Research Article

Antimicrobial efficacy of natural intracanal medicaments: A systematic review

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ABSTRACT

Aim: The aim of this study was to determine the efficacy of natural intracanal medications in eliminating microbes from human root canals. **Materials and Methods:** PubMed central databases were searched. Reference lists from identified articles were scanned. A forward search was undertaken on the authors of the identified articles. Papers that had cited these articles were also identified through the science citation index to identify potentially relevant subsequent primary research. Data of the included studies were independently extracted. **Results:** Three *ex vivo* studies were identified and included in the systematic review, covering 250 samples. Sample size in each study varied from 70 to 90 teeth. Only one study indicated that the natural intracanal medication was significantly more effective than other groups. The other two studies indicated that the natural intracanal medicament was less effective initially, but later, it was equally effective as the other groups based on elimination of microorganisms as evidenced by reduction in colony-forming units. **Conclusion:** Natural intracanal medicaments are equally effective in elimination of bacteria from human root canal when assessed by culture techniques.

KEY WORDS: *Aloe vera*, Canal disinfection, Intracanal medicament, Microbiology, Propolis

INTRODUCTION

Endodontic infections are multifactorial in nature, microorganisms being the major causative agents in the development of inflammation of pulpal and periapical origin. Periapical lesions are shown to heal at a higher rate in the absence of microorganisms in the root canal system.[1] The primary objective of endodontic treatment is the successful elimination of microorganisms from the infected root canal system. Chemomechanical preparation of the root canal system eliminates majority of the microorganisms, but it is very difficult to completely eliminate the microorganisms due to the complexity of root canal system and limitation in accessing the canal by instruments and irrigants.[2] Hence, the need for intracanal medication arises, especially for cases where the infection is persistent even after a regular endodontic treatment. Apical periodontitis is caused by bacteria in the canal space. The treatment of apical periodontitis should, therefore, aim at bacterial eradication.

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Calcium hydroxide has been the most widely used intracanal medicament due to its consistent antibacterial activity and minimal cytotoxicity. However, the role of calcium hydroxide to eliminate few microorganisms remains questionable.[3-5] Furthermore, the buffering activity of dentin can neutralize calcium hydroxide activity in deeper layers of dentinal tubules, and the microorganisms can survive.[6]

The search for an effective antimicrobial agent led to the use of chlorhexidine digluconate (CHX) within the root canal. CHX when used as an intracanal medicament has shown potent results against common endodontic pathogens.[7,8] Research has been conducted on new biological intracanal medicaments which are derived naturally since commercial intracanal medicaments can result in chemical reactions and are unable to eliminate all the microorganisms, natural intracanal medicaments can be considered.[9] Many *in vitro* studies have been conducted utilizing naturally derived intracanal medicaments.[10-12] However, no clinical studies have been conducted yet. The ideal question to be answered in this systematic review can be framed in terms of a problem, intervention, comparison, and outcome question as follows: In teeth, undergoing endodontic treatment, does a

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naturally derived intracanal medicament, compared with conventionally used intracanal medicaments, result in elimination of bacteria from the root canal system as measured by negative culture? The study samples for bacterial culture were collected after placement of intracanal medicament and when the canal was reaccessed after few days.

MATERIALS AND METHODS

An exhaustive search was undertaken to identity all *in vivo* and *ex vivo* studies that compared the microbiological status of pre- and post-medicated human root canals. The PubMed Advanced Search was conducted using keywords which automatically created a complex search strategy [Figure 1]. No language restriction was applied to the search. The search yielded 11 studies which were subjected to the preliminary analysis. Titles and abstracts, where available, were scanned and the relevance of each study to the antibacterial efficacy of naturally derived calcium hydroxide was determined. Hand search was also conducted. The inclusion and exclusion criteria used for the search were as follows.

Inclusion Criteria

- Patient undergoing root canal therapy with a non-contributory medical history
- *Ex vivo* studies.

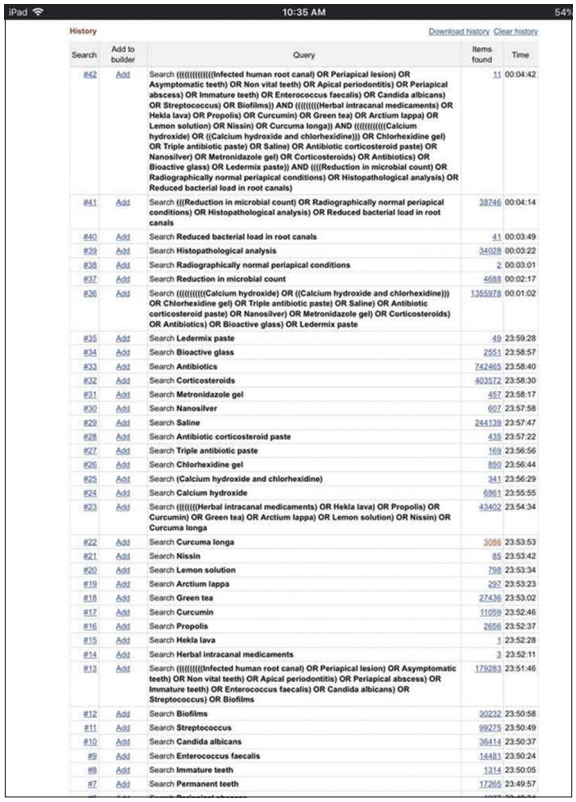

Figure 1: Search strategy

Exclusion Criteria

- Case reports/case series
- Animal studies
- *In vitro* studies
- Studies not meeting inclusion criteria.

RESULTS

The first search identified 11 publications, of which 10 were excluded after reviewing the title or abstract. Hence, a total of one article fulfilled the inclusion criteria. Two hand-searched articles fulfilled the inclusion criteria. Therefore, a total of three publications fulfilled all criteria for inclusion. Following is the search flowchart used [Figure 2].

DISCUSSION

A total of three *ex vivo* studies were obtained after the search.

According to Ramani *et al.*, 70 freshly extracted teeth were divided into three groups, Group 1 (chlorhexidine), Group 2 (ethanolic extract of propolis), and Group 3 (control group). It was concluded that ethanolic extract of propolis was significantly more effective than CHX against activity of *Enterococcus faecalis*. This can be attributed to a study conducted by Mirzoeva *et al.* who suggested that the effect of propolis on membrane permeability and membrane potential may contribute enormously to its overall antibacterial activity and may decrease the resistance of cells to other antibacterial agents.[13] However, as far as the activity against *Candida albicans* is concerned, it was less effective as compared to CHX. However, at the end of 10 days, this difference was not significant. This could mean that the activity of propolis against *C. albicans* overtime had increased. The biological activity of propolis is usually attributed to the flavonoids which have been mentioned earlier.

According to Chua *et al.*, 90 extracted teeth were divided into five groups, Group 1 (propolis), Group 2 (triple antibiotic paste), Group 3 (2% chlorhexidine gel), Group 4 (calcium hydroxide with propylene glycol), and Group 5 (sterile saline as negative control). There was a reduction in number of colony-forming units which were statistically significant in all groups. Propolis was less effective than triple antibiotic paste, 2% chlorhexidine gel, and calcium hydroxide against *C. albicans* on day 1 but equally effective after 7 days. The possible reason for lower antibacterial activity of propolis on day 1 could be due to the slower rate of penetration in the dentinal tubules as compared to the other groups. Eventually, propolis diffused along the entire dentinal tubule and was as effective as other medicaments after 7 days. The antibacterial action of propolis is due to the presence of flavonoids and phenolic acids which interact with

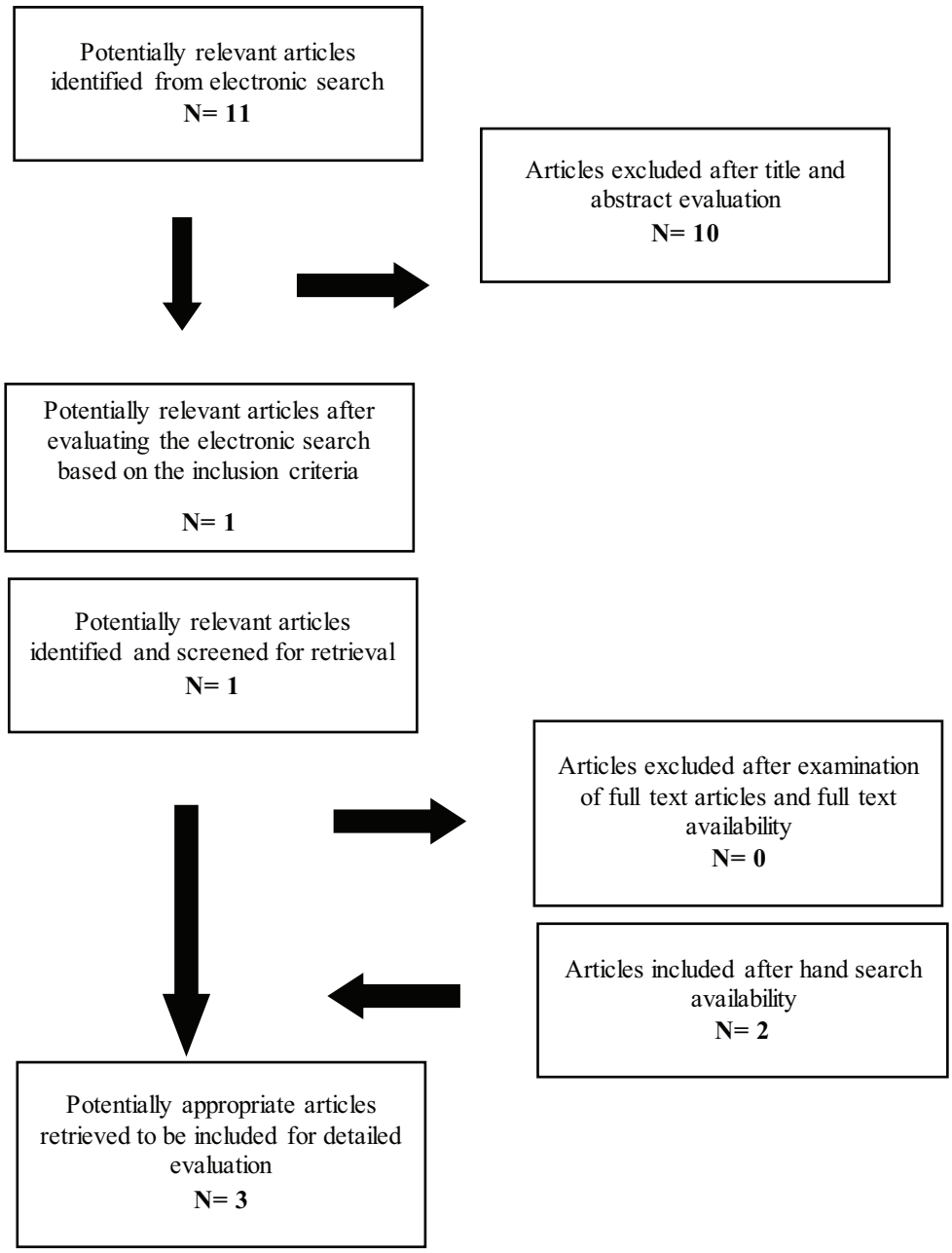

Figure 2: Search flowchart

the cellular sulfhydryl compounds on the cell wall. This damages the integrity of the cell wall and prevents further cell division. According to Bazvand *et al.*, 90 freshly extracted teeth were divided into five groups, Group 1 (triple antibiotic mixture), Group 2 (0.2% CHX gel), Group 3 (propolis), Group 4 (*Aloe vera* gel), and Group 5 (normal saline). It was concluded that propolis was as effective as the other intracanal medicaments, but *A. vera* was found to be least effective. Although *A. vera* has antibacterial effect due to its vitamins, enzymes, minerals, amino acids, salicylic acid, lignin, and saponin, it is less effective as compared to other intracanal medicaments.

Three studies were included in this review, which were of level three of evidence. Thus, the level of evidence is low.

CONCLUSION

From this systematic review, it can be concluded that natural intracanal medicaments are not as effective as other commercially available intracanal medicaments.

However, a good number of clinical trials are needed to establish their potency as an effective intracanal medicament.

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