Herbal Medicines in Endodontics – A comprehensive review

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ABSTRACT

Endodontic treatment aims complete disinfection of the entire root canal system which involves the use of some chemical substances. The materials currently used for this purpose never achieved complete disinfection and also have other disadvantages like weakening of the tooth structure, predisposing to fracture of the tooth. Over the past decade, interest in drugs derived from medicinal plants has markedly increased. In dentistry herbal medicines has been used as anti-inflammatory, antibiotic, analgesic, sedative and also as endodontic irrigant. This review focuses on various herbal drugs and products as well as their therapeutic application, side effects and possible drug interactions when used as herbal medicines in endodontics.

Key Words: Endodontic treatment, Herbal medicine, Root canal irrigant

INTRODUCTION

When the Dental pulp undergoes pathological changes due to trauma or caries, microorganisms enter the pulp chamber and invade the anatomic irregularities of the root canal system. Although a substantial number of bacterial species have been identified as inhabitants of the oral cavity, because of bacterial interactions, nutrient availability and low oxygen potentials in root canals, the number of bacterial species present in endodontic infections is restricted. These selective conditions lead to the predominance of facultative and anaerobic microorganisms, particularly Enterococcus faecalis which is a dominant enterococcus species. It survives in the root canal as a single organism without the support of other bacteria and multiply, causing infection that stimulates local bone resorption. The cells of E. faecalis remain viable and are more resistant to endodontic treatment. They also have the capability to invade the dentinal tubules and adhere to the collagen in presence of human serum, thus acting as a pathogen in failed endodontically treated teeth. The mode of growth of E-faecalis is through the biofilm formation that allows microorganisms to stick to and to multiply on the surfaces. Commonly they are the only strains recovered from the obturated root canal. Hence, achieving predictable long term success of the root canal treatment requires effective debridement and disinfection of entire root canal system and prevention of reinfection. Although chemomechanical preparation of root canal is able to reduce the number of bacteria, the intracanal medicament with anti-bacterial action is required to maximize the disinfection of root canal system in infected cases. Several chemicals and therapeutic agents are used to disinfect the root canal. The most effective among them are Sodium Hypochlorite (NaOCl), 2% solution of CHX and Ca(OH)2, which possess varying degree of antibacterial activity. Sodium Hypochlorite has been the most widely used root canal irrigating solution for several decades due to its excellent properties of tissue dissolution and antimicrobial activity. But it has several undesirable characteristics such as tissue toxicity, risk of emphysema when overfilling, allergic potential, disagreeable smell and taste and inability to remove the smear layer. The smear layer has been postulated to be an avenue for leakage as well as to provide a substrate for bacterial growth and ingress. CHX also has been used effectively to irrigate the canals and as an intracanal medicament due to its broad spectrum antimicrobial activity, biocompatibility and ability to disinfect the dentinal tubules against Enterococcus faecalis. However, the use of CHX as an irrigant is generally restricted because it can discolor the teeth and tongue, can cause loss of taste, burning sensation of the oral mucosa and subjective dryness of oral cavity. The effectness of CHX to clean the root canal walls is generally found to be inferior to NaOCl. Ca(OH)2 has been advocated as an intracanal medicament because of its anti-bacterial, antiresorptive and tissue dissolving properties. However, Ca(OH)2 is not effective in eliminating bacteria from the dentinal tubules. It was reported that Enterococcus faecalis present in the dentinal tubules was resistant to Ca(OH)2 over 10 days. Recently, there has been a growing trend to seek natural remedies as part of dental treatments. Herbal or natural products have been used in dental and medical practice for thousands of years and have become even more popular today due to their high antimicrobial activity, biocompatibility, anti-inflammatory and anti-oxidant properties. According to WHO...
herbal medicine is defined as plant derived material or preparation which contains raw or processed ingredients from one or more plants with therapeutic values. Botanically speaking a herb is any plant that lacks the woody tissue characteristics of shrubs or trees. They are plants used medicinally for their flavor or scent. With herbal, homeopathic remedies and holistic or alternative medicine gaining increasing popularity among the public, as dental practitioners we face a responsibility to explore and understand these products and extrapolate their implications on our current patient management strategies. This paper reviews the role of various herbal products in endodontics.

**MORINDA CITRIFOLIA**

*Morinda citrifolia* commonly known as Noni, is indigenous to tropical countries and is considered as an important folk medicine. It is also called as Indian Mulberry, Ba ti tian, Nono or Nonu, Cheese fruit and Nhan in various cultures throughout the world. Its juice has a broad range of therapeutic effects including antibacterial, anti-inflammatory, antiviral, antitumor, analgesic, hypotensive, anti-inflammatory and immune enhancing effects.

The use of *Morinda citrifolia* juice as an endodontic irrigant might be of interest to patients and endodontic professionals as part of the growing trend to seek natural remedies as part of dental treatment and might be advantageous because it is a biocompatible antioxidant and not likely to cause the severe injuries to patients that might occur through NaOCl accidents. An in vitro study compared the effectiveness of MCJ with NaOCl and CHX to remove the smear layer from the root canal walls of instrumented teeth. It was concluded that the efficacy of Morinda Citrifolia was similar to NaOCl in conjunction with EDTA as an intracanal irrigant. The antimicrobial activity of 2% CHX gel propolis, Morinda citrifolia juice and Ca(OH)₂ has been compared on *E.faecalis* infected root canal dentin at two different depths and three intervals. It was concluded that Propolis and *Morinda citrifolia* were effective against *E. faecalis* in dentin on extracted teeth. *Morinda citrifolia* appears to be the first juice to be identified as a possible alternative to the use of NaOCl as an intracanal irrigant.

**TRIPHALA**

Triphala is an Indian ayurvedic herbal formulation consisting of dried and powdered fruits of three medicinal plants *Terminalia bellerica*, *Terminalia chebula*, and *Emblica officinalis*. Triphala has been proven to be safe, containing active constituents that have beneficial physiological effect apart from its curative property such as antioxidant, antiinflammatory, and radical scavenging activity, and may have an added advantage over the traditional root canal irrigants.

A recent study showed that Triphala was as effective as NaOCl and a doxycycline based irrigant on root canal biofilms that were 3 weeks old. It brought about a 8 log reduction in *E.faecalis* counts, when compared to saline. Moreover, Triphala is also a very good chelating agent because of the fruits that are rich in citric acid, and holds promise in the removal of smear layer.

**GREEN TEA POLYPHENOLS**

It is a traditional drink of Japan and China and is prepared from the young shoots of tea plant *Camellia sinensis*. The leaves from the tea plant contain polyphenolic components with activity against a wide spectrum of microbes. The anti-oxidative properties of unfermented tea can be attributed to the ability of the polyphenols contained in the leaves of *Thea chinensis*, especially the gallo catechins, to inactive free radicals. GTPs have demonstrated antioxidant, anti-inflammatory and antimicrobial properties in numerous human, animal, in vitro studies. Green and black teas both contain flavonoids that inhibit the growth and activity of the bacteria associated with tooth decay. Tea also contains natural fluoride, which may be helpful in preventing dental caries. The antimicrobial activity is due to inhibition of bacterial enzyme gyrase by binding to ATP B sub unit. Green tea exhibits antibacterial activity on *E-faecalis* planktonic cells. It is also found to be a good chelating agent.

**PROPOLIS**

The chemical composition of *Propolis* is complex. The most important pharmacologically active constituents in propolis are flavonoids, phenolics and aromatics. It is believed that flavonoids account for much of the biologic activity in propolis. Propolis exhibits a wide range of biologic activities, including antimicrobial, anti-inflammatory, antioxidant, anesthetic and cytotoxic properties. The anti-inflammatory property of propolis is due to the presence of caffeic acid and phenethyl ester (CAPE) in propolis. 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. Propolis is dispensed in various forms. Propolis being a good antimicrobial and anti-inflammatory agent, can serve as a better intracanal irrigant and intracanal medicament.

A comparative evaluation on microbial efficacy of propolis, NaOCl and saline when used as intracanal irrigants indicated that the propolis has antimicrobial activity equal to that of NaOCl. The antibacterial efficacy of three commonly used intracanal medicaments with propolis against *Enterococcus faecalis* has been compared. They concluded that propolis had good in vitro antibacterial activity against *Enterococcus faecalis* in the root canals, suggesting that it could be used as an alternative intracanal medicament. The antimicrobial activity of propolis with Ca(OH)₂ as intracanal, medicament against *Enterococcus faecalis* found that propolis was effective in eliminating the microorganisms.

**ARCTIUM LAPPAPA**

*Arctium lappa* is a plant brought from Japan and acclimated in Brazil, which is widely used in popular medicine all over the world for its well-known therapeutic applications. It has anti-bacterial and anti-fungal activity, diuretic, anti-oxidant and anxiolytic action, platelet anti-aggregating effect and HIV inhibitory action. In Dentistry, *Arctium lappa* has been investigated due to its antimicrobial potential against oral microorganisms, specifically those associated with endodontic infections. An in vitro evaluation of antimicrobial activity of *Arctium lappa* against microorganisms specifically found in endo
dodontic infections showed a great microbial inhibition of *Arctium lappa* against the tested endodontic pathogens. The microbial inhibition potential of *Arctium lappa* observed in this study opens perspective for its use as an intracanal medication.

**NEEM**

*Azadirachta indica* A. Juss is a commonly seen medicinal tree in India, which is considered holy. Popularly known as “Indian neem/Margosa tree” or “Indian lilac”, it is well known in India and its neighboring countries for more than 2000 years as one of the most versatile medicinal plants having a wide spectrum of biological activity. In Sanskrit, it is called “arishtha” meaning “reliever of sickness” and is regarded as the village dispensary of India. Importance of neem tree has been recognized by US National Academy of Sciences where neem is entitled as ‘a tree for solving global problems’.

Each part of the neem tree has some medicinal property and is thus commercially exploitable. Biologic activities and pharmacologic actions of neem are very well established with crude extracts and their different fractions from its leaf, bark, flowers, roots, seed and oil. Use of neem as an endodontic irrigant might be advantageous because it is a biocompatible antioxidant and thus not likely to cause the severe injuries to patients that might occur via NaOCl accidents. Bitter taste associated with this plant can be altered by different formulations due to addition of sweeteners and flavors to increase the patient compliance and acceptability. A study showed significant differences in the zone of inhibition of diameters of neem extract and 2% NaOCl against *E. faecalis* and mixed culture.

**LIQUORICE**

Liquorice is the most commonly used crude drug and flavouring agent in kampo medicines [traditional Chinese medicines modified in Japan] . A number of pharmaceutical effects of Liquorice are known anti-inflammatory, antiviral and anticarcinogenic. Liquorice has been found that growth and adherence of the cariogenic bacteria *Streptococcus mutans* was markedly inhibited. Liquorice has been evaluated for the management of oral lichen planus. The study reported that Liquorice extract was as effective as triamcinolone acetonide but tolerated for the management of oral lichen planus. The study reported that the clinical and radiographic findings showed that Liquorice extract was as effective as triamcinolone acetonide but tolerated for the management of oral lichen planus.

**CONCLUSION**

The major advantages of using herbal alternatives are easy availability, cost effectiveness, increased shelf life, low toxicity and lack of microbial resistance reported so far. The *in vitro* observations of herbal products appear promising but preclinical and clinical trials are needed to evaluate the biocompatibility and safety factor before they can conclusively be recommended as intracanal irrigating solutions and medicaments. Herbs are generally safe if used with proper knowledge, but they can be harmful if misused. Many herbal drugs bare potential risk, side effects and drug interactions that may affect our safe practice of dentistry.

**REFERENCES**


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