

# **Management of Multiple Dental Root Fracture Injuries: A Case Study**

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## **ABSTRACT**

Management of multiple facial and traumatic dental injuries can pose a clinical challenge and requires a multi-disciplinary input to optimise function, healing and maintain long term prognosis of the dentition. A 23 year old male was seen at the Emergency Department at The Royal London Hospital after sustaining multiple facial and dental injuries from an epileptic seizure. This case describes the clinical management of a horizontal intra-alveolar root fracture in the middle third of the upper right lateral incisor associated with complete avulsion of the coronal fragment and avulsion of the upper left central incisor. The UR2 showed signs of bony healing between the root fragments 7 months after the injury but early signs of pulpal necrosis was evident in the coronal fragment and endodontic treatment was carried out to the fracture line. The UL1 became non-vital and periapical radiolucency was evident radiographically 3 months after the injury. During the endodontic treatment, it was noted that the GP was short of the apex and the CT scan confirmed a small apical fracture. In conclusion, we found that horizontal fracture in the mid third of the root with complete displacement of the coronal fragment had a good healing potential and supported the evidence that adequate repositioning is related to hard tissue formation between the coronal and apical fragments.

## **INTRODUCTION**

High impact injuries to the face can result in dento-alveolar trauma. Horizontal root fractures of the anterior maxillary teeth occurs in 0.5-7% of cases with the upper central incisors being the most commonly involved teeth<sup>1</sup>. It has been reported that up to 27% of cases can also involve the lateral incisor<sup>2</sup>. The position of root fracture often determines the prognosis of the traumatised tooth, with apical and middle third root fractures having a better prognosis than cervical root fractures<sup>3</sup>. Root fractures can also occur in combination with a luxation injury, resulting in displacement of the coronal fragment. Immediate repositioning and stabilisation with a flexible splint is essential to allow for a favourable outcome. Endodontic treatment may be required depending on the extent of the displacement, radiographic examination and pulpal symptoms.

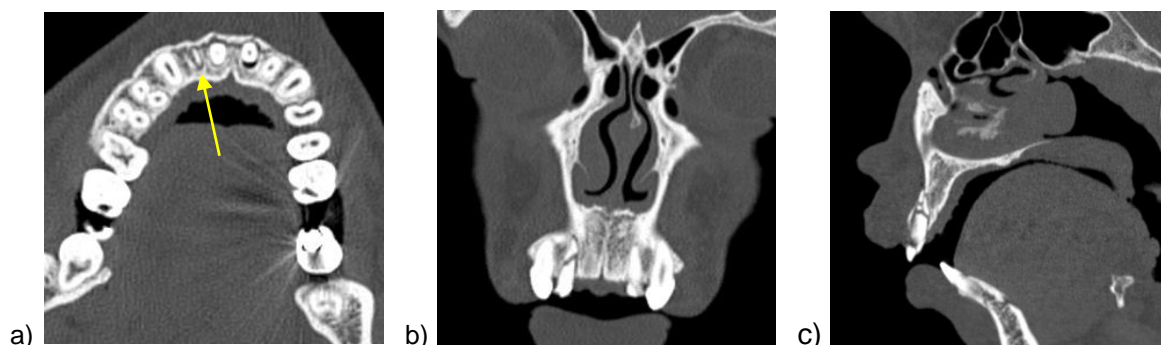
## **CASE DETAILS**

### **HISTORY**

A 23 year old male attended the Emergency Department at The Royal London Hospital after a fall from an epileptic seizure. He sustained fractures to the mandible and maxillary alveolar labial segment. The UR2 had sustained an oblique root fracture with avulsion of coronal fragment. There was also avulsion of UL1 and multiple dental fractures. The avulsed teeth, which were placed in water by the Ambulatory Care Service, had an extra-oral dry time of approximately 2 hours. These were repositioned and splinted from upper 3-3.

The patient also underwent Open Reduction Internal Fixation of the bilateral condyles and right parasymphyseal fracture under general anaesthesia. The flexible splint was removed 4 weeks later by the OMFS team where discolouration and slight mobility was noted for the UR2. He was subsequently referred to the Adult Restorative Trauma Clinic at The Royal London Dental Hospital.

Medically, he has mild learning difficulties and epilepsy diagnosed from age 15. He is on Sodium Valproate and under the Neurosurgery team.



**Fig 2.** CT mandible showing a) maxillary alveolar fracture across the UR2 to UL1 with root fracture through the UR2 (arrow) and labially displaced UL1 after repositioning b,c) Oblique root fracture of UR2 with apical fracture and labial displacement

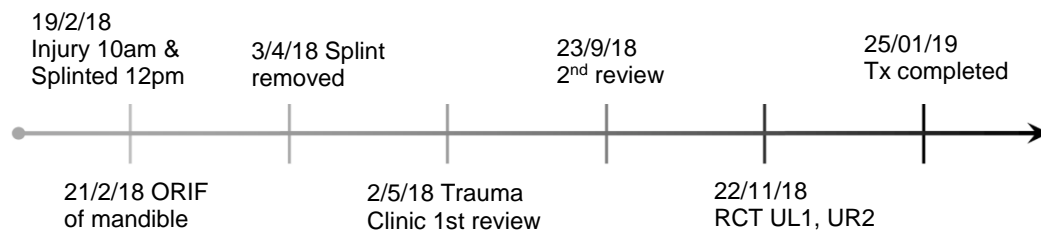


Fig 1. Timeline of injury to completion of treatment

**EXAMINATION**



Fig 2. Pre-Operative Photographs-after removal of splints & management of mandibular fractures

FS	FS	FS				#		#	#			FS	FS	●	
8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
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Fig 3. Dental charting

BPE:

3	3	3
3	3	3

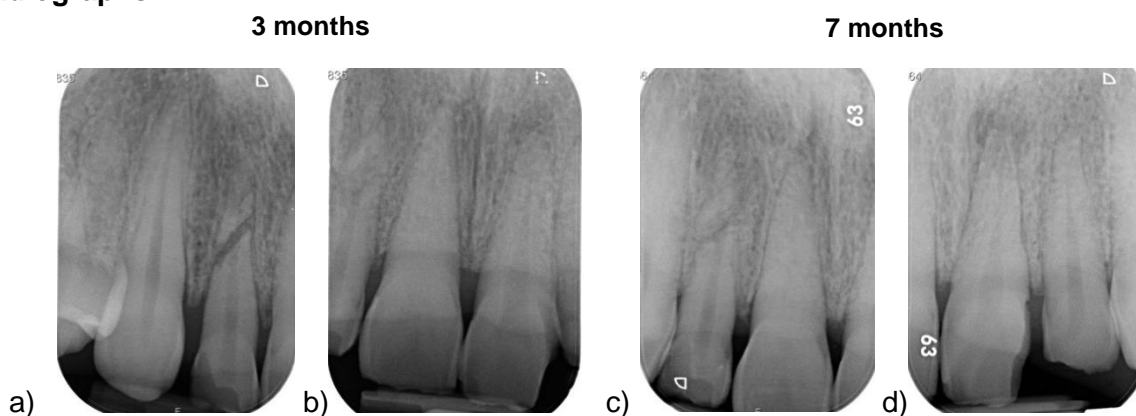
On examination, he had pain on mouth opening, moderately restored dentition with class I occlusion. Labial tenderness was evident around the buccal sulcus of UR2 to UL2 and UR2, UL1,UL2, LR2, LR6, LL1, LL6 were fractured. He had poor oral hygiene with generalised plaque resulting in false pocketing and generalised bleeding on probing.

**Special investigations**

**Sensibility Testing**

Date	Findings	UR2	UR1	UL1	UL2
02/05/18 (3 months)	<b>Fracture</b>	Enamel-dentine # +mid root #	Infraction	Enamel-dentine #	Enamel-dentine #
	<b>EPT</b>	64	64	64	12
	<b>TTP</b>	+	-	+	+
21/09/18 (7 months)	<b>Ethyl Chloride</b>	+ve	+ve	-ve	+ve
	<b>EPT</b>	6	10	64 (non-vital)	15
	<b>Discolouration</b>	Grey	-	-	-
	<b>Mobility</b>	I	-	-	-
	<b>TTP</b>	+	-	+	-

**Radiographs**



**Fig 4.** Peri-apicals a,b) **3 months after injury** (1 month post-splint removal)- UR2 oblique mid-third root fracture with connective tissue healing between the diastasis and apical radiolucency around UL1 c,d) **7 months after injury** (5 months post-splint removal)- localised interposition of bone and connective tissue evident at the fracture site.



**Fig 5.** Bitewings showing fractured distal enamel LR6 and mesio-buccal cusp LL6, <10% horizontal bone loss

Sensitivity tests and radiographs were performed at 3 and 7 months after injury. At 3 months, UR1, UR2, UL1 were not responsive to pulp test but at 7 months, UR1, UR2 became responsive. The UL1 was not mobile but was non-vital with presence of peri-apical pathology. UR2 was vital, reduced in mobility with signs of healing radiographically but discolouration and tenderness was present which was suggestive of pulpal necrosis in the coronal fragment.

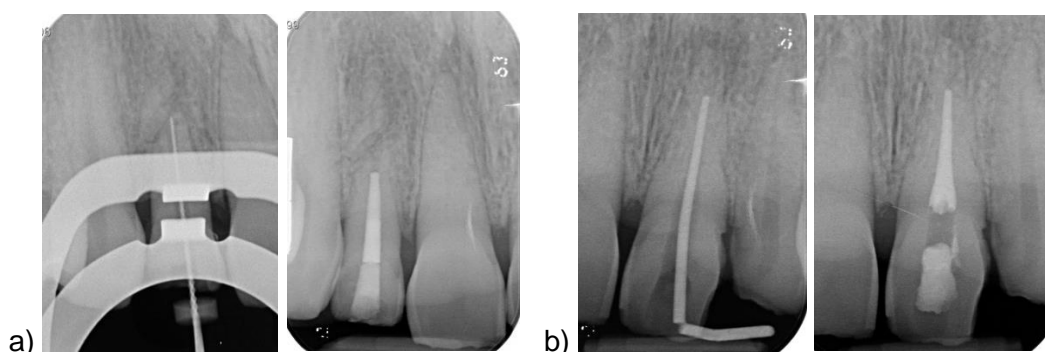
## **DIAGNOSES**

Following clinical and radiographic assessment the following diagnosis were made;

- Generalised moderate marginal gingivitis
- Maxillary dento-alveolar fracture around the UR2 to UL2
- UR2: Uncomplicated enamel-dentine fracture with oblique mid- third root fracture, avulsion of coronal fragment with pupal necrosis
- UL1: Avulsion, uncomplicated distal enamel-dentine fracture with peri-apical periodontitis
- UL2: Uncomplicated enamel-dentine fracture palatally extending subgingivally
- LL6: Uncomplicated mesio-lingual enamel-dentine fracture
- LR2, LR6, LL1: Enamel fractures

## **TREATMENT** (within the Restorative Department)

1. Oral Hygiene Instructions (OHI) + 6PPC + RSD >4mm
2. RCT of UR2 up to the root fracture and of UL1



**Fig 6.** a) UR2 obturation to the fracture line b) UL1 GP short of the apex due to suspected apical 1/3<sup>rd</sup> root fracture.

**UR2:** RCT was carried out to the fracture line and apical stop was created and step back was achieved using K-files. Obturation was carried out using standard GP; System B to create an apical seal and Obtura to backfill, ideally below to the CEJ. Final obturation (Fig 5a) shows GP beyond the CEJ.

**UL1:** Working length of 20mm was measured to zero reading on the Root ZX apex locator which appeared short of the apex (Fig 5b). The length was further verified by the paper point technique. The CT mandible shows signs of apex fracture which may explain the shortening of the GP. Obturation was carried out using the same method as the UR2 and sealed with composite.

**3. Restoration of UL2, LR2, LR6, LL1, LL6 enamel-dentine fractures with composite**

**4. Review vitality of UR1 and periodontal health**

**FOLLOW-UP**

To be reviewed on the Restorative trauma clinic in 3 months to monitor endodontically treated teeth and vitality:

- UR2 RCT- monitor discolouration +/- internal bleaching
- UL1 RCT- signs of resorption
- UR1, UL2- monitor vitality due to involvement with dento-alveolar injury +/- RCT



**Fig 7. Post-Operative Photographs**

**DISCUSSION**

Early signs of pulpal necrosis in the UR2 coronal fragment is likely caused by the separation of the pulp and periodontal ligament during avulsion of the coronal fragment. The positive healing response and vitality at 7 months suggests that horizontal root fractures have a reparative potential despite complete displacement and necrotic pulp coronally<sup>4</sup>. Literatures have shown that small diastasis between fragments and favourable repositioning during splinting have a great influence in hard tissue healing<sup>5,6</sup>.

A decision was made to root treat the coronal fragment only, as there was bony healing at the fracture site. This was due to appropriate repositioning of the UR2 allowing it to heal with a gap between the coronal and apical fragments. As a result of this, it would be difficult to negotiate the apical fragment, which is most likely to have preserved its blood supply. There were also no signs of secondary inflammation or pathological changes apically. Studies have shown that apical portion can maintain vitality due to the intact blood supply but this is unpredictable as the UL1 has multiple fractures within the apical fragment<sup>7</sup>.

Standard GP was used for obturation instead of Mineral trioxide aggregate (MTA) as there was progression of healing. However, in both cases, the use of MTA would have been an ideal choice of material for apexification due to regenerative properties when in contact with the pulp or peri-radicular tissues<sup>8</sup>. Previous studies have shown better healing in root-end fillings after root resection<sup>9</sup>.

## **CONCLUSION AND CLINICAL IMPLICATIONS**

Favourable healing in mid-third root fractures is highly dependent on early repositioning and stabilisation of the displaced coronal fragment to its correct position, in order to reduce the diastasis. Treatment of traumatised dentition is dictated by clinical and radiographic examinations. It is therefore important to review shortly after the injury so that treatment is carried out in a timely manner, to improve the overall prognosis and reduce post-healing complications.

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