



QUALITY IMPROVEMENT IN DENTAL AND MEDICAL KNOWLEDGE, RESEARCH, SKILLS AND ETHICS FACING GLOBAL CHALLENGES

Edited by
Armelia Sari Widyarman, Muhammad Ihsan Rizal,
Moehammad Orliando Roeslan & Carolina Damayanti Marpaung



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Damayanti Marpaung

Universitas Trisakti, Indonesia



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Preface

Faculty of Dentistry Universitas Trisakti (Usakti) presents FORIL XIII 2022 Scientific Forum Usakti conjunction with International Conference on Technology of Dental and Medical Sciences (ICTDMS) on December 8th–10th 2022. The theme of the conference is “Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges”.

The triennial conference has served as a meeting place for technical and clinical studies on health, ethical, and social issues in field medical and dentistry. It is organized around 12 major themes, including behavioral, epidemiologic, and health services, conservative dentistry, dental materials, dento-maxillofacial radiology, medical sciences and technology, oral and maxillofacial surgery, oral biology, oral medicine and pathology, orthodontics, pediatrics dentistry, periodontology, and prosthodontics.

The most recent findings in fundamental and clinical sciences related to medical and dental research will be presented in the conference that will be published as part of the conference proceeding. This proceeding will be useful for keeping dental and medical professionals up to date on the latest scientific developments.

Dr. Aryadi Subrata
Chairman FORIL XIII conjunction with ICTDMS

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Challenge and management of dental implant during COVID-19 pandemic: Bone formation on second stage implant surgery

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ABSTRACT: Background(s): The COVID-19 pandemic has had many impacts on dental care, especially in cases of implant treatment with two-stage procedures which require a lot of visiting time. The second stage of the implant procedure which is usually performed 3 months after insertion aims to achieve osseointegration between bone and implant. But during the pandemic, the follow-up treatment of dental implants has been delayed to comply with the government-issued policy to restrict any dental care. This case report aims to evaluate the clinical condition that occurred due to the second-stage implant procedure delay. Case report (s): Two cases in patients of different sex and age have presented different bone surfaces after a 13-month delay of implant placement in the lower left region. The first case was a 43 years old woman who had implants placed in a case of long-standing tooth loss. After 13 months of delay, no bone formation closure was found on the surface of the cover screw. In the second case was a 31 years old man who had an implant placed on an extracted tooth after a failed root canal treatment, 5 months after extraction. After 13 months of delay, it was found that the cover screw was completely covered by bone formation and was not visually visible. Case Management(s): The first case, the cover screw can be easily accessed and continued with further treatment. Whereas in the second case, bone removal is required with radiographic guidance and surgical templates to find the cover screw that has been installed and proceed to the completion stage. Conclusion(s): A well-planned treatment and good communication with the patient are essential when delaying the second stage of implant treatment. The delay does not cause significant difficulties in the process of completing the implant installation.

1 BACKGROUND(S)

The implant procedure is getting simpler, wider prosthetic options at affordable prices are the reasons dentists recommend implants as a treatment to replace missing teeth (Kurnia *et al.* 2014). Although the success rate of implant treatment is very good, several things must still be considered in the choice of implants as a treatment such as case selection, oral hygiene, general health, treatment planning, and good communication because it requires more than one treatment visit (Cardoso *et al.* 2020; Putriyanti *et al.* 2017).

Dental implants that are available in the market are one-piece (the abutment is attached to the implant) and two-piece (the implant and abutment are separate). In one-piece implants, the installation procedure is simpler and requires only one surgical process, but has the

disadvantage of not being able to correct soft tissue during abutment placement. Two-piece implants require two surgical stages, implant placement, and abutment placement. Two-piece implants have the advantage of having a wider choice of abutments, making it easier to select the required restoration according to the case (Kurnia *et al.* 2014).

In the two-piece implant treatment, after the implant is placed, sutures are performed to cover the surface of the implant and minimize pressure during the healing process. The second stage of surgery for a two-piece implant is to install the abutment. This process is generally carried out after 2–6 months to obtain good osseointegration between implant and bone (Karimbux & Weber 2017). Osseointegration is the direct contact of bone on the implant without the presence of fibrous tissue (Parithimarkalaignan & Padmanabhan 2013).

The COVID-19 pandemic that entered and spread to Indonesia has affected all aspects of life, especially dental care. In the hospital, there were restrictions on the number of patient visits and procedures using aerosols (Sulijaya & Koerniadi 2022). Delays in dental treatment were carried out for mutual safety, including in these two cases: 13 months of delay in the second stage of surgery on 3 implants in the lower left region. This case study aims to clinically evaluate a second-stage delay of 13 months in 2 different cases. The use of the data has obtained the consent of all patients for scientific purposes.

2 CASE REPORT(S)

2.1 Case 1

A 43-year-old woman came for implant treatment on two lower left molars that had been extracted 10 years ago. The results of bone diagnosis (bone mapping) showed that there was sufficient bone width for implant placement with an interocclusal distance of 4 mm on both teeth due to having experienced tooth loss for a long time. The general condition, intraoral condition, and oral hygiene of the patient are good. The patient had no systemic disease and did not smoke. The results of laboratory tests for vitamin D (25-Hydroxyl) showed a value of 40.75.

The surgical procedure was performed on February 13th, 2020, with a flap opening and two-piece implants on both teeth. Tooth #36 was implanted with an SLA (Sandblasted Large Grid Acid Etching) implant with a diameter of 3.3 mm and height of 10 mm. Tooth #37 was implanted with an implant with a diameter of 4.1 mm and a height of 10 mm. The second stage can be held in March 2021 (13 months after the first stage). The results of the clinical and radiographic evaluation 13 months after implant placement showed no signs of peri-implantitis (Figure 1A, 1B). No obstacles were found when opening the cover screw and

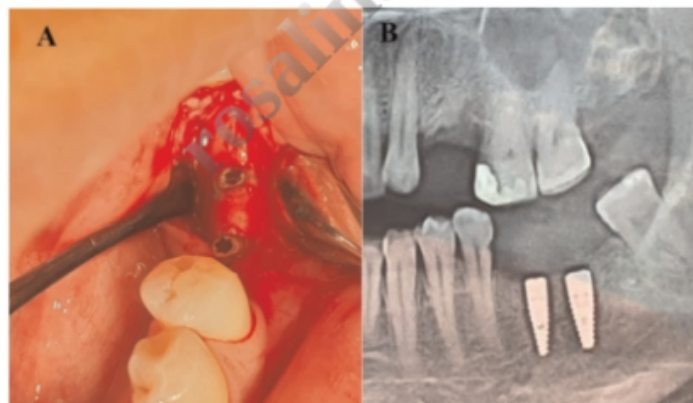


Figure 1. Case 1 At the second stage implant surgery, intra-oral clinical appearance (A) and radiograph (B) after 13 months of delay.

installing the abutment. The healing process went well and closed tray printing was carried out with the impressions sent to the dental laboratory. The restoration was fixed according to the execution time in 1 week after the molding procedure.

2.2 Case 2

A 31-year-old man presented with 37 teeth that had large caries and fractured during endodontic treatment. The tooth was extracted in October 2019 and an implant was planned. The results of bone diagnosis (bone mapping) showed that there was sufficient bone width for implant placement with an interocclusal distance of 5 mm. Intraoral conditions and oral hygiene were moderate. The patient had no systemic disease and did not smoke. Laboratory tests for vitamin D (25-Hydroxyl) showed a value of 30.4.

The surgical procedure was performed on February 12th, 2020, with a flap opening and two-piece implants. Tooth #37 was installed with an SLA (Sandblasted Large Grid Acid Etching) implant with a diameter of 4.1 mm and a height of 10 mm. The second stage can be held in March 2021 (13 months after the first stage). The results of clinical and radiographic evaluation 13 months after implant placement showed no signs of peri-implantitis, but a complete bone closure was seen over the surface of the implant cover screw (Figure 2C, D). At the abutment installation stage, it is necessary to do bone removal to be able to find and open the cover screw which is not visually visible. Healing after this stage went well and closed tray printing was performed with the impressions sent to the dental laboratory. The restoration was fixed 1 week after the molding procedure.



Figure 2. Case 2 At the second stage of implant surgery, after 13 months of delay, intra-oral clinical appearance shows the cover screw was not visible (C) and radiograph (D).

3 DISCUSSION

The process of delaying dental care can occur due to many factors. In this case, the COVID-19 pandemic which still shows a high number of cases, is an obstacle while continuing treatment. During treatment delays, well-maintained communication is able to maintain the patient's confidence to remain cooperative during the long treatment period. The state of overall health and health during follow-up care is always monitored properly. Consumption

of nutritious foods and supplements containing calcium and vitamin D is always recommended during treatment.

The second stage which was supposed to be done 3 months after the initial stage of implant placement, was delayed for 13 months. At the time of flap opening in the second stage in these two cases shows different picture. In the first case, the two cover screws that have been installed can be easily seen and opened without significant obstacles. Whereas in the second case, the cover screw that has been installed is not visible at all when the flap was opened.

Bone removal is required by using radiographic photo guidance along with the use of surgical templates that have been created and used during the first stage of implant placement. The bone extraction process is carried out with care, at a low speed, and continuously moistening the work area with NaCl to avoid tissue necrosis. The critical time/temperature associated with the occurrence of bone tissue necrosis is around 47°C for 1 minute (Nandal & Ghalaut 2014; Parithimarkalaignan & Padmanabhan 2013). The use of surgical templates is very helpful in determining the location of the implant so as to avoid treatment failure due to exposure of the implant that has been implanted (Karimbux & Weber 2017). Radiographic features also help in this process by paying attention to the position of the opposing tooth to the implant that has been implanted. After the second stage process, oral health in both patients was maintained by recommending the use of chlorhexidine gluconate 0.12% mouthwash twice a day for 2 weeks (Sulijaya & Koerniadi 2022).

The long-term success criteria for implants are supported by bone stability, absence of mobility, no complaints from the patient, no peri-implantitis found, and the stability of hard and soft tissue conditions around the implant (Putriyanti *et al.* 2017). Implant stability is one of the keys to successful implant placement (Fathurrahman & Hudyono 2020). The success of osseointegration depends on exogenous factors such as implant characteristics, biocompatibility, operator capability, and operating technique. Endogenous factors influence bone conditions such as quality, quantity, and healing capacity. Premature loading will adversely affect soft tissue and long-term function, whereas delayed loading will result in better bone healing and long-term function (Nandal & Ghalaut 2014; Parithimarkalaignan & Padmanabhan 2013). Other literature states that delaying the second stage is carried out with the aim of ensuring the re-establishment of blood flow in the treatment area (a blood supply reestablishment) (Chen *et al.* 2004).

Minimizing trauma in each procedure and maintaining vascularity will have effect on osseointegration in implant treatment (Sulijaya & Koerniadi 2022). Several things must also be carefully considered to prevent complications, such as the quality of bone tissue found in the maxillary and mandibular posterior regions, anatomical variations, inadequate surgical technique, inexperienced surgeon, inadequate planning, bone resorption, inappropriate occlusal forces, and bone deficiency (Cardoso *et al.* 2020).

The classification of implant placement after tooth extraction consists of 4 types: type 1 for direct implant placement after extraction, type 2 for implant placement 6–8 weeks after extraction, type 3 for 3–4 months after extraction, and type 4 for implant placement after 4 months of tooth extraction (Karimbux & Weber 2017). The post-extraction bone healing process follows wound healing in general. The wound healing process in humans ranges from 2–32 days. Bone remodeling is the process of old bone being replaced by new bone and consists of 4 phases: rest, resorption, reversal, and formation. Osteoclasts resorb bone for about 2 to 4 weeks to create resorption cavities which are then filled by osteoblasts for about 3 months (Lestari 2012; Mello *et al.* 2016). If the resorption cavity is overfilled by osteoblasts, the remodeling balance is positive. The ability of osteoblasts to fill the resorption cavity is associated with age. Imbalance of resorption and formation can reduce bone mineral density and cause microarchitecture damage (Lestari 2012).

Bone quality is very influential in the implant's installation process. Dense bone has a higher elastic modulus and is stronger and more resistant to deformation than low-density bone. Bone quality is divided into 4 types, namely homogeneous cortical bone (type 1), thick cortical bone surrounded by dense trabecular (type 2), thin cortical layer surrounded by

dense trabecular bone (type 3), and thin cortical layer surrounded by thin trabecular bone (type 4) (Warreth *et al.* 2017). Type 2 (D2) bone is usually found in the anterior and posterior mandible and it takes 4 months for adequate bone healing (Nandal & Ghalaut 2014). Bone quality is high when implant contact and bone forms rapidly around the implant. In implant placement, the trabecular structure determines the quality of the bone. Trabecular bone is filled with bone marrow and has a higher turnover than cortical bone (Lestari 2012; Mello *et al.* 2016). Trabecular bone varies with age, sex, and location. This is what is suspected to be the cause of the cover screw closing in the second case, which was experienced by a male patient of a younger age and implant placement a few months after tooth 37 extraction.

Every injury on a major blood vessel is associated with a nutrient supply which is also responsible for local bone changes. Tooth loss may cause bone atrophy, where blood vessels' number and size will decrease while periosteal blood vessels' number will increase. Bone will change throughout life, in terms of mechanical function, shape, bone cells, and the resulting matrix including minerals deposited in the matrix. However, age does not affect bone osseointegration in the late stages, only in the healing stage. There is an initial slowing of healing due to decreased cell function. Aging is not an inhibitory factor for implant osseointegration (Lestari 2012).

In addition, bone formation around the implant can be caused by the osteoconductivity of the implant material itself. Implant biocompatibility greatly influences implant treatment. The chemical composition of the implant material is in accordance with the biodynamic activity consisting of bio-tolerant implants that allow the material not to be rejected when implanted in bone tissue and will be surrounded by soft tissue and hard tissue. Bioinert implants play a role in bone surface apposition, which leads to osteogenesis while bioactive implants allow the chemical to form osteogenesis and new bone. Collagen and bone minerals will bind directly to the surface of the implant so that there is a bond between the bone and the implant (Bone Implant Contact) (Arsista & Eriwati 2018; Power & Ronald 2019).

The macro and micro-structure of the SLA (Sandblasted Large Grid Acid Etching) implant surface can speed up healing time because its hydrophilic nature can make the blood move into the crevices of the implant surface. Its chemical activity is able to stimulate blood and protein to enter the micropores of the implant surface and stimulate the initial process of osseointegration (Arsista & Eriwati 2018).

Vitamin D is known to act as an immunomodulator in the regulation of calcium metabolism. A total of 15 vitamin D play an important role in bone metabolism (Mangano *et al.* 2018). Several previous studies suggest taking vitamin D to give good results after surgery to help the healing process and osteogenic activity. Consumption of supplements containing calcium and vitamin D is often done by elderly individuals to maintain bone health and strength. Bone health is also supported by healthy and nutritious food to support successful treatment and to optimize the healing process (Lau *et al.* 2013). In both cases, the vitamin D (25 Hydroxyl) test was at an optimal level of >30 ng/mL (Mangano *et al.* 2018). This supports the state of osseointegration and remodeling bone that occurs in both cases.

4 CONCLUSION(S)

The success of treatment that takes a long time is largely determined by treatment planning and good communication between doctors and patients, especially in maintaining trust, health, and oral hygiene in the area around the implant. The second stage delay in the installation of two-piece implants showed good osseointegration results and did not cause significant obstacles in the implementation of the next stage of implant treatment.

CONFLICT OF INTEREST

The authors have no conflicts of interest in this study.

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