



# MANAGEMENT OF A COMPLICATED CROWN FRACTURE VIA CVEK PULPOTOMY

A Clinical Case Report

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## Abstract

Preserving pulp vitality following complicated crown fractures is essential to prevent post-traumatic pain, infection, root resorption and to allow ongoing apexogenesis of immature teeth. This case report describes initial management of a 9-year-old boy who attended with multiple pinpoint pulp exposures on his UR1, 48 hours after trauma. A Cvek pulpotomy was completed alongside composite restoration. At his 4-month review, the patient was asymptomatic and there were no signs indicating loss of vitality. This case shows the importance of attempting to maintain pulp vitality and providing a good coronal seal to maximise patient outcomes. Delay in presentation, extent of injury, periodontal damage and patient co-operation are all factors which need to be considered before deciding which pulp therapy will provide the best outcome for each patient.

## Introduction

This case report describes how a Cvek pulpotomy was used to treat a complicated crown fracture in a young patient with a delayed presentation after dental trauma. Pulpotomy is the surgical removal of part of the dental pulp to allow the rest to maintain vitality and continue normal function<sup>1</sup>. A Cvek pulpotomy involves removal of 1-3mm of coronal pulp which aims to preserve cell rich coronal pulp tissue which has improved healing capability than radicular pulp with long-term success rates of 87.5-100% being reported for those treated within 72 hours<sup>1,2,3</sup>. Factors which influence whether to perform a pulpotomy include extent of fracture, presence of concurrent displacement injury, whether the tooth has an open or closed apex and whether exposure is traumatic or carious. Current literature suggests that a delay in presentation of up to 9 days and exposures of up to 4mm may have minimal effect on the outcome of Cvek pulpotomies<sup>1</sup>. Current AAPD guidelines state that neither the time from accident nor size of pulp exposure is critical, providing that superficial inflamed pulp tissue is amputated to healthy pulp<sup>4</sup>.

## Case Details

### History

A 9-year-old boy attended Newcastle Dental Hospital's paediatric department in September 2019, 48 hours after falling off his bike. He had been brought immediately to A+E and was cleared of a head injury. There was no reported loss of consciousness, nausea or vomiting and the missing tooth fragment had been accounted for.

Medically the patient had well-controlled asthma. Socially he lived at a protected address and was subject to a child protection plan alongside 1-to-1 support for special educational needs. He had had a previous general anaesthetic in 2018 for extraction of 5 carious primary teeth. He had no previous local anaesthetic experience and was mildly dentally anxious.

### Examination

On examination he had a small forehead laceration which had been sutured by A+E. Intraoral soft tissue examination was unremarkable and oral hygiene was fair. His UR1 had a complicated crown fracture with 3 pinpoint pulp exposures. Caries was evident on his URE, LRE and all four first permanent molars.



Figure 1- Pre-operative anterior view showing complicated crown fracture UR1



Figure 2- Pre-operative upper occlusal photograph showing 3 pinpoint pulp exposures on UR1

### Special Investigations

Due to tenderness, he only tolerated an upper standard occlusal radiograph and OPG at his initial appointment, which showed no obvious root fractures or periapical pathology, with a minimally open apex UR1.



Figure 3- Pre-operative plain film upper standard occlusal

Baseline Trauma Checks				
	UR2	UR1	UL1	UL2
Colour	Normal	Normal	Normal	Normal
Sinus	No	No	No	No
Mobility	0	0	0	0
TTP Apically	No	Mild +	No	No
TTP Buccally	No	No	No	No
Ethyl Chloride	+	-	+	+
EPT	20	45	7	7

### Diagnoses

- 1) Enamel dentine pulp fracture and concussion UR1
- 2) Caries UR6, UL6, LR6, LL6, URE + LRE

### Treatment Provided

At his initial appointment, a Cvek pulpotomy was completed on the UR1 under local anaesthetic and rubber dam isolation. The coronal pulp was unroofed and amputated to a depth of approximately 2.5mm from the fracture site until haemostasis was achieved after applying cotton wool soaked in saline for 4 minutes. The pulp chamber was dressed with non-setting calcium hydroxide, GIC and flowable composite. The crown was restored with a shade A2 composite tip using a cellulose crown former.



Figure 4- Saline soaked cotton wool in situ



Figure 5- Haemostasis achieved

### Follow-up

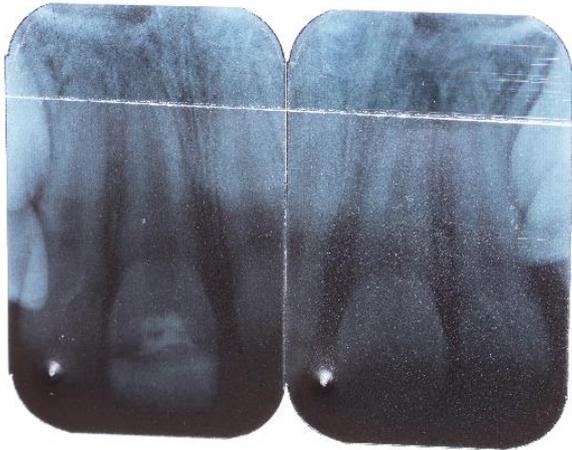


Figure 6- Intraoral post-op shot



Figure 7- Extraoral post-op shot

Unfortunately, the patient was not brought to multiple reviews despite reminders. This led to raising of concerns via our safeguarding team who managed to arrange a review in



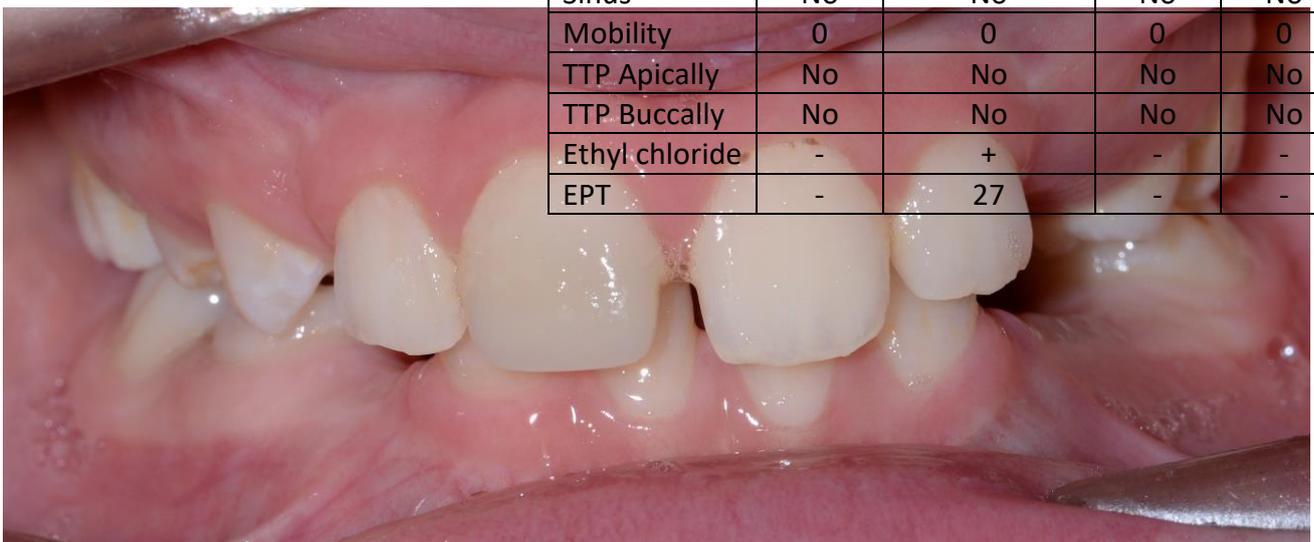
February 2020 via their social worker. On review, the patient had remained asymptomatic aside from slight sensitivity to cold from UR1. On examination there were no signs of infection. Vitality testing showed the UR1 to be the only tooth responding positively (so these responses may be unreliable). The patient tolerated periapicals which showed no obvious pathology or root resorption and the UR1 had a minimally open apex with parallel dentine

Figure 8- Plain film periapical radiographs taken at 4-month review in February 2020

walls.

Following discussion of options, the patient's mum elected to undergo

4-Month Review Trauma Checks				
	UR2	UR1	UL1	UL2
Colour	Normal	Composite A2	Normal	Normal
Sinus	No	No	No	No
Mobility	0	0	0	0
TTP Apically	No	No	No	No
TTP Buccally	No	No	No	No
Ethyl chloride	-	+	-	-
EPT	-	27	-	-



restorations of his carious teeth with his GDP. He will be reviewed in 3 months within our department.

Figure 9- Anterior view at 4-month review appointment



Figure 10- Plain film bitewing radiographs taken at 4-month review shows caries in all 4 first permanent molars alongside URE and LRE which are near exfoliation.

## Discussion

A recent retrospective study showed the frequency of pulp necrosis and infection to be approximately 10% for both partial pulpotomy and coronal (Cvek) pulpotomy with no significant difference between either group<sup>5</sup>. However the frequency of pulp necrosis after direct pulp capping was significantly higher than either pulpotomy technique at 57% (however this was based on a smaller sample size)<sup>5</sup>.

Contraindications for a Cvek pulpotomy include if inflammation extends beyond the coronal pulp, if pulpal haemostasis cannot be achieved or if there are any signs of loss of vitality or root resorption. Significant displacement injury may also reduce prognosis. Good patient co-operation and ability to tolerate local anaesthesia is also key for success<sup>2</sup>.

Alternative methods of management may have been to provide direct pulp capping with either calcium hydroxide (Dycal) or mineral trioxide aggregate (MTA). Recent studies have shown that MTA has a higher clinical success rate than calcium hydroxide and shows histological evidence of reduced inflammatory responses and increased dentine bridge formation, but discolouration may be an unwanted side effect<sup>6,7</sup>. However for this patient, we felt his delayed presentation would have increased pulpal bacterial infiltration thereby reducing the likelihood of success with pulp capping. In addition, the absence of any significant periodontal injury increased our hopes of a successful outcome with a Cvek pulpotomy.

## Conclusion and Clinical Implications

This case shows the importance of attempting to maintain pulp vitality following traumatic injuries. Providing prompt treatment and good coronal seal is imperative for any crown fracture. For those patients with larger pulp exposures or delayed presentations, a Cvek pulpotomy may be the treatment of choice.

## References

- 1) Bimstein E, Rotstein I (2016). Cvek pulpotomy- revisited. *Dental Traumatology* **32**: 438-442
- 2) Barratt O, Dixon C, Barry S (2017). Technique Tips: A complicated crown fracture: The Cvek pulpotomy. *Dental Update* **44** (11): 1096-1097
- 3) Blanco L, Cohem S. (2002). Treatment of Crown Fractures with exposed pulps. *Journal of Californian Dental Association* **30**(6):419-425
- 4) American Academy of Pediatric Dentistry (2014). Pulp Therapy for Primary and Immature Permanent Teeth. Accessed at: [https://www.aapd.org/media/Policies\\_Guidelines/BP\\_PulpTherapy.pdf](https://www.aapd.org/media/Policies_Guidelines/BP_PulpTherapy.pdf) (Accessed 20/02/20).
- 5) Wang G, Wang C, Qin M (2017). Pulp Prognosis following conservative pulp treatment in teeth with complicated crown fractures- a retrospective study. *Dental Traumatology* **33** (4): 255-260
- 6) Li Z, Cao L, Fan M, Xu Q (2015). Direct Pulp Capping with Calcium Hydroxide or Mineral Trioxide Aggregate: A Meta-Analysis. *Journal of Endodontics* **41** (9): 1412-1417
- 7) Eshandarizadeh A, Shahpasandzadeh MH, Shahpasandzadeh M, Torabi M, Parirokh M (2011). A comparative study on dental pulp response to calcium hydroxide, white and grey mineral trioxide aggregate as pulp capping agents. *Journal of Conservative Dentistry* **14**(4):351-355.