Case Report

A new insight into dental implant treatment for trauma-induced edentulism and associated temporomandibular joint disorders: A Case Report

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ABSTRACT

Introduction: Anterior implant placement is always challenging, especially when it is caused by trauma. Treatment preference is not only because of bone sufficiency but also aesthetic considerations. The complications aggravated by trauma and temporomandibular joint disorder need particular emphasis. The aim of this case report is to describe a new insight into dental implant treatment for trauma-induced edentulism and associated temporomandibular joint disorders. **Case report:** A 24-year-old woman had a motor vehicle accident. Her four anterior mandibular teeth were extracted through fractures. The patient also complained of clicking in both jaws during mouth opening. A bone graft and modification provisoris-stabilization splint were applied before definitive treatment. Furthermore, a 4-unit Porcelain Fused to Metal (PFM) implant-supported-fixed partial denture was done to replace the missing teeth. **Conclusion:** New insight into dental implant treatment for trauma-induced edentulism and associated temporomandibular joint disorders with replacement of several anterior mandibular missing teeth due to trauma with temporomandibular disorders could be treated with dental implant modification splint that functions as a temporary restoration as well, which was an alternative treatment option. The patient was satisfied with the result of the treatment, especially in the aesthetic aspect.

KEYWORDS

dental implant, trauma, temporomandibular joint disorders, splint

INTRODUCTION

Missing teeth related to oral health-related quality of life (OHRQoL) due to traumatic dental injury (TDI) in permanent teeth impact biological and socio-psychological aspects.[1–4] The higher number of tooth losses is in accordance with the increasing oral health impact profile (OHIP) score, indicating greater oral impairment. It also impacts the severity of oral function in the masticatory system.[5,6]

Atrophy occurs in the edentulous segments of the alveolar resorption under the mucoperiosteum, and the amount of the resorption varies among individuals.[7] The edentulous patients, evaluated from a radiological perspective, had a lower articular eminence inclination than dentate patients and were more prominent in females.[8] It was also found that temporomandibular joint disorders (TMDs) have a positive role in the evidence.[9] The presence of TMD signs was correlated with

the number of missing teeth.[10,11] Although TMD is not always related to missing teeth, the symptom could be more severe if the patient had a TMD problem and was missing teeth.

Dental implants for replacing missing teeth could be the best choice with a satisfactory survival rate.[12,13] This treatment was feasible in the aesthetic zone involved, which had the same survival rate as other regions in the jaw.[13,14] Moreover, tooth loss due to a traumatic injury has a positive outcome.[15]

This paper will describe a young female who experienced a post-traumatic motor vehicle accident, and her five mandibular anterior teeth were extracted due to the root fracture involved, so that the teeth could not be preserved. Moreover, she complained of temporomandibular disorder before the accident. This case was managed by a new treatment modality that combined a modified provisoris splint prior to implant treatment. The aim of the case report is to describe a new insight into dental implant treatment for trauma-induced edentulism and associated temporomandibular joint disorders.

Case Report

A 24-year-old young female patient was referred from a private dental clinic to the prosthodontics clinic at Universitas Padjadjaran Dental Hospital (RSGM UNPAD), with the chief complaint being mobility and fractured anterior mandibular teeth due to a motor vehicle accident a month ago. The patient intended to replace the teeth with a permanent prosthesis.

Extraoral assessment showed that the patient has a square facial form with a convex profile, labial tonus that is moderate, and hypertonus. She has a normal range of mouth openings and no gland swelling. The clicking of both jaws and deviation during mouth opening were observed. The patient reported that she has a unilateral chewing habit, and the clicking sound occurred before the accident. There was no pain during palpation of the joint or mouth opening and closing. The intraoral assessment exhibited a large jaw, an oval shape, normal intermaxillary space, and good oral hygiene. Teeth 33-43 were splinted with composite resin.

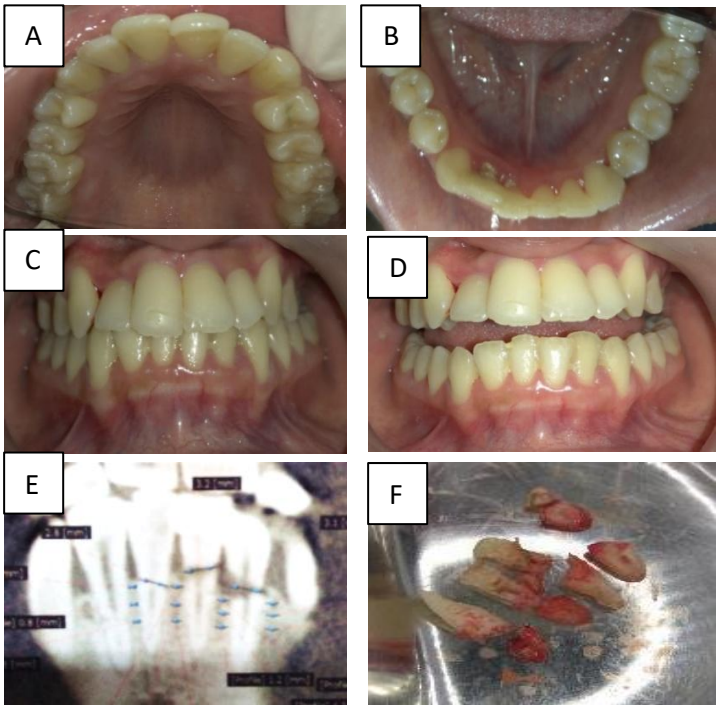

Figure 1. Preliminary oral condition; A. maxillary occlusal; B. mandibular o-cclusal; C. maxilla and mandibular teeth occlusion; D: open occlusion; E. CBCT showed the fracture location; F. tooth fracture fragments.

The root fractures were vertical under the labial bone level. Figure 1b shows a lingual view of a root fracture on teeth 41, 42, but the fracture on 31, 32, and 33 could not be seen from this aspect because of the fracture position. The cone beam computed tomography (CBCT) showed the tooth fracture location from 32-42 (Figure 1e). The patient was first referred to the oral surgery and periodontics clinic for serial extraction and bone preservation using an alloplast bone graft material and pericardium membrane.

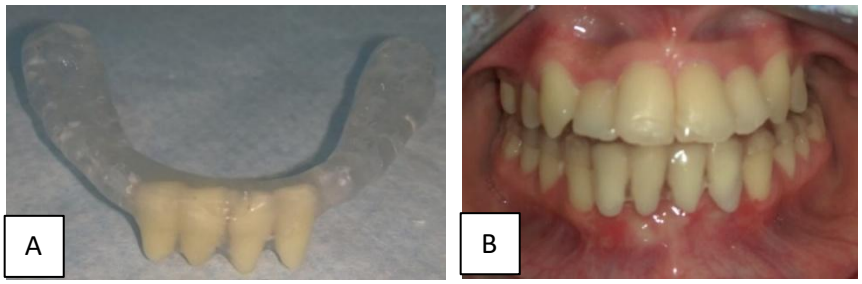

Figure 2. Modification provisoris-splint; A. a modified provisoris-stabilization splint; B. a modified provisoris-stabilization splint inserted on mandibular.

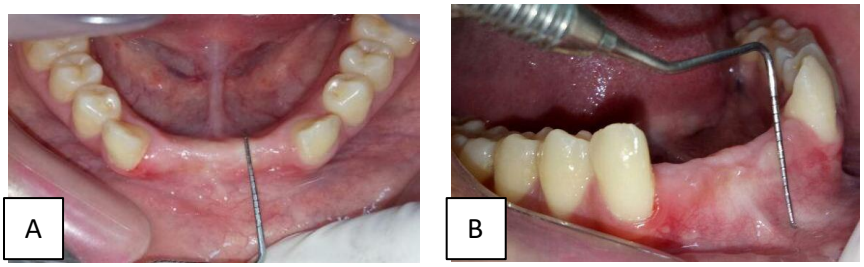

Figure 3. A 6-month evaluation of post-extraction and bone graft site; a. occlusal view; B. labial view.

The diagnosis of the TMD was disc displacement with reduction without limited opening, while the differential diagnosis was disc displacement without reduction. The prognosis was good. Due to the diagnosis, prior to the surgery, a modified provisoris-stabilization splint was prepared for both treating temporomandibular disorder and as a temporary restoration. A splint was made from heat-cured clear acrylic resin with artificial teeth 32-42 attached to it (Figure 2).

The splint was made for aesthetics and function. It was controlled periodically. The patient was able to speak and eat while using the splint. Moreover, the splint would remain until the implant restoration was cemented. After 6 months, the patient was evaluated. The bone sufficiency was checked intraorally using a probe (Figure 3) and CBCT. The diagnosis of the edentulous region was class 1 based on the Prosthodontic Diagnostic Index (PDI) for the partially edentulous patient. The prognosis was good. The implant treatment was selected. The CBCT also performed implant placement design (Figure 4-7).

Figure 4. Multiple Planar Reconstruction (MPR) view of mandibular bone. A. coronal, B sagittal, C axial, D 3d

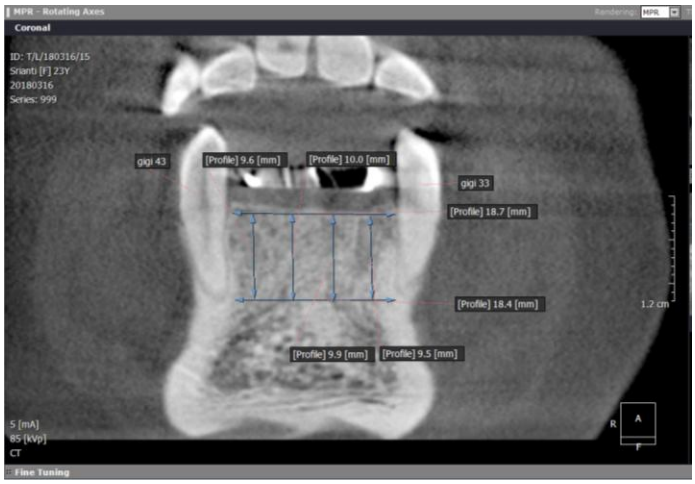

Figure 5. Coronal view.

Table 1. Implant site measurement based on CBCT.

Regio	mesio-distal implant site	bukolingual implant site	Alveolar crest to foramen mentalis
32	3.5 mm	3.9 – 4 mm	17.6 – 19.9 mm
31	4.1 mm	4.1 mm	17.6 – 19.9 mm
41	3.3 mm	5,1mm – 5,6 mm	17,6 mm – 19,9 mm
42	5,8 mm -7,1 mm	5,1mm – 5,6 mm	17,6 mm – 19,9 mm

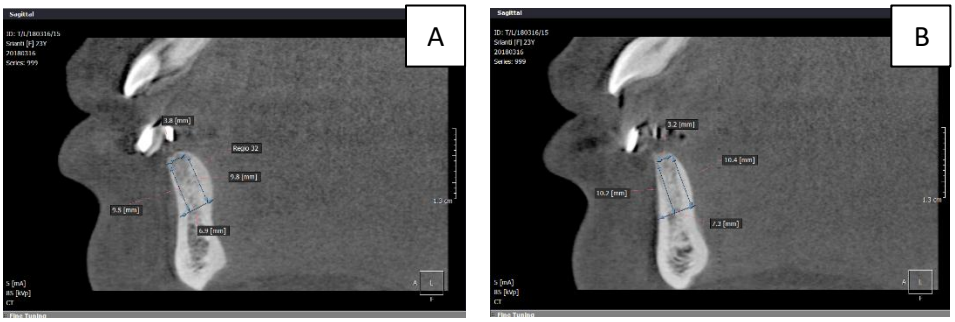

Figure 6. A.Sagital view 32; B. Sagital view 31.

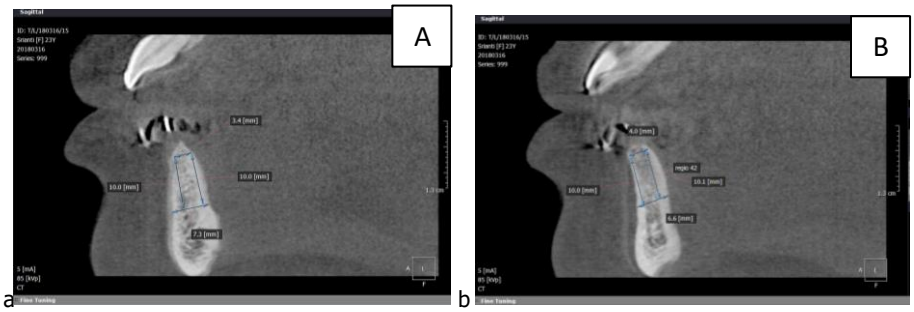

Figure 7. A. Sagital view 41; B. Sagital view 42.

Based on CBCT assessment, from a coronal view, the length mesial 33-43 at the cervical and apical areas was not much different, 18.77 mm and 18.4 mm, respectively. While the height of alveolar bone from cervical to apical at regions 32 and 42 was 9.5 and 9.6 mm, respectively. Moreover, from the sagittal view, we saw that at regions 32 and 42, the widths were 3.8 and 4 mm.

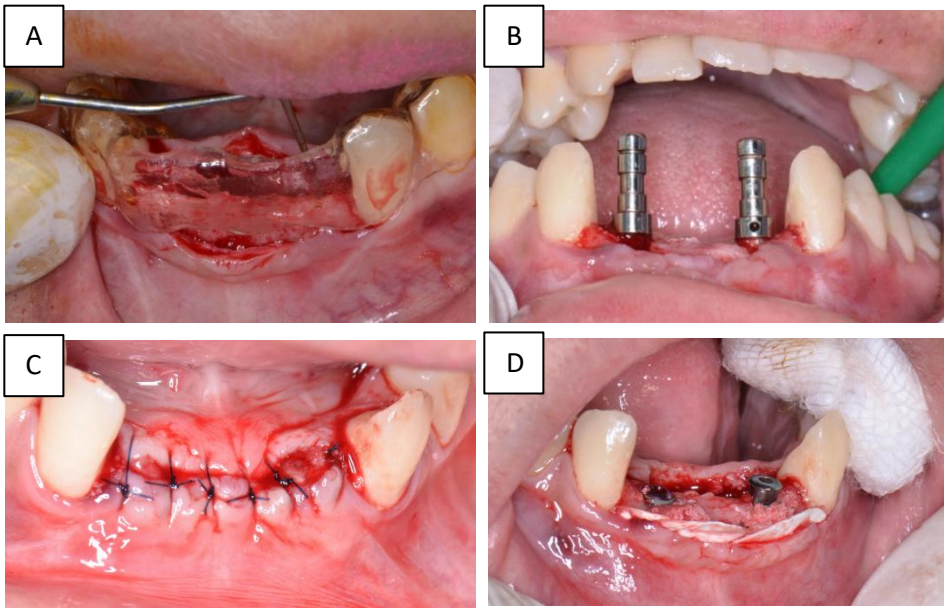

Figure 8. Implant placement with bone graft and membrane; A. a flap and surgical guide placement; B. paralell pin placement; C. implants position; D. hecting the flap area.

The design of the definitive prosthesis was a 4-unit PFM implant-supported-fixed dental prosthesis with the implant (TSIII SA Implant System, Osstem, Korea) placement insert in regions 32 and 42. The diameter of the fixture was 3.5 mm and its length 10 mm, with a two-stage method procedure (Figure 8). Bone grafts (GAMA-CHA, Swayasa Prakasa, Indonesia) and membrane pericardium (Batan Research Tissue Bank, Indonesia) were used around the implant site, covering fixtures exposed in the labial site, then interrupted suturing technique was performed.

The second-stage surgery was done three months later, replacing the cover screw with a healing abutment. In the following appointment, the open tray impression technique with fixture level was chosen to avoid any dissimilarity between the two implant abutments. Finally, a 4-unit PFM implant-supported fixed partial denture screw type was inserted. The clicking sound did not totally disappear but was smoother. Oral hygiene instruction was explained, and the need for control was informed to the patient.

DISCUSSION

The edentulous space in this case was treated with implant-supported fixed partial denture prostheses. The result of this treatment was satisfying. The dental implant treatment can achieve the goal of oral rehabilitation after missing teeth. However, the replacement outcome of the tooth loss due to traumatic injury by a dental implant has not been stated clearly. Although high satisfaction with the aesthetic outcome was revealed.[15,16] Furthermore, establishing an accurate diagnosis for this case should be considered.

Factors to consider when placing one or more implants are the alveolar bone, interdental spaces, and interocclusal spaces. The minimum mesial-distal clearance for an implant placed between two teeth is 7 mm. The minimum dimensions required for buccolingual width will increase or decrease depending on the size of the implant. For example, if we want to place an implant with a diameter of 7 mm, a bone width of at least 9 mm is required. Assuming that the implant diameter is 4 mm and the implant length is 10 mm, the required minimum jawbone width is 6-7 mm, and the minimum bone height is 10 mm (in the posterior mandible, it is at least 12 mm, where additional margins are required to secure the mandibular

nerve). This dimension is necessary to retain at least 1.0–1.5 mm of bone around all implant surfaces after preparation and placement. The minimum amount of interocclusal space required for restoration is 7 mm.[17] In this case, we used a diameter implant of 3.5 mm in regions 3.2 and 4.2, although the buccolingual width was less than sufficient according to the CBCT calculation, but we added the graft and membrane on both sides to prevent implant exposure.

The graft and membrane in this case were also used for socket preservation purposes. We could see that the bony thickness of the buccolingual and mesiodistal areas was still maintained six months after the extraction, before implant placement. The socket preservation should be considered to maintain the volume of the bone after tooth extraction. This procedure is done for preparing the placement of a dental implant and increasing the level of its longevity in the patient's mouth.[18,19] There are several techniques for the preservation, including combinations of bone grafts and membranes. The membrane was giving advantages for the stability of the graft.[18]

The diagnosis of the patient's joint was disc displacement with reduction, treated with an occlusal splint, and an improvement of the sign and symptom. Temporomandibular joint disorders (TMDs) occur in adults at a rate of around 31%, and the most prevalent diagnosis was disc displacement with reduction.[20] Tooth loss has a positive correlation with TMD signs and symptoms. Hence, the evidence is more frequent in patients with several tooth losses and no malocclusion.[21] Clicking and deviation are common signs of temporomandibular disorder. Sometimes patients do not recognize that sign as a form of the disorder. Symptoms of the disorder are often detected late in further circumstances. The etiology of temporomandibular joint disorders (TMDs), such as degenerative changes, has been correlated with the disc's internal derangements. The treatment could be non-invasive, minimally invasive, or invasive. The occlusal splint is included in the invasive one.[22]

Temporary restoration is highly needed in the aesthetic zone. In this case, we did not replace the edentulous area with a dental bridge. A dental bridge is no longer used in the anterior region because the aesthetics are less satisfactory than implant restoration; furthermore, a longer span has higher technical complications.[23] It could also affect the vital abutment teeth. In this case, we had to make a double device beside the bridge and also create a stabilization splint for it. Removable prostheses were not chosen because the denture could press the alveolar site and make abutment tooth mobility,[24] so we could not maintain bone volume. With a modified provisoris-stabilization splint, we could achieve both aims, which were to maintain the aesthetic and treat the TMD.

The dental implant treatment has been reported to have a long-term success rate. Furthermore, in this regard, the combination with the TMD problem still needs further evaluation. Limitations of this study are the potential complications that might occur are the clicking itself, chipping of the porcelain veneered of the implant restoration, or implant failure could happen if oral hygiene is not maintained.

CONCLUSION

New insight into dental implant treatment for trauma-induced edentulism and associated temporomandibular joint disorders with replacement of several anterior mandibular missing teeth due to trauma with temporomandibular disorders could be treated with dental implant modification splint that functions as a temporary restoration as well, which was an alternative treatment option. The patient was satisfied with the result of the treatment, especially in the aesthetic aspect. This study implies that proper treatment for missing teeth due to trauma in the anterior region could yield a satisfying result.

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