



Alternative endodontic technique in pediatric dentistry: lesion sterilization and tissue repair

Aslı Aşık¹ · Özant Önçağ¹

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Abstract

Primary teeth are necessary for mastication, phonation, esthetic, and maintaining the place for the permanent teeth. The success of endodontic treatment in primary teeth is actually based on eliminating microorganisms in the root canal system by adequate irrigation and obliteration. In the pediatric patient, it is not always possible to do perfect endodontic treatment; therefore, lesion sterilization and tissue repair becomes an alternative technique. Lesion sterilization and tissue repair is a non-instrumental endodontic technique developed in Japan in 1990 and used to treat abscesses, mobility, sinus tracts, radiolucency in the furcation area in primary teeth in pediatric patient. The technique is based on using triple antibiotic paste (including metronidazole, minocycline, and ciprofloxacin) for disinfecting the root canal system. Minocycline, a component of triple antibiotic paste has the ability to raise the interleukin-10 level while inhibiting collagenases and matrix metalloproteinases. Metronidazole and ciprofloxacin have the feature to repair tissue by the effect of generating fibroblasts. The aim of the article is to summarize the indications, contraindications, used materials and protocol of lesion sterilization and tissue repair in pediatric patient.

Keywords Lesion sterilization and tissue repair · Triple antibiotic paste · Endodontic treatment · 3Mix-MP

Quick reference/description

Pulp therapy of primary tooth aimed to retain the function of mastication, phonation, swallowing, and the preservation of the space required of the permanent tooth. Pulp therapy becomes a difficult procedure to perform for a dentist in situations

✉ Aslı Aşık
asikasli95@gmail.com

¹ Department of Pediatric Dentistry, School of Dentistry, Ege University, 35100 Bornova, İzmir, Turkey

crossing as extensive root resorption, uncooperative pediatric patients, inadequate bone and periodontal support. Also in primary teeth, root canal anatomy is complicated and mechanical debridement is not always enough for disinfection. Lesion sterilization and tissue repair (LSTR) is an alternative technique that is based on a non-instrumental endodontic treatment that involves the placement of a mixture of 3 antibiotics as metronidazole, minocycline, and ciprofloxacin (3Mix) together with macrogol and propylene glycol (MP). LSTR was developed in The Cariology Research Unit of Niigata University School of Dentistry in Japan by Hoshino in 1990 and then became more popular by Takushige in 2003. These antibacterial drugs are selected on the basis of the microorganism population in the root canal system in primary teeth and have the task to sterilize the lesion and repairing tissue. Priority for using metronidazole and ciprofloxacin to generate the fibroblasts and these fibroblasts play a significant role in tissue regeneration. Minocycline is used for inhibiting collagenases and matrix metalloproteinases, besides increasing the level of anti-inflammatory cytokine interleukin-10. Especially LSTR is favored over pulpectomy when a primary tooth is to be kept for less than a year and has root resorption. After applying LSTR, continuity of abscess and sinus tract, and, no improvement in mobility clinically and radiolucency in radiographic examination is an indication for extraction which should be followed by placing a space maintainer.

Indications

- Primary teeth with pain and sensitivity to percussion
- Presence of acute and chronic pulpitis
- Presence of abscess
- Presence of mobility with Grade I and II
- Presence of sinus tract
- Presence of radiolucency in the furcation area
- Uncooperative pediatric patients
- Parents not willing for primary teeth extraction

Contraindications

- Primary teeth nearing exfoliation
- Presence of perforation in furcation area
- Excessive internal and external resorption
- Children with allergic to agents used
- Children with infective endocarditis

Materials/instruments

Equipment for clinical dental examination (probe, mirror, and tweezers)

Rubber dam and/or cotton rolls

Sterile diamond fissure / round burs

Tungsten carbide round burs

Water-cooled aerator

Low-speed handpiece

Sharp spoon excavator

Sterile saline

1% Sodium hypochlorite

Metronidazole tablet/capsule

Ciprofloxacin tablet/capsule

Minocycline tablet/capsule

Macrogol

Propylene glycol

Mortar

Blade

Amber-colored containers

Clean mixing pad/glass slab

Glass ionomer cement

Stainless steel crown

Procedure

Preparation of 3Mix-MP paste

- Commercially available tablet or capsule forms of metronidazole, ciprofloxacin and minocycline are supplied, and the enteric coating of tablets by scraping the coating with the blade or shell of capsules are removed (Fig. 1a, b).
- Each of the components is powdered in clean mortars separately (Fig. 1c, d) and stored in an amber-colored air-tight container to prevent moisture.
- 3Mix-MP paste should be prepared freshly for each use. The same amount of powdered metronidazole, ciprofloxacin and minocycline drugs (1:1:1) are mixed on a clean mixing pad/glass slab.
- For MP preparation, one part of propylene glycol and the same volume of macrogol (M:P = 1:1) are mixed.
- For standard 3Mix-MP preparation: one part of MP and 7 parts of 3Mix powder are (Standard 3 Mix-MP paste: 3Mix: MP = 7:1) mixed.

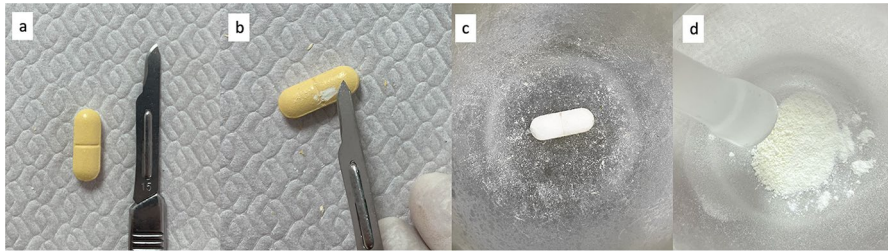
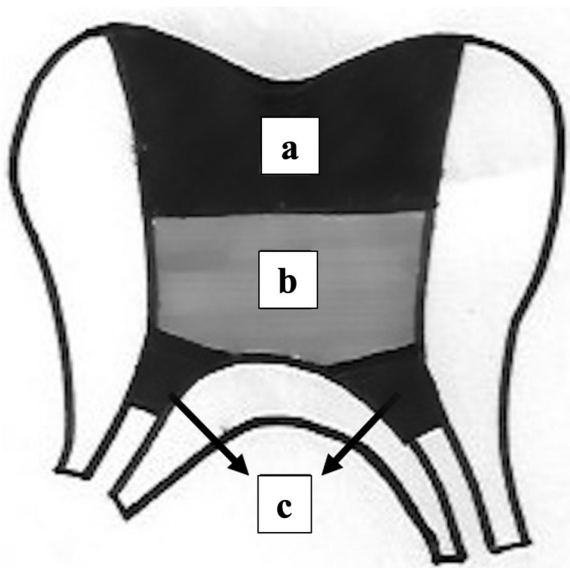


Fig. 1 Enteric coat of commercially available tablet (a) scraped with sterile blade carefully (b) and placed in mortar separately (c) for equally powdered (d)

The stepwise clinical protocol is as follows

- Following local anesthesia, rubber-dam and/or cotton rolls are placed to isolate the involved tooth from the oral environment.
- Using a water-cooled aerator, the carious enamel is removed with the help of a sterile diamond fissure and a round bur and a cavity is created in accordance with the endodontic cavity principles.
- Carious dentin is completely removed with the help of tungsten carbide round burs used with a low-speed handpiece.
- The ceiling of the pulp chamber is removed with the help of a sterile diamond fissure bur.
- Dentin debris is washed with sterile saline and coronal pulp tissue (infected pulp or pulp residues) is removed with the help of a sterile sharp excavator.

Fig. 2 Lesion sterilization and tissue repair for deciduous teeth: **a** final restoration with composite resin, **b** is glass ionomer cement base, and **c** is where the 3Mix-MP paste is placed



- The canal orifices are expanded to be 1 mm wide and 2 mm deep for 3Mix-MP application.
- The pulp chamber is cleaned with 1% sodium hypochlorite and the pulp residues are removed.
- The 3Mix-MP paste is placed in the cavity to cover the canal orifices and pulp base (Fig. 2c).
- High viscosity glass ionomer cement is used as a base (Fig. 2b) in restoration than finish restoration with composite resin (Fig. 2a)
- If possible, it is recommended to apply a stainless steel crown to the tooth after adequate preparation.

Follow-up: After treatment in 1, 3, 6 and 12 months, clinical and radiographic examination is recommended to be done. Criteria for success are listed as clinical absence of pain, sensitivity to percussion, sinus tract and radiographically observing a decrease in radiolucency of furcation area.

Pitfalls and complications

- The triple antibiotic paste that contains minocycline may cause discoloration of hard dental tissues therefore replacing the minocycline with clindamycin or cefaclor can be preferred.
- LSTR applied to excessively damaged tooth crowns have more possibility for fracture; therefore, applying stainless steel crown should be preferred for preventing such fractures.
- The triple antibiotic paste is radiolucent and not detectable in the radiographic examination. This limitation should be carefully addressed in patient records and adding iodoform into triple antibiotic paste to make it radiopaque may be preferred.
- The history of the patient should be taken carefully for LSTR application, because unwanted reactions may be encountered, especially if the patient is allergic to the antibiotics used.
- Always keep in mind that using several antibiotics can cause bacterial resistance.

Further readings

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