



## ROLE OF HERBS IN INTRACANAL MEDICAMENTS

PRATISHTA JAIN\*<sup>1</sup> AND MANISH RANJAN<sup>2</sup>

<sup>1</sup>Final year BDS, Saveetha University, Chennai, India.

<sup>2</sup>Department of Conservative Dentistry & Endodontics, Saveetha University, Chennai, India.

### ABSTRACT

The major objectives of an endodontic treatment are to remove the diseased tissue, eliminate bacteria from the root canal system and prevent its recontamination. Intracanal medicaments are used in a root canal treatment to eliminate any remaining viable bacteria in the root canals after instrumentation, to reduce the inflammation of periapical tissues and to prevent reinfection of the root canal system. For this purpose, a wide variety of synthetic antimicrobial agents are available but due to their adverse effects on the host like hyper sensitivity, immune suppression and allergic reactions, there's a need to find natural plant based alternatives for these conventional drugs. Herbal alternatives are affordable, effective and non toxic. Thus, this review aims at providing a comprehensive overview of the various herbal agents that can be used as effective intracanal medicaments.

**KEYWORDS:** Herbs, intracanal medicament, calcium hydroxide, root canal system, *Enterococcus faecalis*



**PRATISHTA JAIN**

Final year BDS, Saveetha University, Chennai, India.

## INTRODUCTION

The main aim of an endodontic treatment is to remove the diseased tissue, to eliminate bacteria from the root canal system and to prevent its recontamination. An intracanal medicament is used to eliminate any remaining viable bacteria in the root canals after instrumentation, to reduce the inflammation of periapical tissues, to render the root canal contents inert and neutralize tissue debris and to prevent reinfection of the root canal system<sup>1</sup>. Many synthetic anti microbial agents have been used as intra canal medicaments, but due to their adverse effects on the host like hyper sensitivity, immune suppression and allergic reactions there's a need to find natural plant based alternatives for these conventional drugs. Intra canal medicaments can be classified on the basis of their chemical composition into calcium hydroxide, phenolic compounds (e.g. eugenol and camphorated monochlorophenol), aldehydes (Formocresol), halides (e.g. iodine potassium iodide), antibiotics, and various combinations<sup>2</sup>. Most of these have been reported for toxicity, development of resistant strains, and suppression of the immune system<sup>3</sup>. Calcium hydroxide is one of the most commonly used intra canal medicaments. Its use is attributed to its high pH, antimicrobial effect and potential to stimulate healing of pulp and periapical tissues. However it has been shown that the buffering action of dentine neutralizes the action of calcium hydroxide in the deeper layers of dentinal tubules<sup>4</sup>. This results in the survival of microorganisms resulting in endodontic failure. Formocresol, camphorated mono-chlorophenol, merthiolate, metacresylacetate, beechwood creosote, and glutaraldehyde exhibit antibacterial action in a vapour form<sup>5</sup>. Although, they are effective against most of the pathogenic microorganisms, alpha hemolytic streptococci and enterococci have been reported to be resistant to the vapours of these medicaments. Their role is also limited because they are extremely toxic, antigenic and its effect is lost after a few days. Due to the above disadvantages, the need for finding effective herbal alternatives that could replace the synthetic intracanal medicaments arises.

The main advantages of using herbal alternatives are easy availability, cost effectiveness, increased shelf life, low toxicity and lack of microbial resistance. There have been numerous studies to evaluate the efficacy of various herbs as intracanal medicaments. Thus, this review aims at enlisting and describing the various herbal agents that have been studied to be used as effective intracanal medicaments.

### NATURAL INTRACANAL MEDICAMENTS

#### *Arctium lappa*

*Arctium lappa* is a plant obtained from Japan and acclimated in Brazil. It has been widely used in medicine for its therapeutic applications. It possesses significant anti bacterial, anti oxidant and anti fungal properties. The antibacterial activity of *Arctium lappa* has been attributed to the presence of polyacetylenes<sup>6</sup>. It has been reported to exhibit in vitro activity against gram-negative bacteria, including *E. coli*, *Shigella flexneri*, and *Shigella sonnei*. Julaina Vianna et al evaluated the anti microbial efficacy of *Arctium lappa* against the most commonly found micro organisms in endodontic infections. It was observed that *Arctium lappa* showed great microbial inhibition potential, opening its perspective for use as an intracanal medicament<sup>7</sup>. In another in vitro study by Marcelo Gentil et al, the antibacterial activity of *Arctium lappa* was evaluated against a mixed bacterial suspension of *Pseudomonas aeruginosa*, *Escherichia coli*, *Lactobacillus acidophilus*, *Streptococcus mutans* and *Candida albicans*. It was found to inhibit the growth of all microorganisms in the study<sup>8</sup>.

#### *Eucalyptus Oil*

It is an essential oil, obtained from the leaf of Eucalyptus. It has anti inflammatory and anti bacterial activities and can be used as a vehicle for intracanal medicaments<sup>9</sup>. Studies have reported that the antimicrobial activity of Eucalyptus essential oil only in pure concentration on *Pseudomonas aeruginosa* and *Escherichia coli*<sup>10</sup> as well as on *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Bacillus subtilis* and *Staphylococcus aureus*<sup>11</sup>. Considering the

antimicrobial potential of eucalyptus essential oil against resistant microorganisms<sup>10, 11</sup>, it is expected that its association with Calcium hydroxide contributes to the control of endodontic infections. However, more laboratorial steps are to be conducted in order to confirm the potential for constituting it in intracanal medicaments and to consider the clinical applicability of these associations.

### ***Ricinus communis***

It is rich in ricinoleic acid, also known as castor acid, and can be used as a root canal irrigant as well as an intracanal medicament<sup>12</sup>. In a study conducted by Marcia Carneiro Valera et al, the antimicrobial activity of auxiliary chemical substances and natural extracts against *Candida albicans* (*C.albicans*) and *Enterococcus faecalis* (*E.faecalis*) in root canals was evaluated in vitro. It was found that *Ricinus communis* extract was able to completely eliminate *C.albicans* and it was also able to significantly reduce the amount of *E. faecalis*<sup>13</sup>. In another study by Lucas da Fonseca Roberti Garcia et al, it was observed that calcium hydroxide and *Ricinus communis* oil paste had better activity than calcium hydroxide and propylene glycol paste against microorganisms commonly found in endodontic infections<sup>14</sup>.

### ***Uncaria tomentosa***

It is an Amazonian herb which possesses anti-inflammatory, anti-viral, anti-bacterial and anti-oxidant activities. In dentistry, it can be used as an intracanal medicament<sup>15</sup>. It contains oxindole alkaloids, triterpenes, vegetal steroids, phenolic compounds, glycosides, tannin, and flavonoids. These compounds may be related to its antimicrobial activity<sup>16</sup>. Isopteropodine-HCl, a pentacyclic oxindole alkaloid isolated from the bark of the plant, was shown to be the most potent of the tested compounds and has antibacterial activity against Gram-positive bacteria<sup>17</sup>. In an in vitro study, the susceptibility to *Uncaria tomentosa* of microorganisms frequently found in infected root-filled teeth was evaluated and it was suggested that 2% gel of *Uncaria tomentosa* inhibits microorganisms frequently found in infected root-filled teeth and that this effect may be increased when it is combined with Chlorhexidine<sup>18</sup>.

### ***Propolis***

Propolis (Bee glue) is a by-product of honey bees which possesses anti-microbial, anti-inflammatory and anti-oxidant properties. Its major active components are flavonoids and cinnamic acid derivatives. An Ethanol extract of Propolis can promote bone regeneration and induce hard tissue bridge formation<sup>19</sup>. The efficacy of propolis has been evaluated in various studies. In a study conducted by Abhishek Parolia et al, anti-bacterial efficacy of three intracanal medicaments with propolis were investigated and compared. It was found that propolis could be used as an alternative intracanal medicament since it showed significant anti-bacterial activity against *E.faecalis* present in the root canals<sup>20</sup>. In another study by D.Kandaswamy et al, anti-microbial activity of propolis with calcium hydroxide was evaluated. It was observed that propolis could effectively eliminate the microorganisms, thus opening its perspective for use as an intracanal medicament<sup>21</sup>. Oncag et al compared the antibacterial efficacy of three intracanal medicaments with propolis against *E.faecalis* and concluded that propolis had potent antibacterial activity against *E.faecalis*<sup>22</sup>. Awawdeh et al also evaluated the efficacy of propolis and calcium hydroxide in Ex-vivo as a short-term intracanal medicament. It was found that Propolis is very effective in rapidly eliminating *E.faecalis*<sup>23</sup>.

### ***Casearia sylvestris***

*Casearia sylvestris* is a medicinal plant commonly found in tropical America and Brazil that offers a wide range of uses: antiseptic and antimicrobial activity. In a study by Silva FB et al it was found that propolis showed the least anti-inflammatory exudates followed by *Casearia sylvestris* extract when compared to Otosporin, a corticosteroid-antibiotic solution. Thus, *Casearia sylvestris* could be a valid alternative for a short-term intra-canal medicament in cases of pulp and periapical inflammatory processes<sup>24</sup>.

### ***Curcuma longa***

Also known as the Indian spice turmeric, it is a member of the ginger family and has curcumin as the principle curcuminoid. It possesses good anti-oxidant, anti-microbial and anticancer activity. In an in vitro evaluation by

Hemanshi kumar, the antimicrobial efficacy of *Curcuma longa*, *Tachyspermum ammi*, Chlorhexidine gluconate and Calcium hydroxide was compared against *E.faecalis*. It was found that *Curcuma longa* showed the highest zones of microbial inhibition ranging from 21-23mm when compared to the others. Thus it was concluded that *Curcuma longa* could be a promising intracanal medicament in eliminating *E.faecalis*<sup>25</sup>.

### **Liquorice**

Liquorice is the root of *Glycyrrhiza glabra* from which a somewhat sweet flavor can be extracted. In a laboratory evaluation by Badr AE et al, the antibacterial and cytotoxic effects of liquorice when used as a root canal medicament were studied. It was concluded that liquorice either used separately or used along with calcium hydroxide had a potent bactericidal effect on *E. faecalis* and had retained compatibility with fibroblasts in tissue culture when compared to calcium hydroxide used alone as an intracanal medicament<sup>26</sup>.

### **Morinda citrifolia**

*Morinda citrifolia* also known as Indian mulberry, has a wide range of uses due to its biocompatibility, and anti bacterial, anti inflammatory, anti viral, anti oxidant and analgesic effects. In an in vitro study by Anuj Bhardwaj, the antimicrobial activity of natural extracts of *Morinda citrifolia*, Papain and Aloe vera (all in gel formulation), 2% Chlorhexidine and Calcium hydroxide against *E.faecalis* was compared. It was observed that Chlorhexidine showed 100% inhibition from day 1-5 followed by *Morinda citrifolia* which also showed 86.02% inhibition from day 1-5. Calcium hydroxide showed the least. Thus it was concluded from the study that *Morinda citrifolia* could be used as effective intra canal medicament but further investigations are required to determine the optimum concentration for its use as an intracanal medicament<sup>27</sup>.

### **Papain**

Papain is a proteolytic cysteine enzyme exhibiting significant antibacterial and anti-inflammatory properties. In the study by Anug Bhardwaj et al, antimicrobial efficacy of natural extracts of *Morinda citrifolia*, Papain

and Aloe vera gels, 2% Chlorhexidine and Calcium hydroxide against *E.faecalis* was compared and the results were in the order from most to least effective: Chlorhexidine, *Morinda citrifolia* gel, Papain gel followed by Aloe Vera and the least calcium hydroxide<sup>27</sup>.

### **Ocimum sanctum**

Also known as Tulsi, it belongs to the Labiateae family. It possesses antibacterial, antifungal and anti viral properties. In a preliminary study by Navin Mishra et al, *Ocimum sanctum*'s essential oil extract was evaluated for its antibacterial and anti-inflammatory properties. It was observed from the study that the antibacterial efficacy of essential oil extract of *Ocimum sanctum* was directly proportional to an increase in concentration and contact period. Greater antibacterial efficacy was seen by 100% essential oil when tested at all the contact periods. Thus it was concluded that *Ocimum sanctum* had beneficial properties but further investigations are required for its potential use as an intracanal medicament<sup>28</sup>.

### **Allium sativum**

Also called as Garlic, it has been known to have broad spectrum antimicrobial properties with both bacteriostatic and bactericidal activities. The antimicrobial potency is due to its ability to inhibit toxin production and expression of enzymes for pathogenesis. Antimicrobial properties of aqueous garlic extract against 133 multidrug-resistant gram-positive and gram negative bacterial isolates were analyzed in an in vitro study which revealed the antimicrobial efficacy of aqueous garlic extract and use of garlic in health and herbal remedies<sup>29</sup>. Thus it could be an effective intracanal medicament but further studies are required to determine its concentration as an intra canal medicament.

### **Lemon solution**

Lemon solution is considered as a natural source of citric acid with low acidity. In a study by Sawsan T et al, fresh lemon solution was shown to have wide antibacterial efficiency including *E.faecalis* and hence can be used as an intracanal medicament<sup>30</sup>.

## CONCLUSION

The major advantages of herbal irrigants are safety, easy availability, increased shelf life, cost effectiveness and lack of microbial resistance so far. The in vitro studies conducted so far have shown that herbs can have a promising role as intracanal

medicaments. However, further clinical trials and investigations are required to be considered as effective alternatives to the synthetic intracanal medicaments.

## CONFLICT OF INTEREST

Conflict of interest declared none.

## REFERENCES

1. B.S Chong and T.R. Pitt Ford, The role of intracanal medication in root canal treatment. *International Endodontic Journal*, 25(2): 97-106, (1992).
2. El Karim I, Kennedy J, Hussey D, The antimicrobial effects of root canal irrigation and medication. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*, 103: 560-569, (2007).
3. Harrison JW, Bellizzi R, Osetek EM, The clinical toxicity of endodontic medicaments. *J Endod*, 5: 42-47, (1979).
4. Madhubala MM, Srinivasan N and Ahamed S, Comparative evaluation of Propolis and Triantibiotic Mixture as an intracanal Medicament against *Enterococcus faecalis*. *JOE*, 37 (9): 1287-1289, (2011).
5. Peters OA, Current challenges and concepts in the preparation of root canal systems: a review. *J Endod*, 30: 559-567, (2004).
6. Schulte, K. E., Rucker, G., and Boehme, R, [Polyacetylenes as components of the roots of bur]. *Arzneimittelforschung*, 17(7): 829-833, (1967).
7. Julaina Vianna, Debora Cristina Baldoqui, Jose Odair et.al, Antimicrobial Activity of *Arctium lappa* Constituents Against Microorganisms Commonly Found in Endodontic Infections. *Braz Dent J*, 16: 192-96, (2005).
8. Marcelo Gentil, Juliana Vianna Pereira, Yara T Corrêa Silva Sousa, Rosimeire Pietro, Manoel D. Sousa Neto, Luiz Pascoal Vansan and Suzelei de CastroFrança, In vitro evaluation of the antibacterial activity of *Arctium lappa* as a phytotherapeutic agent used in intracanal dressings. *Phytotherapy Research*, 20(3): 184-186, (2006).
9. Yuri Wanderley Cavalcanti, Leopoldina De Fátima Dantas De Almeida, Mariana Machado Teixeira De Moraes Costa, Wilton Wilney Nascimento Padilha, Antimicrobial activity and pH evaluation of Calcium hydroxide associated with natural products. *Braz Dent Sci*. 13(8): 49-54, (2010).
10. Cimanga K, Kambu K, tona I, Apers s, de bruyn t, Hermans n et al, Correlation between chemical composition and antibacterial activity of essential oils of some aromatic medicinal plants growing in the democratic republic of congo. *J ethnopharmacol*, 79(2): 213-20 (2002).
11. Prabuseenivasan s, Jayakumar m; ignacimuthu s, In vitro antibacterial activity of some plant essential oils. *bmc complement Altern med*, 39(6): 486-94, (2006).
12. Lucas Da Fonseca Roberti Garcia, Gabriela Lemos De Almeida, Fernanda De C. P. Pires-De-Souza, Simonides Consani, Antimicrobial activity of a calcium hydroxide and *Ricinus communis* oil paste against microorganisms commonly found in endodontic infections. *Rev Odonto Ciênc*, 24(4): 406-409, (2009).
13. Marcia Carneiro Valera, Lilian Eiko Maekawa, Luciane Dias de Oliveira, Antonio Olavo Cardoso Jorge, Érika Shygei, and Cláudio Antonio Talge Carvalho, In vitro antimicrobial activity of auxillary chemical substances and natural extracts on *Candida albicans* and *Enterococcus faecalis* in root canals. *J Appl Oral Sci*, 21(2): 118-123, (2013).
14. Lucas da Fonseca Roberti Garcia, Gabriela Lemos de Almeida, Fernanda de C. P. Pires-de-Souza, Simonides

- Consani, Antimicrobial activity of a calcium hydroxide and Ricinus communis oil paste against microorganisms commonly found in endodontic infections. Rev. odonto ciênc, 24(4): 406-409, (2009).
15. Daniel R Herrera, Lidia Y Tay, Eluise C Rezende, Vitoldo A Kozlowski Jr and Elizabete B dos Santos, In vitro antimicrobial activity of phytotherapeutic *Uncaria tomentosa* against endodontic pathogens. J Oral Sci, 52(3): 473-6, (2010).
  16. Aquino R, De Feo V, De Simone F, Pizza C, Cirino G, Plant metabolites. New compounds and anti-inflammatory activity of *Uncaria tomentosa*. J Nat Prod, 54: 453-459, (1991).
  17. García R, Cayunao C, Bocic R, Backhouse N, Delporte C, Zaldivar M, Erazo S, Antimicrobial activity of isopteropodine. Z Naturforsch C, 60: 385-388, (2005).
  18. Daniel R. Herrera, Lidia Y. Tay, Eluise C. Rezende, Vitoldo A. Kozlowski Jr and Elizabete B. dos Santos, In vitro antimicrobial activity of phytotherapeutic *Uncaria tomentosa* against endodontic pathogens. Journal of Oral Science, 52(3): 473-476, (2010).
  19. Rathod S, Brahmanekar R, Kolte A, Propolis – A natural remedy. Indian J DentRes, 10 (8): 50-52 (2013).
  20. Abhishek Parolia, manuel S. Thomas, M. Kundabala et.al, Propolis and its potential uses in oral health. Int.J Med. Med .Sci, 2: 210-15, (2010).
  21. D.Kandaswamy, N.Venkateshbabu, D.Gogulnath et.al, Dentinal tubule disinfection with 2% chlorhexidine gel, propolis, morinda citrifolia juice, 2% povidone iodine, and calcium hydroxide. Int endod J, 43: 419-23, (2010).
  22. Oncag O, Cogulu D, Uzel A, Sorkun K , Efficacy of propolis as an intracanal medicament against *Enterococcus faecalis*. General Dentistry, 54(5): 319-322 (2008).
  23. Awawdeh L, Al-Beitawi M, Hammad M, Effectiveness of propolis and calcium hydroxide as a short-term intracanal medicament against *Enterococcus faecalis*: a laboratory study. Aust. Endod. J., 35: 52-58, (2009).
  24. Silva FB<sup>1</sup>, Almeida JM, Sousa SM, Natural medicaments in endodontics -- a comparative study of the anti-inflammatory action. Braz Oral Res, 18(2): 174-9, (2004).
  25. Hemanshi Kumar, An *in vitro* evaluation of the antimicrobial efficacy of *Curcuma longa*, *Tachyspermum ammi*, chlorhexidine gluconate, and calcium hydroxide on *Enterococcus faecalis*. J Conserv Dent, 16(2): 144–147, (2013).
  26. Badr AE, Omar N, Badria FA, A laboratory evaluation of the antibacterial and cytotoxic effect of Liquorice when used as root canal medicament. International Endodontic Journal, 44: 51–58, (2011).
  27. Anuj Bhardwaj, Suma Ballal, and Natanasabapathy Velmurugan, Comparative evaluation of the antimicrobial activity of natural extracts of *Morinda citrifolia*, papain and aloe vera (all in gel formulation), 2% chlorhexidine gel and calcium hydroxide, against *Enterococcus faecalis*: An in vitro study. Journal of Conservative Dentistry, 15 (3): 293, (2012).
  28. Mishra N, Logani A, Shah N, Sood S, Singh S, et al, Preliminary Ex-vivo and an Animal Model Evaluation of *Ocimum sanctum*'s Essential Oil Extract for its Antibacterial and Anti- Inflammatory Properties. Oral Health Dent Manag, 12 (3): 509, (2013).
  29. Iwaiokun BA, Ogunledun A, Ogbolu DO, Bamiro SB, Jimi-Omojola J, In vitro antimicrobial properties of aqueous of garlic extract against multidrug- resistant bacteria in *Candida* species from Nigeria. J Med Food, 7 (3): 327-333, (2004).
  30. Abuzied ST, Eissa SAL, Comparative study on antibacterial activities of two natural plants versus three different intracanal medicaments. ( Online article) [http://www.kau.edu.sa/Files/165/Researches/19240\\_Comparative%20Study%20On.pdf](http://www.kau.edu.sa/Files/165/Researches/19240_Comparative%20Study%20On.pdf)