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Root Canal Filling Materials For Deciduous Teeth

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Introduction

Widespread use of pulp therapy to avoid deciduous tooth loss in children. The consequences of dental caries-induced loss of deciduous teeth include arch length reduction & insufficient space for the insertion of permanent teeth. Pulp therapy is primarily intended to eliminate microorganisms from root canals in order to avert their subsequent infection. Mechanical cleansing and rinsing of root canals in deciduous molars is challenging due to their intricate morphology. **[1]**

Over the years, numerous substances have been suggested, involving zinc oxide eugenol by itself or in combination with formocresol, iodoform, and camphorated phenol. Additionally, calcium hydroxide, iodoform, otherwi[1]se a combination of the two have been proposed as paste components.**[2]**

Zinc oxide eugenol (ZOE) cement, which is composed of eugenol (liquid) and zinc oxide (powder), was the most widely used infill material until recently. It can cause deviation of the permanent tooth bud, irritate periapical tissues, & solidify into a dense mass that is resistant to resorption**.[3]**

Iodoform-containing oil-based calcium hydroxide pastes, such as CalPlus (DenPro, Prevest, USA), have been recommended as filling materials for primary teeth on account of their restorative and antibacterial properties, as well as their user-friendly composition **[4].** As opposed to conventional filling materials (ZOE), this product has already been dosing and mixinged. There is no need for any manual blending process. Potential intra-canal & external resorption is their primary drawback; such resorption may ultimately result in failure.**[5]**

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The increasing popularity of bioceramics & other novel endodontic cement varieties can be attributed to their advantageous physicochemical & biological characteristics, which include resistance to alkaline pH, non-shrinking nature, chemical stability in biological environments, biocompatibility, & bioactivity. Calcium silicate materials make up the majority of bioceramics, which are an alternative to the conventional calcium hydroxide. **[6]**

Permanent teeth utilize these bioactive materials for a variety of purposes, including pulpotomy, pulp capping, resorption, perforation repair, and root canal filling. Recently, they have also gained support in the field of pediatric dentistry. For primary teeth, Bio-C Pulpecto (Bio-CP) (Angelus, Basil, Londrina, Paraná, Brazil) is the first resorbable bioceramic filling material. Calcium silicate, toluene sulphonamide, calcium tungstate, sulfuric acid ester glycol, and titanium oxide comprise its composition. **[7]**

Methods

Ascoping review approach was used to review articles from PubMed, EBSCOhost, and Google Scholar that met the following criteria:

1. Articles that discuss root canal filler materials utilized in pulpectomy therapy for primary teeth.

2. Articles that elaborate on the usefulness of root canal filling materials in the treatment of pulpectomy of primary teeth.

3. Articles published in the last ten years.

4. Accessible full-text articles.

5. Articles in English and Indonesian.

This scoping review began with a literature search strategy, followed by the determination of inclusion and exclusion criteria, proceeded by screening, and choosing studies using PRISMA-ScR, and lastly, data extraction. The electronic databases PubMed, EBSCOhost, & Google Scholar were searched. The search strategy was conducted based on each database used to identify relevant articles using the AND and OR Boolean operators as well as the limit function of each database if it was available. The study search was carried out by following the PRISMA-ScR flowchart (Preferred Reporting Items for Systematic Reviews & Meta-Analyses Extension for Scoping Review). The first phase entails screening articles based on their titles. The abstract screening will be the next step. Articles that are relevant to the abstract will be included. The full-text version of the article would choose. For a full-text

feasibility aspect screening, full-text articles that can be accessible would be sought and read in- depth. A search on PubMed revealed 89 articles, a search on EBSCO host yielded 137 articles, and a search on Google Scholar got 442 articles. There were duplication checks performed, resulting in the collection of 618 items. The first screening was done by reading the title and abstract. 604 papers were selected because they were irrelevant and did not match the inclusion requirements; 14 articles were then

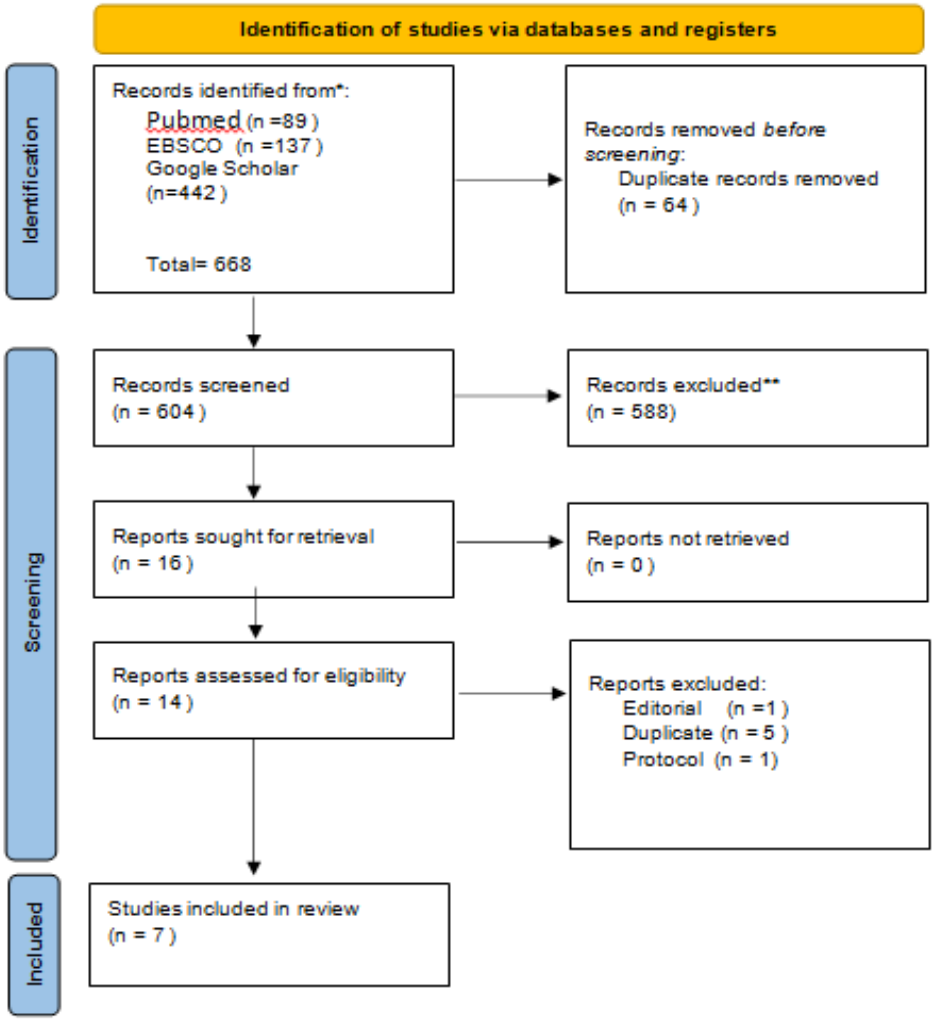
retrieved for additional screening. The second screening involved reading the full text for its content. Seven articles were chosen for screening, and seven articles were subsequently obtained for review.

Data synthesis

In our meta-analysis, we utilized the inverse variance approach specifically for continuous outcomes. This method involved pooling of the mean differences (M.D.) between the two groups alongside their respective standard deviations (S.D.). Conversely, In the double-arm meta-analysis, categorical outcomes were combined into a relative risk (R.R.) among both groups under comparison, accompanied by ninety-five percent of the confidence interval (C.I.). Conversely, in the single-arm meta-analysis, the mean alterations (M.C.s) for continuously evaluated results were pooled, along with their respective ninety-five percent confidence intervals (C.I.s). In proportions with ninety-five percent confidence intervals, categorical outcomes were summed. Prior to applying the random effect model, the model with a fixed effect was utilized when the effect estimate was derived from a collection of homogeneous studies. The I2 statistics chi2 test was employed to examine the statistical heterogeneity among studies. A chi2-p-value greater than 0.1 indicated heterogeneity, whereas an I2-value of less than or equal to fifty percent suggested substantial heterogeneity. For meta-analysis, version 5.4 of the Review Manager software (RevMan) was utilized.

Results:

Literature search results:



Characteristics of the included studies:

In clinical investigations, the randomization unit was either the individual's body otherwise the tooth. Certain studies failed to identify the randomization unit; these are characteristics of the studies that were involved in the summary.

Table 1

Author	**age**	**Sample size**	**Follow up duration**
Al-Ostwani et al., 2016	**3 to 9**	**39**	**6 and 12 months**
Cassol et al., 2019	**2 to 7**	**23**	**6,9 and 12 months**
Chen et al., 2017	**5.88**	**155**	**6, 12 and 18 months**
Goel et al., 2018	**4 to 9**	**120**	**3,6,9 and 12 months**
Ozalp et al., 2005	**3 to 9**	**76**	**2,4,6,8,10 and 12**
Reddy and Fernandes, 1996	**3 to 8**	**26**	**3,6 and 9 months**

Rewal et al., 2014	**4 to 9**	**50**	**3,6 and 9 months**

Meta-analysis results:

Clinical evaluation

During the six-month clinical evaluation, iodoform-based infill materials exhibited a marked reduction in failures with pooled RR and 95% CI=0.32[0.11,0.97], p-value=0.04 the pooled studies for this outcome were homogenous with chi-p 0.73 and I^2 0%. **Figure 1.** presents the forest plot for clinical evaluation at six months.

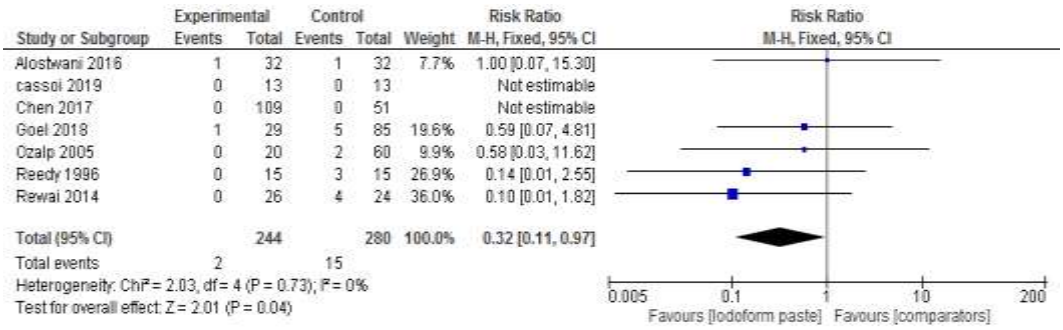


Figure 1. forest tract for six-month clinical evaluation.

Filling materials based on iodoform were assessed in a clinical setting demonstrated insignificant differences when compared to other materials at the 12 months with pooled RR and 95% CI=0.56[0.25,1.27], p-value=0.17 the pooled studies for this outcome were heterogenous with chi-p 0.1 and I^2 48%. **Figure 2.** presents the forest plot for clinical evaluation at 12 months.

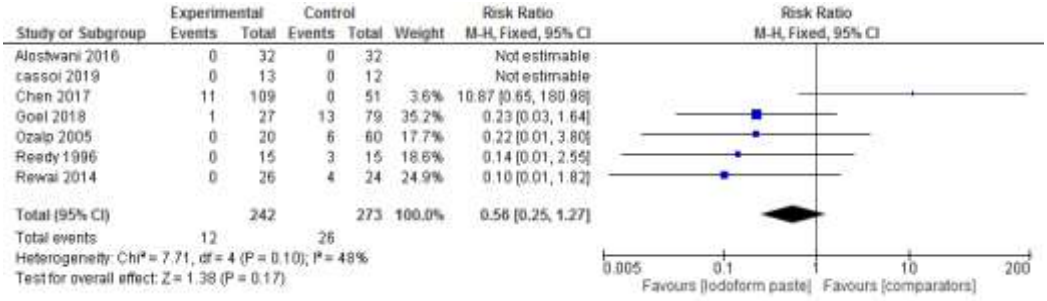


Figure 2. forest plot for clinical assessment at 12 months.

In the clinical evaluation, iodoform-based filling materials was insignificantly different when compared to other materials at the 18 and 30 months with pooled RR and 95% CI=1.01[0.12,8.32], p-value=0.99 the pooled studies for this outcome were heterogenous with

chi-p 0.14 and I^2 55%. **Figure 3.** depicts the forest plot for clinical evaluation at 18 to 30 months.

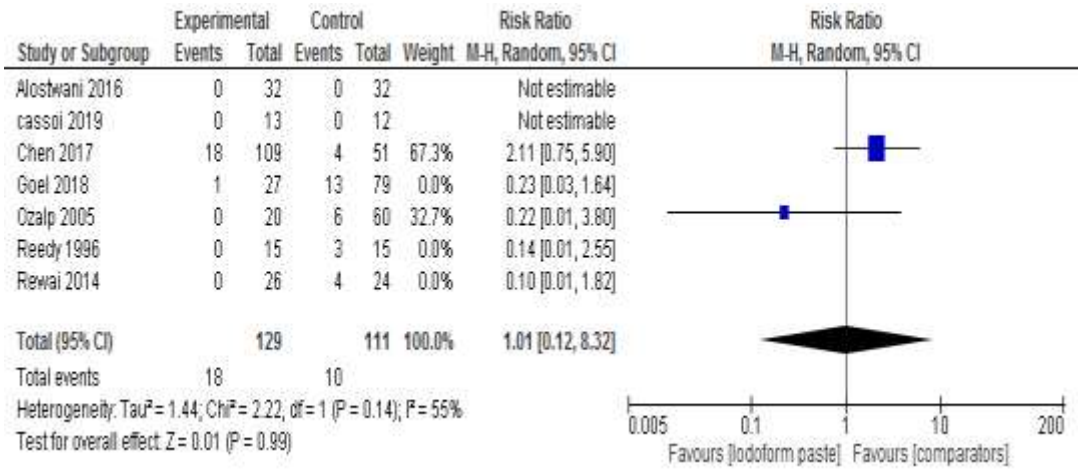


Figure 3. depicts the forest plot for clinical evaluation at 18 to 30 months.

Radiographic evaluation

At six months, was noted no statistically significant variance among iodoform-based & non-iodoform-based materials according to the radiographic assessment. with pooled RR and 95% CI=0.6 [0.24,1.51], p-value=0.28 our pooled studies for this outcome were homogenous with chi-p=0.3 and I^2 =17%. **Figure 4.** shows the forest plot for radiographic evaluation at six months.

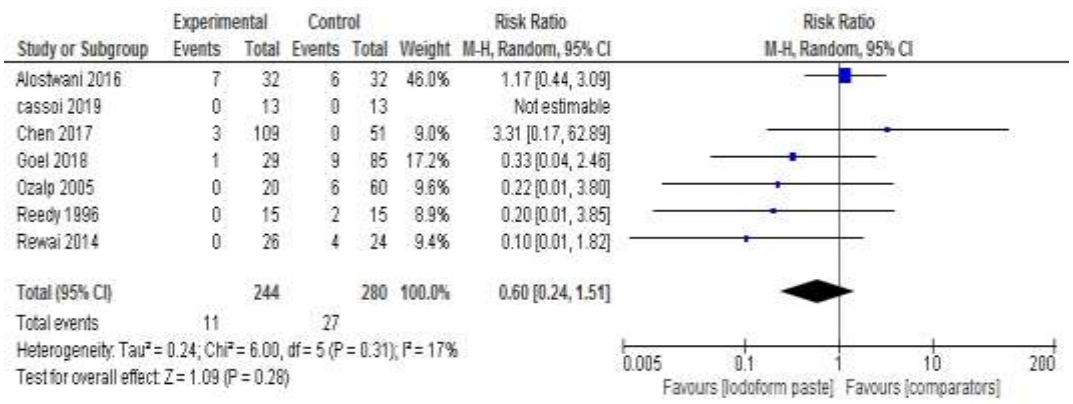


Figure 4. six months from now, the forest tract will be radiographic evaluated.

At 12 months, was noted no statistically significant variance among iodoform-based &non-iodoform-based materials according to the radiographic assessment. with pooled RR and 95% CI=0.43[0.14,1.33], p-value=0.14 our pooled studies for this outcome were heterogenous with chi-p=0.07 and I^2 =49%. **Figure 5.** shows the forest plot for radiographic evaluation at 12 months.

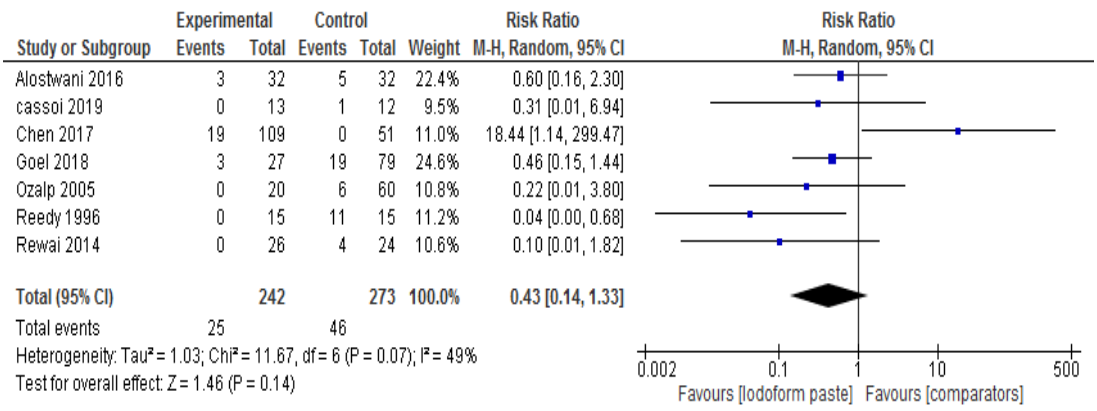


Figure 5. the forest tract to be evaluated radiographically at 12 months.

Regarding the radiographic assessment, no statistical distinction was observed among materials containing iodoform & those lacking it at the 18 to 30 months with pooled RR and 95% CI=1.03 [0.13,8.36], p-value=0.98 our pooled studies for this outcome were heterogenous with chi-p=0.13 and I^2 =57%. **Figure 6.** shows the forest plot for radiographic evaluation at six months.

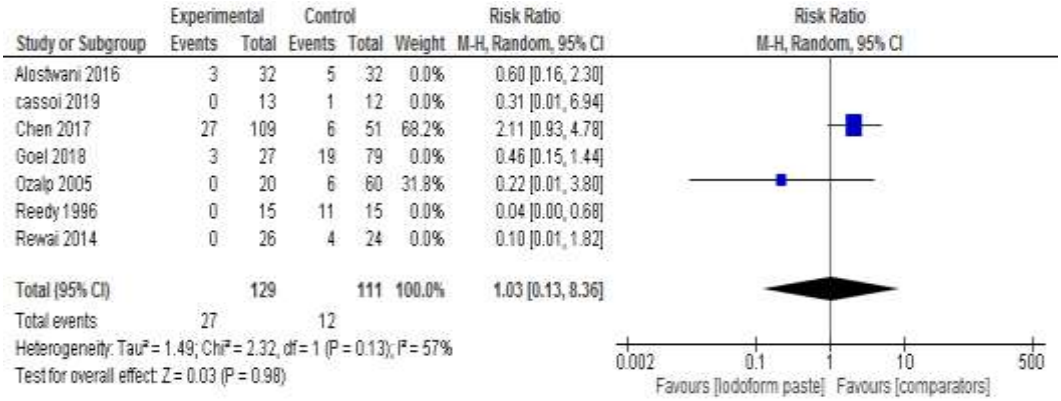


Figure 6. the forest plot for radiographic evaluation at 18 to 30 months.

Discussion

Despite the progress achieved in safeguarding against dental caries, the growing awareness among individuals regarding the importance of preserving natural dentition, & the rising volume of individuals seeking assistance from pedodontic clinics, premature loss of deciduous teeth remains a prevalent issue **[8].**

The premature loss of deciduous teeth results in numerous aesthetic, functional, & physiological compromises. Due to the structure of deciduous teeth, decay advances considerably more rapidly & in a shorter amount of time; therefore, regular dental pulp therapy is required **[9].**

Critical characteristics of a root canal filling material intended for primary teeth include resorption at a rate equivalent to that of the primary teeth's roots. The material should possess the following characteristics: non-toxicity towards periapical tissue & permanent tooth pathogen, rapid resorption beyond the apex, antiseptic and radioopaque properties, resistance

to shrinkage, adhesion to the tooth's walls, absence of discoloration, & ease of filling & removal, should the need arise. In primary dentition, calcium hydroxide, vitapex, & metapex have been widely utilized as root canal filling materials, notwithstanding the numerous disadvantages related to these substances. **[10].**

In addition to its antiseptic properties, iodoform is resorbed in accordance with the root during canal filling in deciduous teeth; it has no detrimental impact on the embryo of permanent teeth. It is readily applicable to side canals & root canals. Furthermore, it has been documented that the excessive iodoform pathway swiftly substitutes for healthy tissue &does not induce any foreign object reaction. At times, the substance is resorbed at a faster rate than the root, resulting in the voiding of the canals. **[11].**

The existing body of literature has yielded inconclusive results regarding the optimal restorative material for pulpectomy of primary teeth. For the purpose of treating root canals in deciduous teeth, this systematic review & meta-analysis compared iodoform-based & non-iodoform-based filling substances.

The present meta-analysis & systematic review included 7 articles **[10, 12-17]** comparing the outcome of filling materials containing iodoform & those not containing iodoform for the management of root canals in deciduous teeth.

Regarding clinical evaluation, the pooled data of the included studies revealed that Iodoform-based infill substances demonstrated significant decreased failures within six months. However, at 12-, 18- and 30-months follow-ups, the current meta-analysis showed that iodoform-based filling materials have insignificant differences when compared to other materials. Consequently, Iodoform-based filling substances exhibited superior short-term performance in clinical trials in comparison to non-iodoform-based filling materials, while maintaining comparable long-term efficacy.This comes in agreement with the recent systematic review and meta-analysis by **Silva et al., [18]** including 19 articles and showed that At the 6-month, 9-month, & 12-month follow-up periods, iodoform-based filling materials were associated with fewer clinical failures than noniodoform-based filling materials (OR = 0.43, 95%CI: 0.19–0.97, p = .04; OR = 0.46, 95%CI: 0.23–0.93, p = .03). However, no such reduction was observed at the 18-30 month follow-up period (OR = 1.08, 95%CI: 0.58–2.03, p .81).

Furthermore, Pedrotti et al. [19] conducted a network meta-analysis comprising seven articles and 263 teeth in order to examine the impact of various root canal filling materials on the failure rate of endodontic treatment of necrotic primary teeth. Based on the meta-analysis's direct evidence, zinc oxide pastes were associated with a greater failure risk than iodoform pastes (OR 7.07 95% CI 1.02, 62.59). Regarding the indirect evidence, the materials were identical. Iodoform pastes exhibited a significantly high probability (81%) of being the treatment associated with the fewest failures in comparison to the other treatments. The calcium hydroxide pastes exhibited the greatest likelihood of being the least favorable alternative.

Additionally, Rhaiem et al. [20] demonstrated in a systematic review comprising eight articles that zinc oxide eugenol in combination with calcium hydroxide & iodoform outperformed zinc oxide eugenol in terms of clinical & radiographic success rates, resorption rate comparable to that of the roots, accelerated resorption of extruded particles, & maximum reduction in the size of preoperative inter-radicular radiolucencies.

However, in a separate meta-analysis of ten studies**, Najjar et al. [21]** found no statistically significant variations in the clinical efficacy rates of zinc oxide eugenol & calcium hydroxide

plus iodoform at six & twelve months of follow-up. On the other hand, at least an 18-month follow-up, zinc oxide eugenol demonstrated statistically significant higher success rates.

Regarding radiographic evaluation, the pooled data of the included studies revealed that Was observed no statistically significant distinction observed among materials containing & lacking iodoform. at the 6-, 12-, 18- and 30-months follow-ups. Consequently, both Iodoform-based and non-iodoform-based filling materials showed similar radiographic performance in the short- & long-term evaluations.

Silva et al. [18] conducted a meta-analysis that supported the findings of the present research. Their results indicated that was noted no significant distinction in radiographic failures among filling materials based on iodoform & those not based on iodoform at the a six-month (OR = 0.72, 95%CI: 0.39–1.32, p .29) & 18–30-month (OR = 1.06, 95%CI: 0.51–2.21, p .87). However, a reduced number of radiographic failures were observed during the 9–12-month follow-up period (OR = 0.49, 95%CI: 0.51–2.21, p .

Furthermore, consistent with the findings of the present investigation, **Najjar et al. [21]** demonstrated in a separate meta-analysis that the radiographical success rates of zinc oxide eugenol & calcium hydroxide plus iodoform didn't vary statistically significantly at the six &12-month follow-up.

Increased utilization of randomised clinical trials **[10, 12-17]** has occurred in recent years, as suggested by systematic evaluations concerning filling materials for deciduous teeth **[18-21].** However, it is crucial to highlight that the efforts to improve the quality of the trials were insufficient in order to bolster the scientific evidence. This emphasizes the necessity for additional research in order to strengthen the surety of the evidence.

An additional limitation of the research is the heterogeneity of the data sources. Consequently, the precise conclusion remains inadequate. Additionally, restricted access to complete journals will impact the outcomes of the search &interpretation. There are currently a number of unresolved inquiries.

Conclusion

In contrast to noniodoform-based filling materials, iodoform-based filling materials demonstrated superior short-term clinical & radiographic performance, while their long-term performance was comparable. Nevertheless, the majority of the studies exhibited an uncertain or high risk of bias, & the overall certainty of the evidence varied from low to very low. Consequently, it is recommended that a future investigation be conducted, with a greater emphasis on randomized controlled trials.

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