

# Comparison between Calcium Hydroxide (CH) and Mineral Trioxide Aggregate (MTA) as Pulp Capping Agent: A Systematic Review

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## ABSTRACT

Pulp capping treatment aims to maintain the vitality of the pulp so that dental function is maintained. Calcium hydroxide (CH) and Mineral Trioxide Aggregate (MTA) were used to maintain pulp vitality by forming a dentinal bridge formation without toxic effects. This study aimed to evaluate the effect of CH as pulp capping material in comparison with MTA. Clinical trials conducted searches in PubMed journals and Wiley for articles published in the last ten years to evaluate the effects of pulp capping material CH and MTA. Journals that met the inclusion criteria received, and the information does not need to put in exclusion criteria - Journal of the difference effectiveness of the material included in the systematic review. Three studies that did not meet the inclusion criteria and journals that could not be opened were excluded from the research study. The MTA treatment group showed a much higher success rate than the calcium hydroxide group. From this review, it was concluded that MTA is superior to CH in the absence of an inflammatory response and dentinal bridge formation.

**Keywords:** Calcium hydroxide, Mineral trioxide aggregate, Pulp capping.

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## INTRODUCTION

Treatment of pulp inflammation is a major challenge for dentists. External stimuli such as caries can affect the tooth pulp. Therefore, a dentist must prevent tooth loss, one of which is by maintaining the vitality of the dental pulp. Various ways to maintain vitality, such as pulp capping. Hoping that the pulp vitality of the pulp is maintained and makes improvements to the mineral tissue (dentinal bridge).<sup>1,2</sup>

In the world of dentistry, Calcium Hydroxide (CH) is a material that is often used in pulp capping treatment which is proven to have a good standard. Besides having many advantages, CH also has many disadvantages, namely the pulp surface there is inflammation and necrosis after application of CH material to the pulp surface, high solubility in the mouth, degradation over time, and reduced mechanical resistance which can lead to microfiltration.<sup>4,5</sup>

Mineral Trioxide Aggregate (MTA) results in better dentinal bridge formation and less pulp inflammation based on histological studies and has been widely used. Although there have been many studies showing the success of pulp capping treatment with MTA rather than CH, there are still results that show insignificant results in several studies. Therefore, this systematic review will emphasize the success rate of pulp capping treatment using MTA rather than CH.<sup>5-7</sup>

## METHOD

### Search Method

This systematic review was conducted regarding reporting from the Systematic Review approach and Meta-Analysis to see the comparison of CH material with the MTA

Inclusion Criteria:

1. Journal of the past ten years
2. Research human teeth in the oral cavity
3. English language journals
4. Journal with clinical trial article types
5. Pulp capping with CH and MTA

6. Not a review journal (systematic review and literature review)

Exclusion Criteria:

1. A journal cannot be opened
2. Research conducted on animals

## Research Question

To make a research question stated in population, intervention, comparison, and outcome (PICO). People in this study: Patients who need pulp capping treatment. Intervention: Tooth pulp capped with CH. Contrast: pulp capping using MTA. Result of use: success

### Search Strategy

In the library conducted a comprehensive PubMed and Wiley search for articles published over the past five years reporting comparisons of Calcium Hydroxide (CH) with Mineral Trioxide Aggregate (MTA) as a Pulp Capping ingredient. The Search Strategy uses the following keywords: Calcium Hydroxide (CH), Mineral Trioxide Aggregate (MTA), Pulp Capping.

## RESULTS

An initial search resulted in 108 articles. It consisted of 8 journals in PubMed, 100 journals from Wiley. Duplicated titles were removed, and 106 titles were left, which then filtered titles and abstracts obtained eight articles that met the standard. The next extraction was obtained from reading the full text, and the remaining five articles were following PICO (Population, Intervention, Comparison, and Outcome).

## DISCUSSION

Research that has been conducted by zhaofei et al., to determine the dentin bridge formation and inflammatory response showed that the inflammatory response was low in the MTA group carried out on 325 tooth samples compared to CH with OR = 4.56%; 95% CI, 2.65-7.83; P <0.00001. The dentin bridge formation in the MTA group was better than the CH group with the same sample with OR = 3.56; 95% CI, 1.89-6.70; P <0.0001. Research

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conducted by Eskandarizadeh A et al. In 2016, 90 maxillary and mandibular first premolar teeth for 30, 60, and 90 days showed lower inflammatory response and better dentin bridge formation in the MTA group than in the CH group after 90 days of application.

Research conducted by Kundzina R et al., showed a significant relationship with the P-value = 0.006 where the MTA group showed a high success rate of 85% lower pain response after application of the material compared to the CH group by 52% after 36 months.

Research conducted by Claudia Brizuela et al., 169 patients with an average age of 11.3 years who were treated for pulp capping with evaluations for three months, six months, and one year showed the MTA group was more successful than the CH group.

Research by Hilton T.J et al. in 2016, CH caused more than 31.5% failure compared to MTA 19.7% after two years of evaluation.

MTA is a material that can be applied widely, for example filling the root tip, repairing perforation and root furcation, limiting the open apex, pulp capping, apexification, pulpotomy of primary and permanent teeth, and filling to maintain primary teeth besides MTA has properties of biocompatible materials. MTA has good sealing closure capabilities, is biocompatible with tissues, the ability to form dentinal bridges and cementum, and regenerates periodontal ligaments so that it has been used as pulp capping material in humans for the last 12 years.<sup>8-12</sup>

### CONCLUSION

MTA has a higher success rate with less pulp inflammation and results in less inflammatory pulp formation of more dentinal bridges than CH material.

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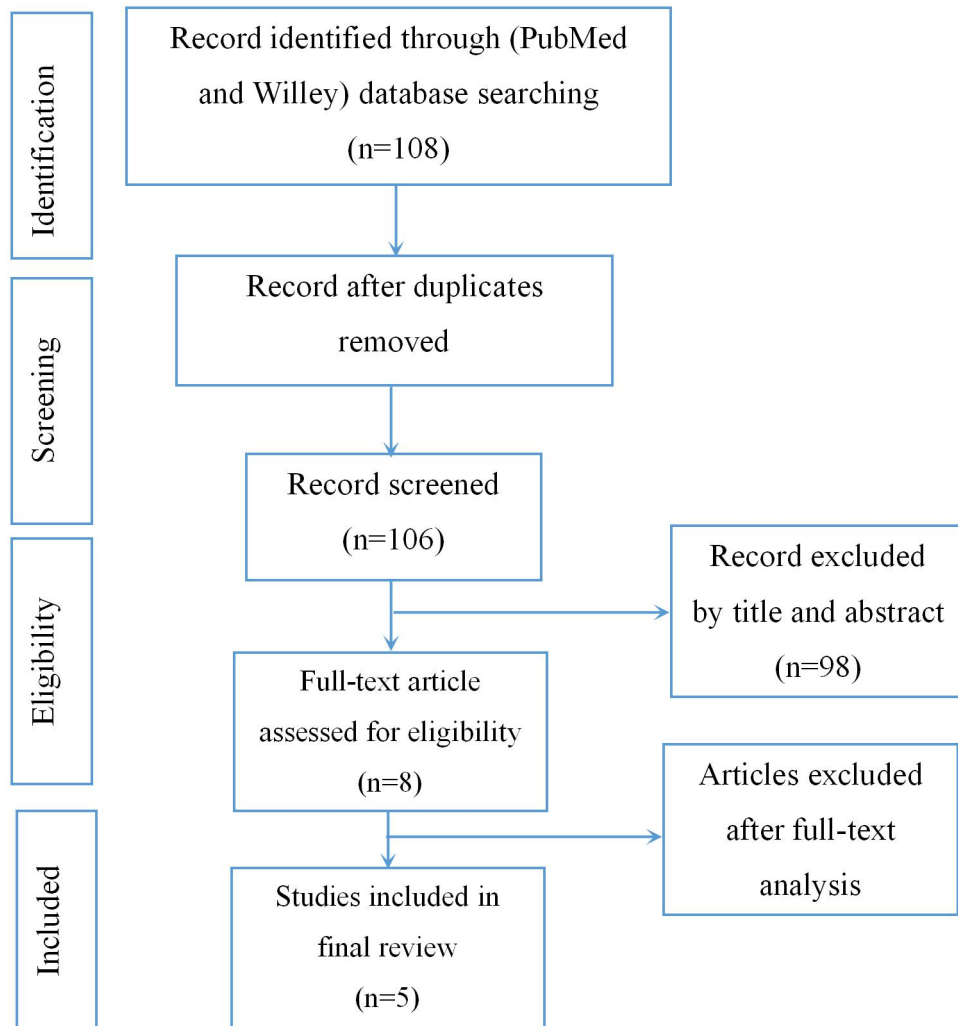


Figure 1. PRISMA Flow Chart

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**Table 1.** Journal Synthesis

Authors (Years)	Material Type		Types Of Research	Evaluate Use of Material Pulp Capping
Hilton T.J et al. (2016)	CH	MTA	Randomized clinical trial	MTA failure rate is less at 19.7% compared to CH 31.5%
Claudia Brizuela (2017)	CH	MTA	Randomized clinical trial	MTA failure rate was less after one year of application compared to CH
Kundzina, R (2017) et al.	CH	MTA	Randomized clinical trial	There is a significant relationship between the MTA group which is superior to CH with a value of $p = 0.006$
Eskandarizadeh A et al. (2016)	CH	MTA	Randomized clinical trial	MTA significantly formed dentin bridge during a 90-day evaluation than CH
Zhaofei Li et al. (2015)	CH	MTA	Meta-analysis	MTA material improved dentinal bridge and lower inflammatory response than CH.