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Case Report

Vertical Root Fracture and Gingival Fenestration Closure: A Detailed Case Report

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Abstract

Crown-root fractures are among the most challenging dental traumas to treat, requiring a multidisciplinary approach. This type of fracture starts in the crown and extends obliquely into the root. Subgingival fractures complicate restoration and need thorough assessment. Vertical root fractures (VRFs) usually lead to extraction and feature a longitudinal crack in the root. Identifying a VRF can be difficult for both general dentists and endodontists, and they can occur in both treated and untreated teeth. Symptoms may mimic endodontic or periodontal diseases, making diagnosis challenging. In terms of subsequent oral rehabilitation, dental implant placement has emerged as a viable option for restoring masticatory function and aesthetic considerations. This report presents a clinical case in which immediate implant placement, accompanied by connective tissue grafting, was employed in a patient exhibiting a vertical root fracture.

Keywords: *Crown-Root Fractures, Vertical Root Fractures, Immediate Implant Placement, Connective Tissue Grafting*

Introduction

The management of traumatic dental injuries is a prevalent aspect of dental practice. Various fracture types exist, with crown-root fractures being particularly challenging due to their requirement for a multidisciplinary approach. A dental trauma characterized by a fracture line originating in the crown and extending apically towards the root in an oblique direction is designated as a crown-root fracture. Subgingival fractures pose significant restorative challenges and necessitate comprehensive evaluation for effective treatment. A vertical root fracture (VRF) is defined as a longitudinal fracture of the root structure. VRFs are typically observed in teeth that have undergone endodontic treatment; however, they have also been sporadically reported in non-endodontically treated teeth (1).

Literature indicates that vertical root fractures represent the third most common indication for tooth extraction, with a reported prevalence ranging from 4% to 25%. The diagnosis of VRFs is complex and must be informed by a thorough patient history, clinical findings, and radiographic assessments to facilitate early identification (1). Suggested root fractures may exhibit spontaneous healing if addressed promptly with appropriate therapeutic interventions. The prognosis for a root fracture is intricately linked to its anatomical location, particularly in relation to the gingival sulcus. While novel treatment modalities aimed at tooth preservation have been investigated, outcomes have frequently been unfavorable, resulting in extraction being the predominant course of action (2).

In terms of subsequent oral rehabilitation, dental implant placement has emerged as a viable option for restoring masticatory function and aesthetic considerations. Recent advancements have sought to reduce treatment duration and the invasiveness of interventions, given that conventional approaches typically involve delayed implant placement, necessitating a healing period of 6 to 12 months following extraction. Presently, immediate implant placement post-extraction has demonstrated a high degree of predictability and success (2).

Furthermore, root fractures may co-occur with periodontal tissue involvement, manifesting as periodontal pockets or gingival fenestrations. Gingival fenestrations are defined as the exposure of the tooth surface due to the concomitant loss of adjacent bone and soft tissue. Various techniques have been proposed for the management of these conditions, including the application of connective tissue grafts, diverse flap designs, and guided tissue regeneration (3).

This report aims to present a clinical case in which immediate implant placement, accompanied by connective tissue grafting, was employed in a patient exhibiting a vertical root fracture.

Case Presentation

A 64-year-old female patient came in for a consultation regarding increased swelling in the gingival area around tooth 1.5. She reported experiencing intermittent pain, mostly when eating or applying pressure to that area. The pain varied in intensity from mild to moderate, and she also mentioned that the area bled when she brushed her teeth.

During the intraoral clinical examination, mobility was observed in the metal-ceramic crown of tooth 1.5. There were no signs of periodontal disease; however, the examination revealed that tooth 1.5 had a metal crown on a metal post. A fistula was present in the middle third of the tooth, accompanied by a single 7 mm periodontal pocket and significant bleeding upon probing.

To further evaluate the condition, X-rays and a cone beam computed tomography (CBCT) scan were performed. The radiographs showed no evidence of bone loss or periodontal disease. However, the CBCT revealed a fracture in the buccal wall of the root. Specifically, it indicated a root fracture at the cervical third, likely caused by the introduction of a metal stump spike through a possible false pathway, leading to a gum perforation at the vestibular level (fenestration).

Due to the condition of the tooth and the impossibility of performing oral rehabilitation, it was decided to extract the tooth. After the extraction, the tooth will be replaced with an implant. Additionally, to manage the peri-implant soft tissue and address the gingival fenestration, a palatal subepithelial connective tissue graft will be utilized.

Surgical procedure

The implant surgery was successfully performed under local anesthesia, beginning with the careful creation of a full-thickness flap. This process involved making intrasulcular incisions and incisions over the bone crest to effectively reflect the mucogingival tissue and expose the root. Following this, an atraumatic extraction of tooth 1.5 was achieved, ensuring minimal trauma to the surrounding tissues.

For bone preparation, continuous cooling with sterile saline was utilized, while adhering to a specific sequence of drill diameters and lengths to promote optimal conditions for implant placement. The implant (3.4 mm x 11.5 mm, Biohorizons TRX) was then placed precisely, and the gap was filled with Enxerto Ósseo Baumer - Integral OrthoGen, a bovine-derived bone graft to enhance stability.

Additionally, the gingival fenestration was effectively addressed by using a connective tissue graft from the palate. The procedure concluded with flap suturing using Vicryl sutures in sizes 5.0 for the gingival graft and 3.0 for the flap, ensuring secure closure for optimal healing.

The patient was prescribed analgesics (ketoprofen 100 mg every 6 to 8 hours for 4 days), antibiotics (amoxicillin 1 g twice daily for 1 week), and chlorhexidine gluconate 0.12% to be used twice daily for two weeks. They were instructed to apply ice packs at 20-minute intervals for the first 24 hours. A printed letter detailing all surgical advice was provided, including a recommendation to follow a soft food diet for the first week. The sutures were scheduled to be removed after ten days of postoperative healing.

Figure 1: *Vestibular view of the radicular extension fracture of tooth 1.5.*

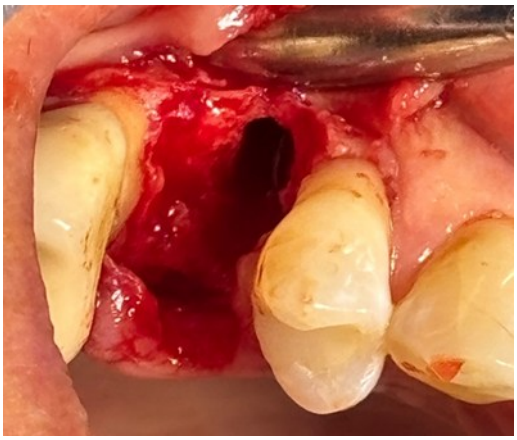
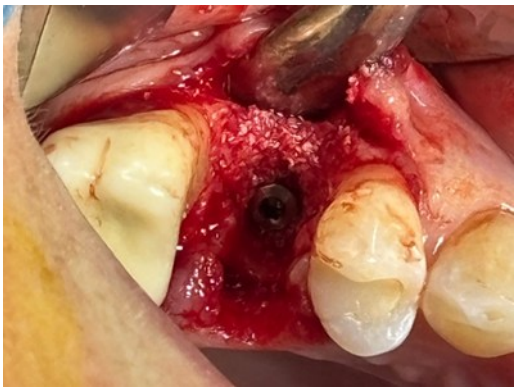
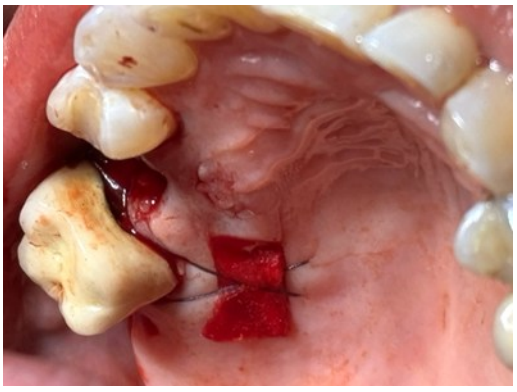


Figure 2: *Post-atraumatic extraction socket demonstrating sufficient residual bone structure, which facilitates the immediate placement of the dental implant.*





Figures 3 and 4: *Implant placed in the site of tooth 1.5 with bone graft material in the gap area. Additionally, a subepithelial palatal connective tissue graft was applied to the internal side of the flap to close the gingival fenestration. The flap was closed and sutured with Vicryl 5.0 sutures.*

After a four-month waiting period for osseointegration and healing, surgery was conducted to reopen the implant and install an abutment for future oral rehabilitation. Subsequently, a cemented and screwed crown was placed over the implant. The outcome was aesthetically pleasing and functionally beneficial for the patient.

Figure 5: *Implant 1.5 with definitive rehabilitation using a ceramic crown and complete healing of the gingival fenestration. The result is both aesthetic and functional.*

Discussion

Among the various types of dental trauma, crown-root fractures are one of the most challenging to treat and require a multidisciplinary approach. In cases of complex root fracture involving the buccal wall of the root, rehabilitation with implants is considered a common practice. Traditionally, the two-stage delayed implant technique has been employed, which has reported a survival rate of 81.2% (4). However, in the present case, immediate implant placement with simultaneous grafting was chosen. A relevant study indicates that success was achieved in the placement of 13 immediate implants, which remained in position with no significant radiographic changes of bone loss after a 3-year follow-up (5). Furthermore, it has been evidenced that the survival rate of these implants ranges between 80% and 90%, with a success rate close to 90%, especially in procedures performed on non-infected teeth (4), as is the case in question.

According to the literature, the use of immediate implants in areas where a recent extraction has been performed, along with the immediate grafting of subepithelial connective tissue, presents itself as an effective therapeutic option, with predictable results in the management of non-restorable teeth. The one-stage technique has demonstrated improvement in the quality of soft tissues by the end of the 12-month follow-up (6). Therefore, this technique can be considered a valid alternative for treatment.

In the present clinical case, it was decided to perform the extraction, immediate implant, and connective tissue graft in a single phase, as the site met the necessary conditions. Among these conditions were adequate buccal bone thickness, absence of infection and periodontal disease, as well as a sufficient level of mucosa, factors that the literature considers essential for achieving successful outcomes (7). Currently, multiple benefits are recognized associated with the use of connective tissue grafts, such as the improvement of the phenotype due to the increase in thickness and quality of the keratinized tissue. Additionally, advantages such as the long-term stability of the implant and the aesthetic improvement of the gingival contour are reported (8).

Additionally, a study mentions the utility of subepithelial connective tissue grafts to cover defects in soft tissues, such as gingival fenestrations, which can be complicated to treat in post-extraction sites or larger defects. This graft significantly improves the quality of the gingival tissue surrounding the implant, providing cellular and vascular support that favors the integration of soft tissue and facilitates the migration of epithelial cells from the edges of the fenestration defect, thus improving the site conditions and its subsequent repair (9). However, it is essential to consider the possible complications that could arise, such as graft and palatal tissue necrosis, excessive bleeding, prolonged pain or discomfort, as well as infections at the donor and/or recipient sites (10).

Conclusion

The use of immediate implants with connective tissue grafts has allowed satisfactory aesthetic and functional outcomes for the patient in this case. This suggests that, under the appropriate conditions, this technique can be a valid option for the treatment of vertical root fractures with gingival fenestration.

Conflict of Interest

The authors declare no conflict of interest.

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