Evaluation of Regenerative Endodontic Methods for Immature Necrotic Permanent Teeth

Chen, M (MS, DDS), Gibbs, J (DDS), Alhazmi, H (BDS, MS, DMSc), Fida, Z (DMD)

Boston Children's Hospital
Where the world comes for answers

HARVARD MEDICAL SCHOOL TEACHING HOSPITAL

Background/ Significance

•Immature permanent teeth that sustain significant trauma or caries can have significant negative outcomes, including lack of continued tooth development, persistent infection, fracture and ultimately tooth loss with no successor.

•Regenerative Endodontic Procedures (REP) would allow for continued development of the root and vitality of the tooth, as a regenerative response to trauma, caries, or abnormality as opposed to traditional apexification.

•One particularly important step in REP is the formation of a blood clot in the root of the tooth. This blood clot acts as a scaffold for tooth regeneration. The ability to achieve a blood clot can be variable.

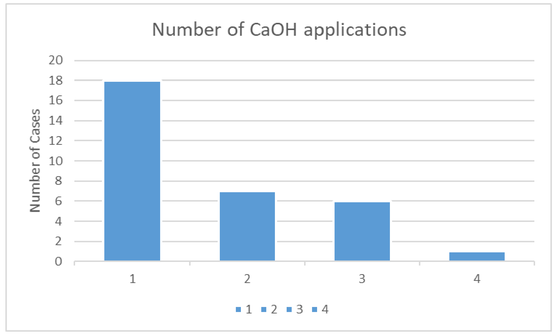

Figure 1. Number of CaOH applications

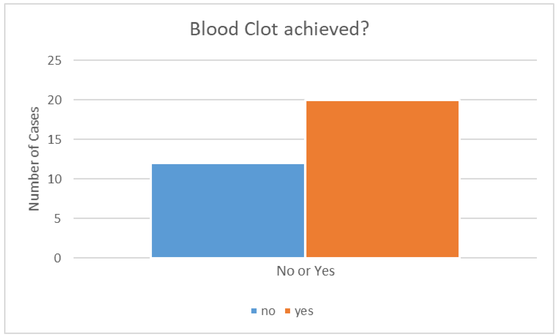

Figure 2. Achieving blood clot

Methods

•A retrospective chart review was conducted for a cohort of patients treated with REP at the Boston Children's Hospital Department of Dentistry from 2019-2023.

•Primary outcome was whether a blood clot could be achieved or not during the REP.

•Secondary outcomes were evaluated to assess if various factors may affect the primary outcome of achieving a blood clot (reason for pulp necrosis, root development stage, pre-op symptoms, presence of swelling or sinus tract, presence of radiographic pathology, concentration of sodium hypochlorite used, number of calcium hydroxide applications, administration of antibiotics)

• Descriptive statistical analysis, chi-square tests for association between the factors listed, and logistic regression model for the association between the number of calcium hydroxide (CaOH) applications and number of visits were completed.

Blood Clot?	1 CaOH application	>1 CaOH application	Total
No	4	8	12
Yes	14	6	20
Total	18	14	32

Pearson $Chi^2 = 4.0974$ Pr = 0.043
Fisher's exact = 0.068

Figure 3. Chi-Square test for association between Number of CaOH applications and Achieving blood clot

Logistic Regression:
N = 32

	Odds Ratio	P>|z|	95% confidence interval	
CaOH 1 application	4.666667	0.049	1.005802	21.65215

Figure 4. Odds of having blood clot with single application of CaOH application

Results

Study Population Results	N=32 (%)
Age	
< 9 years	18 (56.25)
≥ 9 years	14 (43.75)
Teeth	
Anterior	28 (87.50)
Posterior	4 (12.50)
Trauma	
Yes	28 (87.50)
No	4 (12.50)
Moorrees stage of development	
2	3 (9.38)
3	3 (9.38)
4	8 (25.00)
5	14 (43.75)
6	4 (12.50)
Intraoral swelling or abscesses	4 (12.50)
Sinus tract	8 (25.00)
Pain	7 (21.88)
Radiographic pathology	24 (75.00)
Concentration of sodium hypochlorite irrigation	
Full	21 (65.62)
Diluted	11 (34.38)
Local anesthetic	
with epinephrine	31/32 (96.88%)
without epinephrine	1/32 (3.12%)
Oral antibiotics	5/32 (15.62%)
Dental visits	
Two or less visits	18/32 (56.25%)
More than two visits	14/32 (43.75%)

Conclusions

- While there was significance in association between the number of CaOH applications and success achieving a blood clot as well as between the number of visits and success achieving a blood clot, more research still needs to be done to elucidate more information regarding the factors associated with success for regenerative endodontic therapies, with an ultimate goal of developing a standardized protocol for treatment.

MAGNET RECOGNIZED AMERICAN NURSES CREDENTIALING CENTER