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CLINICAL AND RADIOGRAPHIC EVALUATION OF 4 ROOT CANAL FILLING MATERIALS IN PRIMARY TEETH

Anuva Bhardwaj[1], Kriti Sharma[2]
[1,2].Department of Pedodontics and Preventive Dentistry, Himachal Dental College, Sundernagar,Mandi, Himachal Pradesh.

ABSTRACT:

AIM: To evaluate the efficacy of zinc oxide, calcium hydroxide, aloe vera and 10% sodium fluoride as an obturating material in primary teeth. MATERIALS AND METHOD: 60 children aged 4-8 years with pulpally involved primary molars requiring root canal procedure were divided into 4 groups of 15 children each and were treated with Group I (zinc oxide eugenol), Group II (zinc oxide and aloe vera gel), Group III(zinc oxide, calcium hydroxide and 10% sodium fluoride) and group IV(zinc oxide, calcium hydroxide and aloe vera gel). The subjects were followed up clinically and radiographically for 3 and 6 months. RESULTS: The overall success rate of Group III and Group IV was 93.3% whereas Group II was 86.6% and Group I was 80%. CONCLUSION: All materials used in the present study are equally effective as obturating materials as the success rates of all them are statistically insignificant. (p>0.05)

Keywords:pulpectomy, aloe vera, primary teeth, sodium fluoride, zinc oxide, calcium hydroxide

INTRODUCTION:

The primary tooth is the best space maintainer for both primary and mixed dentition. They not only stimulate the development of the alveolar bone but also helps in the masticatory process and guide the succadaneous permanent teeth in their proper position. Thus, primary teeth should be preserved until their normal exfoliation occurs.[1,2]

The primary tooth which has irreversibly affected pulpal tissue either due to caries or traumatic lesions, pulpectomy is carried out to maintain the function and integrity of the involved tooth.[3]Numerous root canal filling materials for deciduous teeth are available since a long time but the frequently used materials are calcium hydroxide, zinc oxide eugenol and iodoform form pastes.[4,5] In 1930 Sweet introduced zinc oxide eugenol paste as the first obturating material for primary teeth. It has its anti-inflammatory and analgesic properties that are beneficial after the root canal procedure.[6] None the less, it has certain drawbacks like it causes irritation in the tissues of the periapical area, slows the resorption of the tooth, causes necrosis of cementum and bone, changes the path of eruption of succedaneous tooth; it has also been evident from some cases that when zinc oxide eugenol goes beyond the apices, it hardens into a cement which resists resorption. It can remain in the alveolar bone from months to even years, causing a mild foreign body reaction.[7]

The use of Calcium hydroxide in dentistry was first commenced by Herman (1930).[8] It has popularly been

*Corresponding Author Address: Dr. Anuva Bhardwaj. E-mail: bhardwajanuva1@gmail.com

used in the treatment of periapical lesions in permanent teeth and for apexication procedures. Regardless of its advantages, its main drawback is its tendency to get depleted from the root canals faster than the physiologic resorption of the roots.[9]

To overcome the disadvantages of Zinc oxide eugenol (slow rate of resorption) and calcium hydroxide (faster rate of resorption), research is going on to improve their properties by adding antibacterial substances to it or by altering it with other materials. To achieve the desired advantages of zinc oxide and calcium hydroxide, Chawla et al (2008)[3]used this mixture along with 10% sodium fluoride, which resulted in the formation of calcium fluoride that added radiopacity to the material, without the need for addition of any other radiopaque material.

In addition, according to Chawla et al (2008)[3] when sodium fluoride is added as an obturating medium it gives this material a resorption rate equal to that of physiologic resorption of the root.

Since ancient times, aloe vera has been used for the treatment of various ailments due to its regenerative property, immunostimulatory activity and antimicrobial property. It has specific susbstances which have shown to have direct antimicrobial activity. They have been shown to enhance defense mechanisms.[10]Aloe vera has been used for a variety of dental procedures such as healing of dry sockets, acute lesions in the mouth and denture patients with sore ridges etc.[11,12] Since aloe vera is a gel, its placement in the root canal as an obturating material becomes difficult, however when mixed with zinc oxide powder, it becomes easier to place and is easily retrievable.

Therefore, in view of the above stated observations the present study was undertaken to clinically and radiographically evaluate zinc oxide, calcium oxide, aloe vera and 10% sodium fluoride as a root canal filling material in primary teeth.

MATERIALS AND METHODS:

A clinical study was conducted on 60 patients aged 4-8 years attending the outpatient Department of Pedodontics and Preventive Dentistry, Himachal Dental College, Sundernagar. Ethical approval to conduct the study was obtained from Institutional Review Board of Himachal Dental College, Sundernagar. Written consent for the participation of the children was obtained from the parents.

The teeth were included in the study if they had one or more of the following signs or symptoms: (1) History of spontaneous pain (2) Presence of abscess or draining sinus (3) Presence of swelling (4) Uncontrolled hemorrhage after the removal of coronal pulp tissue. (5) Presence of interaddicular or periapical radiolucency not involving the permanent tooth bud. The teeth were

excluded from the study if they were non restorable tooth or a perforated pulpal floor was present or if an excessive internal resorption was present or if there is periradicular involvement extending to the permanent tooth bud or any underlying dentigerous or follicular cyst. Patients with any medically compromised condition or systemic illness.

CLINICAL PROCEDURE

The procedural steps in the selected pulpally involved primary molars were the same in all the groups: Local anesthesia was given in teeth with vital tissue, where as for non vital teeth local anesthesia was not required. All cases were treated under rubber dam for isolation. Access to the pulp chamber was gained after removal of all carious tooth structure with a round bur. All overhanging dentin was removed from the roof of the pulp chamber and a straight line access was achieved depending on the extent of the lesion. Initally spoon excavator was used to remove the bulk of the pulp from the pulp chamber. The radicular pulp was removed with H-files along with repeated irrigation with 2.5% sodium hypochlorite and saline. A diagnostic file radiograph was taken. The canals were prepared by an endodontic file upto the measured working length. Simultaneously, irrigation was done using 2.5% sodium hypochlorite and normal saline. At this point, patients were divided into 4 groups as given in Table 1.

After drying the pulp cavity using cotton pellets and paper points, obturation was carried out with the materials of each group respectively. For Group II and IV fresh extract of aloe vera gel was used.(Figure 1) Intraoral radiographs were taken immediately after the procedure to check whether the material was flown to the required working length. After obturation of the root canals, the cavity was restored with glass ionomer cement. Final restoration was done with stainless steel crown after one week.

Clinical and Radiographic Criteria

After treatment, clinical and radiographic evaluation was performed at 3, 6 months.(Figure 2,3,4) The criteria for clinical success were absence of pain, draining sinus, swelling and presence of healthy soft tissue. The criteria for radiographic success were reduction in size of interradicular radiolucency, absence of internal/ external resorption, evidence of bone regeneration, radiographic continuity of lamina dura. The treatment was judged to be successful when both clinical and radiographic criteria were fulfilled. The success rate of all three groups at 3 and 6 months was determined by statistical analysis using Pearsons chi-square test. $P \leq 0.05$ was considered to be statistically significant.

RESULTS:

Preoperative signs and symptoms were evaluated for pain, mobility, intraoral swelling, draining sinus, and tenderness on percussion and postoperative evaluation was done at 3 and 6 months. (Table 2). None of the patients reported back with tenderness on percussion in any of the groups at 3, 6 months follow up. On preoperative and postoperative comparison for tenderness on percussion the difference was found to be statistically significant in all the groups. ($p \leq 0.05$)

(Table 4). Only one patient out of fifteen reported back with sinus at six months follow up in group IV. On pre and postoperative comparison for sinus, group III was found to be statistically significant($p \leq 0.05$) (Table 5).In groups I, II and IV, none of the patients reported back with pain postoperatively, at 3 and 6 months follow up however in group III, postoperative pain was reported in one tooth(6.7%) at 3 months. On preoperative and post operative comparison for pain of all the groups the difference was found to be statistically significant ($p \leq 0.05$) (Table 6). In all four groups, there was no sign of postoperative swelling at 3, 6 months follow up. On pre and postoperative comparison for postoperative swelling, no statistical difference was found. ($p \geq 0.05$)(Table 7). In Group I, II, III none of the patients had tooth mobility at 3 and 6 months follow up. Only one patient in group IV showed tooth mobility at 6 months follow up. On pre and postoperative comparison for tooth mobility the difference was found to be insignificant ($p \geq 0.05$) (Table 8)

On radiographic evaluation Group I showed three failures (20%) two failures due to increase in size of radiolucency and one failure due to developing radiolucency, group II showed two failures (13.3%) at 3 and 6 months follow up one was due to increase in size of the radiolucency and another was due to the development of radiolucency following treatment and in group III and IV at 3, 6 months follow up, one failure (6.7%) was seen due to increase in size of radiolucency and in group IV. On pre and postoperative comparison there was statistical significance in all four groups for 3 months with 6 months ($p \leq 0.05$). In case of resorption for group I, II, III there was no resorption present postoperatively in any of the cases. Only one patient (6.7%) in group II showed external resoprtion of the root at 3 and 6 months. On statistical evaluation between the groups, the difference was found to be insignificant. ($p \geq 0.05$) (Table 9,10)

Overall success for group III and group IV was highest with the success rate of 93.3% in which fourteen out of fifteen cases were successful at 3 and 6 months followed by group II with the success rate of 86.6% in which thirteen cases were successful at and group I in which twelve cases were successful giving it a success rate of 80% at 3 and 6 months.

On intergroup comparison, the overall success between all the groups was found to be statistically insignificant (p≥0.05) (Table 11, Graph 1,2)

DISCUSSION:

Endodontic treatment is a preferred procedure for preserving a restorable primary molar with an infected/ necrotic pulp.[13]The therapeutic goals are to eliminate bacteria and their products and ensure hermetic seal of the root canals, so that primary teeth can complete its function until normal exfoliation can occur without harming the successor of affecting the health of the patient.[14] Rifikin(1980)[15] listed the requirements of an ideal root canal filling material for primary teeth that it should be antibacterial, resorb at a similar rate as the primary root, be harmless to the periapical tissues, and to the permanent tooth germ, resorb readily if extruded beyond the apex, be antiseptic, fill the root canals easily, adhere to the walls, not shrink, be easily removed if necessary, be radioopque and not discolour the tooth. So far, a number of materials have been employed, but the most commonly used root canal filling materials for primary teeth are zinc oxide eugenol, Iodoform based pastes (KRI, Maisto's paste), calcium hydroxide either alone or in combination with iodoform (vitapex, metapex). Sweet (1930)[6] described the use of zinc oxide eugenol to fill the root canals of primary teeth. The material still continues to be the most widely used preparations for primary tooth pulpectomies. Success rate of 82.3% Barr et al (1991)[16], 82.5% Gould J (1972)[17], 84% Flaitz et al (1989)[18], 86.1% Coll et al (1996)[19] and 92% Yacobi et al (1991)[20]have been reported with the use of Zinc oxide Eugenol. Despite the high success rates, Zinc oxide eugenol does not meet all criteria required from an ideal root canal filling material for primary teeth.

Aloe vera is a shrubby tropical and subtropical plant, which has succulent and elongated leaves. Aloe vera belongs to the family Liliaceae, which is commercially widely used in therapeutic purposes.It has a long history as a home remedy for burn wounds. Hence it is commonly called as burn plant.[21] David RH (1997)[22]reported that aloe vera can be used for various therapeutic as well as preventive purposes owing to its anti inflammatory, antibacterial, antifungal, antiviral, moisturizing, and pain-relieving properties, and is used in the treatment of minor burns, skin abrasions, and irritations, and in the treatment of psoriasis and frostbite. The antimicrobial effects of aloe vera have been attributed to the plant's natural anthraquinones: aloe emodin, aloetic acid, aloin, anthracene, anthranol, barbaloin, chrysophanic acid, ethereal oil, ester of cinnamonic acid, isobarbaloin, and resistannol.

In group I, II, III, IV tenderness on percussion was not reported in any patient postoperatively at 3 and 6 months which reveals the efficacy of the

materials used in our study. Results of our study were in accordance with the Nadkarni et al (2000)[23], Mani et al(2000),[24]Chawla et al (2001).[25] Only 1 failure in group IV was seen due to the presence of draining sinus at the end of 6 months.

The results of group I, II, III were in accordance with Reddy and Fernandes (1996),[26]Nadkarni and Damle(2000)[23] and Khairwa et al(2014)[27]whose studies also reported absence of draining sinus following treatment at various follow up visits. Only one patient in Group III reported with history of mild pain and slight discomfort on chewing at 3 month follow up. The patient was kept under observation but at 6 month follow up the pain subsided and the tooth was completely asymptomatic.

Results of group I,II,IV were in accordance with Mani et al (2001)[24], Khairwa et al (2014),[27] Al Ostwani et al (2016)[28] who evaluated the pulpectomy of non-vital primary molars using four different root canal filling pastes, with zinc oxide eugenol as a control group showing reduction in subjective symptoms in all except one tooth. In our study it was observed that none of the patients in any of the groups had intraoral swelling at 3, 6 months postoperatively. This reveals the efficacy of the all the materials which are being used in the study. Our results of group I, III were in accordance with Reddy and Fernandes (1996),[26]Nadkarni and Damle (2000)[23] and Mortazavi et al (2004)[29] whose studies also showed relief in intraoral swellings following the treatment at various follow up visits. The follow up evaluation of group I, II, III after 3, 6 months revealed reduction in mobility, however mobility was seen in 1 patient at the end of 6 month in group IV. Our results for Group I, II, III were in accordance with Reddy and Fernandes (1996)[26] and Nadkarni et al (2000),[23]Khairwa et al (2014),[27] Rai TS et al (2017)[30]who all also reported reduction in mobility following treatment at subsequent visits.

For interradicular radiolucency the evaluation was carried out by caterogorizing them into 4 groups: (1)An increase in size of interradicular radiolucency (2) Decrease in size of interaradicular radiolucency (3) Size of the radiolucency remains unchanged. (4) Development of radiolucency following treatment.

In group I, there were 3 failure cases at 6 months, in 1 there was development of radiolucency following treatment and in other 2 failures there was in increase in size of the radiolucency Results of our study were similar to the studies carried out by Gupta S(2011)[31], Trairatvorakul et al (2008)[32] and Mortazavi et al (2004)[29] who showed similar findings. Our results were in contrast with Mani et al (2000)[24]who showed complete healing of radiolucency in 46.6 percent in the zinc oxide eugenol group in 6 months.

In group II, at 6 months, 2 failure cases were seen one due to increased radiolucency, and another due to developing radiolucency following treatment. Our results were in accordance with studies done by Gupta S (2011)[31], Trairatvorakul et al (2008)[32] and Mortazavi et al (2004)[29]

In group III, on both 3 and 6 months evaluation, 1 failure was seen as there was increase in size of the radiolucency on radiographic evaluation. Similar results were seen in studies done by Khairwa et al (2014),[27] Mani et al (2000)[24]

In group I, III and IV none of the patients showed external/internal resorption at 3 months and 6 months. However in group II external root resorption was observed in 1 patients at 3 months and 6 months but the patient was free from any clinical signs and symptoms at 3 and 6 months.

Our results of group I, III, IV were in accordance with Reddy and Fernandes (1996),[26]Nadkarni and Damle (2000)[23]and Mortazavi et al (2004)[29]who showed similar results.

The high clinical and radiographic success of group III, IV shows its excellent healing capabilities due to their anitbacterial and anti-inflammatory properties. Since long Zinc oxide eugenol has been the material of choice of paediatricdentistswordwide, even though it fails to meet the ideal requirements of root canal filling material in primary teeth. There are numerous investigations suggestive of it being toxic to the periapical tissues and causing necrosis to the hard tissues. In addition when forced beyond the apex, there is a risk of deflection of the succedaneous tooth due to the slow rate of resorption. Zinc oxide, calcium hydroxide and 10% sodium fluoride (group III) and zinc oxide, calcium hydroxide and aloe vera have (group IV) have shown excellent results whereas zinc oxide and aloe vera gel (group II) has also shown good clinical and radiographic results, therefore they can be considered to be an effective root canal filling materials for obturation in primary teeth.

CONCLUSION:

This study concludes that all four materials can be effectively used as obturating materials for pulpectomy in primary teeth. In addition, zinc oxide in combination with aloe vera or sodium fluoride can be used as a new obturating material in primary teeth in place of zinc oxide eugenol.

REFERENCES:

1. Brothwell DJ. Guidelines on the use of space maintainers following premature loss of primary teeth. J C an Dent Assoc 1997;63:753-66.
2. da Costa CC, Almeida IC, Locks A, da Costa Filho LC. Clinical comparative study of the effects of two types of mandibular space-regaining devices. Gen Dent 2003;51:120-6.
3. Chawla HS, Setia S, Gupta N, Gauba K, Goyal A. Evaluation of a mixture of zinc

oxide,calcium hydroxide, and sodium fluoride as a new root canal filling material for primary teeth. J Indian SocPedoPrev Dent 2008;26(2):53-57

4. Chawla HS, Mani SA, Tewari A, Goyal A. Calcium Hydroxide as a root canal filling material in primary teeth: A pilot study. J Indian SocPedoPrev Dent 1998;16:90-2.
5. Goerig AC, Camp JH. Root canal treatment in primary teeth: A review. Pediatr Dent 1983;5:33-7.
6. Sweet CA. Procedure for treatment of exposed and pulpless deciduous teeth. J Amer Den Assn 1930;17:1150-53
7. Hashieh I A, Ponnmel L, Camps J. Concentration of Eugenol apically released from ZnO E based sealers. J Endod 1999;25(11):713-5
8. Hermann BW. Dentin obliteration der wurzelkanalenachbehandlungmit calcium. ZohnartzlRundschau 1930;39(1):888-92
9. Nurko C, Ranly DM, Garcia Godoy et al. Resorption of a Calcium Hydroxide/ Iodoform paste (Vitapex) in root canal therapy for primary teeth: a case report. Pediatr Dent 2000; 22:517-520
10. Kriplani R, Thosar N, Baliga MS, Kulkarni P, Shah N, Yeluri R. Comparative evaluation of antimicrobial efficacy of various root canal filling materials along with aloe vera used in primary teeth: A microbiological Study . J ClinPaed Dent 2013;37;(3):257-62
11. James Harrison. Aloe vera in dentistry, book aloe vera, Natures Medicine Chest, page 19
12. Singh Smitha, Jindal Rahul, Singh Sourabh. Aloe vera: Boon to a dentistry.Indian Research and Review 2010;4(6):138-41
13. Ramar K, Mungara J. Clinical and radiographic evaluation of pulpectomies using three root canal filling materials: An in-vivo study. J Indian socPedodPrev Dent 2010;28(1) :25-29
14. Rosendahl R, WeinerrGrodd A. Root canal treatment of primary molars with infected pulp using calcium hydroxide as a root canal filling. J ClinPediatr Dent. 1995;19(4):255-58
15. Rifkin A. A simple, effective safe technique for the root canal treatment of abscessed teeth. J Dent Child 1980;47:435-41
16. Barr ES, Flaitz CM, Hicks JM. A retrospective radiographic evaluation of primary molar pulpectomies. Pediatr Dent 1991;13:4-9
17. Gould JM. Root canal therapy for infected primary molar teeth-preliminary report. J dent Child.1972;39(4):269-73
18. Flaitz C.M Barr E.S and Hicks JM. Radiographic evaluation of pulpal therapy for primary anterior teeth. J Dent Child 1989;56:182-85
19. Coll JA, Sadrian R Predicting pulpectomy success and its relationship to exfoliation and succadenous dentition. Pediatr Dent 1996;18(1):57-63
20. Yacobi R, Kenny DJ, Judd PL, Johnston DH. Evolving primary pulp therapy techniques. J Amer Dent Assoc 1991;122:83-85
21. Grindla D, Reynolds T. The aloe vera phenomenon - A review of the properties and modern uses modern uses of the leaf parenchyma gel. J Ethnopharmacol1986;16:117-51

22. Davis RH. Aloe Vera: A scientific approach. New York: Vantage Press;1997
23. Nadkarni U, Damle SG. Comparitive evaluation of calcium hydroxide and zinc oxide eugenol as root canal filling material for primary molar. A clinical and radiographic study. J Indian SocPedoPrev Dent 2000;18(1):1-10
24. Mani SA, Chawla H.S, Tewari A, Goyal A. Evaluation of calcium hydroxide and zinc oxide eugenol as root canal filling material in primary teeth. J Dent Child 2000:142-147
25. Chawla HS, Mathur VP, Goyal A. A mixture of calcium hydroxide and Zinc oxide Powder as a root canal filling material for primary teeth: a preliminary study. J Indian SocPedoPrev Dent 2001;19:107-109
26. Reddy VV, Fernandes. Clinical and radiological evaluation of Zinc oxide eugenol and Maisto's paste as obturating materials in infected primary teeth: A nine months Study. J Indian SocPedodPrev Dent 1996;14:39-44
27. Khairwa A, Bhat M, Sharma R, Satish V, Maganur P, Goyal AK. Clinical and radiographic evaluation of zinc oxide with aloe vera as an obturating material in pulpectomy: An in vivo study. J Indian SocPedoPrev Dent 2014;32(1):33-8
28. Al-Ostwani AO, Al-Monaqel BM, Al-Tinawi MK. A clinical and radiographic study of four different root canal fillings in primary molars. J Indian SocPedodPrev Dent 2016;34:55-9
29. Mortazavi M, Mesbahi M. Comparison of zinc oxide eugenol and vitapex for root canal treatment of necrotic primary teeth. Int J Paedr Dent 2004;14(6):417-24
30. Rai TS, Kaur I, Dhawan L, Geetanjali, Shafat S, Oberoi IS. Comparison of endoflas and zinc oxide eugenol as root canal filling materials in primary dentition. Int J Res Health Allied Sci 2017;3(1):1-5.
31. Gupta S, Das G. Clinical and radiographic evaluation of zinc oxide eugenol and metapex in root canal treatment of primary teeth. J Indian SocPedodPrev Dent 2011;29:222-8
32. Trairatvorakul C, Chunlasikaiwan S. Success of pulpectomy with zinc oxide eugenol versus calcium hydroxide/iodoform paste in primary molars: a clinical study. Pediatr Dent 2008;30(4):303-8
33. Kennedy DB. Pediatric Operative Dentistry. Dental Practitioner Handbook no.21 Bristol John Wright & Sons.1976;232-39

TABLE:

TABLE 1: DIVISION OF SAMPLES

GROUPS	MATERIALS	PREPARATION OF MATERIALS	FOLLOW UP
GROUP I	Zinc Oxide Eugenol		3,6 Months
GROUP II	Zinc Oxide & Aloe Vera Gel	Mixing ratio is 2:1	3,6 Months
GROUP III	Zinc Oxide, Calcium Hydroxide & Sodium Flouride Solution (10%)	70 mg of zinc oxide powder, 7.5 cm length of calcium hydroxide paste along with drops of 10% of sodium fluoride solution to achieve the desired consistency	3,6 Months
GROUP IV	Zinc oxide, Calcium Hydroxide & Aloe Vera Gel	Mixing ratio is 1:1:1	3,6 Months

TABLE 2: DISTRIBUTION OF TEETH ACCORDING TO PRESENTING SYMPTOMS (PREOPERATIVE)

Sign And Symptom	**Zinc Oxide Eugenol (N=15)**		**Zinc Oxide And Aloe Vera Gel (N=15)**		**Zinc Oxide, Calcium Hydroxide & 10% Sodium Flouride(N=15)**		**Zinc Oxide, Calcium Hydroxide And Aloe Vera(N=15)**		**Total (N=60)**	
	N	%	N	%	N	%	N	%	N	%
Tenderness on Percussion	10	66.7	9	60	8	53.3	6	40	33	55
Sinus	3	20	2	13.3	4	26.7	2	13.3	11	18.3
Pain	14	93.3	13	86.7	15	100	15	100	57	95
Swelling	2	13.3	2	13.3	3	20	2	13.3	9	15
Tooth mobility	1	6.7	2	13.3	2	13.3	2	13.3	7	11.7

*P-value≤0.05 is statistically significant difference between the groups

TABLE 3: DISTRIBUTION OF TEETH ACCORDING TO RADIOGRAPHIC FEATURES (PREOPERATIVE)

Sign And Symptom	**Zinc Oxide Eugenol (N=15)**		**Zinc Oxide And Aloe Vera Gel (N=15)**		**Zinc Oxide, Calcium Hydroxide & 10% Sodium Flouride(N=15)**		**Zinc Oxide, Calcium Hydroxide And Aloe Vera(N=15)**		**Total (N=60)**	
	N	%	N	%	N	%	N	%	N	%
Furcal radiolucency	14	93.3	12	80	14	93.3	14	93.3	55	91.7
Internal/ External Resorption	0	0	0	0	0	0	0	0	0	0

*P-value≤0.05 is statistically significant difference between the groups

TABLE 4: COMPARISON OF PREOPERATIVE AND POSTOPERATIVE TENDERNESS ON PERCUSSION IN DIFFERENT GROUPS

Sign And Symptom	Zinc Oxide Eugenol (N=15)		Zinc Oxide And Aloe Vera Gel (N=15)		Zinc Oxide, Calcium Hydroxide & 10% Sodium Flouride (N=15)		Zinc Oxide, Calcium Hydroxide And Aloe Vera (N=15)		Total (N=60)	
	N	%	N	%	N	%	N	%	N	%
Baseline	10	66.7	9	60	8	53.3	6	40	33	55
3 months	0^a	0	0^c	0	0^e	0	0^g	0	0	0
6 months	0^b	0	0^d	0	0^f	0	0^h	0	0	0

*P-value≤0.05 is statistically significant difference between the groups

^{a,b,c,d,e,f,g,h} P-value≤0.05 is statistically significant for preoperative with postoperative

TABLE 5: COMPARISON OF PREOPERATIVE AND POSTOPERATIVE SINUS IN DIFFERENT GROUPS

Sign And Symptom	Zinc Oxide Eugenol (N=15)		Zinc Oxide And Aloe Vera Gel (N=15)		Zinc Oxide, Calcium Hydroxide & 10% Sodium Flouride (N=15)		Zinc Oxide, Calcium Hydroxide And Aloe Vera (N=15)		Total (N=60)	
	N	%	N	%	N	%	N	%	N	%
Baseline	3	20	2	13.3	4	26.7	2	13.3	11	18.3
3 months	0	0	0	0	0^a	0	0	0	0	0
6 months	0	0	0	0	0^b	0	1	6.7	1	1.7

*P-value≤0.05 is statistically significant difference between the groups

^{a,b} P-value≤0.05 is statistically significant for preoperative with postoperative

TABLE 6: COMPARISON OF PREOPERATIVE AND POSTOPERATIVE PAIN IN DIFFERENT GROUPS

Sign And Symptom	Zinc Oxide Eugenol (N=15)		Zinc Oxide And Aloe Vera Gel (N=15)		Zinc Oxide, Calcium Hydroxide & 10% Sodium Flouride (N=15)		Zinc Oxide, Calcium Hydroxide And Aloe Vera (N=15)		Total (N=60)	
	N	%	N	%	N	%	N	%	N	%
Baseline	14	93.3	13	86.7	15	100	15	100	57	95
3 months	0^a	0	0^c	0	1^e	6.7	0^g	0	1	1.7
6 months	0^b	0	0^d	0	0^f	0	0^h	0	0	0

*P-value≤0.05 is statistically significant difference between the groups

^{a,b,c,d,e,f,g,h} P-value≤0.05 is statistically significant for preoperative with postoperative

TABLE 7: COMPARISON OF PREOPERATIVE AND POSTOPERATIVE SWELLING IN DIFFERENT GROUPS

Sign And Symptom	Zinc Oxide Eugenol (N=15)		Zinc Oxide And Aloe Vera Gel (N=15)		Zinc Oxide, Calcium Hydroxide & 10% Sodium Flouride(N=15)		Zinc Oxide, Calcium Hydroxide And Aloe Vera(N=15)		Total (N=60)	
	N	%	N	%	N	%	N	%	N	%
Baseline	2	13.3	2	13.3	3	20	2	13.3	9	15
3 months	0	0	0	0	0	0	0	0	0	0
6 months	0	0	0	0	0	0	0	0	0	0

*P-value≤0.05 is statistically significant difference between the groups

TABLE 8: COMPARISON OF PREOPERATIVE AND POSTOPERATIVE TOOTH MOBILITY IN DIFFERENT GROUPS

Sign And Symptom	Zinc Oxide Eugenol (N=15)		Zinc Oxide And Aloe Vera Gel (N=15)		Zinc Oxide, Calcium Hydroxide & 10% Sodium Flouride (N=15)		Zinc Oxide, Calcium Hydroxide And Aloe Vera (N=15)		Total (N=60)	
	N	%	N	%	N	%	N	%	N	%
Baseline	1	6.7	2	13.3	2	13.3	2	13.3	7	11.7
3 months	0	0	0	0	0	0	0	0	0	0
6 months	0	0	0	0	0	0	1	6.7	1	1.7

*P-value≤0.05 is statistically significant difference between the groups

TABLE 9: COMPARISON OF PREOPERATIVE AND POSTOPERATIVE CHANGE OF FURCAL RADIOLUCENCY IN DIFFERENT GROUPS

Sign And Symptom	Zinc Oxide Eugenol (N=15)		Zinc Oxide And Aloe Vera Gel (N=15)		Zinc Oxide, Calcium Hydroxide & 10% Sodium Flouride (N=15)		Zinc Oxide, Calcium Hydroxide And Aloe Vera (N=15)		Total (N=60)	
	N	%	N	%	N	%	N	%	N	%
3 months										
Same in size	5	33.3	5	33.3	4	26.7	7	46.6	22	36.7
Decrease in size	7	46.7	6	40	9	60	6	40	28	46.7
Increase in size	2	13.3	1	6.7	1	6.7	1	6.7	5	8.3
Developing Radiolucency	1	6.7	1	6.7	0	0	0	0	2	3.3
6 months	a		b		c		d			
Same in size	0	0	0	0	0	0	0	0	0	0
Decrease in size	12	80	11	73.3	13	86.7	13	86.7	49	81.7
Increase in size	2	13.3	1	6.7	1	6.7	1	6.7	5	8.3
Developing Radiolucency	1	6.7	1	6.7	0	0	0	0	2	3.3

*P-value≤0.05 is statistically significant difference between the groups

[a,b,c,d] P-value≤0.05 is statistically significant for 3 months with 6 months

TABLE 10: COMPARISON OF PREOPERATIVE AND POSTOPERATIVE INTERNAL/EXTERNAL RESORPTION IN DIFFERENT GROUPS

Sign And Symptom	Zinc Oxide Eugenol (N=15)		Zinc Oxide And Aloe Vera Gel (N=15)		Zinc Oxide, Calcium Hydroxide & 10% Sodium Flouride (N=15)		Zinc Oxide, Calcium Hydroxide And Aloe Vera (N=15)		Total (N=60)	
	N	%	N	%	N	%	N	%	N	%
Baseline	0	0	0	0	0	0	0	0	0	0
3 months	0	0	1	6.7	0	0	0	0	1	1.7
6 months	0	0	1	6.7	0	0	0	0	1	1.7

*P-value≤0.05 is statistically significant difference between the groups

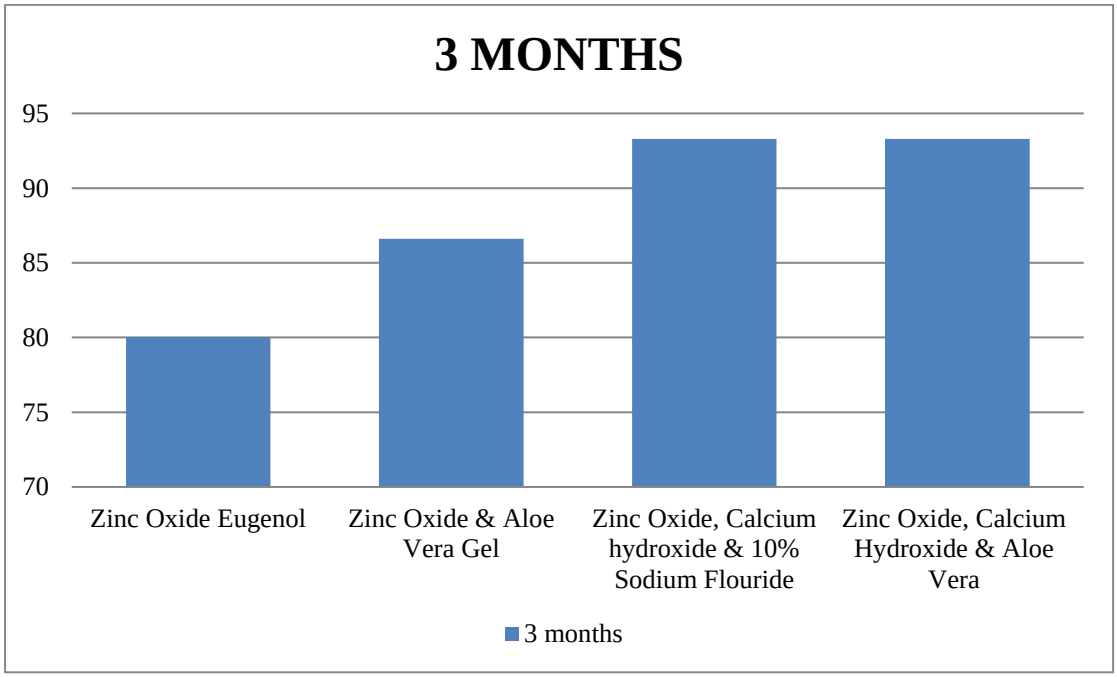
TABLE 11: OVERALL SUCCESS RATE OF THE TREATMENT AT 3, 6 MONTHS

Sign And Symptom	Zinc Oxide Eugenol (N=15)		Zinc Oxide And Aloe Vera Gel (N=15)		Zinc Oxide, Calcium Hydroxide & 10% Sodium Flouride (N=15)		Zinc Oxide, Calcium Hydroxide And Aloe Vera (N=15)		Total (N=60)	
	N	%	N	%	N	%	N	%	N	%
3 months	12	80	13	86.7	14	93.3	14	93.3	53	88.3
6 months	12	80	13	86.7	14	93.3	14	93.3	53	88.3

*P-value≤0.05 is statistically significant difference between the groups

GRAPHS:

GRAPH 1: OVERALL SUCCESS RATE AT 3 MONTHS



GRAPH 2: OVERALL SUCCESS AT 6 MONTHS