UTHealth Houston School of Dentistry

Twenty-Four Month Follow-Up of Pulpal Medicaments in Primary Molars

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ABSTRACT

Purpose: This retrospective study compared (1) efficacy of ferric sulfate (FS), formocresol (FC), and mineral trioxide aggregate (MTA) for vital pulpotomy in primary molars and (2) success of lesion sterilization and tissue repair (LSTR) for non-vital treatment to gold standards for pulpotomy, FC and MTA. ***Methods:*** Chart review of pulpotomies with 6- to 24-month follow-up was conducted at UTHealth School of Dentistry. Sign/symptom resolution and clinic/radiographic failure were collected at initial, 6-, 12-, 18-, and 24-month appointments and analyzed using chi-square and Fisher exact tests ($P<.05$ considered significant). ***Results:*** Evaluation of 680 primary molars included 188 FS-, 43 FC-, 34 MTA-, and 24 LSTR-treated teeth. FS showed worsened radiographic symptoms and more failures than FC and MTA at 12- and 24-month recalls ($P\leq.03$). At 6-months, MTA exhibited increased radiographic failure compared to FC and FS and greater failures than FC and LSTR ($P\leq.04$). LSTR performed better radiographically at 6-months ($P=.01$) and showed no difference in clinical symptom resolution or success compared to FC and MTA at 6-, 12-, and 18-months ($P>.05$). ***Conclusion:*** Study confirms FC and MTA are gold standard for vital pulpotomy, demonstrating symptom resolution and clinical/radiographic success. LSTR, similar in technique to pulpotomy, has comparable success and symptom resolution to FC and MTA.

BACKGROUND

- Dental pulp testing in pediatric patients is challenging and an accurate pulp diagnosis impacts treatment success and further complications.[1-3]
- The American Academy of Pediatric Dentistry (AAPD) recommends MTA or FC for primary teeth vital pulpotomy.[4-6] LSTR, a non-vital pulp therapy utilizes an antibiotic mixture, follows the vital pulpotomy procedure but is used for non-vital primary molars.[6-8]
- AAPD recommends clinical/radiographic follow-up of pulp-treated teeth yearly.[9]

The goal of this study was to evaluate the efficacy of FC, FS, and MTA as pulpal medicaments for vital pulpotomy in primary molars and compare the performance of LSTR for non-vital pulp therapy against the gold standards for pulpotomy (FC and MTA) over 24-months clinically and radiographically.

METHODS

- This study was approved by the UTHealth Houston Institutional Review Board (HSC-DB-22-0693).
- EHR charts of pediatric patients with a completed therapeutic pulpotomy (CDT code D3220) seen at UTHealth Houston School of Dentistry pediatric clinics were identified.
- Patients included in this study had 6- to 24-month follow-up post-treatment with an SSC completed same-day as pulp treatment. Clinical and radiographic signs and symptoms were recorded at initial and recall appointments.
- Clinical and radiographic failure were recorded. Type of tooth loss (i.e., natural exfoliation, extraction due to treatment failure, or extraction for reasons other than pulp failure) was documented, recognizing not all radiographic failures resulted in extraction.
- Vital Pulp Analysis compared FC, FS, and MTA while Non-Vital/Vital Analysis compared FC, MTA and LSTR. Chi-square and Fisher exact tests were used for statistical analysis. P-values <.05 considered significant.

RESULTS

Table 1. Number of Treated-Teeth with Follow Up

	Initial N	6-Months N (%)	12-Months N (%)	18-Months N (%)	24-Months N (%)
FC	434	277 (63.8)	274 (63.1)	236 (54.4)	217 (50)
FS	188	113 (60)	104 (55)	69 (37)	101 (54)
MTA	34	21 (62)	16 (47)	12 (35)	20 (59)
LSTR	24	21 (88)*	12 (50)	5 (21)*	-

A total of 680 primary molars were included in this study.

*LSTR had the most return for follow-up at 6-months ($P=.05$) but the highest lost at 18-months ($P<.001$).

Figure 1. Increased radiographic follow-up at 24-months post- treatment

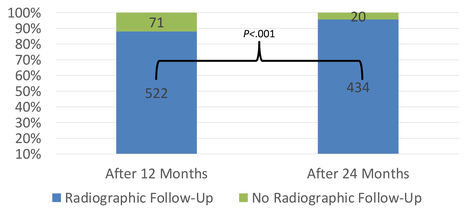


Figure 2. Higher failure rates in mandibular primary molars

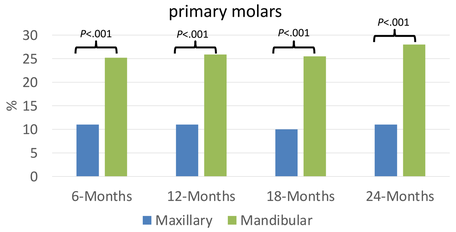
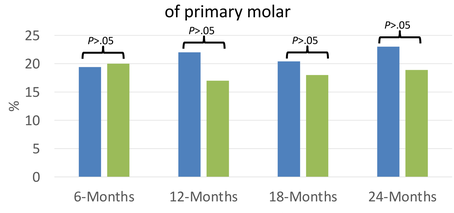
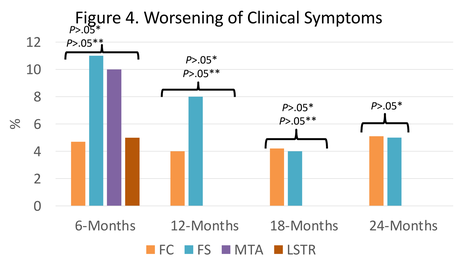


Figure 3. No difference in failures based on type of primary molar



Vital Pulp Analysis* and Non-Vital/Vital Analysis**

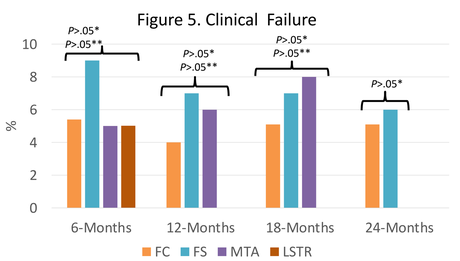
Figure 4. Worsening of Clinical Symptoms



*FS showed increased worsening of clinical symptoms at 6- and 12-months

**MTA at 6-months and FC at 12- and 18-months had greatest worsening of clinical symptoms.

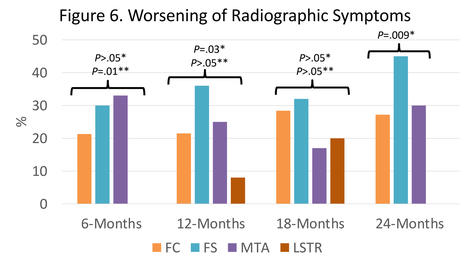
Figure 5. Clinical Failure



*FS experienced greatest clinical failure more often at 6-, 12-, and 24-months.

**FC showed greatest clinical failure at 6-months while MTA had increased clinical failures at 12- and 18-months.

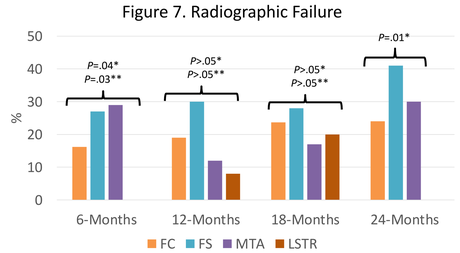
Figure 6. Worsening of Radiographic Symptoms



*FS presented with the greatest worsening of radiographic symptoms at 6-, 12-, 18-, and 24-months.

**LSTR did not have worsening radiographic symptoms at 6-months. No significant differences at 12- and 18-months.

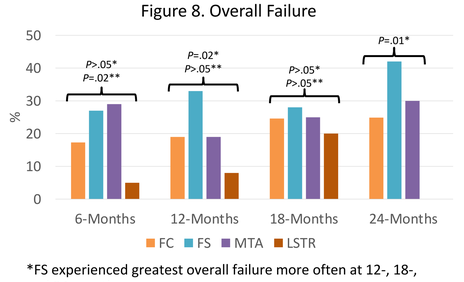
Figure 7. Radiographic Failure



*MTA had the greatest radiographic failure at 6-months and FS more often at 12-, 18-, and 24-months.

**MTA had the greatest radiographic failure at 6-months and FC showed the greatest radiographic failure at 12- and 18-months.

Figure 8. Overall Failure



*FS experienced greatest overall failure more often at 12-, 18-, and 24-months.

**MTA showed increased overall failure at 6-months and no differences among FC, MTA, and LSTR at 12- and 18-months.

Results not displayed in table and figures:

- Most teeth were treated by post-grad/faculty and dental dam isolation (93.2%, 55.4%; $P<.001$).
- FS showed more complete radiographs at 6- ($P<.001$) and 24-months ($P=.001$) and LSTR presented with more complete radiographs at 6- ($P<.001$) and 12-months ($P=.002$) than FC and MTA.
- Insufficient data to analyze differences in type of tooth loss at recall appointments.

DISCUSSION

In this study, there is a trend for FC and MTA to be superior in resolution of symptoms and clinical/radiographic success compared to FS after 24-months and LSTR demonstrates comparable clinical/radiographic success and resolution of symptoms to FC and MTA after 18-months.

- The results of this current study **support the recommendations of the AAPD**[6] regarding treatment recommendations for vital and non-vital primary molars. LSTR shows promise as long-term treatment for non-vital primary molars beyond the current recommended 12-months.

Limitations:

- Retrospective study with varying sample sizes with smaller MTA and LSTR study groups
  - Risk of bias with multiple primary molars treated in the same patient
- LSTR study group was limited to 18-months follow-up due to recent implementation of technique in clinic.

Further research should focus on prospective studies with larger, equally-sized samples, randomized treatment allocation, standardized documentation, and long-term follow-up. Future studies can explore the use of LSTR antibiotic paste for vital primary molars. Additional information on time until tooth loss by exfoliation or extraction can provide insight to longevity of pulpal treatment.

ACKNOWLEDGEMENTS

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REFERENCES