Optimizing Dental Restoration: Crown Fragment Reattachment With Laser Gingivectomy & Hemostasis: A Case Report

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Abstract

Dental trauma often results in crown fractures, necessitating immediate attention to restore both function and aesthetics. This case report details the successful reattachment of a fractured crown fragment using advanced techniques including gingivectomy and laser hemostasis. To enhance the outcome, gingivectomy performed to optimize the gingival margin, and laser hemostasis was employed to achieve precise tissue management and optimal healing. The patient experienced satisfactory functional and aesthetic outcomes with no complications during follow-up. This case highlights the effectiveness of combining modern dental techniques for optimal restoration outcomes.

Keywords: Dental restoration, crown fragment reattachment, gingivectomy, laser hemostasis, traumatic injury, adhesive techniques.

INTRODUCTION

Coronal fractures are a common form of dental trauma and its sequelae may impair the establishment and accomplishment of an adequate treatment plan. Among the various treatment options, reattachment of a crown fragment is an immediate conservative treatment that can be considered for crown fractures. Reattachment of fractured fragment offers an immediate conservative, esthetic and cost-effective restorative option that has been shown to be an acceptable alternative to restoration of fractured area with composite resin.[1] Gingivectomy is a surgical treatment that involves removing unsupported gingival tissue. The diode laser is most commonly used in gingivectomy. It is highly absorbable by hemoglobin and melanin, allowing for easier soft-tissue manipulation during gingival recontouring, as well as better epithelization and healing[2]. Heat is created during laser usage, resulting in coagulation, drying, and vaporization at the energy absorption site, which prevents bleeding by closing blood vessels and suppressing pain receptors at the incision site. The following clinical case reports the management of a fractured posterior teeth successfully treated using the following two treatment modalities.

CASE REPORT

A forty five year old female patient reported to the Department of Conservative Dentistry and Endodontics, Ahmedabad Dental College and Hospital with a chief complain of severe pain and fractured tooth in upper left back tooth region after accidental chewing on a hard object four days before. Patient was asymptomatic before four days and experienced sudden pain in upper left back tooth region after accidental chewing on hard object. Clinical hard tissue examination revealed a fracture line in upper left first molar (26) extending subgingivally and the fractured fragment was mobile. (Fig 1)

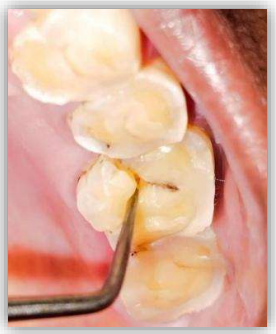

Fig 1

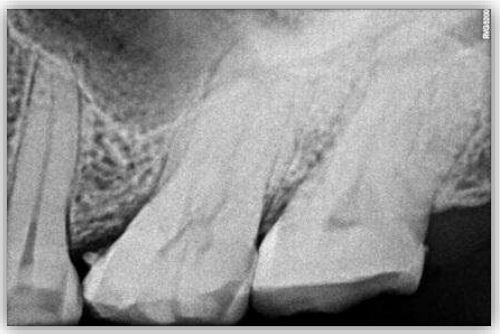

Fig 2

The tooth showed positive response to tenderness on percussion and palpation. Electric pulp testing showed a delayed response in affected tooth compared to contralateral tooth. On radiographic examination an oblique fracture line involving pulp was seen irt 26. (Fig 2)

Final diagnosis was a complicated crown fracture irt 26 extending subgingivally.

Treatment plan was as follows:

a) Removal of the mobile fractured crown fragment
b) Immediate single visit root canal treatment
c) Laser gingivectomy to control subgingival hemorrhage
d) Immediate reattachment of fractured fragment using dual cure resin cement
e) Full crown prosthesis irt 26.

The mobile fractured fragment was removed with maxillary root forceps. Fractured fragment was stored in physiological saline. After fragment extraction, there was constant oozing of blood which was controlled by pressure pack application until obturation. (Fig 3, 4).

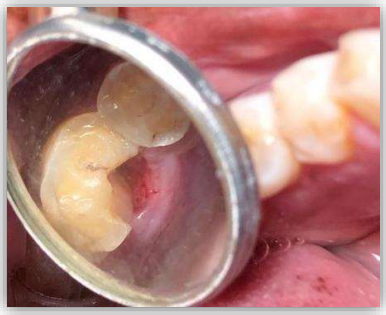

Fig 3

Fig 4

Immediate single visit root canal treatment was done. Access opening irt 26 done under local anesthesia (2% lignocaine 1:80,000) using No 2-round diamond bur & Endo Z bur (Fig 5) Working length determination with #15K files. (Fig 6) Irrigation by following standardized irrigation regimen using 3% of sodium hypochlorite (NaOCl), 17% ethylene diamine tetraacetic acid (EDTA) and physiological saline was done during the procedure. Final cleaning and shaping were done with Neoendo rotary files. Master apical file sizes were as follows: Mesiobuccal #25.04 Distobuccal #25.04 Palatal #30.04. Single cone Obturation using # 25.04, #25.04, #30.04 gutta percha cones (Fig 7)

Reattachment requires absolute dry field hence laser hemostasis was done. Cavosurface Bevels were placed on the tooth in order to enhance retention of fractured fragment.

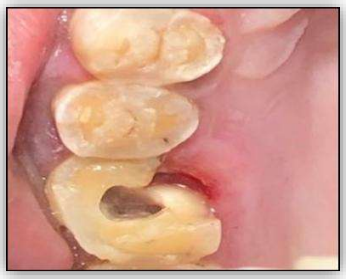

Fig 5

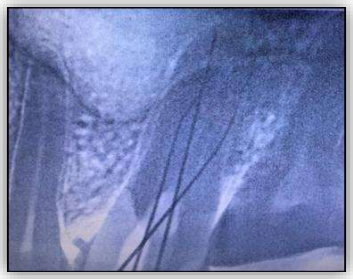

Fig 6

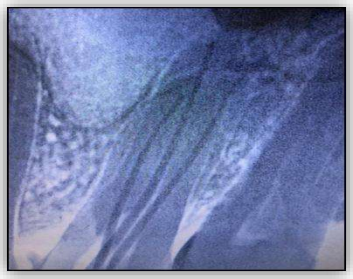

Fig 7

A low power diode laser was used for gingivectomy of the unsupported gingival tissue & for hemostasis of subgingival bleeding before reattachment of the fragment. A 980 nm diode soft tissue laser with a fiberoptic tip was used with low brush like movements. (Fig 8)

Fig 8

Following gingivectomy and complete hemostasis, the fit of the fragment was checked on the tooth. Reattachment of the fractured fragment was initiated. The tooth was selectively etched, rinsed & dried and dentin bonding was done followed by light curing. (Fig 9) The coronal fragment was also etched, rinsed & dried. (Fig 10)

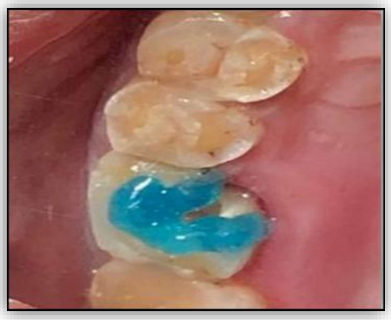

Fig 9

Fig 10

The coronal fragment was bonded to the tooth using a dual cure resin cement & excess cement was removed using floss interdentally. (Fig 11)

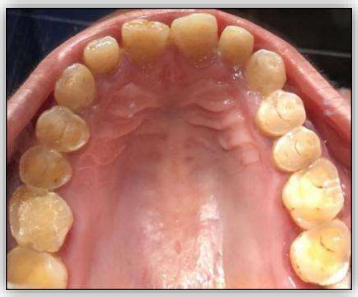

Fig 11

Occlusion was checked. Disocclusion was done and post operative instructions were given. Patient was recalled after 7 days for follow up. Patient was asymptomatic and radiographic examination showed normal findings. (Fig 12)

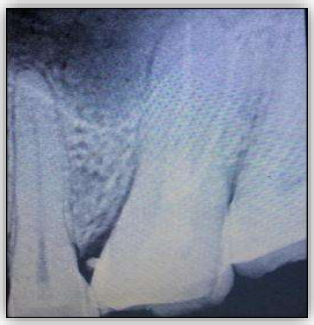

Fig 12

To prevent further fracture or dislogdment of the segment a ceramic facing crown was fabricated irt 26. Six months followed up showed sound periodontium clinically, no periapical pathology radiographically and prothesis was functionally acceptable. (Fig 13, 14)

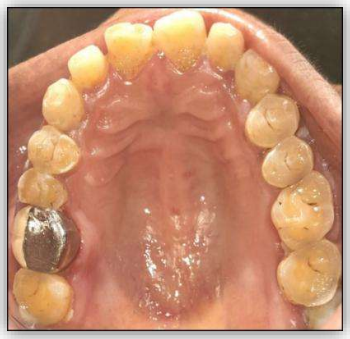

Fig 13

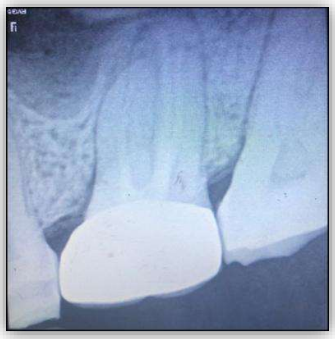

Fig 14

DISCUSSION

The development of adhesive material creates new perspective in the reconstruction of fractured teeth; it is now possible to achieve excellent results with the reattachment of fractured tooth fragment provided that the biological factors, materials and techniques are logically assessed and managed[3]. Thus, reattachment should be the first choice of immediate treatment when the fracture fragment is available as it is a conservative approach.

Reattachment provides good and long-lasting results as it maintains the tooth's original anatomic form, colour, contour and surface texture. It is beneficial especially in cases of margins extending subgingivally[4].

Also, for management of gingival soft tissue & bleeding in cases of trauma low power lasers like diode laser are used[5]. A common application for soft-tissue lasers — including diode models that operate at wavelengths between 655 and 980 nanometers (nm) — include the subject of this clinical report, the laser gingivectomy procedure[6].

According to the study done by Timur V. Melkumyan et al (2018) the use of hemostatic agent to control bleeding, has shown determinable effect on bond strength of composite resin to human dentin and also significantly decreased the quality of adhesion[7].

Moreover, Davoudi A et al (2016) experienced "laser etching effect" by irradiating laser to prepare sufficient surface roughness and permitting mechanical interlocking with adhesive resins[8]. Therefore, the use of a hemostatic agent was avoided in the above clinical case and a laser was used to achieve hemostasis and gingival soft tissue management for ideal adhesion.

Laser application offers multiple advantages in dental traumatology involving pulp and hard tissues. Pulp temperature increases only minimally during laser treatment. Laser irradiation provides high decontamination of the exposed site (bactericidal effect). Laser ablation removes the smear layer and debris, leaving the dentinal tubules open and thus allowing the adhesion process[9].

The use of lasers as an adjunctive or alternative option may facilitate treatment and has the potential to improve healing. Potential advantages over conventional methodologies include improved precision and visualization for operators, and less discomfort for patients. Lasers are becoming an adjunctive treatment methodology, as well as a stand-alone addition to the dental armamentarium[10].

Conflict of Interest: No conflict of interest

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