

Review Article

Ayurvedic Herbs in Endodontics

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ABSTRACT:

Ayurveda is a science that developed as humans evolved. It is the oldest medical science originating from the Indian subcontinent and has been practiced since the 12th century BC. Ayurvedic medications have been used for various ailments as it has anti-inflammatory, antibiotic, analgesic, and sedative agents. In endodontics, the elimination of bacteria present in the root canal system is the fundamental objective of endodontic treatment as they play an important role in the development and maintenance of periapical lesions. Because of the cytotoxic reactions from most of the commercial intracanal medicaments used, the trend of recent medicine intends to use biological medication extracted from natural plants. A single herb exhibits multiple benefits, and its use in dental treatment proves to be an effective adjuvant. The applications of medicinal plants in endodontics are varied ranging from intracanal medicaments, and pulp capping agents to irrigants and retreatment agents. This paper reviews the role of various commonly used herbs in endodontics.

Keywords-Endodontics, Herbs, Ayurveda.

Key Message- As we are living in an age of evidence-based medicine. Although few in-vivo and in-vitro observations of herbal products appear promising, but still many preclinical and clinical trials are needed to evaluate the biocompatibility and safety factor before they can conclusively be recommended for the clinical use.

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INTRODUCTION

Medical sciences in India dates back to the time of Vedas and Puranas. Ayurveda, the conventional Indian medicinal system is the most ancient yet widely practised science with sound analytical and experimental basis [1]. The World Health Organisation (WHO) defines “herbal medicine as a practice which includes herbs, herbal materials, herbal preparations and finished herbal products that contain as active ingredients parts of plants, or other plant materials, or combinations” [2]. Traditional healers have been using herbs since long time to prevent or cure infectious diseases. Herbs are rich in a wide variety of secondary metabolites, such as tannins, terpenoids, alkaloids, & flavonoids, which have been found in vitro to have antimicrobial properties. This paper will provide a review of the various commonly used herbal alternatives that are being researched as potential endodontic irrigants, intracanal medicament, retreatment agents and pulp capping agents.

DENTAL APPLICATIONS

As a single herb can perform a number of different functions, the use of herbs for endodontic procedures has become increasingly popular. Medicinal plants have been employed as antibacterial agents to combat several endodontic infections. With obtundent and soothing effects, it has also been used in a variety of endodontic medicaments and dressings [3].

1) Herbal irrigants-

In endodontics, bacteria are the main causative factor in the development of pulp and periapical diseases. Primary root canal infections are polymicrobial, typically dominated by obligatory anaerobic bacteria. Mechanical instrumentation alone does not result in a bacteria-free root canal system and when the complex anatomy of the root canal system is considered. Therefore, Successful root canal treatment is dependent on the removal of these microorganisms through chemo-mechanical instrumentation [4].

Various types of root canal irrigants are being used in endodontics such as acids (citric and phosphoric),

chelating agent (ethylene diaminetetraacetic acid EDTA), proteolytic enzymes, alkaline solutions (sodium hypochlorite, sodium hydroxide, urea, and potassium hydroxide), oxidative agents (hydrogen peroxide and Gly-Oxide), local anaesthetic solutions, and normal saline etc.

At present, sodium hypochlorite (NaOCl) appears to be the most effective. However, unpleasant taste and odour, cytotoxic effect [5], resorption [6], inability to remove smear layer and fully eradicate microbes from the infected canals [7] are the main disadvantages of this popular irrigant. CHX could be used as alternative for sodium hypochlorite but the use of CHX as an endodontic irrigant is generally restricted because it can discolor teeth, and some patients might have side effects such as loss of taste, burning sensation of the oral mucosa, subjective dryness of the oral cavity, and discoloration of the tongue [8].

To overcome problems associated with commonly used irrigants, use of natural plant extracts as endodontic irrigants becomes a new interest to the professionals to seek natural remedies in dental treatment.

A. Neem (*Azadiracta Indica*)-

Popularly known as “Indian neem/ Margosa tree” or “Indian lilac”, is well known in India. Neem leaves, seeds and bark possess a wide spectrum of antibacterial action against gram negative and gram-positive microorganisms. This product has been proved to be effective against *E-faecalis* and *candida albicans*. Its antioxidant and antimicrobial properties make it a potential agent for root canal irrigation as an alternative to sodium hypochlorite [9]. A number of in vivo and in vitro studies have been done so far where Neem used as irrigant showing remarkable results. In one of the study by Hegde V and Kesaria DP evaluated the antibacterial effectiveness of 2% NaOCl, propolis, neem leaf extract, turmeric, and licorice against *E.faecalis* and *C. albicans* and observed that neem leaf extract exhibited the greatest zone of inhibition against the two endodontic pathogens [10].

B. Triphala-

Triphala is an Indian ayurvedic herbal formulation consisting of dried and coarse powder made out of three medicinal plants, *Emblica-officinalis*, *Terminalia chebula* and *Terminalia bellerica* blended in equal proportion [11]. *Triphala* has been proven to be safe, containing active constituents that have beneficial physiologic effect apart from its curative property such as antioxidant, anti-inflammatory, and radical scavenging activity [12]. Prabhakar J et al in 2010 concluded in their study that *Triphala* was as effective as NaOCl and a doxycycline based irrigant on root canal biofilms. Moreover, *Triphala* is a good chelating agent because of the fruits that are rich in citric acid, and holds promise in the removal of smear layer [13].

C. Noni (*Morinda Citrifolia*) –

Morinda Citrifolia identified as a possible alternative to NaOCl in root canal irrigation. It contains phytochemicals that own antibacterial, antiviral, antifungal, antitumor, anthelmintic, analgesic, hypotensive, anti-inflammatory and immune enhancing effects. It has been reported that *M.citrifolia* inhibits pathogenic bacteria, such as *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Proteus morgani*, *Bacillus subtilis*, *Escherichia coli*, *Helicobacter pylori*, *Salmonella species*, and *Shigella species*. This might be attributed to the presence of secondary metabolic phenolic compounds, such as acubin, L-asperuloside, alizarin, and anthraquinones including scopoletin [14].

D. Green Tea (*Camellia Sinensis*)-

It is a tea made solely from the leaves of *camellia sinensis*. The antimicrobial activity is due to inhibition of bacterial enzyme gyrase by binding to ATP B subunit [15]. Green tea exhibits antibacterial activity on *E-faecalis* planktonic cells. It can be used as an effective anti-plaque agent, root canal irrigant, chelating agent and also used for storage of avulsed tooth.

2) Intracanal medicaments;

Intracanal medicaments have routinely been employed in root canal therapy as interappointment antimicrobial medicine to eliminate residual microorganisms, suppress bacterial recolonisation and prevent reinfection. However, numerous in-vitro investigations have demonstrated that the routinely used intracanal medications' phenol and aldehyde derivatives are extremely toxic to mammalian cells and that their antibacterial activity is insufficient to counteract this toxicity [16, 17]. Therefore, endodontic treatment is increasingly incorporating natural therapies, with *Arctium lappa*, *triphala*, and *propolis* being evaluated as intracanal medications [3].

A. Arctium Lappa-

Arctium lappa, also known as burdock, is a plant that was imported from Japan and domesticated in Brazil. Due to its well-known therapeutic actions, it is used extensively in popular medicine across the world. Sesquiterpene lactones and the sugar inulin are the active ingredients in burdock. Research by Gentil M et al., and Chikkanna M et al., have revealed its significant antimicrobial activity against endodontic pathogens which paved the way for its use as an intracanal medicament [18, 19].

B. Aloe Vera (*Aloe Barbadensis*)-

Aloe vera (*Aloe barbadensis*) is a succulent plant which retains and store water in the stems and leaves. It has various active components: vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids, and amino acids. Due to the inclusion of anthrax quinine, which prevents the growth of *S.pyogenes* and *E.faecalis*, it is effective against both of these bacteria. In an in-vitro study carried out by Kurian B et al., it was discovered that aloe vera's Minimum Inhibitory

Concentration (MIC) was superior to calcium hydroxide in the removal of *E.faecalis* and that its antibacterial activity was demonstrated to escalate with time [20].

It has also been proven as a good endodontic irrigants because of considerable antimicrobial activity against various species. **Vinothkumar S et al 2013** did a study to compare five different herbal extracts (*Curcuma longa* (CL), *Azadiracta indica* (AI), *Aloe barbadensis* (AV), *Myristica fragrans* (MF) and *Terminalia chebula* (TC) as antimicrobial endodontic irrigants and they concluded that all 5 extracts appear prudent to replace the traditional root canal irrigant [21].

C. Turmeric (*Curcuma Longa*)-

Curcumin [diferuloylmethane], the main yellow bioactive component of turmeric has been shown to have a wide spectrum of biological actions, including antimicrobial, anti-inflammatory and antioxidant activities [22]. A report suggested that curcumin in aqueous preparations exhibits phototoxic effect against gram positive and gram-negative bacteria [23]. Ground turmeric eliminates pain and swelling [24].

D. Propolis -

This is prepared from resins collected by honeybees from trees of poplars and conifers or from flowers of genera *clusia*. It also contains viscidone. It is used as intracanal medicaments [25], root canal irrigant [26] and storage media for avulsed teeth to maintain viability of periodontal ligament [27]. Ethanol extract of propolis presents good properties for endodontic use, such as promoting bone regeneration and inducing hard tissue bridge formation in pulpotomies or pulp capping. The anti-inflammatory property of propolis is due to the presence of caffeic acid and phenethyl ester [CAPE] in *Propolis* [28, 29].

3) Retreatment agents:

There are several removal techniques available, ranging from mechanical instrumentation, application of heat, to use of gutta percha dissolving agents and these techniques may either be used individually or in conjunction. Traditional solvents like halothane and chloroform were shown to be less effective than orange oil at softening gutta-percha, according to research conducted by **Oyama KO et al.**, [30]. In comparison to eucalyptol and distilled water, xylol and orange oil were found to be more effective at removing a variety of endodontic sealers, including those made of zinc oxide and eugenol (Endofill and Intrafill), silicon-polydimethylsiloxane (RoekoSeal), and calcium hydroxide [31, 32].

4) Pulp capping agents:

Direct pulp capping involves covering exposed pulp tissue with a material which facilitates pulpal healing and induces reparative dentine formation. Various materials have been used as pulp capping agents including calcium hydroxide and different calcium silicate cements such as Mineral Trioxide Aggregate (MTA) and Biodentine. The use of herbal remedies

for pulp capping may also be an effective alternative as in a study done by **Rahayu RP and Pribadi N et al** in 2020 on the combinations of propolis and Ca(OH)₂ in dental pulp capping treatment for the stimulation of reparative dentin formation in a rat model and results showed that it is able to stimulate the process of pulp tissue repair by increasing the expression of IL-10, TGF- β , VEGF, TLR-2 and decreased expression of IL-8 and it also showed antibacterial as well as immunomodulatory properties [33].

CONCLUSION

The article will surely aid the Endodontist to have an interest in implementing the herbal products in their day-to-day practice because of its easy availability, cost effectiveness, increased shelf life, low toxicity, and lack of microbial resistance as reported so far. Therapeutic approaches with herbal medicine are often staggered due to lack of data on safety and efficacy and meticulous clinical trial evidence. It is recommended that more researches should be undertaken.

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