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Pulpitis Treatment in Primary Teeth Via Biodentine, Metapex and Zinc Oxide Eugenol

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Abstract:- This study is a case study and non-experimental observational study based on individual case reports of pulpitis in primary teeth. The study I engaged in focusing on treatment via particular types of filling materials. Diagnosis was taken by patient history anamnesis, clinical and paraclinical examination. In this case study, the treatment was done in two types, pulpotomy and pulpectomy. Three types of material were used: Metapex, Zinc Oxide Eugenol and Biodentine. The patients came to assessment after 6 months and were evaluated for clinical and radiological failure.

- ***Aim***

Based on current research and clinical cases, the study aims to assess and investigate the depth, validity and advancement of pedodontics in the area of dental pulpitis in primary teeth.

Keywords:- *Pulpitis, Primary Teeth, Irreversible Pulpitis, Pulpotomy, Pulpectomy, Biodentine, Metapex, Zinc Oxide Eugenol.*

I. INTRODUCTION

The most common chronic condition affecting children that has a detrimental influence on their quality of life is dental caries in primary teeth. [1] Primary teeth are commonly impacted by extensive tooth decay, which is the most prevalent disease in this group of teeth. Approximately 42% of children between the ages of 2 and 11 years old have dental cavities in their primary teeth, averaging 1.6 decayed teeth per child. Sadly, most dental caries in children go untreated. Furthermore, decay in primary teeth elevates the likelihood of decay in permanent teeth.[2] When caries reach the pulp, it can result in symptoms such as spontaneous pain, especially at night, pain upon biting, swelling within the mouth, or the formation of a sinus tract. [4] There are different classifications of pulpitis in primary teeth, including reversible and irreversible, acute and chronic. Inflammation can easily spread from the coronal to the radicular pulp, affecting the formation of the periodontal apparatus and the tooth's growth zone. [3]

The type of pulp therapy depends on the diagnosis and indications, which can be achieved through a combination of clinical evaluation, dental and medical history, examination of oral and extra-oral signs, radiographic examination, and pulp sensitivity testing. Clinical diagnosis can determine whether the pulpitis is reversible or irreversible and is based on factors such as pain intensity, location, duration, and relief or aggravation. The correct diagnosis also takes into account the sensibility of the pulp and surrounding periapical, furcation, and crown areas, as well as the status of the adjacent bone in permanent teeth with closed apices. These factors are crucial for determining the correct diagnosis and treatment prognosis.[11]

Pulp interventions are a combination of a pulp treatment method and a medicament. The goal of these interventions is to preserve the health of the tooth and its supporting tissues. Depending on the extent of the disease, three pulp treatment methods are available: direct pulp capping, pulpotomy, and pulpectomy. In direct pulp capping, a therapeutic substance is placed directly on the exposed pulp, pulpotomy, which involves removing a portion of the pulp, pulpectomy, which entails removing all of the pulp in the pulp chamber and root canal of the tooth. These treatments involve removing the caries and a portion of the pulp tissue, followed by the application of medicaments. This approach helps to maintain the temporary integrity of the tooth. [2] Endodontic treatment is one method to save primary teeth until exfoliation when more advanced caries lesions reach the pulp-dentin complex and cause pulp necrosis. [1] The ultimate objective of endodontic treatment in pediatric dentistry is to preserve primary teeth in the child's oral cavity while eliminating any signs or symptoms.[6] The majority of non-vital pulp treatment methods for primary teeth involve instrumenting and filing the root canals with resorbable materials. [1]

The most often used materials are zinc oxide eugenol paste, calcium hydroxide, and iodoform paste. [1] The use of innovative and advanced materials to produce hard tissue and preserve pulp vitality is becoming more and more popular. Progressive new materials have been created by dental researchers in order to provide the best care for the patients. [7]

A. BIODENTINE

Biodentine has high mechanical qualities, good sealing ability with dentine, and biocompatibility similar to those of MTA, which can be used in direct contact with the pulpal tissue. It met all the physiognomies of the ideal restorative material, including having good physical and mechanical qualities, technical aspects from the dentist's point of view, patient acceptability, and other clinical features that contributed to the material's effectiveness.[8,9] In the circumstance that the odontoblastic layer is only partially impaired, biodentine may accelerate pulp healing and restoration. [10]

B. METAPEX

Metapex (Metapex, Meta Dental, New York, USA) and Vitapex (Neo Dental Chemical Products Co., Ltd., Tokyo, Japan), which are a combination of calcium hydroxide and

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iodoform, are another alternative for easy application in primary teeth pulpectomy. Studies have shown that this material has a favorable rate of resorption, reduced void formation, and satisfactory radiographic and clinical outcomes. However, it has been observed that this combination may not have a potent antimicrobial activity, which may be due to the strong inhibitory effect of dentin. Another iodoform-based paste containing calcium hydroxide, Endoflas F.S.(Sanlor and Cia. S. en C.S., Columbia, South America), has also been reported to have high clinical success rates.[5]

C. ZOE

Zinc oxide eugenol (ZOE) paste has been the traditional and widely accepted root canal filling material for primary teeth since its introduction in 1930. Studies have reported moderate to high success rates with ZOE paste, with over 90% success reported. However, it has some disadvantages such as the difference in rate of resorption compared to that of the root, risk of deflection of the erupting successor teeth especially in cases of overfill, and concerns about its antimicrobial activity which may become limited after the material is set.[4,5]

II. MATERIALS AND METHOD OF RESEARCH

A. Method of the research

This study is a case study and non-experimental observational study based on individual case reports of pulpitis in primary teeth. The study I engaged in focusing on treatment via particular types of filling materials. Diagnosis was taken by patient history anamnesis, clinical and paraclinical examination. In this case study, the treatment was done in two types, pulpotomy and pulpectomy. Three types of material were used: Metapex, Zinc Oxide Eugenol and Biodentine. The patients came to assessment after 6 months and were evaluated for clinical and radiological failure. In this case study 17 kids between the ages of 3 and 6 years old were examined, diagnosed and treated with pulpitis at the Public Health Institution of Mother and Child Polyclinic and in a private dental pediatric clinic “Dr. Romaniuc- clinica stomatologica", in Chisinau, Republic of Moldova, supervised by Dr. Nina Shevchenko and Dr. Manar Shawdary from November 2022 to January 2023. Out of 17 patients; 9 of them were males and 8 were females (Table 1). All patients selected for this study were affected by chronic (irreversible or necrosed) pulpitis, without any pathological root resorption or periapical process on the radiographic picture. The children displayed symptoms such as dull pain that lasted for about an hour, as well as times when there was no pain but the parents recognized the child having a sharp, severe pain a few weeks prior. Not all of the patients responded to thermal tests. Due to poor oral hygiene and lack of skills to deal with an uncooperative child by the parents results in the patient's poor overall oral health. A dental plaque coating was seen on the majority of the individuals, plaque and bacteria carried out to untreated caries that eventually led to pulpitis.

Material used	Number of patients of the study
Biodentine	6 cases (35.3%) 2 male cases(33.3%), 4 female case (66.6%)
Metapex	5 cases (29.4%) 3 male cases(60%), 2 female cases (40%)
ZOE	6 cases (35.3%) 4 male cases(66.6%), 2 female cases (33.3%)

Table 1: Cases count per materials treated in pulpitis in primary teeth

Evaluation of efficiency of the material treatment of pulpitis in primary dentition took place by the cooperation of the patients and their parents. The patients were examined and diagnosed thoroughly by history anamnesis, clinical picture and paraclinical picture as panoramic x-ray, bitewing x-ray or periapical x-ray with chronic irreversible pulpitis and without evidence of radiologic pathology of bone or pathological root resorption . Subsequently, treatment is done with one of the three different materials that are used in the study. Treatment for pulpotomy was done with Biodentine, and treatment for pulpectomy was done with either Metapex or ZOE by randomization (Figure 1). X-ray pictures are taken before and after treatment. After 6 months the patient returns, evaluation of the clinical and paraclinical examinations are taken and the presence of clinical failure and radiological failure is checked.

The search engine was done with PubMed, Google Scholar, Wiley Library and Cochrane Library for scientific article keywords: pulpitis in primary teeth, pulpectomy, pulpotomy.

B. Patient examination and diagnosis

In this study, all patients were welcomed to the dental office and underwent data collection, medical history and anamnesis to facilitate accurate diagnosis. The patient’s parents participating in the study reported no history of congenital or hereditary chronic conditions of the child. The patients and their parents were asked questions regarding the infected tooth:

- Is pain present? If yes, defines the pain, does it persist when the stimulus is removed?
- What triggers the pain.
- How often, how bad and how long?
- Do you experience any fever or swelling?

- Were medications used, if yes, which?

During the clinical examination, an exobuccal inspection and palpation was performed to assess any pathological features such as color asymmetry of the face and presence of any enlarged, tender or mobile lymph nodes. No extraoral pathological signs were found in all patients. An intraoral examination was conducted to inspect for any abnormalities in color, lesions, or tooth cavities. Probing was done to evaluate tooth hardness and the depth and softness of the cavity. The probe handle was used for percussion to determine pain in the horizontal plane. Tooth mobility was evaluated through palpation. Lastly, a thermal test was performed using ethyl chloride gas applied on a small cotton roll on the tooth crown to observe the reaction. In acute pulpitis, there will be severe pain that takes longer to subside, while in chronic pulpitis the reaction will be mild or absent in the case of pulp necrosis. A normal reaction is a brief sensation without pain. Paraclinical examination was taken to confirm the pulpitis diagnosis and to make sure there is no pathological periapical process or pathological root resorption of the affected tooth.

C. Materials used in the Research

The treatment of the infected tooth was carried out after a proper diagnosis was made. To minimise any potential discomfort or pain for the patient, topical and injectable anaesthesia were administered. In all cases, infiltrative anaesthesia was utilised. Benzocaine 20% gel applied topically to the gingival area surrounding the tooth in the future injection site. The injectable infiltrative anaesthesia, consisting of articaine 4% with adrenaline 1:100,000 by Septodont , was then administered via a 30G diameter and 25mm length needle from the buccal, lingual, and interdental directions. The patient was given time for the anaesthetic to take effect. Isolation of the prepared tooth was achieved through either rubber dam or cotton rolls, based on the patient's level of cooperation. The affected tissue was then removed using low speed round bur and excavator, and any smoothing of the walls was completed with high speed spear or conical shape burs. Access to the pulp chamber was gained after removal of all affected soft tissue, any remaining tissue was removed using low speed instruments. Anticoagulant solutions and materials, such as Astringedent (15.5% Ferric Sulfate) by Ultradent, were used as necessary, and an anticoagulative sponge was employed if bleeding persisted. Irrigation was performed using chlorhexidine 2% by TehnoDent with an Ultra max Ultrasonic root canal cleaning device by Denco. In pulpectomy cases, canal irrigation was also done with the same solution and device. Rotatory canal NiTi kids files by Decno were utilised exclusively for pulpectomy procedures. For pulpotomy, the pulp cavity was dried and filled with Biodentine by Septodont. The Biodentine capsule was opened, 5 drops of the liquid were added, the capsule was closed and mixed in an amalgamator for 30 seconds 4200 RPM in a triturator to achieve a putty-like consistency. The biodentine was then applied with an applicator in the pulp chamber. In pulpectomy cases, the canal was dried with absorbent paper points Wave one Gold by Dentsply and filled with either Metapex by Meta-Biomed or Zinc Oxide Eugenol with a lentula. The Metapex was distributed on a mixing tray and spread on the lentula. Meanwhile, the ZOE was blended in a 1:1 ratio of zinc oxide powder and eugenol liquid, on the mixing tray and then placed on the lentula. After filling the pulp cavity, restoration was applied. In cases of ZOE, Glass Ionomer Cement (GIC) was utilised due to eugenol's inhibiting effect on composite polymerization. GIC Fuji IX by GC (Figure 25) was mixed with a 1:1 ratio of liquid and powder and applied to the dried cavity on top of the ZOE. For Biodentine and Metapex, most cases utilised only the compomer. Etching applied with 37% phosphoric acid semi-gel for 10 seconds, then thoroughly rinsed and dried. The bonding material, Prime&Bond by Dentsply Sirona, was applied and cured with a light cure lamp. The compomer Dyract eXtra by Dentsply Sirona was then layered on and polymerized with the same light cure lamp. In some instances where the patient was less cooperative, GIC was used to fill the cavity in the same manner as in ZOE. The occlusion was checked via articulating paper blue 40miu, polished and corrected with a high speed handpiece and olive and spear burs, final polishing was completed with silicone polishers and contour discs. At the six-month follow-up appointment, the patient presented for evaluation of potential clinical or radiological failure in the treated primary tooth. Clinical failure was determined by assessing the presence of pain or discomfort, swelling, and discoloration. Radiological failure was assessed through the use of radiographs, which were examined for evidence of periapical radiolucency and widening of the periodontal ligament space, as well as pathological root resorption.

III. CASES

A. Case 1 - Pulpotomy with Biodentine

➢ *Patient present*
- Four year old and two months
- Female

➢ *Chief Complaint*
- The mother reported that the child experienced severe pain during the night, causing them to wake up 10 days prior.
- Pain description
- ✓ Three days of pain without any history of fever or swelling, no medication was used
- ✓ Pain is triggered while eating cold or sweat and lasts a couple minutes.

➢ *Social History*
- Youngest of three children
- Lower socioeconomic status

➢ *Medical History*
- Review of the medical history showed no congenital or hereditary conditions, no reported allergies to drugs or foods, no current medication use, and that all vaccinations were up to date.

➢ *Dental History*
- Been to a dentist in the past

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- Poor oral hygiene
- A diet low in protein and high in carbohydrates
- The use of toothpaste that contains fluoride
- Adequate water fluoridation levels
- No reported history of dental injury.

➢ *Extraoral Examination*
- No notable results

➢ *Intraoral Examination*
- Soft tissue
- ✓ No notable results
- Dental and Hard tissue
- ✓ Complete primary dentition
- ✓ Moderate plaque buildup was found.
- ✓ Several teeth displayed advanced cavities.

➢ *Diagnosis Tools*
- Two bitewing x-ray was taken
- Thermal test with ethyl chloride gas patient described throbbing, shooting pain that lasted several minutes

➢ *Differential Diagnosis*
- Deep caries
- Acute reversible pulpitis

➢ *Diagnosis*
- Based on the patient's history of pain, clinical examination, and radiographic results, is a deep cavity with irreversible pulpitis on tooth 74
- Extensive cavities present in other primary teeth.

➢ *Issues*
- Multiple untreated cavities
- Elevated risk of tooth decay due to various causes such as a diet rich in tooth-decaying substances, inadequate oral hygiene with significant plaque buildup
- Young child with low cooperation, who requires significant treatment for many teeth.

➢ *Treatment Plan*
- Explanation to the child's mother about the significance of preserving the first primary molar, particularly before the eruption of the first permanent molar for maintaining proper spacing.
- Thorough treatment of all other cavities.
- Aftercare that includes: Instructions for postoperative care and oral hygiene at home. Prevention plan to avoid future decay. Schedule for future dental check-ups

➢ *Treatment*
- Anaesthesia - topical and infiltrative (articaine 4% with adrenaline 1:100,000)
- Isolation - cotton rolls
- Preparation - low speed round bur, excavator and high speed with conical bur.
- Anticoagulant - Astringedent (15.5% Ferric Sulfate) by Ultradent
- Irrigation of the cavity - chlorhexidine 2% by TehnoDent with an Ultra max Ultrasonic root canal cleaning device by Denco (Figure 1).
- Pulp cavity filled with Biodentine by Septodont
- Restoration - 37% phosphoric acid semi-gel etching for 10 seconds, rinsed and dried, bonding material was applied with an applicator, light cured and compomer was placed in diagonal layers and light cured in each layer.
- Correcting and polishing - the bite was evaluated using an articulator, and adjustments were made using olive and spear burs. The surfaces were then smoothed with a contour disc and a silicone conical polisher. (Figure 2)(Figure 3)


Fig. 1: Pulpotomy


Fig. 2: Final result


Fig. 3: X-ray Final result

➢ *Evaluation After 6 Months*
- The clinical examination revealed no signs of failure, with the treated tooth being free of pain, discomfort, swelling, or discoloration.
- The radiographic results showed no signs of radiological failure, with no observable periapical changes, including

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no radiolucency or alterations in the periodontal ligament space.

B. Case 2 - Pulpectomy with Metapex

➢ *Patient present*
- Three year old and ten months
- Female

➢ *Chief Complaint*
- The mother reported that the child experienced pain last week and currently constantly bothered by tooth on the lower jaw
- Pain description

✓ Pain to hot, cold or sweat and lasts for multiple minutes.

➢ *Social History*
- Only child
- Middle class

➢ *Medical History*
- An examination of the patient's medical history revealed no evidence of congenital or hereditary disorders, no reported sensitivities to drugs or food, no current medication intake, and that all vaccinations were current and up-to-date.

➢ *Dental History*
- Previous dental visit
- Poor oral hygiene practices
- Low protein, high carbohydrate diet
- Use of fluoride-containing toothpaste
- Adequate water fluoridation
- No history of dental injury reported

➢ *Extraoral Examination*
- No notable results

➢ *Intraoral examination*
- Soft tissue

✓ No notable results
- Dental and Hard tissue

✓ Complete primary dentition
✓ Moderate plaque buildup was found.
✓ Several teeth displayed advanced cavities.

➢ *Diagnosis Tools*
- OPG x-ray was taken
- Thermal test with ethyl chloride gas patient described sharp pain that lasted several minutes

➢ *Differential diagnosis*
- Deep caries
- Acute reversible pulpitis

➢ *Diagnosis*
- The patient's history of pain, clinical examination (Figure 4), and radiographic results (Figure 5) indicate the presence of a deep cavity near the root of tooth 84 with irreversible pulpitis, and moderate tooth decay on tooth 85.
- Cavities present in other primary teeth.


Fig. 4: Clinical picture

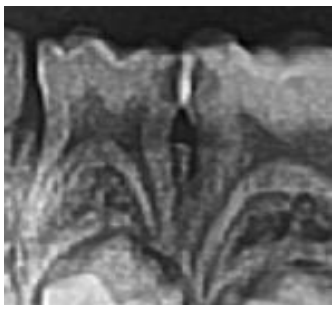
Fig. 5: X-ray picture

➢ *Issues*
- Multiple untreated dental cavities
- Risk of tooth decay is heightened due to various reasons, including a diet high in tooth-decaying substances and poor oral hygiene resulting in significant plaque accumulation.

➢ *Treatment plan*
- Explanation to the child's mother regarding the importance of preserving the first primary molar, especially before the emergence of the first permanent molar, to ensure proper spacing.
- Comprehensive treatment for all other dental caries..
- Postoperative care plan that includes the following: home oral hygiene instructions, plan to prevent future decay and schedule for future dental appointments and check-ups.

➢ *Treatment*
- Anaesthesia - topical and infiltrative (articaine 4% with adrenaline 1:100,000)
- Isolation - rubber dam, medium thickness with a clasp and safely wire
- Preparation - low speed round bur, excavator and high speed with spear bur.
- Anticoagulant - 15.5% Ferric Sulfate and coagulating sponge
- Irrigation- chlorhexidine 2% by TehnoDent with an Ultra max Ultrasonic root canal cleaning device by Denco
- Canal preparation - Rotatory canal NiTi kids files by Decno (Figure 6)
- Canal filling - Canal dried with paper point and filler with Metapex using a lentula.

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- Restoration - 37% phosphoric acid semi-gel etching for 10 seconds, rinsed and dried, bonding material was applied with an applicator, light cured and compomer was placed in diagonal layers and light cured in each layer.
- Correcting and polishing - the bite was evaluated using an articulator, and adjustments were made using olive and spear burs. The surfaces were then smoothed with a contour disc and a silicone conical polisher. (Figure 7)
- X-ray - periapical x-ray was done to evaluate the results (Figure 8)

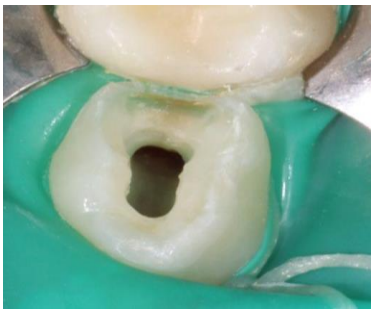
Fig. 6: Pulpectomy

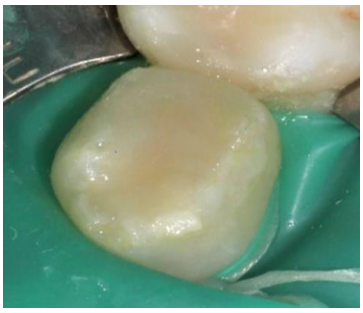
Fig. 7: Final result


Fig. 8: X-ray Final result

➢ *Evaluation after 6 months*
- No signs of clinical failure were observed, as the affected tooth was free of pain, discomfort, swelling, and discoloration.
- The radiographs revealed the absence of radiological failure, with no periapical changes observed, such as radiolucency or changes in the periodontal ligament space.

C. Case 3 - Pulpectomy with Zinc Oxide Eugenol

➢ *Patient Present*
- Six year old and seven months
- Female

➢ *Chief Complaint*
- The mother came with a child for yearly dental check up - child has no complain

➢ *Social History*
- First child of two
- Middle class

➢ *Medical History*
- A review of the patient's medical history uncovered no indications of congenital or hereditary conditions, no reported sensitivities to drugs or food, no current medications being taken, and all required vaccinations were current and up-to-date.

➢ *Dental History*
- Previous dental appointment
- Inadequate oral hygiene practices
- Low protein, high carbohydrate diet
- Use of fluoride-containing toothpaste
- Adequate water fluoridation levels
- No history of dental trauma reported.

➢ *Extra oral Examination*
- No notable results

➢ *Intraoral Examination*
- Soft tissue
- ✓ No notable results
- Dental and Hard tissue
- ✓ Complete primary dentition
- ✓ Sever plaque buildup was found.
- ✓ Several teeth displayed advanced cavities.

➢ *Diagnosis Tools*
- OPG x-ray was taken
- Thermal test with ethyl chloride gas had signs for pain or discomfort of the patient

➢ *Differential Diagnosis*
- Deep caries
- Acute reversible pulpitis

➢ *Diagnosis*
- The patient's pain history, clinical examination (Figure 9), and radiographic results (Figure 10) indicate the presence of a deep cavity near the root of tooth 84 with irreversible pulpitis, and deep tooth decay on tooth 85.
- Cavities present in other primary teeth.


Fig. 9: Clinical picture of teeth 84

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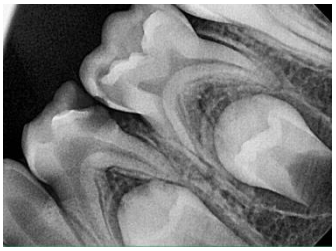

Fig. 10: X-ray of teeth 84, 85

➢ *Issues*

- Multiple unaddressed dental cavities
- Increased susceptibility to dental caries due to multiple etiologies, including consumption of a diet containing high amounts of substances detrimental to dental health, and the presence of inadequate oral hygiene practices resulting in substantial plaque accumulation.

➢ *Treatment Plan*

- Education provided to the parent of the child regarding the importance of conserving the first primary molar, especially prior to the emergence of the first permanent molar, in order to sustain appropriate spacing.
- Complete treatment of all other dental caries.
- Postoperative care instructions, oral hygiene measures to be followed at home, and a plan for future decay prevention were part of the aftercare regimen, along with a schedule for future dental examinations.

➢ *Treatment*

- Anaesthesia - topical and infiltrative (articaine 4% with adrenaline 1:100,000)
- Isolation - cotton rolls
- Preparation - low speed round bur, excavator and high speed with spear bur.
- Irrigation- chlorhexidine 2% by TehnoDent with an Ultra max Ultrasonic root canal cleaning device by Denco
- Canal preparation - Rotatory canal NiTi kids files by Decno
- Canal filling - Canal dried with paper point and filler with ZOE using a lentula.
- Restoration - GIC is mixed and applied on the cavity .
- Correcting and polishing - the bite was evaluated using an articulator, and adjustments were made using olive and spear burs. The surfaces were then smoothed with a contour disc and a silicone conical polisher. (Figure 11)
- X-ray - periapical x-ray was done to evaluate the results (Figure 12)

Fig. 11: Clinical Final result

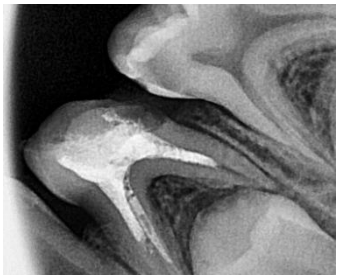

Fig. 12: X-ray final result

➢ *Evaluation After 6 Months*

- The absence of clinical failure was confirmed, with no symptoms of pain, discomfort, swelling, or discoloration in the treated tooth.
- Radiographs indicated the absence of radiological failure, with no evidence of periapical changes, including radiolucency or changes in the periodontal ligament space.

IV. OWN RESULTS AND DISCUSSIONS

Results of the research In this study, evaluating the efficacy of various endodontic treatment materials (Table 2), it was found that Biodentine was an effective material for pulpotomy, as evidenced by the absence of clinical or radiological failure in all six teeth at 6 months follow-up visits. Similarly, Metapex was found to be an effective material for pulpectomy, as there were no reports of clinical failure, or radiological failure in any of the five patients at 6 months follow-up visits. Treatment with ZOE for pulpectomy also resulted in no pathological signs in the clinical evaluation of all teeth. However, one radiological failure was observed among the six teeth treated with ZOE.

Interpretation of data from literature A randomised control study review conducted by Cochrane Oral Health, consisting of 87 trials that investigated pulp treatment success in primary teeth, concluded that the comparison between Metapex and Zinc Oxide and Eugenol (ZOE) paste was inconclusive, with no clear evidence of a difference between the two treatments in terms of failure at 6 or 12 months, as determined by both clinical and radiological evaluations (Smaïl-Faugeron et al. 2018).[2] However, my trial indicated that ZOE indicated radiological failure, while Metapex did not. The comprehensive review also found that Biodentine treatment resulted in no statistically significant clinical failure or pain at six and twelve months [2], which is in line with the findings of my trial.

A. Own Opinion

Based on the results of my study and the information gathered from the literature, it can be concluded that all three materials, Biodentine, Metapex, and Zinc Oxide and Eugenol (ZOE), are effective in pulpotomy and pulpectomy treatments for primary teeth. Biodentine showed to be an effective material with no clinical or radiological failures in all teeth at 6 months follow-up. This is supported by the comprehensive review conducted by Cochrane Oral Health, which found no statistically significant clinical failure or pain in the use of Biodentine at 6 and 12 months. Metapex was also found to be effective in my study, with no reports of clinical or radiological failure in the patients. The review conducted by Cochrane Oral Health concluded that the comparison between Metapex and ZOE was inconclusive, with no clear evidence of a difference between the two treatments in terms of failure at 6 or 12 months. ZOE paste, although effective in the clinical evaluation of all teeth in my study, indicated one radiological failure among the six treated teeth. The review conducted by Cochrane Oral Health also found the comparison between Metapex and ZOE to be inconclusive, with no clear evidence of a difference between the two treatments in terms of failure. However, it is worth mentioning that ZOE is relatively cheaper compared to the other two materials.

		Biodentine	Metapex	ZOE
Base (n = 17)		n = 6	n = 5	n = 6
6 months follow up (n = 17)		n = 6	n = 5	n = 6
Clinical finding				
	Success	6 (100%)	5 (100%)	6 (100%)
	Failure	0	0	0
Radiographic finding				
	Success	6 (100%)	5 (100%)	5 (83.3%)
	Failure	0	0	1 (16.67%)

Table 2: Clinical and Radiological success (S) and failure (F) rates for Biodentine pulpotomies , Metapex pulpectomy and ZOE pulpectomy at 6 months of follow-up

V. CONCLUSION

In conclusion, all three materials have their benefits and limitations and the choice of material may depend on various factors such as cost, availability, and personal preferences. As a dental practitioner, it is important to consider the individual needs of each patient and make an informed decision based on the available evidence.

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