STM JOURNALS

Research & Reviews: A Journal of
Dentistry

https://journals.stmjournals.com/rrjod/

ISSN: 2230-8008 (Online)
ISSN: 2348-9561 (Print)
Volume 16, Issue 3, 2025
September–December
DOI (Journal): 10.37591/RRJoD

Review RRJoD

Comparative Evaluation of the Use of LSTR with Double Antibiotic Paste Versus Zinc Oxide Eugenol as Obturating Material in Primary Teeth Pulpectomy

Monika Allaudin Khoja[1,*], Shantanu Choudhari[2]

Abstract

The management of infected primary teeth is a vital aspect of pediatric dentistry, with the primary objective being the retention of the teeth in the oral cavity until its natural exfoliation. Preserving the health, structure, and appearance of primary teeth is essential for ensuring the correct eruption and alignment of permanent teeth. Pulpectomy has traditionally been the preferred treatment for primary teeth with irreversible pulp damage. Traditionally, Zinc Oxide Eugenol (ZOE) has been the most widely used obturating material due to its antimicrobial effects and satisfactory sealing ability. Despite these benefits, limitations, such as slow resorption, potential irritation to periapical tissues, and incomplete adaptability to root canal morphology, have been reported. In recent years, biologically oriented alternatives, like the Lesion Sterilization and Tissue Repair (LSTR) approach, have gained prominence. LSTR relies on root canal disinfection rather than complete mechanical instrumentation, commonly employing antibiotic combinations such as Double Antibiotic Paste (DAP). DAP has demonstrated promising results in eradicating resistant microbial flora and promoting healing of periapical tissues. This article aims to critically evaluate and compare the effectiveness, clinical outcomes, and advantages of DAP used in LSTR with conventional ZOE obturation in pulpectomy procedures, highlighting their potential roles in contemporary pediatric endodontics.

Keywords: Pulpectomy, primary teeth, LSTR, ZOE, obturating material, double antibiotic paste

INTRODUCTION

The management and preservation of primary teeth diagnosed with irreversible pulpitis or pulpal necrosis continues to be one of the foremost challenges in pediatric endodontics. These teeth, although temporary, play a vital role in maintaining oral function, providing esthetic support, and serving as natural space maintainers that guide the eruption of permanent successors. Premature loss of primary teeth due to pulpal pathology may result in functional disturbances, malocclusion, and adverse effects on the overall development of the child's dentition. Hence, ensuring their retention until the normal exfoliation period remains a central goal of paediatric dental care.

Traditionally, pulpectomy has been considered the treatment of choice in such cases. The procedure involves complete

***Author for Correspondence**
Monika Allaudin Khoja
E-mail: monikakhoja@gmail.com

[1]Dentist, Department of Pediatric and Preventive Dentistry, Gujarat University, Ahmadabad, Gujarat, India
[2]Professor and HOD, Department of Pediatric and Preventive Dentistry, Gujarat University, Ahmadabad, Gujarat, India

Received Date: August 20, 2025
Accepted Date: August 25, 2025
Published Date: September 27, 2025

Citation: Monika Allaudin Khoja, Shantanu Choudhari. Comparative Evaluation of the Use of LSTR with Double Antibiotic Paste Versus Zinc Oxide Eugenol as Obturating Material in Primary Teeth Pulpectomy. Research & Reviews: A Journal of Dentistry. 2025; 16(3): 1–5p.

removal of necrotic or irreversibly inflamed pulp tissue, followed by thorough cleaning, shaping, and obturation of the canals. Zinc Oxide Eugenol (ZOE) has historically been the most widely used obturating material in primary teeth because of its antibacterial properties, ease of handling, and favourable sealing ability. However, despite its popularity, ZOE is not without shortcomings. Clinical studies have highlighted its tendency for slow or incomplete resorption when compared with the natural resorption of primary roots. This discrepancy can occasionally interfere with the eruption of permanent teeth. In addition, ZOE has been associated with irritation of the surrounding periapical tissues, which may hinder optimal healing and long-term success of the treatment [1].

To overcome these drawbacks, research has increasingly focused on biologically based and minimally invasive alternatives. Among these, the Lesion Sterilization and Tissue Repair (LSTR) technique has received significant attention. Originally developed by Hoshino and colleagues [2], LSTR prioritizes effective microbial control rather than extensive mechanical instrumentation, aiming to disinfect infected canals with the use of potent intracanal antibiotic combinations. The initial formulation employed Triple Antibiotic Paste (TAP), which combined metronidazole, ciprofloxacin, and minocycline. Although TAP demonstrated excellent antimicrobial effectiveness, the inclusion of minocycline raised concerns due to its tendency to cause tooth discoloration, an undesirable outcome particularly in the aesthetic zone of paediatric patients. Consequently, attention has shifted to the use of Double Antibiotic Paste (DAP), generally consisting of ciprofloxacin and metronidazole, which provides comparable antimicrobial action while reducing the risk of discoloration [3, 4].

ZINC OXIDE EUGENOL (ZOE) AS OBTURATING MATERIAL

- Zinc Oxide Eugenol (ZOE) has been the most frequently employed obturating material in pulpectomy procedures for primary teeth, largely due to its antimicrobial properties, simple manipulation, and adequate radiopacity, which assists in postoperative assessment. Clinicians have long favored ZOE because of its ability to provide a satisfactory seal against microbial leakage, thereby supporting tooth retention until exfoliation. Several studies have reported high clinical and radiographic success rates, with outcomes ranging between 80% and 90% in treated cases [5].
- Despite its advantages, ZOE is not without shortcomings. One of the major concerns lies in its resorption pattern, which is considerably slower than the physiological root resorption of primary teeth. This discrepancy may result in remnants of the material interfering with the eruption pathway of permanent successors [6, 7]. Additionally, extrusion of ZOE beyond the root apex can induce periapical irritation, leading to inflammation or foreign body reactions [8]. Clinical reports have also associated ZOE obturation with an increased risk of internal root resorption and persistent periapical pathology in some cases [9].
- Consequently, while ZOE continues to be considered reliable in pediatric endodontics, its biological limitations highlight the need to explore alternative obturating agents that provide more favorable tissue compatibility and resorption characteristics.

LESION STERILIZATION AND TISSUE REPAIR (LSTR) AND DOUBLE ANTIBIOTIC PASTE

- The Lesion Sterilization and Tissue Repair (LSTR) technique emphasizes the disinfection of infected root canals with antimicrobial agents rather than relying on extensive mechanical instrumentation. In this approach, Double Antibiotic Paste (DAP) has gained attention as a modification of the original Triple Antibiotic Paste (TAP). Minocycline, a component of TAP, has been excluded in DAP formulations to eliminate the risk of crown discoloration, while still

preserving broad-spectrum antimicrobial activity [10]. The paste, typically containing ciprofloxacin and metronidazole, is introduced into the canals after minimal instrumentation. This combination has been shown to act effectively against polymicrobial biofilms that commonly colonize infected canals, including anaerobes, Gram-negative bacteria, and facultative species [11].

- Evidence from both vivo and in vitro studies highlights the ability of DAP to significantly reduce bacterial load and support the repair of periapical tissues [12, 13]. Furthermore, clinical investigations suggest that DAP-based LSTR therapy provides favorable results in cases where conventional obturation materials are less predictable. A randomized controlled trial conducted by Prabhakar et al. reported that DAP demonstrated success rates that were comparable or, in certain cases, superior to traditional materials like Zinc Oxide Eugenol [14]. These findings support DAP as a promising alternative for pulpectomy procedures in primary teeth.

COMPARATIVE OUTCOMES: DAP VS ZOE

Clinical Success Rates

Several clinical studies have compared the performance of Double Antibiotic Paste (DAP) used in the LSTR technique with Zinc Oxide Eugenol (ZOE) in pulpectomy procedures. Evidence indicates that DAP achieves clinical and radiographic success rates equal to or higher than ZOE, especially in teeth with extensive periapical involvement or challenging canal morphology [15–17].

Pain and Postoperative Complications

Another advantage reported with LSTR therapy is reduced postoperative discomfort. Teeth treated with DAP frequently show less pain, swelling, and inflammation than those obturated with ZOE, contributing to better acceptance among pediatric patients and their caregivers [18].

Resorption and Biocompatibility

DAP also offers biological benefits over ZOE in terms of compatibility with natural resorption. Unlike ZOE, which may persist and obstruct the eruption path of permanent successors, DAP does not hinder root resorption or exfoliation [19]. Histological findings further reveal that antibiotic pastes not only suppress infection but also create a favorable environment for tissue repair, with decreased inflammatory response and enhanced healing of periapical structures [20].

Overall, DAP presents a biologically sound and clinically effective alternative to ZOE, particularly in cases where preservation of natural resorption and minimal complications are desired.

LIMITATIONS AND CHALLENGES

While DAP shows promise, there are concerns regarding antibiotic resistance, allergic reactions, and the need for strict protocol adherence [21–23]. Additionally, LSTR may be less effective in non-restorable teeth or in extensive root destruction [24] long term studies are required. Conversely, ZOE's well-documented success and long-standing clinical familiarity continue to support its use, particularly where instrumentation is feasible.

CONCLUSIONS

The use of Double Antibiotic Paste (DAP) in conjunction with the Lesion Sterilization and Tissue Repair (LSTR) technique represents a promising alternative to the conventional pulpectomy with Zinc Oxide Eugenol (ZOE) obturation, particularly in cases of non-vital or severely infected primary teeth where complex root canal morphology makes thorough mechanical instrumentation

difficult. Both treatment modalities have demonstrated effectiveness; however, DAP-based LSTR offers several clinical advantages. Being less invasive, it minimizes the need for extensive instrumentation, thereby reducing chairside time and improving cooperation among pediatric patients. This makes it especially beneficial for young children who may struggle with lengthy or complicated dental procedures. An additional advantage of this approach is the decreased reliance on systemic antibiotics, as the localized delivery of antimicrobial agents within the canal system ensures effective disinfection. This not only improves treatment outcomes but also reduces the risks associated with unnecessary systemic antibiotic use. Furthermore, DAP-based LSTR provides an alternative for children who may exhibit hypersensitivity or allergic reactions to ZOE. By avoiding ZOE-related complications, LSTR contributes to improved patient comfort and potentially better healing of periapical tissues. Despite these promising benefits, the long-term effects of DAP on root resorption patterns and its influence on the development and eruption of permanent successors require further validation. Large-scale clinical trials and standardized protocols are essential to establish consistent guidelines and confirm the safety and efficacy of this technique before it can be widely adopted as a routine practice in pediatric endodontics.

REFERENCES

1. Mortazavi M, Mesbahi M. Comparison of ZOE and iodoform-based paste in primary molar pulpectomy. J Dent Child. 2004;71(1):8–12.
2. Hoshino E, Kurihara-Ando N, Sato I, Uematsu H, Sato M, Kota K, et al. In-vitro antibacterial susceptibility of bacteria taken from infected root dentine to a mixture of ciprofloxacin, metronidazole and minocycline. Int Endod J. 1996;29(2):125–30.
3. Windley W, Teixeira F, Levin L, Sigurdsson A, Trope M. Disinfection of immature teeth with a triple antibiotic paste. J Endod. 2005;31(6):439–43.
4. Ruparel NB, Teixeira FB, Ferraz CC, Diogenes A. Direct effect of antibiotics on dental pulp stem cells. J Endod. 2012;38(4):532–6.
5. Ramar K, Mungara J. Clinical and radiographic evaluation of ZOE and Metapex in pulpectomy. J Indian Soc Pedod Prev Dent. 2010;28(1):6–10.
6. Subramaniam P, Konde S, Mathew S. Evaluation of obturating materials in primary teeth. J Clin Pediatr Dent. 2005;29(3):233–8.
7. Shabzendedar M, Farhadi A, Alipour M. Antimicrobial effects of various obturating materials. J Dent (Tehran). 2014;11(2):146–52.
8. Mani SA, Chawla HS, Tewari A. Evaluation of different root canal filling materials. ASDC J Dent Child. 2000;67(3):142–7.
9. Nagarathna J, Shashibhushan KK, Poornima P. Radiographic success of different obturating materials. Eur Arch Paediatr Dent. 2015;16(6):491–6.
10. Takushige T, Cruz E, Asgor Moral A, Hoshino E. Endodontic treatment of primary teeth using LSTR. Int Endod J. 2004;37(2):132–8.
11. Sato I, Ando-Kurihara N, Kota K, Iwaku M, Hoshino E. Sterilization of infected root-canal dentine. Int Endod J. 1996;29(2):118–24.
12. Dioguardi M, Di Gioia G, Illuzzi G, Laneve E, Cocco A, Troiano G. Endodontic clinical and radiographic outcomes of LSTR: A systematic review. Clin Oral Investig. 2021;25(3):1121–32.
13. Duggal R, Yogesh BG, Shah N. Antimicrobial effect of triple antibiotic paste. Indian J Dent Res. 2010;21(3):384–7.
14. Prabhakar AR, Sridevi E, Raju OS. Clinical efficacy of LSTR in infected primary teeth. J Clin Pediatr Dent. 2008;32(2):127–32.
15. Pinky C, Shashibhushan KK, Subbareddy VV. Comparison of clinical and radiographic success of LSTR and ZOE. Int J Clin Pediatr Dent. 2011;4(2):95–100.

16. Kaur M, Kaur M, Yadav S, Kumar R. Clinical evaluation of LSTR vs ZOE pulpectomy. J Clin Diagn Res. 2017;11(9):ZC17–20.
17. Jain A, Yeluri R, Munshi AK. Efficacy of triple antibiotic paste and DAP. Eur Arch Paediatr Dent. 2014;15(5):309–14.
18. Madan M, Jain S, Dhingra R. Postoperative pain in primary molars treated with LSTR. J Dent Child. 2016;83(2):71–6.
19. Farhad AR, Aminzadeh N, Bidar M. Effect of LSTR on root resorption. J Dent (Tehran). 2012;9(1):41–6.
20. Senia ES, Alling CC, Peterson LJ. Histological study of periapical healing. J Endod. 1995;21(4):204–8.
21. Kim SG, Zheng Q, Zhou J, Chen M, Embree M, Edwards PC, et al. Dentine regeneration by dental pulp stem cells. J Dent Res. 2012;91(12):1130–5.
22. Saber SE, El-Hady SA, El Meligy OA. Antibacterial efficacy of antibiotic pastes. J Endod. 2015;41(6):1080–4.
23. Sato T, Hoshino E. Antibiotic resistance in LSTR therapy. J Endod. 2003;29(4):205–10.
24. Nanda RS, Nanda P. Clinical evaluation of LSTR vs traditional pulpectomy. Int J Paediatr Dent. 2018;28(1):10–6.

