International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

CMC Gel for Lesion Sterilization and Tissue Repair Pulpectomy in Primary Tooth - A Case Series

Dr. Savitha Sathyaprasad[1], Dr. Akshata Gangur[2]

[1]MDS, PhD FAIMER, Head of the Department, Department of Pediatric and Preventive Dentistry, KVG Dental College and Hospital, Sullia, Karnataka, India

[2]Post Graduate Student, Department of Pediatric and Preventive Dentistry, KVG Dental College and hospital, Sullia, Karnataka, India

Abstract: ***Dental caries in primary teeth progress rapidly due to thinner enamel and dentin, often resulting in early pulpal and periapical involvement. Premature loss of primary teeth can lead to space loss, altered eruption sequence, and functional disturbances. Conventional pulp therapy in primary teeth is challenging because of complex root canal anatomy, physiological root resorption, and limited child cooperation. Lesion Sterilization and Tissue Repair (LSTR) therapy offers a minimally invasive biological alternative using locally delivered antimicrobial agents. Aim: To assess the clinical effectiveness of Clindamycin gel–based modified triple antibiotic paste (CMC-TAP) as a lesion sterilization and tissue repair technique in pulpally involved primary molars. Methodology: Two pediatric patients aged 5 and 6 years presenting with dentoalveolar abscesses in primary molars were treated using LSTR therapy. Following clinical and radiographic diagnosis, access opening and pulp extirpation were performed. A modified triple antibiotic paste composed of ciprofloxacin and metronidazole powders mixed with Clindamycin gel was placed in the pulp chamber. Coronal sealing was achieved using glass ionomer cement, followed by stainless steel crown placement when indicated. Clinical evaluation was performed at one-month follow-up. Results: Both cases showed complete resolution of pain and swelling with no clinical signs of infection. The treated teeth remained functional and asymptomatic, indicating effective lesion sterilization and tissue repair. Conclusion: Clindamycin gel–based LSTR therapy is a simple, effective, and child-friendly alternative to conventional pulp therapy in primary teeth, providing sustained antimicrobial action, reduced chair time, and preservation of primary teeth as natural space maintainers.***

Keywords: Clindamycin Gel, LSTR, Antibiotic Paste, Pulpectomy, Ciprofloxacin and Metronidazole, Abscess, Pain, Swelling

1. Introduction

Dental caries in primary teeth progress faster due to thinner enamel and dentin reaching to pulp leading to pulpitis. If left untreated lead to premature loss of primary teeth can bring about disturbances like alteration in eruption sequence, space loss, development of deleterious habits, functional and speech impairment. Hence endodontic pulp therapy becomes imperative to restore and preserve primary teeth as the primary teeth play a crucial role as effective natural space maintainers[1]. Pediatric endodontic procedures are difficult and challenging as we encounter anatomic liabilities like tortuous root canals, ramifications and presence of multiple accessory canals, extensive root resorption and ample medullary bone spaces which favors spreading of infection and poor hermetic seal due to the lack of apical closure and psychological factors of child belonging to pre-cooperative age group. Owing to these factors, conventional pulp therapy has not always been successful[1,2]. In such conditions LSTR was proven successful over the conventional pulp therapy and LSTR was proven to favor more retention of primary tooth as a natural space maintainer.

Lesion Sterilization and Tissue Repair (LSTR) therapy, introduced by Hoshino in 1990, offers a new biologic approach to treating deep carious lesions with periapical involvement using a mix of 3 drugs. As per AAPD guidelines (2020), advantages include less technique sensitivity, cost-effectiveness, non-instrumentation technique, and reduced chair time, particularly beneficial for pediatric patients.[3]The paste demonstrates effective biocompatibility and antimicrobial action against various bacteria including Streptococcus aureus, Enterococcus faecalis, Pseudomonas aeruginosa, Bacillus subtilis, and Candida albicans. By combining three different antibiotics together gives better outcome. In this technique, a mixture of 3 antibiotics specifically, metronidazole, ciprofloxacin, and minocycline are used to sterilize infected root dentine. Clindamycin has effectiveness against Streptococci and anaerobes compared to Minocycline. Minocycline also has a disadvantage of tooth discoloration. Hence, in the present study, Minocycline will be replaced by Clindamycin. In addition to this Iodoform will be used to make it radiopaque.[4]

In LSTR procedure chemical sterilisation is the main stay as it is compensating for the biomechanical preparation. So, Clindamycin added to the triple antibiotic paste can be beneficial as it has broad-spectrum antimicrobial activity and it increases the synergistic effect when used with other antibiotics. It is effective in treating acute infections, flare-ups and abscesses. As in these procedures the medicaments are compensating for the bmp it is important to use a medicament that can sterilise the lesion and enhance the natural repair so the consistency and duration of its viscosity to be available is a point to be noted hence in our study we wanted to use the gel form of clindamycin. Reason being the routine intracanal medicaments have a limited time for action and medication in gel form can increase the time of action and reduce the bacterial load and it will also provide an efficient workable mix compared to saline. Study by Dr. Savitha N S et al. showed significant antimicrobial activity of clindamycin gel against E. faecalis that is responsible for most of the endodontic failures and reinfections in primary teeth .[5]Thus, considering the success rate and advantages of these techniques over conventional pulp therapy this case report assess the effectiveness CMC GEL as lesion sterilization and tissue repair pulpectomy in primary tooth.

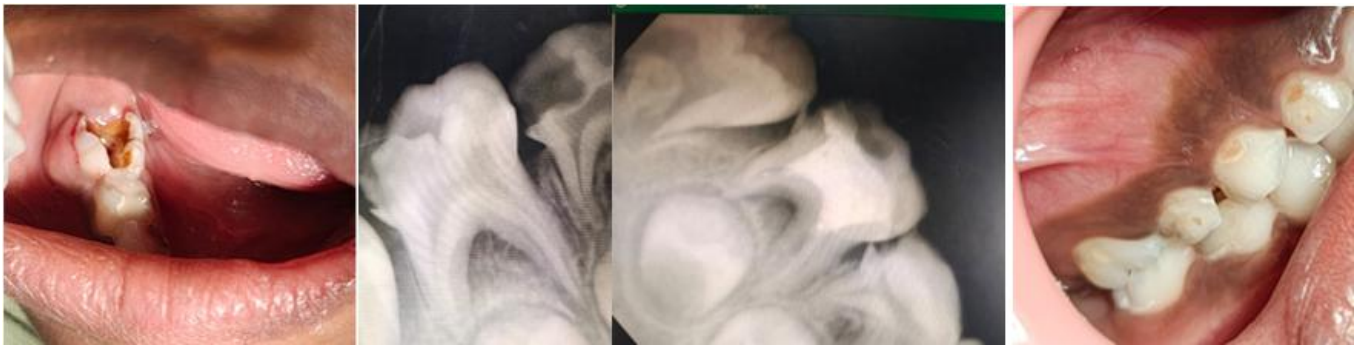
2. Case Description

The clinical procedure of LSTR and final restoration performed on each of the two cases are presented here. After complete dental examination with appropriate radiographs, a clinical diagnosis was made. Informed consent was obtained prior to the treatment after discussion of the risks, benefits, and alternatives with the parents.

Preparation of 3-Mix Paste - The chemotherapeutic agents used, ciprofloxacin, metronidazole were pulverized into powder after the removal of the enteric coating on the drugs and were kept separately in tightly capped containers to prevent exposure to moisture and light. These powdered drugs were then mixed in a ratio of 1:1 with Clindamycin gel to form 3-mix paste.

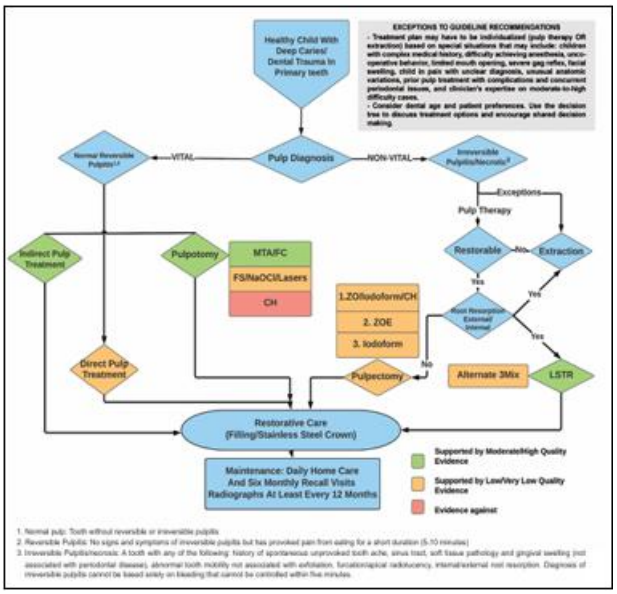
Case 1

A 6-year-old male child reported to the Department of Pedodontics, KVGDCH Sullia with the chief complaint of pain in the lower right back tooth region. The patient was highly, and the parents gave a history of intermittent pain for the past two weeks, with the intensity of pain increasing especially during the nights. On clinical examination, the dentoalveolar abscess was seen in the lower primary molar. The intraoral periapical radiograph showed disto-occlusal radiolucency involving enamel, dentin and pulp without any degenerative changes physiological root resrption seen with both the roots of the second molar. Because of the uncooperative and anxious behavior of the child NIET using the triple antibiotic paste was planned for disinfection of the pulp and periapical lesion. The access opening was done in the primary second molar, and the coronal pulp tissue was extirpated under local anesthesia followed by proper irrigation done. Then the modified CMC -triple antibiotic paste was placed in the pulp chamber over the root canal orifices, and glass ionomer restoration was given as a coronal seal. At one month follow-up, the patient was asymptomatic with the absence of pain.



Case 2

The second case describes A 5-year-old female child reported to the Department of Pedodontics, KVGDCH Sullia with the chief complaint of pain and swelling in the lower left back tooth region from past two days. On clinical examination, the dentoalveolar abscess was seen in left lower back tooth region with proximally carious first primary molar. The periapical radiograph showed resorption of roots in the first molar and periradicular radiolucency with resorption of the distal root. Lesion sterilization therapy using CMC GEL followed by stainless steel crown was planned. After the treatment, follow-ups were done. At 1 month follow up, the patient was asymptomatic with the absence and pain.



3. Discussion

LSTR Therapy or noninstrumental endodontic treatment, is a new biological approach for the treatment of pulpally involved primary teeth which aims to place antibiotics locally into the root canals which offers an advantage over systemic administration as adverse effects are prevented and presence of substantially higher concentrations in the root-canal system.3Mix can easily distribute through the ramifications of the tooth and induce a sterile zone, promoting tissue repair.

The present study examined success rate of LSTR using CMC -TAP in pulpally involved primary molars. LSTR is easier and quicker to perform, and has been suggested as a potential alternative to replace pulpectomy as it does not require multiple visits to be completed, even for teeth with periapical lesions. Various studies have been conducted over the years using different techniques and medicaments to find out clinical and radiographic success of LSTR technique in deeply carious primary molars with signs and symptoms of pulpal involvement. Prabhakar et al. (2008) in a study evaluated that the success rate of LSTR was 83% in teeth, in which radicular pulp was removed when compared to the teeth without radicular pulp removal (37%). Hence, in the present study, LSTR with removal of radicular pulp was performed in teeth with signs of irreversible pulpitis or non-vital teeth with/without furcation radiolucency. Several studies have confirmed the efficacy of TAP in LSTR. However, the addition of minocycline causes certain complications such as primary tooth discoloration and discoloration of underlying permanent successor (Rafatjou et al. 2018), demineralisation of radicular dentin and weakening of root structure. In a recent in vitro study conducted by Karczewski et al. (2018) to assess cytotoxicity, antimicrobial efficacy and dentin discoloration of CMC-TAP, it was concluded that clindamycin could serve as a viable alternative to minocycline in TAP. In modification of vehicle, Takushige et al. compared the macrogol-propylene glycol combination with a sealer used as a vehicle, finding that propylene glycol alone showed superior dentin penetration than the sealer. Pinky et al. and Nanda et al. simplified the vehicle to only propylene glycol in their studies, focusing on its effective delivery properties. Meanwhile, Dutta et al. tested distilled water versus 2% chlorhexidine gluconate as vehicles, observing that the antibiotic powder mixed with chlorhexidine gluconate achieved maximum bacterial inhibition, likely due to chlorhexidine's known antimicrobial properties enhancing the overall antibacterial effect. In the present case report, Clindamycin gel is used in triple antibiotic paste (TAP) for primary tooth root canal treatment contributes to longer setting time and prolonged retention in the canal, which is beneficial for sustained antibacterial action. This extended presence ensures effective disinfection not only in the main canal but also enables penetration into accessory canals, improving sterilization of complex canal anatomy in primary teeth.

Advantages of clindamycin gel in TAP within the lesion sterilization and tissue repair (LSTR) concept include its broad-spectrum antibacterial activity, effectiveness against resistant microbes, and comparable antibiofilm efficacy to conventional TAP. Clindamycin aids in thorough elimination of polymicrobial infections in necrotic pulp and periapical lesions, providing a sterile environment conducive to tissue healing and repair. The gel form helps maintain the paste in place longer, allowing deeper diffusion and sustained antimicrobial effect without frequent redressing. This results in quicker symptom resolution, reduced recurrence of infection, and promotes regeneration of periapical tissues around the primary tooth. Study by Dr. Savitha N S et al. showed significant antimicrobial activity of clindamycin gel against E. faecalis that is responsible for most of the endodontic failures and reinfections in primary teeth.

Given the positive results of the two completed cases, further controlled clinical trials are warranted with long-term follow-up to assess the exfoliation of the treated teeth and to determine the implications, if any, to the succedaneous teeth. Additionally, for LSTR to become a reliable treatment option, the selection criteria and protocol need to be continually re defined and updated to yield the best predictable outcomes. Clinical cases of LSTR therapy show promising results for the future of pediatric dentistry. LSTR therapy is particularly favotable for young patients because it can potentially avoid extraction and is relatively non traumatic to the partent. In addition, the restored tooth is more stable in the dental arch as a space maintainer. With continued research and consistent favorable results. LSTR certainly has the potential to be a revolutionary therapy for the treatment of abscessed primary molars.

4. Conclusion

Dental caries in primary teeth progress rapidly, often leading to pulp involvement and premature tooth loss. Conventional pulp therapy faces limitations due to anatomical and behavioural challenges in children. LSTR using Clindamycin gel provides effective chemical sterilization and promotes tissue repair. It offers broad antimicrobial activity, reduced chair time, and improved patient comfort. Hence, CMC gel-based LSTR proves to be an effective alternative for preserving primary teeth.

References

[1] Savitha, Sathyaprasad & Meghana, Devalaraju. (2023). Clindamycin gel as novel intracanal medicament against Enterococcus faecalis in Primary Teeth. 5. 6-

[2] Sain S, J R, S A, George S, S Issac J, A John S. Lesion Sterilization and Tissue Repair Current Concepts and Practices. International Journal of Clinical Pediatric Dentistry [Internet]. 2018;11(5):446–50. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6379530/

[3] Shetty, Amarshree A.; Geethanjali, G.; Hegde, Amitha M. Lesion sterilization and tissue repair in primary teeth. SRM Journal of Research in Dental Sciences 11(2): p 99-105, Apr–Jun 2020. | DOI: 10.4103/srmjrds.srmjrds_87_19

[4] Burrus D, Barbeau L, Hodgson B. Treatment of abscessed primary molars utilizing lesion sterilization and tissue repair: literature review and report of three cases. Pediatr Dent. 2014 May-Jun;36(3):240-4. PMID: 24960392.

[5] Triveni MN, Dhaval P, Rachappa MM (2019) Lesion Sterilization and Tissue Repair (LSTR) Technique and its Clinical Application in Primary and Permanent Teeth: A Review. Ann Essence Dent 11:4.

[6] Thakur S, Deep A, Singhal P, Chauhan D. A randomized control trial comparing the efficacy of 3Mixtatin and Modified 3Mix-MP paste using lesion sterilization and tissue repair technique to conventional root canal treatment in primary molars of children aged 4-8 years: An in vivo study. Dent Res J (Isfahan). 2021 Nov 22; 18: 93. doi: 10.4103/1735-3327.330874. PMID: 35003558; PMCID: PMC8672123.

[7] Burrus D, Barbeau L, Hodgson B. Treatment of abscessed primary molars utilizing lesion sterilization and tissue repair: literature review and report of three cases. Pediatr Dent. 2014 May-Jun;36(3):240-4. PMID: 24960392.

[8] Grewal N, Sharma N, Chawla S. Comparison of resorption rate of primary teeth treated with alternative lesion sterilization and tissue repair and conventional endodontic treatment: An in vivo randomized clinical trial. J Indian Soc Pedod Prev Dent. 2018 Jul-Sep;36(3):262-267. doi: 10.4103/JISPPD.JISPPD_140_17. PMID: 30246747.

[9] Lokade A, Thakur S, Singhal P, Chauhan D, Jayam C. Comparative evaluation of clinical and radiographic success of three different lesion sterilization and tissue repair techniques as treatment options in primary molars requiring pulpectomy: An in vivo study. J Indian Soc Pedod Prev Dent 2019; 37: 185-9

[10] Kharadly, D. Y. E., Tawil, S. B. E., Nasr, R. A., & Beshlawy, D. M. E. (2022). Triple antibiotic paste and simvastatin in the treatment of non-vital primary molars with inflammatory root resorption: A randomized control trial. International Journal of Health Sciences, 6(S6), 3715–3728. https://doi.org/10.53730/ijhs.v6nS6.10439

[11] Chak RK, Singh RK, Mutyala J, Killi NK. Clinical Radiographic Evaluation of 3Mixtatin and MTA in Primary Teeth Pulpotomies: A Randomized Controlled. Int J Clin Pediatr Dent. 2022;15(Suppl 1): S80-S86. doi: 10.5005/jp-journals-10005-2216. PMID: 35645497; PMCID: PMC9108818.

[12] Rai R, Shashibhushan KK, Babaji P, Chandrappa PM, Reddy VR, Ambareen Z. Clinical and Radiographic Evaluation of 3Mix and Vitapex as Pulpectomy Medicament in Primary Molars: An In Vivo Study. Int J Clin