

HERBAL ROOT CANAL IRRIGANTS - A REVIEW

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ABSTRACT Disinfection of the root canal system is one of the major objectives for the success of root canal treatment. Recently, there has been a growing trend to seek natural remedies as part of dental treatment. Herbal root canal irrigants are proven to be antibacterial, antifungal, economical and contains active constituents that have beneficial therapeutic effects such as antioxidant, anti-inflammatory and radical scavenging activity, safe to use with no side effects and have proven to be an added advantage over the traditional chemical root canal irrigants. This review aims in providing a comprehensive overview of most commonly used herbal root canal irrigants in routine endodontic practice.

KEYWORDS: Herbal irrigants, Chemical irrigants, Antimicrobial action.

INTRODUCTION

'Let food be your medicine and let medicine be your food' was advised by the father of medicine: Hippocrates, over two millennia ago. Folk medicine in different cultures has a long history of ancestors creating primitive medicines during their struggle against natural calamity and disease.¹

Herbal medicine is an increasingly common form of alternative therapy through-out the world. Dental fraternity has also witnessed impact of these herbal medicines as a regular constituent of dental medicine in the form of tooth pastes, gum paints and others.² Herbs have medicinal property due to the presence of different active constituents like alkaloids, volatile essential oils, glycosides, resins, oleoresins, steroids, tannins, terpenes and phenols.³

A herb may exhibit one or more following unique therapeutic properties like anti-bacterial, anti-inflammatory, astringent, anaesthetic, immune strengtheners, anticariogenic, as storage media for avulsed tooth and as antiplaque agents.

This review aims in providing an overview of most commonly used herbal root canal irrigants during endodontic treatment.

TRIPHALA

Triphala [three (tri) fruit(phala)] is one of the well known Indian ayurvedic herbal formulation consisting of dried and

powdered fruits of three medicinal plants namely Terminalia Bellerica, Terminalia Chebula and Emblica Officinalis with tannic acid being its main constituent.⁴ Triphala shows bacteriostatic or bacteriocidal effect on gram-positive and gram negative pathogens. Compared to commonly used chemical root canal irrigants, it is safe and is composed of compounds with proper physiologic effects in addition to its anti-oxidative and anti-inflammatory properties. The most important advantages of triphala include: easy availability, low cost, long-term substantivity, less toxicity and absence of microbial resistance. Triphala's fruit is rich in citric acid, shows the property of chelation and helps in the removal of smear layer from the walls of the root canal.⁵ DiMethyl SulfOxide (DMSO) was used as a solvent for triphala and it is a clean, safe, highly polar, aprotic solvent that helps in bringing out the pure properties of all the components of the herb being dissolved. J. Prabhakar et al⁴ conducted a study on the antimicrobial efficacy of herbal root canal irrigants and found that Triphala exhibited significant antimicrobial activity against *E. faecalis* biofilm formed on tooth substrate. The antimicrobial potency of triphala can be attributed to its formulation, which contains three different medicinal plants in equal proportions. In such formulations, different compounds help in enhancing the potency of the active compounds resulting in an additive or synergistic positive effect.^{6,7} Triphala is proven to be safe and its curative properties such as anti-oxidant, anti-inflammatory and radical scavenging activity have an added advantage over the commonly used chemical root canal irrigants.^{8,9}

MORINDA CITRIFOLIA

Among the medicinal plants discovered by the ancestors of Polynesians, *Morinda citrifolia* (MCJ) is one of the traditional folk medicinal plants that has been used for over 2000 years in Polynesia. Noni is the common name for *Morinda citrifolia* and is also called Indian Mulberry, Ba Ji Tian, Nono or Nonu, Cheese Fruit, and Nhau in various cultures throughout the world. It has broad range of therapeutic effects¹⁰ including antibacterial, anti-inflammatory, anti viral and analgesic effects. Antibacterial activity of MCJ is attributed to its constituents: alizarin, scopoletin, aucubin and asperuloside. Unfortunately, since MCJ, is a natural pure plant extract, it tends to degrade over a period of time and this could explain its initial potent antibacterial activity and then decline in its performance over a period of time. 6% MCJ promises to be a novel root canal irrigant. It is biocompatible, potent antioxidant and is not likely to cause severe soft tissue injuries to patients that occur through sodium hypochlorite accidents when used as root canal irrigant. It was one of the first herbal alternatives used as root canal irrigant.

In a study conducted by Prabhakar AR et al¹¹, 6% *Morinda citrifolia* was compared with 0.2% chlorhexidine solution as root canal irrigant, *Morinda Citrifolia* was found to have significant anti-bacterial activity which is attributed due to its contents alizarin, scopoletin, aucubin and asperuloside. However, the antibacterial activity of MCJ was lower than 0.2% chlorhexidine solution.¹²

GREEN TEA POLYPHENOL

It is a traditional drink of Japan and China and is prepared from the young shoots of tea plant *Camellia Sinensis* and is a member of the theaceae family. The leaves of the tea plant contain polyphenolic components which are active against wide spectrum of microbes.¹³ Green tea powder is made after drying and crushing of fresh leaves of the plant and is produced without passing through the stage of oxidation and fermentation. Phenolic compounds in extracts of green tea are effective in inhibiting the growth of decay-causing bacteria. 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.¹⁴ Green tea polyphenols have significant antioxidant, anticariogenic, anti inflammatory, thermogenic, probiotic and antimicrobial properties. These properties along with ease of availability, economical, longer shelf-life, minimal toxicity or no toxicity and lack of microbial resistance, makes it an excellent alternative to the currently available chemical root canal irrigants.^{15,16} Hashemi et al¹⁷ concluded that green tea extracts, in comparison with antibiotics such as cefotaxime and ceftazidime, showed more effective antibacterial action against *Pseudomonas aeruginosa* that contain lactamase. The antibacterial property is attributed to the catechins present in green tea. Green tea contains catechin

compounds like: catechin, epicatechin, epigallocatechin, epicatechin gallate and Epigallocatechin(also known as EGCG). EGCG is found to be the most active component in green tea. These catechins are water soluble and have a bitter taste. Catechins have wide biological activities which affects membrane dependent cellular processes such as signalling, cell cycle, arachidonic acid metabolism, and mitochondrial functionality. Bacterial strains are susceptible to green tea extracts due to differences in cell wall components. Bacterial cell membrane has a lipid bilayer structure. EGCG binds to the lipid bilayer and causes aggregation of lipid vesicles and leaks the contents from a suspension of vesicles. It causes membrane expansion leading to membrane thinning, loss of cell structure and finally death. It also interferes with DNA replication process by inhibiting bacterial DNA gyrase enzyme.¹⁵

PROPOLIS

The word Propolis was coined by Aristotle, who identified how propolis was used to protect and defend the hive. The term Propolis in Greek means 'Before the City' or 'Defender of the City'. Propolis is a resinous material or sap that is collected after it oozes out from tree bark of poplars and conifers or from flowers of Genera *Clusia*.¹⁸ It is a resin widely used in folk medicine since centuries. Propolis is composed of resin and balsam(50%-70%), essential oils and wax(30%-50%), pollen(5%-10%) and other constituents which are amino acids, minerals, vitamin A, E, B-Complex and the other highly active biochemical substances like bioflavonoids, phenols, cinnamic acid derivatives. The antimicrobial properties of propolis is attributed to its high flavonoid content and in particular with the presence of galangin and pinocembrin. The flavone, baicalein is reported to be largely responsible for antimicrobial effect.

In Dentistry, propolis has been used for the treatment of aphthous ulcers, candida albicans, Acute necrotizing ulcerative gingivitis [ANUG] and periodontitis and also used as a storage media for avulsed tooth to maintain the viability of the periodontal ligament cells. The anti-inflammatory property of propolis is due to the presence of caffeic acid and phenethyl ester in propolis and the ethanol extract of propolis helps in promoting bone regeneration and hard tissue bridge formation in pulpotomies.

Propolis exhibits antioxidant, antibacterial, antifungal, antiviral, anti-inflammatory, anti-tumor and immunomodulatory properties and can serve as a potent root canal irrigant and intracanal medicament.¹⁹

Al-Qathami et al²⁰ compared the antimicrobial efficacy of propolis, sodium hypochlorite and saline as root canal irrigants and found that propolis was equally antimicrobial to that of sodium hypochlorite.

NEEM

Azadirachta indica (Neem) is a commonly seen tree in India and is considered holy. Popularly known as "Indian neem/Margosa tree or Indian lilac" is well known in India and its neighbouring countries for more than 2000 years as one of the most versatile medicinal plant having a wide spectrum of biological activity.¹ Importance of neem tree has been recognized by US National Academy of Science, where neem is entitled as 'a tree for solving global problems.'

Biologically active agents isolated from different parts of the neem plant includes: azadirachtin, meliacin, gedunin, salanin, nimbin, valassin. Neem has an anti-adherence activity by altering bacterial adhesion and ability of organism to colonize. Oil from leaves, seeds and bark of neem tree has a wide spectrum of antibacterial action against Gram-positive and Gram-negative microorganisms and is proved to be effective against *E. Faecalis*, *Candida albicans*. Neem's antiviral, antifungal, antibacterial and anticarcinogenic activity makes it a potential agent for use it as a root canal irrigant. Neem leaf extract is also used to treat dental plaque and gingivitis. Being a bio-compatible antioxidant, using of neem as root canal irrigant is highly beneficial and it is not likely to cause severe harm to patients that might occur in sodium hypochlorite accidents. Its biocompatibility to human periodontal ligament fibroblasts is an important factor favouring its clinical applications. Bitter taste associated with this plant product can be easily altered by the addition of sweeteners and flavours to increase the patient compliance and acceptability.

Naiyak Arathi²¹ observed that ethanolic extracts of neem has significant antimicrobial activity against *E. faecalis*. In another study by Hannah Rosaline et al.,²² the effects of herbal extracts such as *Morinda citrifolia*, *Azadirachta indica* and green tea were evaluated. The most to least effective root canal irrigants were: *Azadirachta indica*, sodium hypochlorite, green tea, *morinda citrifolia* and saline. Thus, it is an effective herbal alternative to the commonly used root canal irrigants like sodium hypochlorite.

CONCLUSION

The major advantages of using herbal root canal irrigants are: easy availability, cost effectiveness, increased shelf life, low toxicity and lack of microbial resistance. The knowledge and understanding of natural approach of treatment in using herbal products as root canal irrigants is still an ongoing process and further research should be carried out in this regard.

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