Abstract---Variety of materials have been utilized. Zinc oxide eugenol was traditionally used to fill primary teeth root canals, but as attempt to conduct better material we used eucalyptus instead of eugenol to see whether it will be less microleakage than zinc oxide eugenol. Aim: The goal of this research was to assess the microleakage of zinc oxide eucalyptus and zinc oxide eugenol in circumstances that were as near to clinical as possible. A primary human deciduous teeth were extracted and stored in normal saline as to preserve the qualities of extracted teeth as possible. Methodology: Hence numerous analyzing ways have been suggested accordingly. yet preceding studiers and researchers shown the effectiveness of Indian ink penetration for direct linear leakage scope (Gutmann JL,1993).so this procedure chosen (the Indian ink). Groups: The following groupings of specimens were created: 40 Extracted primary teeth were obturated with zinc oxide eugenol in one group and other 40 primary teeth were filled with zinc oxide eucalyptus. Analysis: by visualizing teeth after soaking into Indian Ink with microscope and measuring the microleakage by millimeter. Results: both material shown microleakage but ZOEUE was further more. Conclusion: ZOE shown less microleakage to Indian ink than ZOEUC in accordance to their setting time make it more suitable material for deciduous endodontic therapy.

Keywords---Zinc oxide eugenol, Zinc oxide eucalyptus, Microleakage, deciduous teeth, Indian ink, primary endodontic therapy.
**Introduction**

Zinc oxide-eugenol (ZOE) cement has been widely used in dentistry since the 1890s, being used for tasks such as temporary restoration and main endodontic filling for primary teeth, impressions, and temporary cementation for several reason, including: easy handling, excellent cavity sealing ability, bactericidal properties and a sedative effect on sensitive teeth. Today, we have various endodontic filling material that compete for more accuracy and flowability properties. However, their cost is still a major concern, especially in teaching institutes and even in practice. This makes ZOE material as a most widely in dentistry. And as an attempt to improve the qualities of such valued material and as a continuing for a previous research where replacing eugenol with eucalyptus where it had a better antimicrobial quality than the traditional one so in this study a try was attempt to see the other good qualities for this mixture. (Luma Abdulameer, 2019).

3D plugging of the root canals is a demand for successful endodontic treatment and requisite to prevent re-infection to sustain of healthful periapical tissues. Achieving this, many tried to grow this business inventing distinctive brands and types of endodontic sealers interpreting of the apical sealing quality of sealers, as an urgent goal (Sivimay, S; 4, Tay FR, Loushine RJ, Weller RN, Kimbrough WF, Fashley DH, Mak YF, Lai CN, Raina R, Williams MC, 2005). wherefore, leakage studies still advised to be critical and relevant (Economides N, 2004. Miletic I, Ribaric SP, 2002). Thence numerous analyzing ways have been suggested accordingly. yet preceding studiers and researchers shown the effectiveness of Indian ink penetration for direct linear leakage scope (Gutmann JL, 1993). so this procedure chosen (the Indian ink).

**Materials and Methods**

<table>
<thead>
<tr>
<th>Table 1</th>
<th>List of materials and mixing formula (Tchaou et al. 1996)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc oxide eugenol</td>
<td>Zinc oxide powder</td>
</tr>
<tr>
<td>1 scoop (0.2 g)</td>
<td>7 drops (0.07 cc)</td>
</tr>
<tr>
<td>Zinc oxide eucalyptus</td>
<td>Zinc oxide powder</td>
</tr>
<tr>
<td>1 scoop (0.2 g)</td>
<td>7 drops (0.07 cc)</td>
</tr>
</tbody>
</table>

Evaluation of Microleakage into root cracks (Zinc Oxide Eucalyptus & Zinc Oxide Eugenol)

**Sample size**

80 Extracted E molars collected from governorate institutions, as the experiment conduct in-vitro, due to the good ratio of root existence and since it is easier to maintain the space after extraction in accordance to other primary teeth also extraction was done under pathological circumstances and parents will, patients age was from 7 to 10 also the age chosen permit good maintained for the extracted spaces since presence of 6s. Each tooth will be storage in normal saline after extraction to preserve the teeth criteria until work on them maintaining the
quality of tooth structure and prevent dehydration that may compromise the presentation of material qualities in teeth.

**Procedure method**

Hence numerous analyzing ways have been suggested accordingly. yet preceding studiers and researchers shown the effectiveness of Indian ink penetration for direct linear leakage scope (Gutmann JL, 1993). so this procedure chosen (the Indian ink).

**Sample Preparation**

Teeth mounted on a rack of rubber silicone rubber impression material (zhermach zetaplus c silicone impression material, Germany) fixing them during preparation for standard procedure, also silicone was chosen for easier removing. (picture 1).

Access opening done by round turbine and headpiece burs (lusterdent burs, France). (Picture 2). Barbed broach and 10,15 k-files for pulp amputation and canal widening (Ramo medical file system, China). (picture 2)
Working length taken x-ray sensor and digital portable X-ray device. (woodpecker, china), (x-ray portable device, china). (picture 3).

![Image](image_url)

**Instrumentation**

Endodontic treatment in primary teeth can be challenging and time consuming, especially during canal preparation, which is considered one of the most important steps in root canal therapy. Nickel–titanium (Ni–Ti) rotary files have been developed for use in pediatric endodontics. Using rotary instruments for primary tooth pulpectomies is cost effective and results in fills that are consistently uniform and predictable. Baby Rotary files are made with greater flexibility. FDA-approved, CE-certified. The baby CM Niti file is specially designed for children’s deciduous tooth. It’s compatible for generic endo motors. Triangular Cross Section Design. Advanced Tip Process, avoid reamers going over the working length accidents since they 16mm length design. (picture 2). So instrumentation will conducted with 16MM taper 4% size 20 and size 30 (Ramo medical children file system, china) in accordance till getting dentin shaves from all canals of primary Es.

Torque: 2.6N
Speed: 350RPM

To Improve resistance for cyclic fatigue, provide safer experience.

Disinfection with normal saline (0.9% NaCl) irrigation with sequential irrigation of 3% H2O2 (Seal GJ, Ng L-Y, Spratt D, Bhatti M, Gulabivala K, 2002), 5.2% NaOCl and 0.9% NaCl, and the last step irrigated with 17%EDTA. (picture 4).
• H2O2: used as It is active against viruses, bacteria, bacterial spores and yeasts via the production of hydroxyl free radicals which attack proteins and DNA.

• NAOCL: Its advantages are two-fold; pulpal dissolution and antimicrobial effect. NaOCl is a strong base (pH>1) and acts as an organic solvent, causing amino acid degradation and hydrolysis through the production of chloramine molecules. (Zhang W, Torabinejad M, Li Y, 2003) There is evidence to show that a decrease in microbial numbers is achievable when using NaOCl for endodontic treatment of teeth with apical periodontitis. (Shabahang S, Pouresmail M, Torabinejad M, 2003).

• Sterile water and saline: used between two irrigating solutions, to prevent chemical reactions between them. However, water and saline must not be used as the main irrigants as they have neither tissue-dissolving nor antimicrobial activity. (Byström A, Sundqvist G, 1985).

• Edta: Smear layer: since microleakage affected in companionship with smear layer (Kennedy WA, Walker WA, Gough RW, 1986). smear layer is the ultimate artifact of root canal instrumentation performing as a physical fence meddlesome with the compliance and osmosis of sealer into dentinal tubules, which reducing microleakage (Oksan T, Aktener BO, Sen BH, Tezel H, 1993).

In this scrutinize, smear layer evacuated from canals by 17%EDTA root canal irrigation. Resulting superlative Approximation between the intracanalwalls and the fillingmaterial so sealing is improved (“Oksan T, Aktener BO, Sen BH, Tezel H, 1993. Çobankara FK, Adanir N, Belli S, 2004”).
• Mixing zinc oxide eugenol (1 spoon with 7 drops eugenol) and loaded into a dental syringe for the 1st tested material then mixing zinc oxide eucalyptus (1 spoon with 7 drops eucalyptus) then also loaded into a dental syringe as the 2nd tested material according to Table (1) List of materials and mixing formula (Tchaou et al. 1996). Teeth randomly divide into two experimental groups based on the tested materials to obturate (ZOEUC and ZnE).

• Obturation by the tested materials, push out from syringe into root canals and pushed using paper points and for establishing the existence of material core at the apical region and achieving its sufficient compaction a manual pluggers stuck into canals immediately and after the initial set, after injection each material into canals using paper points and for establishing the existence of material core at the apical region and its sufficient compaction a manual pluggers was stuck into the canal immediately and after initial set. (Angerame D, 2012)

• Also depending on preceding investigations, zinc oxide eugenol shows comparably shrinkage afterwards setting (Kazemi, R.B.; Safavi, K.E, 1993) creating voids (Gupta, R.; Dhingra, A, 2015), as lowering the dye penetration. For this purpose, we forced material before and after initial setting by pluggers in each tooth to minimize shrinkage and voids. (Angerame, D, 2012).

• Allow filling materials to set, then fill teeth with amalgam to seal the endodontic material and wait for 24 h for complete set for all teeth fillings.

• Crown part of teeth will be kept to facilitate holding and manipulating teeth since dealing with deciduous teeth.

• Since coronal part will be kept, sealing the tooth with amalgam as composite consider as a sensitive technique that might dehydrate the tooth not like in vivo that the tooth will have a chance to hydrate and also as amalgam not soluble material that will stand soaking in Indian Ink without changing will minimum micropore leakage in comparing with all of the teeth stored at 37°C with in normal saline for 72 hours according to indian ink method. (Delivanis, 1982). (Picture 6).

**Procedure controlling factors**

Hence microleakage is an intricate topic due to possibility of forcing numerous variables themselves that can yo-yo the rate of microleakage infiltration, such as root filling techniques, physical and chemical sealer properties and latency or vacancy of smear layer (Çobankara FK, Adanir N, Belli S, Pashley DH, 2004). All those criteria have been dealt in preparation.
Laboratory work

- Three strikes of manicure will be polished the tooth outside layer, with the exception of the apical 2 mm, which should remain uncovered, Manicure added to secure the tooth surface from ink penetration so that dye can only enter the canal through the apical area.
- The teeth properly cleaned in running water and the nail polish removed with a scalpel blade after each group has been immersed in dye before immersion important to clear any attaches that may inference the penetration of dye to apex and stored at 37°C for 1 week.
- The teeth then demineralized in order to segment them (cross section the tooth) so that the extent of dye penetration measured in millimeters in all parts of the root canal, from the apical stop to the greatest length of dye penetration, demineralized in 5% hydrochloric acid, washed in tap water for 24 hours, dehydrated in ascending concentrations of ethanol at 50%, 70%, 80%, 96% and 100% for 4 hours each, and finally transferred to methyl salicylate for diaphanization.
- Using a measuring microscope The cleared teeth were analyzed by means of a measurement microscope with lence of 100 mm (Measuroscope, Nikon, Japan). The extent of dye penetration was measured in millimeters in all aspects of the root canal by an experienced, calibrated examiner, from the apical stop to the maximum length of dye penetration (Delivanis, 1982).
- Data were analyzed statistically using Kruskal-Wallis multiple comparison test. Multiple comparisons were performed using the Dunn’s post test.) Oksan T, Aktener BO, Sen BH, Teze, 1996).

Results

Descriptive and statistical test of microleakage among groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>T test</th>
<th>df</th>
<th>P value</th>
<th>Cohen’s D ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZOE</td>
<td>2.13</td>
<td>4.12</td>
<td>96.4401</td>
<td>0.000*</td>
</tr>
<tr>
<td>ZOEUC</td>
<td>4.12</td>
<td>4.62</td>
<td>49</td>
<td>2.2376</td>
</tr>
</tbody>
</table>

*=significant at p<0.05.

Results above show that ZOEUC has more microleakage than ZOE with significant difference.
Zoe under Microscope Image
Discussion

The sample size

80 Extracted E molars collected from governorate institutions, as the experiment conduct in-vitro, due to the good ratio of root existence and since it is easier to maintain the space after extraction in accordance to other primary teeth also extraction was done under pathological circumstances and parents will, patients age was from 7 to 10 also the age chosen permit good maintaince for the extracted spaces since presence of 6s. Each tooth will be storage in normal saline after extraction to preserve the teeth criter until work on them maintaining the quality of tooth structure and prevent dehydration that may compromise the presentation of material qualities in teeth. Results showed that ZOE have a relatively acceptable rate of microleakage (≤2.17mm) which agreed with previous studies, (Zmener et al.2005) distinguished that zinc microleakage more incursion. approximate results were obtained in this scrutinize this might due to:

- Hydrogenated resin is one of the fundamental composing's of the zinc oxide eugenol sealer (27 percent) This component gives flowability and plasticity, permitting penetration all of the root canal scheme’s anatomical features. (Hume WR,1948) also due to the reaction of zinc oxide that is instable and can lose of eugenol to push the zinc further more giving a new zinceugenolate, which not existed in ZOEUC. (Vassiliadis LP, Sklavounos SA, Stavrianos CK,1994). Yet its disagreed Past research seen zinc oxide eugenol-based sealers have weak dentinal adhesion and are very porous. (McComb D, Smith DC, Russin TP, Zardiackas LD, Reader A, Menke RA.1976,1980).
- It also agreed with Clark and Philip In their scrutinize, they came upon a bind between flow and setting time. The flow reduced with respect to setting time reduce that show why ZOEUC had even higher rate of microleakage since have lesser dentinal adhesion than ZOE so ZOEUC show (≥4.37mm) micoleakge. considering to the short ZOEUC setting time. (Clark RJ, Phillips RW,1957).

Limitations

One of the main limitations is that the study done on extracted teeth to exclude the possibility of recurrent endodontic infection.

Conclusion

ZOE shown less microleakage to Indian ink than ZOEUC in accordance to their setting time make it more suitable material for deciduous endodontic therapy.

References


