**

Within this period, the patient usually relaxes, having been relieved of postoperative pain, and end up occluding with the implant body. The instructions not to occlude with the implanted section should be given repeatedly. This should be provided with detailed reasoning, and inform them that the consolidation period is roughly eight weeks; then shorten this period in accordance with the analysis of the state of the bone with the technique that will be discussed later. It is best to avoid lengthening the period of consolidation from the time that was given initially. There have been patients that have brushed the implant body with the tooth brush within this time. The ultra-soft brush must be employed and checked that no excess pressure is applied. The patient should visit the clinic once a week within this period, after the stitch removal and placement of the crown prosthesis, to check for presence of bone rejection and plaque control. After the placement of the temporary crown, monitor the state of occlusion for roughly a month, alongside the final checks of any bone rejections.

### **3. The period after the superstructure placement**

Explain to the patients of the importance of plaque control and the necessity of regular check-up. The patient must be able to recognize that the plaque control by the patient themselves can affect the implant treatment prognosis. Instruct the patient to visit the clinic every six months for regular observation. Patients should be informed that during these visits, the state of occlusion, plaque control, and X-ray radiography are assessed. Finally, inform them that there will be letters to remind them to visit the clinic regularly and to not leave a space of more than a year without visiting.

## **B. Example of detailed explanation**

### **1. After the one-piece type installation**

“In the two months following implant installation, the integration of the implant with the bone occurs rapidly. If the implant is chewed with, felt with the tongue/ fingers or placing the side of the cheek on the

palm, the force applied on the implant body can prevent this integration becoming achieved. In some cases the implant body has been known to fall out, so it is important to make a conscious effort not to occlude with the implant on its side.

Be aware that there may be bleeding mixed with the saliva for a few days, and that gurgling excessively to get rid of this will only exacerbate the bleeding. Please refrain from any extensive exercise, having a bath for a long time and alcohol for the rest of the day. Extent of swelling does vary amongst individuals but it may manifest. The peak of swelling is two to three days time. In treating this with extremely cold, like ice cold water will only harden the swelled state, therefore it should be applied lightly with a towel wetted with tap water instead.

A course of antibiotics to prevent infection has been prescribed, so please take these as has been instructed, on time and with the correct dosage. If side-effects of rash or diarrhea presents, let us know. The analgesics have been prescribed for a course of five days. It starts to work 30 minutes after taking it, so take one as soon as you feel slight pain. Other options such as the use of suppositories will be considered if it has not been sufficient, so please do not hesitate to consult us.

Take care when brushing the implant. Please refrain from touching it till the stitches have been removed and we will be responsible for the cleaning till then. Once the stitches have been removed, you can start brushing the implant with ultra-soft brush that we have provided without applying any force. The normal toothbrush will be used once the artificial tooth is placed, but always use the ultra-soft tooth brush till we give you the instruction.

Visit the clinic regularly, as frequently as possible, till the removal of the stitches. Having removed the stitches, visit the clinic once a week. The temporary tooth is fitted two months later, followed by the final prosthesis a month after that. Then the treatment will be complete with a few fittings of the final structure, but please come for a regular follow-up, every six months is the standard. There will be a letter sent to remind you of the follow-up. We will inspect for the state of hygiene in the area of implant, the state of occlusion, and with the radiograph.

Consciously take care of the oral hygiene as the oral care plays a huge role in the life-time of the implant. There have been reports of smoking to have a deteriorating effect on implant. It is best to give up smoking to achieve successful outcome with the implant”

## 2. After the two-piece type installation

“The primary surgery has been successful. The implant body has been buried and covered with the gum so you will not be able to see it. The temporal crown structures or shields will be placed on top of this but refrain from placing it before the stitches are removed. Chewing even after the shielded has been placed can exert pressure on the implant body so please avoid chewing at this position. Be aware that it usually requires roughly a period of 2 months for the implant to integrate with the bone, so avoid applying any pressure before this. If there is pain or swelling with the shield, there are no obligations to force it on, but visit the clinic as soon as possible.

It is usual to find swelling the day after the surgery. The peak is likely to occur in 2 days time, and will subside a week later. You may find a simultaneous manifestation of bruising to the face or the neck. This mark will turn from blue to yellow and completely disappear in three weeks, so it should not be concerned.

Please refrain from gurgling too much after the procedure, and limit it to four times a day. It can also be a

cause of bleeding so minimize as much as possible. Blood may be mixed with the saliva in the first few days after the implant treatment but it is nothing to be concerned with.

Anti-suppurative and analgesia have been prescribed, which should be taken as directed at a regular time with the correct amount. Inform us in case that the drug does not have been suitable. If the analgesic is ineffective, do not hesitate to tell us, use of suppositories may be considered.

Try to visit the clinic as frequently as possible till the removal of the stitches. The secondary surgery will be conducted in two months time depending on the healing process. The secondary surgery will be to mount the abutment, then the placement of the temporary crown on the same day. You will be able to chew from here. You will then be in charge of cleaning your teeth. First, use soft brush and interdental brush. Please bear in mind that the level of tooth brushing will influence the survival rate of the implant. There have been reports of smoking having a deteriorating effect on the success of implant treatment therefore we recommend that you stop smoking.

A month after the placement of the temporary crown, the final prosthesis will be fitted. The treatment will be completed then but please come for a regular follow-up sessions after that. Every 6 months is the standard. There will be a letter sent to remind you near the time of the follow-up. We will check for the state of hygiene in the area of implant, the state of occlusion, and with the radiograph.

With the placement of implant, you should be able to chew in the same way as your own teeth. This will enable you to chew sticky or hard food that was difficult before. Eat with appreciating the benefit of the implant. As I mentioned before, the postoperative care is imperative to be able to continue this chewing sensation, therefore please do not hesitate to ask any questions and inform us of any worries that you may have at any time.”

## **VIII. Points to bear in mind till the placement of the superstructure**

### **A. Response to the bone rejection after the implant installation**

#### **1. Clinical symptoms and characteristics of bone rejection**

Rarely, cases present where the symptoms of pain and gingival swelling persists for a longer period of time than two weeks after the installation of one-piece type, and falling out four weeks later. The implant body is known to fall out due to bone resorption from contracting infection for a reason. The reason for this can be owed to a bone rejection to a stimulus. Bone rejection of this type can be classed into three groups in terms of the disease state to those caused by force, heat or down growth.

Typical manifestation of symptoms:

- Persisting pain.
- Swelling in the gingivae surrounding the implant body.
- There is no plosive sound when tapped.
- Transparency in the bone structure is featured in the radiograph
- Slight movements can be observed

These types of symptoms arise in the two to four weeks following the implant installation. Upon manifestation of these symptoms the implant body is known to fall out rapidly if a suitable treatment is not conducted. It is possible to prevent its elimination by fixing the structure strongly with the use of Superbond, and administration of antibiotics.

## 2. Bone rejection resulting from application of mechanical force

Two factors can be considered as the causes of bone rejection: first, exertion of too much force at the time of implant insertion; and second, the application of excessive occlusal force. The cause of mechanical origin manifests as a characteristic image in the radiograph, typical image of which can be seen in Fig. 3-4-19, the third week after the installation. Here, a resorption cannot be found on the base of the implant, but a significant bone resorption that is in an inverse triangle can be seen in the area around the implant cervix. The state of the bone thought to be affected by the excessive occlusal force is shown in Fig. 3-4-20. Here, a similar radiograph image can be seen. If these kinds of images are obtained, suspect the mechanical forces as the causative factor.

Installation should be conducted with bearing in mind that the application of too much pressure at the time of installation can result in pressurized resorption, as a preventative measure. The expansion of the implant cavity diameter, as the last step, should always be performed with the reamer, and insert the implant having confirmed the depth of the implant cavity to be 2 mm excess of the length of the implant from the HA coated point. To avoid excess occlusal force, the buccolingual width of the superstructure should not exceed three times the width of the implant body diameter. In the molar region, the occlusion at point A should be avoided, and ensure anterior disclusion to be achieved.

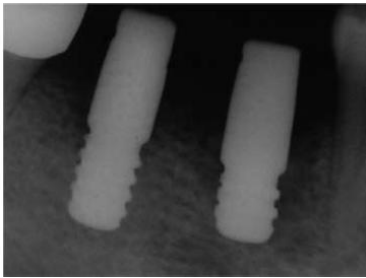


Fig. 3-4-19 Radiograph of the bone rejection resulting from applied mechanical force, three weeks after the surgery.

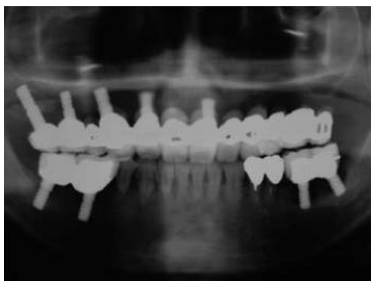


Fig. 3-4-20 Radiograph featuring bone resorption thought to have caused by excessive occlusal force.

## 3. Bone rejection resulting from application of heat

Burning can induce bone rejection. Fig. 3-4-21 features the resorbed state of the bone. The significant difference with those of the mechanical source is that the bone rejection profile with heat lacks the characteristic inverted triangular bone resorption. The bone resorption image is an overall bone resorbed state. With such findings of the bone, heat should be suspected as the causal factor.

To prevent bone rejection from heat, the following factors have be considered during the installation procedure.

- Always perform the procedures with water
- Construct the cavity with 20 torques and 60 revolutions as the standard practice.
- Wash the implant cavity after every step.





Fig.3-4-21 Radiograph of the bone refection resulting from heat

#### 4. Downgrowth

This condition has been known to manifest where the occlusal pressure is applied before the implant has not had the time to integrate with the bone. The probability of this occurring is increased if occlusal pressure is applied within a month after the installation of one-piece type. The radiograph featuring a typical state of downgrowth is shown in Fig 3-4-22. A slight case of bone resorption can be observed in the cervix region of the implant body. Where this kind of finding can be observed in the radiograph, avoid applying any occlusal force for two months. The progress of resorption should be monitored over a period of time.



Fig. 3-4-22 Radiograph featuring a typical downgrowth state of the bone

#### 5. Responding to bone rejection

The key to overcoming this issue is to recognize the symptoms of bone rejection early by bearing in mind the possibility of bone resorption after every implant installation. To enable this quick response, it is essential to inspect the area closely and with X-ray analysis. It should always be inspected at four stages as mentioned below:

- Straight after the installation (to analyze the state of the installation, and to be used as the basis for the following postoperative observations).
- Two weeks after the installation (to recognize the initial signs of bone rejection).
- Four weeks after the installation (final check for signs of bone rejection resulting from the installation).
- Two weeks after the superstructure placement (check for bone rejection resulting from occlusal forces).

The bone rejection should be treated by a firm fixture of the implant body and administration of antibiotics. The points for a firm fixation with Superbond are mentioned below:

- Fix with the Superbond in a way that it covers the implant body (Fig. 2-4-23).
- Leave interdental space to help retain an adequate level of oral hygiene.
- Two month should be considered as the standard period for consolidation.
- Leave sufficient distance between the antagonist teeth, and tell the patient to avoid occlusion on the consolidating region.

- The fixation with the natural teeth should be within limits of physiological movement.

The follow-up after the fixation should be conducted once a week to once two weeks to confirm that there is no loosening, and the state of the gingivae. The impression material consisting of agar is the most effective for use when using Superbond. The agar impression material is applied to coat the surface of the gingivae (Fig. 3-4-24) before adding a layer of Superbond with a brush (Fig.3-4-25). This way, the flowing off of the Superbond can be prevented. After the Superbond has been set, the agar impression material can be removed, and then polish the Superbond layer to remove any sharp edges (Fig. 3-4-26). Alternatively, a method to attach fixing apparatus fabricated with an immediate resin, with Superbond is also possible (Fig. 3-4-27).

The points of administration of antibiotics with the presentation of bone rejection are mentioned below.

- Administer a different group of antibiotics that had been given as a postoperative preventative measure.
- The standard treatment course is a week but consider repeated course of administration where the inflammation of the gingivae is persisting.



Fig. 3-4-23-a,b,c. Fix with Superbond as to cover the implant body



Fig. 3-4-24-a,b. After the installation (a), apply agar impression material to cover the gingivae surface.



Fig. 3-4-25 Apply Superbond with a brush



Fig 3-4-26. After the Superbond has been set, remove the agar impression agent and polish the layer of Superbond to remove any sharp edges.

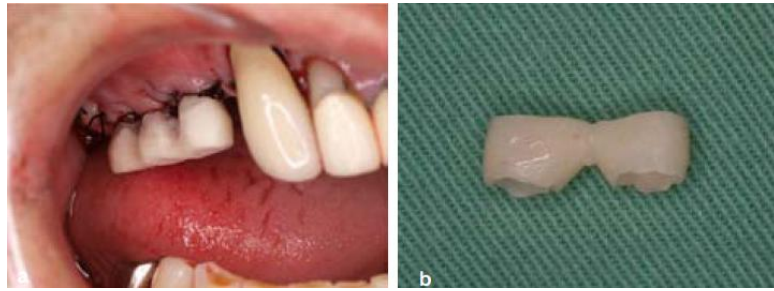


Fig. 3-4-27-a,b. An alternative method in which a fixing appliance fabricated with self-curing material is attached with Superbond.

Lastly, a case encountered that was recovered from bone rejection is presented.

To the case of bone rejection resulting from mechanical force as featured in Fig. 3-4-19, four months consolidation period was given. The radiograph featuring the condition a year later is shown in Fig. 3-4-28. For the bone rejection to have resulted from thermal damage as shown in Fig. 3-4-21, a period of two month was given for consolidation. The radiograph of the same area six months later is shown in Fig. 3-4-29.



Fig. 3-4-28 Radiograph taken of the state a year later from the case of bone rejection to have resulted from mechanical force as shown in Fig.3-4-19



Fig. 3-4-29 Radiograph taken of the state a year later from the case of bone rejection to have resulted from thermal damage as shown in Fig. 3-4-21

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