



## International Journal of Applied Dental Sciences

ISSN Print: 2394-7489  
ISSN Online: 2394-7497  
IJADS 2024; 10(2): 94-98  
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[www.oraljournal.com](http://www.oraljournal.com)  
Received: 17-02-2024  
Accepted: 21-03-2024

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### Novel approach: Surgical extrusion in complex dental cases: A case report

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DOI: <https://doi.org/10.22271/oral.2024.v10.i2b.1929>

#### Abstract

In a case involving a 24-year-old patient referred to the periodontology department for a crown lengthening procedure, the history revealed a tooth fracture resulting from trauma. Clinical evaluation highlighted a lateral incisor fractured at the interdental papilla level, having undergone prior root canal treatment. The patient exhibited sound general health with no medical concerns or surgical contraindications. Upon thorough clinical and radiographic assessments, appropriate candidates were selected for clinical crown lengthening.

This report documents a surgical extrusion technique applied to manage the fractured lateral incisor. The procedure aimed to enhance the clinical crown length, allowing for adequate restoration of the affected tooth. Surgical extrusion involved carefully creating intentional mobility around the tooth's furcation area, enabling controlled orthodontic movement. Gradual extrusion brought the tooth to the desired occlusal level, ensuring optimal positioning for subsequent restorative measures.

Post-procedural follow-ups at regular intervals revealed favorable outcomes. The patient remained asymptomatic, demonstrating robust periodontal health and restored functionality of the tooth. There were no reported complications or adverse findings during the follow-up period, affirming the success and stability of the surgical extrusion approach. This case emphasizes the efficacy of surgical extrusion in managing fractured teeth, particularly when coupled with appropriate restorative interventions. The procedure facilitated the restoration of the affected tooth to its functional and aesthetic integrity, underscoring its significance as an effective treatment modality for challenging dental scenarios involving traumatic injuries and crown length discrepancies.

**Keywords:** Surgical extrusion, crown lengthening, crown prosthesis, intentional replantation.

#### Introduction

Fractures in anterior teeth are prevalent due to their position and prominence in the dental arch [1]. Depending on the fracture's location, various treatments are viable. However, when the fracture occurs at or below the gum line, restoring the tooth becomes challenging and is often considered unfeasible. Replacing teeth with dental implants is a popular choice, but implants have a lower success rate compared to properly treated damaged teeth [2]. Three treatment options, including crown lengthening, orthodontic extrusion, and surgical extrusion, are available to restore a natural tissue connection above the gum and create a strong supportive structure known as the ferrule effect for damaged teeth.

The subgingival position of the fracture margin in CRF poses a challenge for restoration, impacting the biological width and leading to various periodontal issues like inflammation, bleeding, pocket formation, and bone resorption [3-4].

Multiple approaches exist for managing CRF: gingivectomy, apically positioned flap surgery, surgical or orthodontic extrusion, and extraction for extensive root involvement. However, these methods have limitations, particularly in esthetic zones [5].

Surgical extrusion, also referred to as intra-alveolar transplantation or intentional implantation, was initially introduced 24 years ago as a crown lengthening technique for CRF [6]. Initially surgical extrusion was introduced by Tegsjo in 1978 for fractures in the aesthetic zone of young patients, the surgical extrusion technique has evolved over the years without established protocols for guiding clinicians in treatment selection [7].

Surgical extrusion offers potential advantages over crown lengthening and orthodontic methods, demonstrating predictable outcomes in both short- and long-term scenarios. However, occasional instances of apical root resorption and marginal bone loss may arise. The process involves intricate tooth extraction and immediate repositioning in a single

surgical procedure, aiding subsequent prosthetic interventions for achieving satisfactory aesthetics and functionality [8]. The aim of this case report is to demonstrate successful application of surgical extrusion in intricate dental scenarios for improved functional and aesthetic outcomes."

Crown lengthening	Orthodontic extrusion	Surgical extrusion
Crown lengthening, while invasive, involves the removal of bone support, potentially impacting the shape and structure of both the affected and adjacent teeth. This procedure may lead to unintended aesthetic and speech-related consequences.	Orthodontic extrusion offers predictable outcomes but comes with limitations such as patient acceptance, elevated expenses, and an extended treatment period.	Surgical extrusion, also termed intra-alveolar transplantation or intra-alveolar repositioning, involves relocating the remaining tooth structure to amore coronal/supragingival position within its original socket. The success of this procedure relies on healing the alveolus after repositioning, allowing for improved tooth restorability and creating room for re-establishing the biologic width.

**Case Presentation**

A 24-year-old patient was referred to the periodontology department for a crown lengthening procedure following a tooth fracture caused by trauma. Clinical examination revealed a fractured lateral incisor at the interdental papilla level, which had already undergone root canal treatment. The patient had no significant medical history and was in good overall health, with no contraindications for surgical procedures. After thorough clinical and radiographic assessments, suitable candidates were chosen for clinical crown lengthening.

monthly for six months. During these visits, bleeding on probing, tooth mobility, periapical bone changes, and percussion sounds were evaluated through clinical and X-ray examinations.



**Fig 1: Pre-op**

**Surgical procedure**

A week before the surgery, thorough scaling was performed, along with oral hygiene instructions given to the patient. Written consent was obtained after explaining the surgical procedure. Antiseptic preparation involved using a 0.12% chlorhexidine solution. Local anesthesia, utilizing 2% lidocaine, was administered. The distance between the tooth fracture and the surrounding alveolar bone crest was measured using William’s graduated periodontal or UNC-15 probe to determine the required extent of extrusion.

Intrasulcular cuts were extended beside adjacent teeth to raise a complete flap. All granulation tissue was meticulously removed. Using a periostome, a gentle surgical extrusion was performed. The periostome's blade was positioned in the tooth's ligament space, gently manipulating it in a 'walking motion' to loosen the tooth. Carefully, the tooth was adjusted to the desired level using a hemostat, ensuring the fracture margin stood 3-5 mm from the alveolar crest. Simple interrupted sutures were used to close the flaps. Interdental sutures and splinting were utilized for immobilization. Post-surgery, patients were instructed to rinse with 0.12% chlorhexidine for two weeks. They were prescribed painkillers and antibiotics, with suture removal after ten days. Check-ups were scheduled weekly for the first month, then



**Fig 2: Apico-coronal height (Buccally)**



**Fig 3: Apico-coronal height (Palatally)**



**Fig 4: Intro oral periapical radiograph**



**Fig 5: Incision**



**Fig 6:** Full thickness flap reflection



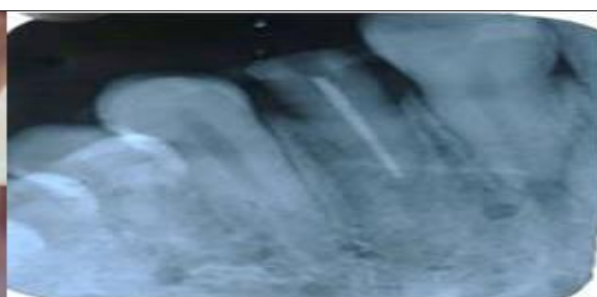
**Fig 7:** The blade of the periosteal elevator was placed in the periodontal ligament space of the tooth and manipulated in a “walking motion” to luxate the tooth



**Fig 8:** Suturing and splint placed



**Fig 10:** 2 weeks post op clinical and radiological



**Fig 11:** 6 weeks post op clinical and radiological



**Fig 12:** Pre-operative and post - operative clinical picture after prosthetic rehabilitation

**Table 1:** Over the past 15 years, the table illustrates the successful instances of surgical extrusion:

Author	Age / Sex	Tooth	Cause	Time of Surgical Extrusion	Tot mm Extrusion	Time of Splint	Outcome	Follow-Up
Nelson-Filho 2006 <sup>[9]</sup>	10 / Male	2.1	Intrusion / Uncomplicated fracture	15 days	/	15 Days	Success	10 Years
Caliskan 2008 <sup>[10]</sup>	12 / Male	1.1	Partial intrusion	/	/	No Splint	Success	2 Years
Mazumdar <i>et al.</i> (2009) <sup>[11]</sup>	42 / Male	1.1/2.1	Intrusion / Uncomplicated fracture	2 H	6mm	6 weeks	Success	2 Years
Senem Yigit -Ozer 2014 <sup>[12]</sup>	19 / Male	4.3	Crown-Root Fracture	3 Days	4 mm	2 weeks	Success	1 Year
Patil 2014 <sup>[13]</sup>	17 / Male	2.1	Intrusion / Uncomplicated fracture	2 Days	7 mm	3 Weeks	Success	1 Year

## Discussions

Complex crown-root fractures require meticulous consideration of treatment options, accounting for fracture placement, expected crown-root ratio, patient's age, preferences, and overall health. Resorting to a traditional crown lengthening procedure might have led to the aesthetic zone losing papilla and excessive loss of supportive periodontal tissue, so this surgical procedure was beneficial. Transplantation serves as a viable treatment when conventional methods fail or are not suitable for complex cases like deep cervical caries or intricate crown-root fractures. However, studies have highlighted typical complications such as inflammatory or replacement root resorption and marginal bone loss associated with surgical extrusion. These issues stem from mechanical or biochemical damage to the periodontal ligament during surgery, influenced by factors like the timing of root canal therapy and methods used for tooth re-implantation<sup>[8]</sup>.

During dental replantation, risks of root resorption exist due to PDL cell dehydration. Studies emphasize the importance of PDL vitality for successful reattachment. Since we employed a periotome which was specially designed for a traumatic extraction or luxation, the root never left the socket during the surgical manipulation, thus minimizing the risk of dehydration of the PDL. The duration teeth are out extraorally correlates with root resorption prevalence. While intact PDL cells on the socket wall play a role in reattachment, the root surface's viable cells seem to have a greater impact. In this case, the roots were never outside the alveolar sockets, potentially explaining the absence of root resorption during follow-up radiography. The teeth showed minimal mobility after 4 weeks, with no issues found post-root canal treatment. The non-rigid fixation method used for the extruded teeth remained stable and positively affected healing. This approach seems advantageous compared to traditional surgical methods.

## Conclusion

The innovative surgical extrusion method showcased in this case report proved successful in managing complex dental scenarios. Post-operative examination revealed minimal tooth mobility, indicating the effectiveness of prior root canal treatment. The non-rigid fixation employed demonstrated stable outcomes, contributing positively to healing. These findings highlight the advantages of this approach over conventional surgical techniques, showcasing its potential as a promising solution in intricate dental cases, offering stability and favorable outcomes.

## Conflict of Interest

Not available

## Financial Support

Not available

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## How to Cite This Article

Dr. Bhansali AK, Dr. Indurkar M, Dr. Jadhav SR. Novel approach: Surgical extrusion in complex dental cases: A case report. *International Journal of Applied Dental Sciences*. 2024; 10(2): 94-98.

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