Retrospective Review of Traumatic Complicated Crown Fractures and Treatment Outcomes

Edmonds K[1], Fida Z[1]

[1]Boston Children's Hospital, Boston, MA; [2]Harvard School of Dental Medicine, Boston, MA

Introduction

- Traumatic dental injuries occur frequently in children and young adults, comprising 5% of all injuries. (Andreasen et al. 2012)
- 25 percent of all school aged children experience dental trauma. (Andreasen et al. 2012)
- 33 percent of adults have experienced trauma to the permanent dentition with the majority of these injuries occurring before the age of 19. (Andreasen et al. 2012)
- The incidence of complicated crown fractures ranges from 2% to 13% of all dental injuries. (Aggarwal et al. 2009)
- Studies show a 72.3% pulpal survival in complicated crown fractures without luxation. (Bissinger et al 2021)
- Intervention is not only vital for the functionality of traumatized teeth, but also for the social and physiological well-being of the patient. (Tonini 2017)

Objectives

Specific Aim: To determine whether delay of time to treatment, isolation method, and pulpal medicament has effects on treatment outcomes rendered for complicated crown fractures in the Boston Children's Hospital Emergency Department.

This research could inform the current practices at the Boston children's Hospital and ways to improve current treatment protocol.

Methods

Retrospective chart review of initial traumatic dental complicated crown fractures and treatments that presented to the Boston Children's Hospital Emergency Department

- January 2015 – January 2021
- Inclusion Criteria: Patients seen in BCH ED, Healthy, Permanent tooth, Complicated crown fracture, No associated luxation
- Exclusion Criteria: Primary tooth, Luxation injury, Unclear diagnosis, Unclear treatment rendered
- 381 charts reviewed, 56 met inclusion criteria

Comparison of cases and variables that contributed to failure of initial treatments in the emergency department.

- Variables of interest: Treatment method, Time from trauma to treatment, isolation method, pulpal medicament
- Treatment Failure: Need for root canal therapy at a subsequent visit due to pain, irreversible pulpitis, pulpal necrosis, periapical radiolucency, and/or frank infection.

Chart Review

Success	80.3% (45 cases)	Failure	19.6% (11 cases)
Therapies Rendered		Isolation Method	
Cvek pulpotomy	51 cases	Cotton Roll	34 uses
Direct Pulp Cap	5 cases	Rubber Dam	22 uses
Pulpectomy	1 case	Pulpal Medicament	
Time to Treatment		Calcium Hydroxide	51 uses
Average of 5.64 hours		MTA	5 uses

Treatment Failure Statistics

Therapies Rendered	
Cvek pulpotomy	9 cases
Direct Pulp Cap	1 case
Pulpectomy	1 case
Time to Treatment	
Average of 7.41 hours	
Isolation Method	
Cotton Roll	9 uses
Rubber Dam	2 uses
Pulpal Medicament	
Calcium Hydroxide	9 uses
MTA	2 uses

Analysis

Conversion of predictor variables to binary variables

- Time to treatment: Raw time, greater that 5 hours, greater than 4 hours, greater than 3 hours - (True: 1, False: 0)
- Isolation: Cotton roll isolation (1), Rubber Dam (0)
- Pulpal Medicament: Calcium hydroxide (1), MTA (0)
- Binary logistic regression completed via XLSTAT to assess statistical significance of predictor variables to that of treatment failure.

Analysis

Binary logistic regressions

Regressions completed via XLSTAT to test for probability of initial treatment failure with various combinations of predictor variables.

- Cotton roll, Time to treatment (raw value) – not statistically significant
- Cotton roll, Time to treatment >3 hours – not statistically significant
- Cotton roll, Time to treatment >5 hours – not statistically significant
- **Cotton roll, Calcium hydroxide use, Time to treatment >3 hours – statistically significant**
- **Calcium hydroxide use, Time (Raw value) – statistically significant**
- **Calcium hydroxide use, Time to treatment >3 hours – statistically significant**
- **Calcium hydroxide use, Time to treatment >4 hours – statistically significant**
- **Calcium hydroxide use, Time to treatment >5 hours – statistically significant**

Conclusions

For patients being treated for complicated crown fractures in the Boston Children's Emergency Department:

- Increased time to treatment is a predictor for future treatment failure
- Use of calcium hydroxide as a pulpal medicament is a predictor for future treatment failure
- Isolation method is not a predictor for future treatment failure