

Chapter 6 - Preparation of the area of installation before the implant surgery

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For a smooth implant surgery and to improve prognosis, it is necessary to prepare the area of treatment suitable for operation. In this chapter, I will discuss the preoperative surgical procedures, intraoral treatment, periodontal disease treatment, occlusal treatment and orthodontic treatment.

I. Preoperative surgical procedure

A. Points to consider in tooth extraction

Tooth extraction should be conducted to minimize bone resorption, a common complication to arise from the extraction procedure.

1. Points when undergoing general tooth extraction

Conduct tooth extraction procedures in the usual manner and limiting the damage to the jaw bone of the extraction cavity with mainly using forceps. Other important points are to ensure complete removal of infection foci, cysts and infected granulation tissues.

The use of typical hemostatic materials should be avoided such as oxycellulose and surgical (oxidized cellulose), and spongel (gelatin sponge) since these can delay the healing of the extraction cavity or prevent bone regeneration process. The bullet-type atelocollagen sponge (Teruplug, Terumo Corporations, Fig. 2-6-1) specifically designed for the tooth extracted sockets, effective for preventing bone resorption, pain and bleeding ¹⁾ after the extraction should be used instead.



Fig. 2-6-1-a,b Teruplug™ (Terumo Corporation)

2. Point to consider for immediate loading

Immediate loading²⁾ is where implant installation is conducted straight after tooth extraction. This technique was developed as a method to minimize the bone resorption. The complication was found to progress with time after the tooth extraction that subsequently led to the difficulty in the implantation and limitations. This method however has its drawbacks as well as its advantages ³⁾.

Advantages:

- Where two stages of surgical intervention is usually necessary, with this method, it can be completed in one step.

- Treatment period can be shortened.

Disadvantages:

- Where the complete removal of the infection foci was not possible, or in some bone structures, the implant installation or the stabilization can be made difficult.
- The suturing accuracy of the gingivae cannot always be achieved.

There are four criteria to fulfill for undertaking the immediate loading

- ① Primary stability can be achieved safely.
- ② Insert the implant, 2 mm deeper than usual.
- ③ Epithelium can be stopped from invading into the internal structures.
- ④ Ensure that the space between the implant and the extraction cavity to be within 2 mm, or otherwise fill the space with bone graft materials.

It should be noted however, that even if the above criteria are met, it does not always indicate that this method is suitable. With regards to AQB implants that have been coated with a layer of HA, the confirmation that this coating layer has been fully enclosed within the bone is not possible with this method. The presentation of the symptoms as a result of the HA-layer exposure does not show within a short duration of time, but has been reported to take more than five years. There have also been studies that have indicated bone resorption to be a complication that inevitably occurs with the immediate loading method, thus leading to a conclusion that this technique must be employed carefully, and that not all cases are appropriate for this method.

Although the statics suggest that the success rates of the immediate loading to be 90%³⁾, if the above factors are considered, especially with the concern of the HA coating layer of AQB implant, either limiting its use, or alternatively await the healing process with application of Teruplug into the extraction cavity before undergoing the usual implant method.

B. Improving the state of gingival alveolar mucosa

The ideal type of mucosa to surround the implant is the attached gingivae (keratinized type), especially in terms of periodontology, in that it has excellent sealing abilities around the implant cervix. In this chapter, I will discuss the vestibular extension procedure and frenectomy, which are the two representatives of surgical methods of gingival alveolar mucosa.

1. Oral vestibular extension procedures

The incision should only be applied to the area of attached gingivae (keratinized gingivae) remaining, and leaving the periosteal flap on top of the periosteum. Perform incision elevation in a way of forming partial thickness flap, peel down the gingivae in the apical direction, and suture the segment with the periosteum. This procedure should enable improved plaque control by the widening of the width of attached gingivae and the expansion in the oral vestibule, therefore improving the overall hygiene of the oral cavity.

2. Frenectomy

This is a surgery to correct the attachment height of the frenulum. In conditions in which the frenulum is

attached at an unusually high position, the width of the attached gingivae becomes narrower. The problem with this is that the contraction of the frenulum during the jaw movement leads exertion of excessive tension and leading to gingival traction. This consequently prevents stabilization of the surrounding gingival structures and effective plaque control. Therefore this preparative operation should not be neglected to facilitate the success of implant surgery.

C. Improving the state of alveolar crest

In order to lengthen the functional time of the implant and its survival, the occlusal conditions including: distribution, equality, and the directionality of the occlusal force applied are important factors to be considered. The key factors in determining the occlusal force, the installation position and its direction, are completely influenced by the state of the alveolar ridge. Thus the necessity of the preparation of the alveolar ridge is obvious in order to improve the prognosis of the implant treatment.

The implant is usually installed to the area of the bone where the quantity is sufficient. But often results in the installation to the lingual side, as the bone resorption on the buccal side is usually more significant. The superstructure thus becomes placed as a cantilever on the buccal side. The lateral forces become greater with such structure and can subsequently lead to the development of severe complications later on. Therefore for such cases, the top-to-bottom treatment scheme may be more appropriate, that places the prime importance on the selection of the prosthesis and allows the adjustment of the alveolar bone structure by the application of GBR techniques.

While on the subject of implant installation arrangement, in the previous practices where three implants were placed next to each other, the central implant was consciously displaced from the row of three, which was referred to as the off-set alignment. By adopting this technique, the implant installation was conducted without any preparative measures made on the alveolar bone, and the location was chosen simply on where a sufficient bone quantity was present. Therefore the placement of the implants tended to be on the palatal side in the maxilla, and to the buccal side in the mandibular, without any considerations to the occlusal relationships. The general consensus was that the misalignment in the series of installation was even better, but was soon contradicted. The reason for such implantation method was derived from two-dimensional analysis and it had not implemented the three-dimensional aspect. This was deemed unreliable, raised issues of the superstructure becoming a cantilever structure by the off-set arrangement; or that the occlusal plane of the superstructure did not always settle within the range of loading support that is constructed by the straight line that converge at the centre of the implanted body. As a result, the preferred alignment at present is with the in-line arrangement, which is also suitable in terms of the esthetics.

It can be concluded that in order to achieve a correct occlusion, the stability of the alveolar ridge is of particular importance, therefore within the treatment plan, the preparation of the state of alveolar ridge is necessary, that includes the superstructure design, and the surgical procedures to facilitate the implant installation. Alveolar alveoplasty, GBR, ridge-expansion or distraction are the common procedures to arrange the alveolar bone structure.

D. Maxillary floor elevation

The most important point to consider when conducting implant to the maxillary anterior region, is evidently the positional relationship with the maxillary sinus. Bone quantity is often insufficient for

implant installation in the areas where there is a significant bone resorption that resulted from tooth extraction, or where the baseline of maxillary sinus is below the standard. Commonly, in such cases, the method has been adopted to graft the bone into the space that has been created by the elevation of the schneiderian membrane from the cortical bone floor of the maxillary sinus. There are sinus-lift and socket-lift techniques. For further details regarding these techniques, refer to Part 6 of this text.

1. Sinus-lift (Fig. 2-6-2) ⁷⁾

Punch a hole on the lateral wall of the maxillary sinus to allow access to the maxillary sinus interior. This technique is typically applied to cases where the the bones are within 5 mm in height.

Advantages:

- Allow direct visualization - reliable surgery can be conducted
- Necessary amounts of bone graft material for the elevation of the maxillary sinus can be applied

Disadvantages:

- Relatively large surgical invasion
- The healing period is long (approx. three to six months) even if the implant has been inserted at the same time
- The grafted bone could be subjected to bone resorption

2. Socket-lift (Fig.2-6-3) ⁸⁾

Typically applied to the cases where the height of the bone is more than 5 mm.

Advantages:

- Extent of surgical invasion is significantly less than that of the sinus-lift procedure

Disadvantages:

- There is a risk of perforating the schneiderian membrane when hammering with osteotome.
- There is a limit to the extent that the maxillary sinus floor can be elevated.

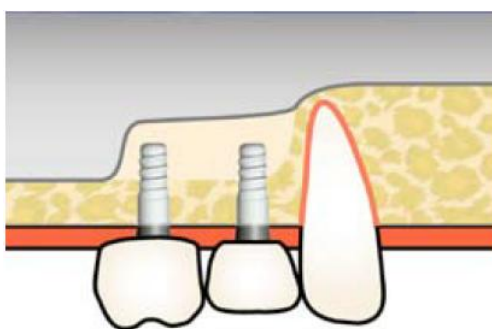


Fig.2-6-2 Sinus-lift procedure

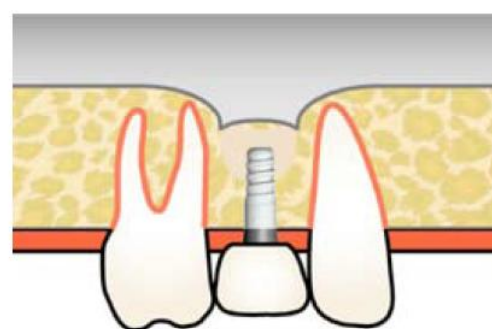


Fig.2-6-3 Socket-lift procedure

E. Examination at the point of installation

It is fundamental to stay true to the basics when conducting the installation. Accurate information including bone quantity and the bone density alongside grasping the anatomical locations of the nasal cavity, maxillary sinus, and the mandibular canal in a three dimensional form, should be obtained using as much analysis tools as possible, before the operation.

The application of CT, which has become the mainstream tool in the examination and diagnosis in the

field of dental surgery, not only has enabled the bone quantity and density to be determined accurately, but also enabled the picture to be displayed in 3D form as well as the simulation of the treatment prior to the actual procedure.

The placement of implant should be conducted with the utmost care, applying the detailed treatment plan constructed with the implementation of the above factors.

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