

Rehabilitation of a Patient with Post-Traumatic Incisal Teeth Fractures with Immediate Implant and Fiber-Post

Travma Sonrası Kesici Diş Kırıkları Olan Bir Hastanın Acil İmplant ve Fiber-Post ile Rehabilitasyonu

^{1b} Melek Almila ERDOĞAN^a, ^{1b} Özlem SARAÇ ATAGÜN^b, ^{1b} Özge HÜR ŞAHİN^c,
^{1b} Ülkü Tuğba KALYONCUOĞLU^a

^aUniversity of Health Sciences Gülhane Faculty of Dentistry, Department of Prosthodontics, Ankara, Türkiye

^bUniversity of Health Sciences Gülhane Faculty of Dentistry, Department of Periodontology, Ankara, Türkiye

^cUniversity of Health Sciences Gülhane Faculty of Dentistry, Department of Endodontics, Ankara, Türkiye

ABSTRACT Fractures of anterior teeth after trauma are frequently encountered in the clinic. In these cases, it can be difficult to achieve ideal function and aesthetics. If a traumatized tooth can be restored, keeping it in the mouth is often the best option, especially for young patients. In teeth that are too damaged to be kept in the mouth, immediate implantation is of great importance in preserving soft and hard tissues. This case report describes the dental rehabilitation of a patient who suffered intraoral trauma resulting in fracture of his lateral and canine incisors with emergency implant placement and splinting of his own crown with a fiber post.

Keywords: Tooth fractures; immediate dental implant loading; post and core technique

ÖZET Travma sonrası ön dişlerin kırılması klinikte sıklıkla karşılaşılan bir durumdur. Bu vakalarda ideal fonksiyon ve estetiği elde etmek zor olabilir. Travma geçirmiş bir diş restore edilebiliyorsa, özellikle genç hastalar için diş ağızda tutmak genellikle en iyi seçenektir. Ağızda tutulamayacak kadar hasar görmüş dişlerde ise acil implant uygulanması yumuşak ve sert dokuların korunmasında büyük önem taşır. Bu vaka raporunda, ağız içi travma sonucu lateral ve kanin kesici dişleri kırılan bir hastanın acil implant yerleştirilmesi ve kendi kronunun fiber post ile splintlenmesi ile yapılan dental rehabilitasyonu anlatılmaktadır.

Anahtar Kelimeler: Diş kırıkları; acil dental implant yerleştirme; kök çivisi tekniği

Trauma to the dentoalveolar region is common and can result in fracture and displacement of teeth and/or bone fragments.¹ Moreover, disruption of the integrity of the tooth structure can lead to lifelong consequences for the patient.² It can be difficult to achieve ideal function and aesthetics in the maxillary aesthetic zone in these situations.³ Options for therapy include straightforward monitoring and follow-ups, conservative care, and even intricate surgical treatments.⁴

Dental implants may be a viable option for severely damaged teeth that cannot be repaired.^{4,5} Single tooth replacement supported by an immediate implant that can mimic the lost tooth structure and restore full function without affecting or damaging neighboring teeth is a good treatment option.⁶ In contrast to delayed implants and delayed loading, immediate implant placement and loading give the patient a more presentable look while providing the necessary dental support for the hard and soft tissue structures at the extraction site.⁷

Correspondence: Melek Almila ERDOĞAN

University of Health Sciences Gülhane Faculty of Dentistry, Department of Prosthodontics, Ankara, Türkiye

E-mail: almilacali@gmail.com



Peer review under responsibility of Türkiye Klinikleri Journal of Dental Sciences.

Received: 12 Aug 2024

Received in revised form: 07 Oct 2024

Accepted: 25 Oct 2024

Available online: 26 Dec 2024

2146-8966 / Copyright © 2025 by Türkiye Klinikleri. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

The use of natural tooth crown as a pontic in the fabrication of prosthesis after cervical root fracture is a known method in the literature.^{8,9} However, to the best of our knowledge, there is limited studies in the literature on the maintenance of tooth, alveolar and gingival contour after trauma by cementing the natural tooth crown onto the post as a crown.¹⁰ This case report describes the rehabilitation of a patient who suffered an oral cavity trauma resulting in fracture of the lateral and canine incisors with immediate implant placement and splinting of his own crown with fiber-post, respectively.

CASE REPORT

A 28-year-old male patient was admitted to Gülhane Faculty of Dentistry, University of Health Sciences for the treatment of his teeth numbered 22 and 23, which were fractured due to trauma while skiing a week ago. Clinical examination revealed that tooth 22 was highly mobile, while tooth 23 had a complicated crown-root fracture. Vitality tests yielded negative responses. Radiologic examination showed that tooth 22 was fractured at the mid-apical triad, while the root of tooth 23 retained its structural integrity (Figure 1).

No oral pathology was observed in other parts of the mouth and the patient was found to have good periodontal health.

The treatment plan was to extract tooth 22 and replace it with an immediate implant and to perform root canal treatment on tooth 23 and cement its crown. The patient is informed about the benefits and harms of various treatment options for temporary and permanent prostheses and about implant options.

After local anesthesia, pulp tissue was removed under rubber dam isolation in the first session and

calcium hydroxide (CaOH_2) was applied. A semi-rigid splint was made with 0.5 mm ligature wire and the patient was scheduled 10 days later. The split dam technique was used for isolation, and the tooth was prepared using a Reciproc 40 (VDW, Munich, Germany) rotary file. Irrigation was performed with 10 mL of 3% sodium hypochlorite (NaOCl) (Cermaked, Stalowa Wola, Poland). The final irrigation protocol was carried out in 3 cycles. In the first activation cycle, 1 mL of 3% NaOCl was applied to the root canal using a 30G needle. Then, the Satelec P5 Newtron XS ultrasonic device (Acteon, Merignac, France) was set to power level 5, and the Irrisafe (Acteon, Merignac, France) ultrasonic endodontic tip was placed in the root canal 1 mm short of the working length according to the manufacturer's instructions to activate the NaOCl solution. After 30 seconds of activation, 5 mL of NaOCl was applied to the root canal, completing the first activation cycle. The second activation cycle was performed using EDTA (Microvem, Ankara, Türkiye). The third activation cycle was carried out in the same manner as the first activation cycle. Final irrigation was performed with 5 mL distilled water. The root canal was filled with R40 gutta-percha (Diadent, Seoul, Korea) and resin-based sealer (Figure 2).

Under local anesthesia, flapless atraumatic extraction of tooth number 22 was performed. The implant site was prepared according to the manufacturer's surgical protocol and the implant was placed 2-3 mm subcrestal along the palatal wall of the removed socket in the optimal prosthetic position and primary stability was achieved [Straumann® BLX (Institut Straumann AG, Basel, Switzerland)]. The space between the implant and the extraction socket was filled with allograft and bovine-derived bone substitute (BioOss spongiosa granules, sized 0.25-1 mm; Geistlich, Wolhusen, Switzerland) bone graft

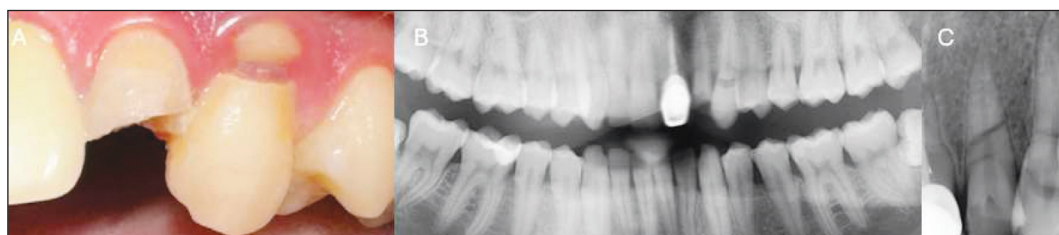


FIGURE 1: A) Intraoral view before treatment; B) Panoramic radiograph before treatment; C) Periapical radiograph before treatment.

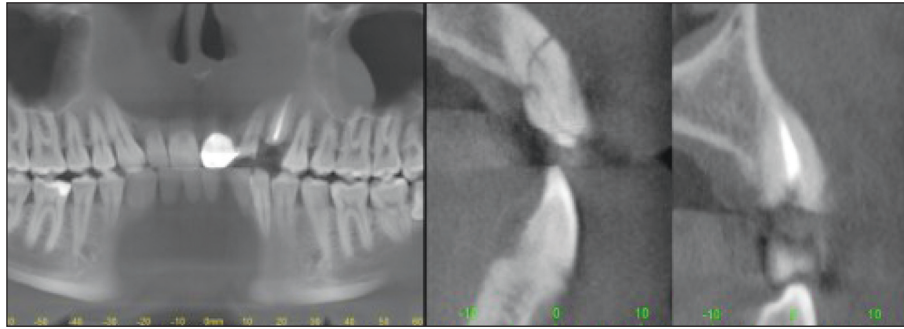


FIGURE 2: Preoperative cone beam computed tomography images after completion of endodontic treatment.

materials. Finally, the implant was rehabilitated with a polymethylmethacrylate (PMMA) temporary abutment (Straumann®, Institut Straumann AG, Basel, Switzerland). Cone beam computed tomography (CBCT) images were obtained baseline and a periapical radiograph was taken after implant surgery (Figure 3A). The implant was evaluated three months after immediate loading using radiographic and intraoral examinations (Figure 3B).

After immediate implant placement, the PMMA temporary abutment with a titanium alloy inlay (Straumann®, Institut Straumann AG, Basel, Switzerland) was prepared intraorally for successful gingival contouring. Crown cementation for tooth 23 was carried. The canal space within the crown was expanded, and a fiber post was bonded to the crown using resin cement (G-CEM ONE, GC Dental; Tokyo, Japan). The crown was then reattached to the root with the fiber post (RelyX, 3M Oral Care), also utilizing resin cement. Tooth 23 was subsequently stabilized with a rigid splint to tooth 24 (Figure 4).

The digital impression was recorded with an intraoral scanner (Trios 5, 3Shape; Copenhagen, Den-

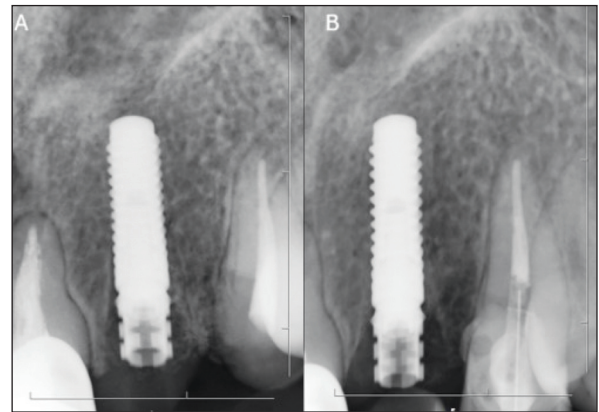


FIGURE 3: A) Postoperative periapical evaluation of the implant. B) Immediately implanted implant after 3 months and control periapical radiograph of tooth number 23 with fiber post.

mark). The temporary crown of the implant was designed (3Shape; Copenhagen, Denmark) non-occlusal, and printed by a 3D printer (MAX UV DLP; Asiga, Sydney, Australia), using a commercial 3D printing resin material (Saremco Print, Crowntec, A2 shade; Switzerland). The printed restoration was controlled intraorally and luted with the temporary cement (Temp Bond, Kerr Corporation, Romulus, MI).



FIGURE 4: A) Placement of the temporary abutment B) Preparation of the temporary abutment and adaptation of the crown of tooth number 23 C) Cementation of the temporary crown number 22 and splinting of tooth number 23.



FIGURE 5: A) Control of the exit profile B) Placement of the permanent abutment C) Cementation of the permanent crown.

Since the implant was placed immediately, it was slightly over embedded to ensure primary stabilization. Therefore, the length of the ti-base was insufficient for a permanent restoration. Thus, it was decided to fabricate a custom abutment. Upon removal of the temporary abutment and crown, the desired gingival aesthetics were achieved. Following conventional impression taking, a titanium custom abutment was fabricated, and the final monolithic zirconia restoration was completed (Figure 5).

Before the study, the patient was informed that the patient's data would be used for scientific purposes. Written informed consent was obtained from the patient.

DISCUSSION

Dental trauma that results in lost or irreversibly damaged teeth is a challenging situation for both the patient and the dentist. A successful outcome requires careful treatment planning that takes into account every facet of the unique patient scenario. The dentist has to weigh the benefits and drawbacks of any potential dental procedure.

For extraction socket type I, immediate implantation of dental implants has shown to be a safe and effective therapy choice.¹¹ Because of the benefits associated with this technique, which include fewer surgical treatments, less patient stress and morbidities, shorter treatment times, and improved management of soft tissue and alveolar morphology, it became a preferred strategy among physicians.¹² In fact, a great deal of research has been done on the long-term stability of this treatment option, with survival rates ranging from 90% to 99%.¹³ In our case, rehabilitation of the patient who lost his anterior tooth after

trauma by immediate implant placement and immediate temporary restoration resulted in very satisfactory results in terms of aesthetics and function.

The greatest approaches to preserve a natural dentition are unquestionably to preserve existing teeth and avoid trauma; this approach has a far longer lifespan than that of dental implants.¹⁴ When deciding whether to extract a traumatic tooth, one must carefully weigh the benefits of maintaining the natural tooth versus an implant; if a traumatized tooth can be restored, keeping it in the mouth is usually the best option, especially for younger patients.^{3,15} In our case, the retention of tooth 23, which was fractured at the enamel-cementum level due to trauma, with a successful root canal treatment and fiber-post application has produced very satisfactory results in terms of aesthetics and patient satisfaction.

Even in complex cases like a single-tooth replacement, immediate implant placement and restoration methods provide extremely dependable clinical results when carried out in the anterior esthetic zone. However, it should not be forgotten that the restoration of the patient's own tooth without extraction is also very important in terms of cost, patient psychology, and ideal aesthetics.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or mem-

bers of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Melek Almıla Erdoğan, Özlem Saraç Atagün; **Design:** Melek Almıla Erdoğan, Özlem Saraç Atagün; **Control/Supervision:** Ülkü Tuğba Kalyoncuoğlu; **Data Collection and/or**

Processing: Melek Almıla Erdoğan, Özlem Saraç Atagün, Özge Hür Şahin; **Analysis and/or Interpretation:** Melek Almıla Erdoğan, Özlem Saraç Atagün; **Literature Review:** Melek Almıla Erdoğan, Özlem Saraç Atagün; **Writing the Article:** Melek Almıla Erdoğan, Özlem Saraç Atagün, Özge Hür Şahin; **Critical Review:** Ülkü Tuğba Kalyoncuoğlu; **References and Fundings:** Melek Almıla Erdoğan, Özlem Saraç Atagün; **Materials:** Melek Almıla Erdoğan, Özlem Saraç Atagün, Özge Hür Şahin.

REFERENCES

1. Moule A, Cohenca N. Emergency assessment and treatment planning for traumatic dental injuries. *Aust Dent J.* 2016;61 Suppl 1:21-38. PMID: 26923446.
2. Mane NA, Shetty P, Borkar AC, Mujumdar SV, Mujawar A. Healing after horizontal root fracture of maxillary central incisor: a case report with 24-month follow-up. *Cureus.* 2023;15(8):e43373. PMID: 37700969; PMCID: PMC10494872.
3. Sheng L, Silvestrin T, Zhan J, Wu L, Zhao Q, Cao Z, et al. Replacement of severely traumatized teeth with immediate implants and immediate loading: literature review and case reports. *Dent Traumatol.* 2015;31(6):493-503. PMID: 26176171.
4. Alam M, Karami S, Mohammadhikah M, Badkoobeh A, Golkar M, Abbasi K, et al. The effect of photobiomodulation therapy in common maxillofacial injuries: Current status. *Cell Biochem Funct.* 2024;42(2):e3951. PMID: 38349051.
5. Li X, Li X, Xu Y, Fu G, Huang H. Comparing the modified socket-shield technique with the conventional immediate implantation technique in the anterior dentition: a 5-year retrospective clinical study. *Clin Oral Implants Res.* 2024;35(7):747-56. PMID: 38747494.
6. Cho YB, Moon SJ, Chung CH, Kim HJ. Resorption of labial bone in maxillary anterior implant. *J Adv Prosthodont.* 2011;3(2):85-9. PMID: 21814617; PMCID: PMC3141124.
7. Kokovic V, Jung R, Feloutzis A, Todorovic VS, Jurisic M, Hämmerle CH. Immediate vs. early loading of SLA implants in the posterior mandible: 5-year results of randomized controlled clinical trial. *Clin Oral Implants Res.* 2014;25(2):e114-9. PMID: 23278375.
8. Parolia A, Shenoy KM, Thomas MS, Mohan M. Use of a natural tooth crown as a pontic following cervical root fracture: a case report. *Aust Endod J.* 2010;36(1):35-8. PMID: 20377563.
9. Ulusoy AT, Cehreli ZC. Provisional use of a natural tooth crown following failure of replantation: a case report. *Dent Traumatol.* 2008;24(1):96-9. PMID: 18173675.
10. Raut AW, Mantri V, Shambharkar VI, Mishra M. Management of complicated crown fracture by reattachment using fiber post: minimal intervention approach. *J Nat Sci Biol Med.* 2018;9(1):936. PMID: 29456401; PMCID: PMC5812083.
11. Elian N, Cho SC, Froum S, Smith RB, Tarnow DP. A simplified socket classification and repair technique. *Pract Proced Aesthet Dent.* 2007;19(2):99-104; quiz 106. PMID: 17491484.
12. Aung YT, Eo MY, Sodnom-Ish B, Kim MJ, Kim SM. Long-term survival rates of tapered self-tapping bone-level implants after immediate placement: a positional effective rationale. *Maxillofac Plast Reconstr Surg.* 2024;46(1):17. PMID: 38727979; PMCID: PMC11087388.
13. Kan JY, Rungcharassaeng K, Lozada J. Immediate placement and provisionalization of maxillary anterior single implants: 1-year prospective study. *Int J Oral Maxillofac Implants.* 2003;18(1):31-9. PMID: 12608666.
14. Andersson L, Andreassen JO, Day P, Heithersay G, Trope M, Diangelis AJ, et al; International Association of Dental Traumatology. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. *Dent Traumatol.* 2012;28(2):88-96. PMID: 22409417.
15. Silvestrin T. The role of implant dentistry in the specialty of endodontics. *Endod Topics.* 2014;30(1):66-74. doi: 10.1111/etp.12061