

Oral rehabilitation using immediate implant placement in mandibular lateral incisors – a case report

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ABSTRACT

Background: Dental problems often lead to missing teeth. After tooth extraction, the alveolar bone will undergo a healing phase, and this will cause some vertical and horizontal resorption. Immediate implant placement can shorten treatment time and preserve the rest of the alveolar bone. **Purpose:** The purpose of this study is to present a case of oral function, equilibrium and aesthetic rehabilitation using immediate implant placement. **Case:** A male patient aged 31 came to Dental Hospital Universitas Airlangga with a fractured anterior tooth. The tooth had fractured two weeks before he came to the hospital, and he wanted to improve his appearance. **Case management:** The mandibular incisor was fractured, and its residual root remained. The treatment plan was to undertake an immediate implant placement. The type of implant chosen was a bone level tapered implant SC roxolid® SLA Ø 2.9 mm and 10 mm long. Surgery was performed in two stages. The first stage was to extract the residual root, position the implant and apply the bone graft. The second stage was to position the healing abutment. A crown impression was made using the closed tray technique. The crown was cemented to the abutment. **Conclusion:** Immediate implant placement is an aesthetic means of rehabilitating a missing tooth, such as an anterior mandibular tooth.

Keywords: aesthetic zone; dental implant; edentulous; human & health; immediate placement

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INTRODUCTION

According to Indonesian Basic Health Research 2018, 57.6 per cent of dental and oral problems that happen in Indonesia often lead to tooth extraction.¹ After the procedure, the alveolar bone will undergo the healing process, and, during that time, vertical and horizontal resorption of the bone will occur.² As much as 25 per cent of bone width will be lost in the first year after tooth extraction, and this will reach 40 per cent in the third year. After the first year of healing, the resorption rate will significantly drop but will still continue perpetually. After tooth extraction, the patient will need tooth replacement to rehabilitate the oral function, aesthetic and equilibrium. There are a lot of ways to replace missing teeth. One of the treatments of choice is dental implant.³

Implant placement can be done immediately after tooth extraction or after the post-extraction wound has

healed, whether it is early implant placement or delayed/conventional implant placement. Early implant placement is done within four to eight weeks after extraction, where soft tissue healing has taken place; whereas, delayed implant placement is done within 12 to 16 weeks after tooth extraction, where there has been partial bone healing.⁴ Immediate implant placement has some advantages, such as preserving the alveolar bone dimension, reducing the amount of surgery and shortening the treatment time. Additionally, by performing immediate implant placement, flap incision may be avoided. However, immediate implant placement also has some disadvantages, such as increased risk of infection and the presence of a gap between the implant surface and the socket wall. Although there are some disadvantages, immediate implant placement is sometimes needed to avoid resorption of the ridge and to avoid a future bone augmentation procedure.^{5,6}

Implant loading can be divided into three types. Immediate implant loading is performed within one week of implant placement. Early implant loading is carried out within one week to two months after implant placement, and conventional loading is performed more than two months after implant placement. From some studies, the healing time to achieve osseointegration of the implant is at least three to four months without loading. The presence of micromotion on implants can interfere with the healing process causing fibrous tissue to form. This fibrous tissue will separate bone and implant. When micromotion reaches a certain threshold, it will cause damage to the implant. However, the development of recent implant technology can shorten waiting time for loading.^{4,7}

A thorough examination and accurate diagnosis is the key to success for an immediate placement implant. Radiography testing is also needed, such as panoramic and cone beam computerised tomography (CBCT). One of the most important things to note is the teeth prognosis. It is also important to note the patient's general health. A patient with uncontrolled systemic disease, a smoking habit, unhealthy adjacent teeth or inadequate buccal, lingual bone and septum is not indicated for immediate implant placement.^{8,9}

The purpose of this study is to show that immediate implant placement is one of the treatment plans that can be considered in such cases. It can help rehabilitate oral function and equilibrium as well as the facial aesthetic.



Figure 1. Frontal intraoral view of the patient showing a missing anterior mandibular tooth.

CASE

A male patient aged 31 years old came to Dental Hospital Universitas Airlangga because he wanted to have a denture to improve his appearance. The anterior mandibular tooth had been fractured two weeks before he came. The patient claimed that he was not suffering from any systemic disease. Extraoral examination showed that the temporomandibular joint, eyes, nose and lips were normal. The patient had an oval-shaped face. Intraoral examination showed that there was a gangrene radix of tooth 31 (Figure 1). A CBCT X-ray was taken to help determine the width and height of the alveolar bone (Figure 2). The CBCT image showed that the radix was 9.29 mm long and its bucco-lingual width was 5.4 mm. The narrowest part of the bone was 4.31 mm wide. The distance between the crown of tooth 41 and tooth 32 was 5.83 mm, and the distance between their roots was 7.65 mm. The distance from the apical tip of tooth 31 to the edge of the mandibular cortex was 20.4 mm. The patient was informed of the treatment options, and he agreed with the treatment. The patient then signed an informed consent.

CASE MANAGEMENT

The treatment chosen for this case was an implant-supported solitary crown for tooth 31. The implant would be immediately placed after tooth extraction. Before the procedure, tooth scaling was carried out to manage the patient's oral hygiene.

The first surgery was performed to place the implant fixture. The first step was to anaesthetise the buccal and lingual area using articaine hydrochloride four per cent. A full thickness flap was made on the top of tooth 31's ridge towards the gingival margin of tooth 32, and then a vertical incision was made on the distal part of tooth 32. Atraumatic extraction was carried out (Figure 3) by dividing the root mesio-distally into two parts, then it was extracted using an elevator and forceps. The post-extraction socket was thoroughly debrided to remove any granulation tissue.

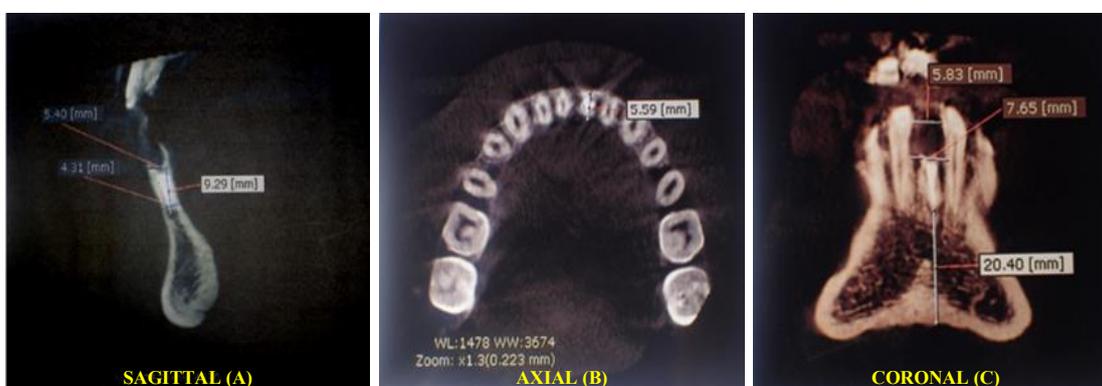


Figure 2. CBCT image containing the available space for implant placement from sagittal view (A), coronal view (B) and axial view (C).

The osteotomy site was prepared with drills in sequential order starting with a needle drill (\varnothing 1.6 mm) followed by a pilot drill (\varnothing 2.2 mm). Drilling maximal speed was 800 rpm, until 10 mm deep and 4 mm below the adjacent tooth's cemento-enamel junction (CEJ), then after every drilling, the depth was checked with a depth gauge. Profile drilling and tapping was done manually, followed by implant placement with simultaneous guided bone regeneration (GBR). The implant fixture using a bone level tapered implant Staumann SC roxolid® SLA \varnothing 2.9 mm and 10 mm long was inserted into the osteotomy site until 4 mm below the CEJ of the adjacent teeth (Figure 4A). A xenograft (BioOss Small Granule) was applied to the exposed implant part on the buccal side and the gap between implant and socket wall. The graft was then covered by a resorbable membrane (Bio-gide) and sutured (Figure 4B and 4C).

An antibiotic (Lincomycin 500 mg) and anti-inflammatory drug (Cataflam 50 mg) were prescribed for five days. The patient was asked to come back to the dental practice one week after surgery to have the sutures

removed. On the first day post-surgery control, the patient reported no complaint. Clinical examination showed redness and swelling on the gingival margin around the implant. A second review took place a week after surgery. The patient had no complaint, and there was no sign of inflammation on the gingiva surrounding the implant. The sutures were removed, then an adhesive bridge was placed as a temporary restoration (Figure 5A), and the patient was asked to come back to the dental practice after six months or if there were any problems. Before the second surgery was performed, the temporary adhesive bridge was taken off, and the surrounding gingiva was evaluated. The surgery was carried out to insert the healing abutment (Figure 5B), and one week after surgery, the patient was asked to come back to the dental practice to take a final impression.

A week after healing abutment placement, the implant and surrounding gingival condition were evaluated: there was no pain and abnormalities in percussion and palpation; no implant mobility; no pain and redness in the soft tissue around the implant. The implant was irrigated with saline

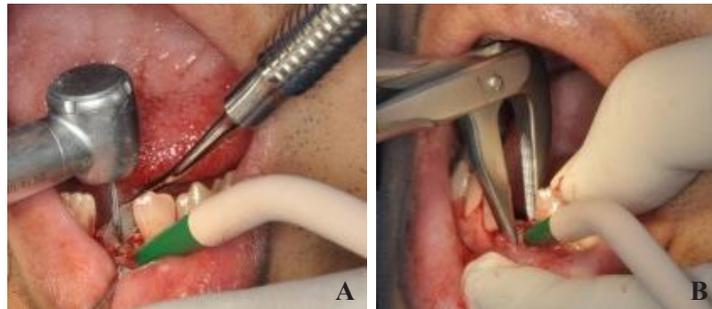


Figure 3. Atraumatic tooth extraction by dividing the left root (A) and extracting the tooth from the socket (B).



Figure 4. Procedure of manual implant fixture placement using implant ratchet (A) followed by bone graft and membrane application (B) and sutured surgery site (C).



Figure 5. The temporary adhesive bridge six months after placement (A) and the attachment of healing abutment (B).

and dried after the healing abutment was removed. Then the clinician inserted an impression post into the implant and secured it with a screwdriver (Figure 6A). The impression cap was then applied on top of the fixed impression post. Medium body silicone impression material was injected around the impression post, then the impression tray, filled with impression material, was placed in the mouth. After the impression material had set, the tray was taken out of the mouth. The impression post then was unscrewed and taken out of the mouth. The impression post was fixed to the analogue using a guide screw and the colour code of the polymer impression cap checked for suitability. The impression post was positioned and pushed into place in the impression tray. An impression of the upper jaw was taken with alginate. Tooth colour was determined using a shade guide, then the laboratory was informed for manufacturing the crown. The healing abutment then was reinserted to the implant. The impression was performed with a closed tray technique (Figure 6B).

The last step was to insert the solitary crown onto the implant. After taking off the healing abutment, the gingival

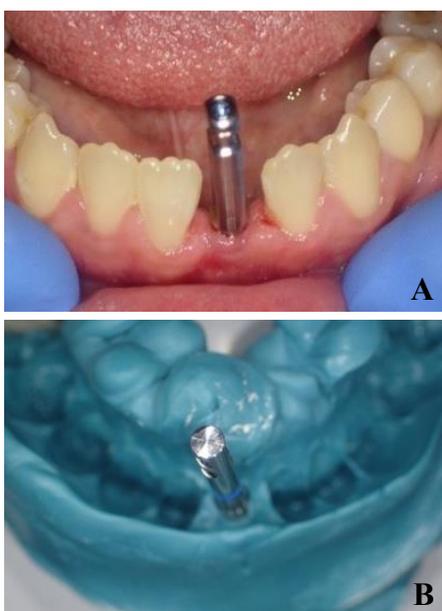


Figure 6. Fixing the impression post (A) followed by the closed tray technique impression, and the implant analogue was placed on the final impression (B).



Figure 7. Frontal intraoral view post solitary crown insertion.

condition surrounding the implant was examined. There was no redness or swelling; the implant showed no response on percussion and no pain during palpation. An abutment (Variobase) was then inserted manually using an implant ratchet with insertion torque of 35 N. Occlusion, retention, stability and comfort had been checked before the zirconia crown was cemented. Articulating paper was used to check whether there was any premature contact on the crown, then the crown was cemented using temporary cement. A week after temporary insertion, the patient had no complaint, and the clinical examination showed no redness or swelling around the crown. Percussion and palpation produced no pain response. The crown was then cemented permanently using Fuji I luting cement (Figure 7).

DISCUSSION

Post-extraction alveolar resorption is a phenomenon that cannot be avoided. When a tooth is extracted, bone loss will occur mostly over the first six months after extraction (40 per cent of bone height and 60 per cent of bone width). This is a continuous process with the rate of 0.25–0.5 per cent of bone loss per year. Implant treatment needs around two to three months for socket remodelling and three to six months for osseointegration.¹⁰

Immediate implant placement should be considered as a treatment plan to shorten treatment time. The major benefit of doing immediate implant placement is that less time is needed for healing, and it can preserve the dimension of bone tissue around the extracted tooth area. Earlier implant placement can result in a better crown/implant ratio, thus giving a better aesthetic and inter-jaw relation, also preserving alveolar bone.^{11,12} Immediate implant placement is usually indicated for a tooth that needs to be extracted because of external trauma, endodontic lesion, root fracture, root resorption or root perforation. Contraindicated conditions are active infection, inadequate bone below the tooth apex (cannot give primary stability) and severe gingival recession.¹²

Immediate implant placement is divided into three categories: (1) immediate placement with immediate loading; (2) immediate placement with early loading; and (3) immediate placement with conventional loading. In this case, immediate implant placement was performed to shorten the treatment period and to prevent major bone resorption. Conventional loading was chosen because there was considerable bone loss on the facial side (aesthetic zone) so that it needed a GBR procedure. The success rate of immediate implant placement with conventional loading is 96 per cent.^{13–15}

Guided bone regeneration is a reconstructive procedure for the alveolar ridge using a bone graft and membrane. This procedure is to improve inadequate bone dimension usually found because of trauma, infection or periodontal disease. Inadequate bone dimension can affect the aesthetic and long-term prognosis of a dental implant and

its superstructure. In this case, bone defect was found on the facial side so that GBR procedure was needed after immediate implant placement.^{16,17} Bio-Oss was used for the GBR procedure. Bio-Oss is derived from bovine bone that is processed to completely remove the organic component. According to Kim et al.¹⁸ (2020), there is no difference between bone augmentation using Bio-Oss or autogenous bone graft. In a GBR procedure, the barrier membrane plays a significant role in bone regeneration. Membranes can prevent soft tissue growth into the defect and maintain the defect cavity throughout the bone regeneration process. Bio-gide, the membrane used in this case, is an absorbable collagen membrane.¹⁹

Dental implants are very variable in size and shape. These variations are based on the condition of the alveolar bone: height, width, length and angulation.²⁰ In this case, a bone-level implant was chosen because it would be placed in the anterior region of the jaw. The implant diameter was determined by the space available between two adjacent teeth, and the length of the implant was determined by the length of bone available. The diameter should leave a 1.5 mm bone surrounding the implant.²⁰ Space available in this case was 6 mm so that a BLT implant Ø 2.9 mm and 10 mm long was chosen.

A solitary zirconia layered crown was used as the restoration because it has good mechanical characteristics and aesthetic.²¹ The patient was taught how to maintain his oral hygiene and, most importantly, the area surrounding the implant. He was instructed to use dental floss and come back to the dental practice every six months to have a routine dental check-up.

In conclusion, immediate implant placement with conventional loading is one of the implant placement techniques that can be performed in such cases. It can help rehabilitate oral function and shorten treatment time. Success rate can be increased with accurate diagnosis and thorough examination.

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