

**Lesion Sterilization And Tissue Repair Therapy (Lstr) of Necrotic Immature Permanent Teeth : An Overview**

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**Abstract**

Root canal infections are polymicrobial in nature, consisting of both aerobic and anaerobic species. The successful treatment of endodontic infections involves effective eradication of the causative microorganisms during root canal treatment procedures. Lesion sterilization and tissue repair (LSTR) therapy is an endodontic treatment procedure that involves non-instrumentation or minimal instrumentation followed by placement of antibiotic mixture to disinfect root canal systems. It is evolving as an alternate treatment procedure in comparison to traditional pulpectomies/root canal treatment and extractions for treatment of nonvital or pulpless teeth. This article reviews the rationale of the technique, evolution, indications, uses and clinical procedures required in performing the technique.

**Keywords:** Lesion Sterilization and Tissue Repair, Triple-Antibiotic Paste, 3-Mix Paste, Regenerative Endodontics, Non-Instrumentation Endodontics, Revascularization.

**Introduction**

The most challenging aspect of endodontic procedures in both primary and permanent tooth is the management of teeth with infected root canal or any other periapical pathologies. The main reason of endodontic treatment is the reduction of the microbes and other noxious substances in the root canal system.<sup>1</sup> Infected root canal is mainly composed of microbial flora of both aerobic and anaerobic organisms, but anaerobic bacteria is predominant, which was removed either by mechanical means (dentin removal) or by chemical means (irrigation).<sup>2</sup>

Lesion sterilization and tissue repair (LSTR) is technique that employs a mixture of antibacterial drugs in a propylene glycol vehicle for the purpose of disinfection of dentinal, pulpal and peri- radicular lesions.<sup>3</sup> LSTR concept was developed at the cariology research unit, school of dentistry, nigatta university, japan, 2004. In recent days, an alternative conservative treatment to the traditional apexification procedures with calcium hydroxide is the concept of revascularization of the necrotic pulps. In Endodontic Regenerative Procedure, conventional treatment using either minimal or no instrumentation is done. This treatment protocol involves the use of Triple antibiotic paste, followed by placement of intracanal medicament and later inducing bleeding from the periapical region. The bleeding would lead a matrix for movement and growth of new vital tissues in root canal spaces.<sup>4</sup> The triple antibiotic pastes generally used includes, metronidazole, minocycline and ciprofloxacin. The therapy aims in lesion promoting tissue repair and regeneration by host's natural healing processes to eliminate the causative bacteria from the lesion and thus sterilizing the lesion.<sup>5</sup> Thus, recommended protocol combines the use of metronidazole, minocycline and ciprofloxacin.

#### **LSTR- Indications<sup>6</sup>**

- a) pulpectomy
- b) Primary tooth associated with pain and tenderness to percussion
- c) Presence of mobility,
- d) Presence of abscess,
- e) Presence of sinus tract,
- f) Presence of radiolucency in furcation areas
- g) Restorable crowns
- h) Immature permanent tooth with incomplete root formation.

#### **Contraindications<sup>7</sup>**

- a) In case of patients who are sensitive and allergic to any of the antibiotic companies
- b) Excessive bone loss in furcation areas involving the underlying tooth germ

#### **Triple Antibiotic Paste<sup>8</sup>**

The antibiotics used in triple antibiotic paste includes ciprofloxacin, minocyclin and metronidazole in the ratio of 1:1:1. The triple antibiotic paste is formed by mixing the three antibiotic powder with macrogol or propylene glycol which ensures the complete eradication of all types of microbial flora in the root canal orifice.

The commercially available triple antibiotic paste is 3-MIX MP usually supplied as a two-part system wherein the dry powder component contains metronidazole, ciprofloxacin, minocycline and iodoform. The liquid component contains polyethylene glycol and macrogol. The components are mixed prior to use.

Since, it is radiolucent in nature, to ensure a proper radiographic confirmation of the proper paste placement, Iodoform was added to the triple antibiotic paste to make it radio opaque.<sup>10</sup>

Ciprofloxacin is a synthetic fluoroquinone possessing bactericidal mode of action. Metronidazole is a nitroimidazole compound exhibiting a broad spectrum activity against protozoa and anaerobic bacteria. Minocycline is a semisynthetic derivative of tetracycline possessing a mode of action similar to metronidazole.<sup>11</sup>

#### **Method Of Preparation<sup>12</sup>**

A Clean mortar and pestle are taken, each tablet is placed to made a ground fine powder after the removal of the enteric coating. Polyethylene glycol is then added to make a smooth paste.

### Dosage<sup>13</sup>

Ciprofloxacin; metronidazole; minocycline (In a ratio of 1:1:1) along with small quantities of iodoform in the powder and propylene glycol or macrogol or along with normal saline as a carrier Ciprofloxacin (200mg), Metronidazole (500mg), Minocycline(100 mg), Propylene glycol/ macrogol, Normal saline as carrier.

### Disadvantages of Polyantibiotic Pastes

A disadvantage of this mixture is tooth discoloration to a bluish-grey hue. The discoloration brought about by tetracycline family is believed to be due to photo-induced reaction. Minocycline binds to calcium-ions through chelation reaction; forming an insoluble complex.<sup>14</sup> Other alternative is to substitute cefaclor instead of minocycline.<sup>15</sup> A modification of the current clinical protocol (Sato et al. 1996, Banchs & Trope 2004) has been promulgated to avoid crown discolouration.<sup>16</sup> This innovative method covers the dentinal tubules of the root dentin, thus preventing any interaction between tri-antibiotic paste and root dentin walls. The coronal walls of access preparation are etched for 20s with 35% phosphoric acid. Bonding agent is applied and cured for 20s.<sup>17</sup>

### Combinations of Tap:=<sup>18</sup>

Several combination of medicaments are tried over years. Some of the well-known combinations are:

- Metronidazole and ciprofloxacin plus minocycline (3-mix paste/ Triple Antibiotic paste).
- Metronidazole and ciprofloxacin plus amoxicillin.
- Metronidazole and ciprofloxacin plus cefaclor
- Metronidazole and ciprofloxacin plus cefroxadine
- Metronidazole and ciprofloxacin plus fosfomycin
- Metronidazole and ciprofloxacin plus rokitamycin
- Penicillin, bacitracin, or chloramphenicol and streptomyci

- Ledermix paste (triamcinolone-a corticosteroid and demeclocycline-a tetracycline antibiotic).
- Neomycin, polymyxin, and nystatin.
- Calcium hydroxide pastes.
- Chlorhexidine paste.

### Method Of Dispensing<sup>19</sup>

The triple antibiotic paste is placed in the canal with the help of a lentulospiral placing 1-2mm short of the working length.

### Endodontic Regenerative Procedure (ERP):

ERP, as discussed includes conventional instrumentation either minimal or no instrumentation followed by placement of intracanal medication and later bleeding is induced from periapical region. The bleeding fromperiapex would lead a matrix for movement & growth of new vital tissue in root canal spaces.<sup>4</sup>

### No Need For Surgical Intervention For Periradicular Pathosis Of Permanent Tooth With Mature Apices:

Traditionally few endodontic failure cases were treated using surgical techniques (surgical endodontics). Surgical endodontics has following Damage to surrounding anatomic structures, especially the neurovascular tissue, Need for surgery. But with the invent of triple antibiotic pastes, the need for surgical endodontics is reduced.<sup>20</sup>

### Conclusion

The Lesion sterilization and tissue repair therapy is simple, painless, time-saving, and with less of a burden to patient physically and mentally. Thus, patient compliance and cooperation of patients is predicable, which is of great concern. This procedure will disinfect the severely infected deciduous teeth and allow it to function as a natural space maintainer until the eruption of its permanent successor. This new concept should be considered especially in cases where prognosis is poor

with the conventional pulpectomy procedure in primary teeth with furcation involvement and severe bone loss.

## References

1. Vijayaraghavan R, Mathian VM, Sundaram AM, et al. Triple antibiotic paste in root canal therapy. *J Pharm Bioallied Sci.* 2012;4:S230-3.
2. Sato I, Ando-Kurihara N, Kota K, et al. Sterilization of infected root-canal dentine by topical application of a mixture of ciprofloxacin, metronidazole and minocycline in situ. *Int Endod J.* 1996;29(2):118-24.
3. Windley W, Texeira F, Trope M. Disinfection of immature teeth with a triple antibiotic paste. *J Endo* 2005;31(6):439-43.
4. Bystrom A, Sundqvist G. Bacteriologic evaluation of the efficacy of mechanical root canal instrumentation in endodontic therapy. *Scand J Dent Res* 1981;89:321-8.
5. Fabricius L, Dahlen G, Ohman AE, et al. Predominant indigenous oral bacteria isolated from infected root canals after varied times of closure. *Scand J Dent Res* 1982;90:134-44.
6. Haapasalo M, Orstavik D. In vitro infection and disinfection of dentinal tubules. *J Dent Res.* 1987;66(8):1375-9.
7. Fouad AF. The microbial challenge to pulp regeneration. *Adv Dent Res* 2011;23:285-9.
8. Gomes-Filho JE, Duarte PC, de Oliveira CB, et al. Tissue reaction to a triantibiotic paste used for endodontic tissue self-regeneration of nonvital immature permanent teeth. *J Endod.* 2012; 38(1):91-4.
9. Grossmann LI. Polyantibiotic treatment of pulpless teeth *J Am Dent Assoc.* 1951;43(3):265-78.
10. Portenier I, Haapasalo H, Rye A, et al. Inactivation of root canal medicaments by dentine, hydroxylapatite and bovine serum albumin. *IntEndod J.* 2001;34(3):184-8.
11. Bansal R, Jain A. Overview on the current antibiotic containing agents used in endodontics. *N Am J Med Sci.* 2014;6(8):351-8.
12. Kaufman AY, Solomonov M, Galieva D, et al. Allergic reaction to the tetracycline component of Ledermix paste: a case report. *IntEndod J.* 2014;47(11):1090-7.
13. Grieve AR, Friend LA, Plant CG. A clinical trial of three root canal medicaments. *Br Dent J.* 1973;134(5):188-93.
14. Kim D, Kim E. Antimicrobial effect of calcium hydroxide as an intracanal medicament in root canal treatment: a literature review - Part I. In vitro studies. *Restor Dent Endod.* 2014;39(4):241-52
15. Prabhakar A, Taur S, Hadakar S, et al. Comparison of Antibacterial Efficacy of Calcium Hydroxide Paste, 2% Chlorhexidine Gel and Turmeric Extract as an Intracanal Medicament and their Effect on Microhardness of Root Dentin: An in vitro Study. *Int J ClinPediatr Dent.* 2013;6(3):171-7
16. Raju SM, Yadav SS, Kumar M SR. Revascularization of immature mandibular premolar with pulp necrosis - a case report. *J ClinDiagn Res.* 2014;8(9):ZD29-31
17. Yassen GH, Chu TM, Eckert G, et al. Effect of medicaments used in endodontic regeneration technique on the chemical structure of human immature radicular dentin: an in vitro study. *J Endod.* 2013;39(2):269-73.
18. Gomes-Filho JE, Duarte PC, de Oliveira CB, et al. Tissue reaction to a triantibiotic paste used for endodontic tissue self-regeneration of nonvital immature permanent teeth. *J Endod.* 2012;38(1):91-4.

19. Kim JH, Kim Y, Shin SJ, et al. Tooth discoloration of immature permanent incisor associated with triple antibiotic therapy: a case report. *J Endod.* 2010;36(6):1086-91.
20. Lenherr P, Allgayer N, Weiger R, et al. Tooth discoloration induced by endodontic materials: a laboratory study. *IntEndod J.* 2012;45(10):942-9.