

Comparative Outcomes of LSTR 3-Mix MP Therapy in Treating Chronic and Necrotic Pulp Conditions in Deciduous Molars

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Abstract

Background: LSTR 3-Mix MP therapy is a non-instrumentation endodontic treatment designed for managing pulpally involved deciduous teeth. It offers a minimally invasive alternative to conventional pulpectomy, particularly in cases with anatomical complexities and physiologic root resorption. This study evaluates the clinical and radiological outcomes of LSTR 3-Mix MP therapy in treating chronic and necrotic pulp conditions in deciduous molars.

Methods: This prospective clinical study was performed from November 2023 to October 2024 evaluated 60 deciduous molars in children aged 3–8 years, divided into Group A (vital pulp with chronic pulpitis) and Group B (non-vital pulp with/without periradicular lesions), conducted at Bangladesh Shishu Hospital & Institute and Shah Ali Dental Clinic, Dhaka.

Results: Clinical success was achieved in 96.7% of cases in both groups, with complete resolution of symptoms, including pain, tenderness, swelling, and abscesses. Radiological success in Group A (vital teeth) reached 100%, with no pathological lesions observed. In Group B (non-vital teeth), periradicular radiolucency resolved in 73.3% of cases, decreased in 13.3%, and remained unchanged in 13.3%. Group A exhibited no swelling pre- or post-treatment, while in Group B, swelling resolved entirely by the second follow-up, with significant improvement noted earlier ($p = 0.001$, $p = 0.042$).

Conclusion: LSTR 3-Mix MP therapy is a highly effective, minimally invasive treatment for deciduous molars with chronic and necrotic pulp conditions. It demonstrated excellent clinical and radiological outcomes, supporting its use as a promising alternative to conventional pulpectomy in pediatric patients.

Key words: LSTR 3-Mix MP therapy, non-instrumentation endodontics, deciduous molars, pediatric dentistry, chronic pulpitis, necrotic pulp.

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I. Introduction

Pulpal diseases in deciduous teeth are a significant concern in pediatric dentistry, often necessitating timely and effective treatment to preserve primary dentition until natural exfoliation.¹ Managing these conditions is challenging due to the complex anatomy of deciduous teeth and the need to balance the preservation of oral health with minimizing patient discomfort.² Conventional treatments, such as pulpectomy and apexification, can be invasive, requiring skilled techniques and advanced equipment.^{3,4} In recent years, alternative methods like Lesion Sterilization and Tissue Repair (LSTR) therapy have gained attention for their simplicity and effectiveness.⁵

LSTR 3-Mix MP Therapy is a non-invasive endodontic approach designed to sterilize infected root canals and stimulate tissue repair without traditional instrumentation.⁶ The technique employs a combination of three antibiotics metronidazole, ciprofloxacin, and minocycline formulated into a paste with a carrier such as macrogol or propylene glycol.³ These antibiotics work synergistically to eliminate the polymicrobial flora in infected canals, addressing both aerobic and anaerobic pathogens.⁷ This approach is particularly advantageous in pediatric patients, where compliance with extensive procedures may be limited.⁸

Chronic and necrotic pulp conditions in deciduous molars are common, manifesting as symptoms ranging from spontaneous pain and tenderness to periradicular abscesses and radiolucencies.¹ Traditional endodontic therapies may be effective but are often associated with procedural complexity, higher costs, and a greater risk of failure due to factors such as anatomical variations, operator experience, and patient cooperation.⁵ LSTR therapy offers a minimally invasive alternative that can achieve comparable outcomes in terms of symptom relief, infection control, and radiographic healing.⁹

The success of LSTR therapy has been reported in various studies, but its comparative efficacy in different clinical presentations, such as chronic pulpitis versus necrotic pulp conditions, remains an area requiring further investigation.¹⁰ Chronic pulpitis is characterized by inflammation of the pulp tissue, which retains partial vitality, while necrotic pulp conditions involve complete loss of vitality, often accompanied by periapical pathology.^{11,12} These differences can significantly influence treatment outcomes, making it essential to evaluate the effectiveness of LSTR therapy in both scenarios.^{13,14}

The study aimed to assess the comparative outcomes of LSTR 3-Mix MP Therapy in treating chronic and necrotic pulp conditions in deciduous molars. By evaluating clinical and radiological outcomes, this study seeks to provide evidence-based insights into the therapy’s efficacy, safety, and potential as a standard treatment modality for pediatric endodontic care. The findings are expected to aid clinicians in selecting appropriate treatment strategies for different pulpal conditions and contribute to the growing body of literature supporting minimally invasive approaches in pediatric dentistry.

II. Methodology & Materials

This prospective clinical study was conducted from November 2023 to October 2024 at the Department of Paediatric Dentistry, Bangladesh Shishu Hospital & Institute, and Shah Ali Dental Clinic, Kallyanpur Bus Stand, Dhaka, Bangladesh. Sixty patients aged 3 to 8 years with 60 deciduous molar teeth were selected using a purposive sampling method. The participants were divided into two groups based on diagnosis: Group A (vital pulp with chronic pulpitis) and Group B (non-vital pulp with or without periradicular lesion). Inclusion criteria for Group A included first and second deciduous molars with chronic pulpitis and spontaneous pain, while Group B included necrotic pulp with dull, localized pain, associated swelling or abscess, and periradicular radiolucency on radiographs. Teeth nearing normal exfoliation, those with perforated pulpal floors, extensive root resorption, or deemed non-restorable were excluded. Data were collected using a structured form documenting patient demographics, clinical history, and presenting complaints. Clinical examinations assessed pain using a Visual Analogue Scale (VAS), swelling via fluctuation tests and diameter measurements, and tenderness to percussion. Radiographic evaluations measured periradicular or furcation radiolucencies using standardized techniques. The size of radiolucencies and swelling was classified as mild (1–5 mm), moderate (6–10 mm), or severe (11–15 mm). Written informed consent was secured from parents or guardians in Bangla. Preoperative signs, symptoms, and radiographic findings were documented before initiating treatment. Consistency in radiographic imaging was maintained by using parallel techniques and standardized angulation. Pain and other clinical parameters were assessed and recorded before and after treatment. The study followed all ethical guidelines to ensure patient safety, confidentiality, and the option for alternative treatments in case of adverse effects. A p-value of less than 0.05 was considered statistically significant.

III. Results

Table I: Distribution of Samples by Affected Teeth (n = 60)

Position of the Tooth	Group A (n = 30)	Group B (n = 30)
Mandibular First Deciduous Molar	2 (6.6%)	8 (26.6%)
Mandibular Second Deciduous Molar	26 (86.6%)	18 (60.0%)
Maxillary First Deciduous Molar	2 (6.6%)	0 (0.0%)
Maxillary Second Deciduous Molar	0 (0.0%)	4 (13.3%)
Total	30 (100%)	30 (100%)

Table I summarizes the distribution of affected deciduous molars among the study groups. In Group A (vital pulp with chronic pulpitis), the majority of cases (86.6%) involved the mandibular second deciduous molar, followed by the mandibular and maxillary first deciduous molars (6.6% each). Group B (non-vital pulp) showed a predominance in the mandibular second deciduous molar (60.0%), with 26.6% in the mandibular first molar and

13.3% in the maxillary second molar. Notably, the maxillary first molar was affected only in Group A, while Group B had no cases involving the maxillary first molar.

Table II: Post-Operative Follow-Up of Swelling or Abscess (n = 60)

Swelling	Group A (n = 30)	Group B (n = 30)	p-value*
Pre-operative			
• Absent	30 (100.0%)	8 (26.7%)	0.001 ^s
• Mild	0 (0.0%)	8 (26.7%)	
• Moderate	0 (0.0%)	12 (40.0%)	
• Severe	0 (0.0%)	2 (6.7%)	
1st Follow-Up			
• Absent	30 (100.0%)	20 (66.7%)	0.042 ^s
• Mild	0 (0.0%)	10 (33.3%)	
2nd Follow-Up			
• Absent	30 (100.0%)	30 (100.0%)	Not done
3rd Follow-Up			
• Absent	30 (100.0%)	30 (100.0%)	Not done
Final Follow-Up			
• Absent	30 (100.0%)	30 (100.0%)	Not done

Table II demonstrates the post-operative follow-up outcomes for swelling or abscess in both groups. Pre-operatively, all patients in Group A had no swelling (100%), while Group B exhibited varying degrees of swelling, with 26.7% showing mild swelling, 40.0% moderate, and 6.7% severe (p = 0.001, significant). At the first follow-up, swelling had resolved completely in Group A (100%), whereas in Group B, 66.7% were swelling-free, and 33.3% still had mild swelling (p = 0.042, significant). By the second follow-up and subsequent follow-ups, swelling had completely resolved in both groups, with all patients being free of swelling or abscess.

Table III: Post-Operative Radiological Evaluation of Periradicular Bony Lesion (n = 60)

Periradicular Bony Lesion	Group A (n = 30)	Group B (n = 30)	p-value*
Pre-operative			
• Absent	30 (100.0%)	10 (33.3%)	0.001 ^s
• Mild	0 (0.0%)	6 (20.0%)	
• Moderate	0 (0.0%)	14 (46.7%)	
1st Follow-Up			
• Not Done	30 (100.0%)	30 (100.0%)	Not Done
2nd Follow-Up			
• Not Done	30 (100.0%)	30 (100.0%)	Not Done
3rd Follow-Up			
• Absent	30 (100.0%)	10 (33.3%)	0.001 ^s
• Decrease	0 (0.0%)	12 (40.0%)	
• Static	0 (0.0%)	6 (20.0%)	
• Increase	0 (0.0%)	2 (6.7%)	
Final Follow-Up			
• Absent	30 (100.0%)	22 (73.3%)	0.002 ^s
• Decrease	0 (0.0%)	4 (13.3%)	
• Static	0 (0.0%)	4 (13.3%)	

Table III illustrates the post-operative radiological evaluation of periradicular bony lesions in both groups. Pre-operatively, all patients in Group A had no radiological evidence of periradicular bony lesions (100%), whereas in Group B, only 33.3% had no lesions, 20.0% had mild lesions, and 46.7% had moderate lesions (p = 0.001,

significant). Radiological evaluations were not performed during the first and second follow-ups for either group. By the third follow-up, all cases in Group A remained lesion-free (100%), while in Group B, 33.3% showed complete resolution of lesions, 40.0% demonstrated a decrease in lesion size, 20.0% remained static, and 6.7% experienced an increase in lesion size ($p = 0.001$, significant). At the final follow-up, all patients in Group A continued to be lesion-free (100%), whereas in Group B, 73.3% showed resolution, 13.3% exhibited a reduction in lesion size, and another 13.3% showed no change ($p = 0.002$, significant). These findings highlight consistent healing in Group A and gradual improvement in Group B, with some residual static or worsened cases.

Table IV: Final Outcome of LSTR 3-Mix MP Therapy

Final Outcome	Group A (n = 30)	Group B (n = 30)	p-value*
Clinical Outcome			
• Successful	29 (96.7%)	29 (96.7%)	Not Done
• Failure	0 (0.0%)	0 (0.0%)	
Radiological Outcome			
• Successful	30 (100.0%)	26 (86.7%)	0.483 ^{ns}
• Doubtful	0 (0.0%)	4 (13.3%)	

Table IV summarizes the final outcomes of LSTR 3-Mix MP Therapy based on clinical and radiological evaluations. Clinically, the therapy was 96.7% successful in both Group A and Group B, with no reported failures in either group. Radiologically, all cases in Group A (100%) achieved successful outcomes, whereas in Group B, 86.7% were successful, and 13.3% were classified as doubtful ($p = 0.483$, not significant).

IV. Discussion

The present study assessed the effectiveness of LSTR 3-Mix MP therapy in managing chronic and necrotic pulp conditions in deciduous molars. The primary goal was to evaluate clinical and radiological outcomes following treatment with this innovative, non-instrumentation endodontic approach. The findings highlight the success of LSTR 3-Mix MP therapy in treating both vital (inflamed pulp) and non-vital (necrotic pulp) teeth, as demonstrated by favorable clinical and radiological results.

A total of 60 deciduous molars were treated using LSTR 3-Mix MP therapy. For comparative analysis, the teeth were divided into two groups: Group A (vital teeth) and Group B (non-vital teeth). Both groups underwent the same standardized treatment protocol. Clinical outcomes were assessed at one week, one month, six months, and one year post-treatment, consistently showing excellent therapeutic effectiveness.

Radiological evaluations were performed six months and one year after completing treatment. Clinically, the results were outstanding, with a 96.7% success rate in both groups. All signs and symptoms, such as pain, tenderness to percussion, swelling, or abscess, disappeared over time, and no complications were observed. This high success rate can be attributed to the robust antibacterial efficacy of LSTR 3-Mix MP therapy.

The findings align with previous research. For instance, Takushige et al., reported a 100% clinical and radiological success rate for non-vital primary teeth treated with LSTR 3-Mix MP therapy.¹⁵ Among 87 cases, symptoms resolved in 83 cases after a single application, while the remaining 4 cases required retreatment but were ultimately successful. Similarly, Takushige et al., documented a 95% success rate in 360 cases of pulpitis in vital teeth treated with the therapy, though 3% required retreatment and 2% showed pulp necrosis without clinical symptoms.¹⁶

In the present study, radiological findings for the vital group demonstrated a 100% success rate, with no pathological lesions developing. In the non-vital group, periradicular radiolucency disappeared in 12 cases, decreased in 4 cases, and remained unchanged in 4 cases after one year. Overall, radiolucency resolved in 22 cases (73.3%) and decreased in 4 cases (13.3%), indicating success. The remaining 4 cases (13.3%) were considered doubtful, possibly due to microleakage or the presence of radiolucent areas associated with erupting succedaneous teeth during root resorption.

The results of this study are consistent with previous findings, such as those by Prabhakar et al., who reported an 81.7% radiological success rate with 8.3% failure.¹⁷ The slight variations in success rates across studies may be influenced by factors such as methodology, patient selection, and follow-up duration.

Based on these findings and supporting evidence from prior studies, LSTR 3-Mix MP therapy can be considered an effective alternative to conventional pulpectomy for deciduous molars. Its simplicity, lack of mechanical instrumentation, and ability to minimize the number of dental visits make it particularly suitable for pediatric patients.^{8,12} Although radiological outcomes in non-vital cases were not as consistently successful as in vital cases, the therapy's overall performance underscores its potential as a minimally invasive, highly effective treatment option for chronic and necrotic pulp conditions in deciduous molars.^{5,16}

V. Limitations of the study

The study was conducted on a relatively small sample size, which may limit the generalizability of the findings. The follow-up period while sufficient for short- to medium-term outcomes, may not fully capture long-term success or complications associated with LSTR 3-Mix MP therapy. Radiological evaluation in some cases was challenging due to the presence of physiologic root resorption and overlapping structures, which may have affected the interpretation of radiolucency.

VI. Conclusion

The present study highlights the effectiveness of LSTR 3-Mix MP therapy in treating deciduous molars with chronic and necrotic pulp conditions. This minimally invasive, non-instrumentation method demonstrated excellent clinical outcomes, with symptoms resolving in 96.7% of cases and high success rates observed radiologically. The simplicity of the procedure, coupled with its high antibacterial efficacy, makes it a promising alternative to conventional pulpectomy, especially in pediatric patients. Although radiological success in non-vital cases was not as consistent as in vital cases, the overall findings support LSTR 3-Mix MP therapy as an effective and child-friendly approach for managing endodontically involved deciduous teeth. Further studies with larger cohorts and direct comparisons with traditional methods are warranted to validate its role in pediatric dentistry.

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