



Unique Journal of Medical and Dental Sciences

Available online: www.ujconline.net

Review Article

INTRACANAL ANTISEPTIC MEDICATIONS; A REVIEW

Ambikathanaya UK*

Lecturer Dept of Conservative Dentistry and Endodontics JSSDCH, Mysore, India

Received: 20-06-2014; Revised: 17-07-2014; Accepted: 14-08-2014

*Corresponding Author: **Dr Ambikathanaya U.K**

Lecturer Dept of Conservative Dentistry and Endodontics JSSDCH, Mysore, India

ABSTRACT

Successful root canal treatment depends on three main phases, biomechanical preparation of the root canal, disinfection and obturation. Disinfection of pulp space is an important step during and after cleaning and shaping. Intracanal medicaments are used for root canal disinfection. It plays a vital role in the success of root canal treatment from the past multivisit to today's single visit technique in various forms. Recent advances in various fields led to the development of introducing newer medications as well as modifying the existing ones and their mode of applications.

Keywords: Intracanal Medicaments, Disinfection, Phenolic Compounds, Antibiotics, Recent Advances and Techniques.

INTRODUCTION

Microorganisms are the main etiological agent of pulp and periradicular diseases¹. However with proceeding infection, necrosis and apical periodontitis the entire root canal system becomes invaded by bacteria. The goal of endodontic treatment is to remove and kill all microorganisms in the root canal and neutralize any agents that may be left in the canal after killing microbes². Endodontic treatment procedure can be divided into three main phases, biomechanical preparation of the root canal, disinfection and obturation³.

Disinfection of pulp space is an important step during and after cleaning and shaping. Intracanal medicaments are used for root canal disinfection. As a part of controlled asepsis, in an infected root canal and their role is secondary to cleaning and shaping of the root canal⁴. The chemical nature of medicaments employed are varied-; they come from a number of different groups, often different chemicals or drugs are combined in a "cock tail" in an attempt to elicit a variety of effects with a single application⁵.

Due to advance in medical and research fields new approaches like photoactivated disinfection, ultrasonics, endox, ozone, lasers and electrochemically activated water have been introduced for the disinfection of the root canal.

Therefore to inactivate this bacterial inflammatory burden, long lasting antibacterial intracanal medication has to be utilized between the endodontic appointments.

Rationale for intracanal antiseptic medication

The rationale behind intracanal antiseptic medication is to eliminate bacteria from the root canal and prevent reinfection.

Residual bacteria in obturated root canal may be denied access to nutrients and die or they may survive and ultimately proliferate. Although chemo mechanical preparation has an important cleaning effect, it can't eliminate all the bacteria from the root which are harbored in dentinal tubules. The remaining bacteria may multiply during the period between appointments often reaching the same level that it was at the start of the previous session in case where the canal is not dressed with a disinfectant between visits.

This calls for the use of an effective intracanal medication that will assist disinfection of the root canal system⁶. Such a medication should be effective throughout its period of application and penetrate the dentinal tubule eliminating bacteria that may be present with mild or least irritation to periradicular tissue.

Another aspect in using intracanal medicament is that, if time doesn't allow completion of the treatment in one appointment. It is generally recommended that root canal should be filled between appointment with an antibacterial, intracanal medicaments for several days or weeks to allow time for diffusion through the tubules and to kill bacteria. Normally irrigants act for a shorter duration and intracanal antiseptic medicaments act for longer duration against microorganisms within the root canal⁷.

Ideal requirements of intracanal antiseptic Medicaments

- A. It should be an effective germicide and fungicide
- B. It should be non-irritating.
- C. It should remain stable in solution
- D. It should have a prolonged antibacterial effect.

- E. It should be active in presence of blood, serum and protein derivatives of tissue.
- F. It should be capable of penetrating the tissue deeply.
- G. It shouldn't interfere with repair of periapical tissues.
- H. It shouldn't strain tooth structure
- I. It should be easily introduced into the root canal.
- J. It should be capable of being inactivated or neutralized in culture medium.
- K. Prevent coronal microleakage and not diffuse through the temporary restoration.⁷

Objectives of intracanal antiseptic medicaments

1. Elimination of micro-organisms.

The objective is to sterilize (destroy all viable micro-organisms) or to disinfect (destroy all pathogens) in the canal space.

2. Rendering contents of canal inert

This represents the attempt usually by chemical means to "mummify" fix or otherwise neutralize tissue or debris left intentionally or unintentionally in the pulp space. If successful this would cause those remnants to become and to remain non irritant.

3. Prevention or control of post-treatment pain

The objective is to reduce or alter the inflammatory response. Medicament might accomplish this by antimicrobial action or by pharmacologically altering the inflammatory response itself. Logically this would reduce the pain that often accompanies inflammation. Pain might also be controlled by the chemical or pharmacological action of the medicament in direct contact with sensory nerves in the pulp or periapical tissues. If the conduction of the nerves is inhibited this would prevent transmission of pain-producing stimuli to the central nervous system.

4. Enhancing Anesthesia

Agents have been suggested as a means of somehow reducing the sensitivity of the inflamed, difficult to anesthetize pulp. If this were true, the pulp could be removed at a subsequent appointment with less anesthetic difficulty.

5. Control of persistent periapical abscess

A continually "weeping" canal or significant pain or swelling after treatment are signs of an active periapical inflammatory lesion. Medicaments have been suggested as a means of controlling this difficult situation. The agent in the canal space would have direct access to the periapical lesions. It might, by direct action restore a healthy balance⁵.

Factors influencing antiseptic action

Antisepsis is the endeavour to prevent or arrest the growth of micro-organisms on living tissues. In vital pulp extirpation, antiseptic measures are necessary to prevent infection in case there is a breach in the chain of asepsis. Irrigating solutions and interappointment dressings need to be antibacterial in action to prevent any micro-organisms, which may contaminate the canal system from multiplying and establishing themselves⁸.

In consequence, it is hardly surprising that unless an antiseptic agent is used, the residual microbial population of the canal will increase in number following root canal preparation. The antiseptic agent who is used should be capable of eliminating all species of micro-organisms liable to be present. Furthermore, since tissue exudate may enter by way of apical

foramen, the agent should be active in the presence of protein derivatives and should not limit its own diffusion by precipitation of albumin. To reach organisms located in minor irregularities of the canal, it should also be freely diffusible. This obviously implies diffusion of the agent in an apical direction.⁹

Drugs (antibiotics)

Certain selected antibiotics satisfy many of the requirements of a root canal antiseptic, in that they are active in the presence of tissue fluid, do not stain the tooth and are virtually non-irritant to tissue cells. Since they are non-irritant very high concentration of antibiotics may be used and so a bactericidal effect is achieved. At present however, there is no single antibiotics effective against all micro-organisms liable to be present in contaminated root canals. A combination of antibiotics or of one or more antibiotics with a chemical antiseptic is therefore necessary.

Possible drawback to use of antibiotics

- a. Resistant strains of micro-organisms may develop.
- b. Allergic response may be elicited in a patient already sensitive to an antibiotic.
- c. Person who was previously insensitive to an antibiotic may become sensitized following its use in the root canal.

Form of the Drug

Although there is generally little or no clinical advantage in employing an antibiotic paste in preference to a chemical antiseptic instances do arise when their use is justified. For example, in a small minority of cases evidence of root canal infection and periapical irritation persist despite apparently thorough preparation of the pulp cavity and treatment with chemical antiseptics; in such teeth the use of antibiotic paste is usually effective. Since antibiotics are in general less irritant to periapical tissue than chemical antiseptics, there is an argument for using such a paste where the apical foramen has been inadvertently widened by over instrumentation and in immature teeth with wide apical foramen. Also there is evidence that chemical antiseptics lose potency within a root canal more rapidly than antibiotic preparation. Thus if the interval between the penultimate visit and that at which the tooth is root filled as longer as 14 days, the use of an antibiotic preparation is advantageous. In view of the potential dangers of an allergic reaction, a preparation containing an antibiotic to which the patient is known to be sensitive should not be used⁹.

A study was conducted by Frederick C. S et al, "Identification of cultivable micro-organisms from root canals with apical periodontitis following two-visit endodontic treatment with antibiotics/steroid or calcium hydroxide dressings."

He concluded that endodontic treatment with different medicaments could markedly affect the diversity and quantity of cultivable micro-organisms in infected canal with some groups of micro-organisms more resistant to treatment than others. It was also noticed that chemo mechanical cleaning with the use of antibiotics/steroids combination or calcium hydroxide as interappointment medicaments produced similar microbiological outcomes¹⁰.

Micro-organisms

The microbial composition of infected root canals is an important factor in selection of intracanal dressings. The

antimicrobial action of these dressings must reach different types of micro-organisms, inhibits osteoclastic activity in root resorption and favours tissue repair.

Location of micro-organisms

The treatment aspect of the complexity of an infected pulp necrosis is not solely related to the mere presence of bacterial organisms throughout the pulp chamber, but also to the fact that they may be lodged in areas of inaccessible for instrumentation and disinfection. Such spaces include lateral canals, isthmuses, crevices and dentinal tubules. Oval shaped canals especially present the clinician with the difficult task of cleaning the entire circumferences as necrotic tissue and debris are often left behind in these canals. Bacteria in dentinal tubules are yet another challenge.

The other factors which influence the antiseptic action are-

1. **Trauma:** The tooth under treatment should be disoccluded at times.
2. **Devitalized tissue:** If present in the root canal or periapical tissue it will interfere with disinfection or with repair.
3. **Dead space:** The medicament should be carried into the root canal so as to come in contact with tissue to be sterilized.
4. **Accumulation of exudate:** Exudate should be allowed to drain or be removed as it accumulates. Root canal dressings should be changed often enough once or twice a week not only to renew the medication but to remove the exudate by means of absorbent points. In early stages of treatment of a tooth with an acute abscess, after the acute symptoms has subsided root canal dressings may be changed even more often to absorb the exudates which accumulates.
5. **Foreign body:** It present in the periapical tissue, root resection or curettage should be performed to eliminate it.⁷

The ethics of reasonable endodontic therapy are focused on prevention, minimization and elimination of infection which are not easy tasks within the condition of a dentin canal system.¹⁰

Classification

According to Grossman intracanal medicament can be classified as

1. Essential oils
 - Eugenol
2. Phenolic compounds
 - Phenol
 - Parachlorophenol
 - Camphorated parachlorophenol
 - Cresol
 - Formocresol
 - Creosote
 - Cresatin
 - Cresanol
3. N₂
4. Salt of heavy metals
 - Metaphen
 - Merthiolate
 - Mercuraphen
5. Halogens
 - Sodium hypochlorite
 - Iodides
 - Chlorexidine

6. Quaternary ammonium compounds
 - 9-aminoacidine
7. Fatty acids
 - Propionic acid
 - Caproic acid
 - Cuprylic acid
8. Sulphonamides.⁶

Eugenol

Eugenol is the chemical essence of oil of clove and is somewhat related to phenol. It is slightly more irritating than oil of clove and is both an antiseptic and an anodyne. It is a pale yellow liquid which becomes dark with age. It has a clove like odor from which it is derived and has slight anesthetic as well as antiseptic properties.⁶

Phenol

It is one of the oldest antiseptic and was introduced by Lord Lister into Medicine in 1867. It is a white crystalline substance has a characteristic odor which is derived from coal tar. Liquefied phenol (carbolic acid) consists of 9 parts phenol and 1 part water. Phenol crystals will become liquefied on the addition of camphor, menthol or thymol. Liquefied phenol ordinarily referred to as phenol has been used in dental treatments as sedatives for the pulp tissue, as disinfection for caries cavity preparation and as root canal medications. It is also used for disinfection before periapical surgery and for cauterizing tissue tags that resist removal with broaches or files. At one time antimicrobials were compared with phenol for their disinfectant action. Thus it is notified as phenol coefficient.⁶

Parachlorophenol

These are colourless needle like crystals like phenol turn dark upon exposure to light. It is a substitution product of phenol, chlorine replacing one of the hydrogen atoms (C₆H₄OHCl). Crystals are soluble in alcohol, ether, alkalis and slightly soluble in water. By trituration with gum camphor it combines to form an oily liquid.⁶

Camphorated parachlorophenol

Composed of 2 parts P-chlorophenol and 3 parts gum camphor, it was introduced into dentistry as a root canal antiseptic by Walkhoff in 1891. It is transparent oily light amber coloured liquid having a characteristics aromatic odour. The camphor serves the purpose of a diluent and vehicle and reduces the irritating effect of pure parachlorophenol. Its antimicrobial effect compared with some other root canal medicaments has been assessed by Grossman. Wantulok and Brown have demonstrated that the vapours of camphorated chlorophenol of cresatin will pass through the apical foramen.

Camphorated Monoparachlorophenol (CMCP): CMCP is made by mixing crystals of paramonochlorophenol with camphor, when liquefaction occurs spontaneously. Various proportions of the two constituents are advocated, the most common being 7 parts of camphor to 3 parts of paramonochlorophenol. Whilst CMPC is a more powerful bactericidal agent than phenol. It is much less irritant and doesn't coagulate albumin.⁷

Cresol (Tricresol)

This mixture of Ortho, Meta and Para-isomeric cresol is obtained from coal tar and may contain a trace of phenol. It is

a colourless or pinkish liquid with a phenolic odor. It is approximately 3 times more effective as a disinfectant than phenol. Cresol is also a substitution product of phenol ($C_6H_4OHCH_3$)⁶.

Creosote

This clear yellowish oily liquid has a sharp pungent aromatic odour which once filled the air of most dental orifices. It is a better disinfectant than phenol and is less toxic and irritating. In dentistry only the beechwood variety of creosote should be used.⁶

Cresatin

Metacresylacetate or cresatin is the acetic acid ester of Metacresol. This antiseptic/ analgesic has a phenolic acetic odour. It is a clear stable oily liquid of low volatility. Its antibacterial effect is enhanced because of its low surface tension and its effect is prolonged by its low vapour pressure. The antimicrobial effect of cresatin is not as marked as that of some of the other members of this group as demonstrated by Grossman, but the drug is less irritating. It is not caustic and doesn't precipitate albumin.

Cresanol

It is a combination of cresatin 1 part, P-chlorophenol 1 part and camphor 2 parts. It is slightly more effective as an antiseptic than cresatin and slightly less irritating than chlorophenol.

N₂

Claimed to be both an intracanal medicament and sealer. N₂ contains paraformaldehyde and phenyl mercuric borate according to Sargenti and Richter. Both of these agents have a high degree of antimicrobial activity, but are irritating and toxic, claims that N₂ has a permanent disinfectant action and unusual antiseptic properties. The author has found the antibacterial effect of N₂ short lived, being dissipated in about a week or 10 days.⁶

Aldehydes;

Formocresol

Introduced by Buckley in 1905. It is a combination of formalin and cresol. It is a clear slightly reddish liquid with a distinctive odour. The proportion of formalin and cresol varies from 1:2 to 1:1. It is a mixture of 3 isomers. The formula is Formaldehyde 19%, Cresol 35%, Glycerin and water 46%.

Heavy metal salts

The salts of the heavy metals are protoplasm poisons. They precipitate albumin and produce new compounds which stain tooth structure. At one time ammoniated silver nitrate was used for disinfection of root canals but it stained tooth structure. Organic mercurial salts such as Metaphen, Merthiolate, Mercuriophen etc are strong disinfectants which have a lesser tendency to precipitate albumin but their usefulness is limited in endodontic because of their staining proclivities.

Halogens

Disinfectant action of the halogens is inversely proportional to their atomic weights. Chlorine having the lowest atomic weight has the greatest disinfectant action of the members of this group. Chlorine is released from sodium hypochlorite and from chloramines. The latter release active chlorine at a lower rate and has been used for short term dressing of the root canal⁷.

Sodium hypochlorite

It is the current irrigating solution of choice. It is used clinically in concentration from 0.5 to 5.25%. Necrotic tissue and debris are dissolved by sodium hypochlorite, a property exploited in biomechanical cleansing of root canals

Chloramine T

Chloramine T is a chlorine compound with excellent antimicrobial qualities. Chloramines (5%) which has a low toxicity is a good alternative intracanal dressing when a history of allergy prevent the use of Iodine compounds. It is also used for disinfecting gutta-percha points⁹.

Iodine

Iodine has been used for many years and is known for its mild effect on living tissue. The two most common preparations used in dentistry are Iodine tincture (5% in alcohol) and Iodine potassium iodide (Iodine 2%, potassium iodide 4%, distilled water 94%). The former solution is used for the disinfection of endodontic surgical fields and the latter for intracanal medication⁶.

Chlorhexidine

It is a synthetic cationic bis-guanides that consists of two symmetric 4-chlorophenyl rings two bi guanide groups connected by a central hexa-methylene chain. It is a positively charged hydrophobic and lipophilic molecule that interacts with phospholipids and lipopolysaccharides on the cell membrane of bacteria and then enters the cell through some type of active or passive transport mechanism. Its efficacy is because of the interaction of the positive charge of the molecule and the negatively charged phosphate groups on the microbial cell walls there by altering the cells osmotic equilibrium. This increase the permeability of cell wall which allows the CHX molecule to penetrate into the bacteria¹¹.

Quaternary ammonium compounds

The quaternary ammonium compounds which one cationic detergent and wetting agents are mildly effective disinfectants. They are practically non irritating in weak solution (1:20000 – 1:50000) and because of their foaming detergent action they could be used for irrigating root canals without fear of causing an inflammation of the periapical tissue. The quats are stable compounds which lower surface tension of solutions are colourless and practically odorless and are more effective in alkaline than in acid media⁶.

Calcium hydroxide

Hermann introduced calcium hydroxide into dentistry in 1920. It is a highly alkaline substance with a pH of approximately 12.5. It has antibacterial properties and has the ability to induce repair and stimulate hard tissue formation

Uses

1. Prevention of root resorption
2. Repair of Iatrogenic perforation
3. Treatment of horizontal root fracture
4. Apexification
5. Apexogenesis
6. Root resorption
7. In weeping canal

PBSC

As mentioned by Grossman PBSC has enjoyed wide use among dentists.

Nystatin replaces sodium caprylate as the antifungal agent in a similar medicament PBSN. Both are available in the paste form that may be injected into root canals or impregnated on paper points. Because there is no volatility, the drug must be placed in the canal to have effect in that area. PBSC may interfere with subsequent culturing procedure and penicillinase may be added to culture media to inactivate penicillin and it should be transformed on the paper point taken to incubate. But with the decline in popularity of intracanal medicament in general and because of the potential for sensitivity due to topical use of antibiotics, PBSC largely has fallen into disuse¹².

Ledermix paste

It is a glucocorticoid antibiotic compound. It was developed by Schroeder and Triadon in 1960. It is used to control pain and inflammation. The sole reason for adding the antibiotic component to ledermix was to compensate for what was perceived to be a possible corticoid induced reduction in the host immune response. Today Ledermix paste remains a combination of the same tetracycline antibiotics, demeclocycline, HCL (at a concentration of 3.2%) and a corticosteroid triamcinolone acetoxide (concentration 1%) in a polyethylene glycol base¹³.

Sulphonamides

The sulfonamides are chiefly bacteriostatic rather than bactericidal agents which interfere with bacterial metabolism and thereby render the micro-organisms more vulnerable to destruction by the defensive mechanism of the body. They are used as medicaments by mixing with sterile distilled water or by placing a moistened paper points into a fluffed jar containing the powder. Yellowish tooth discolouration has been reported after use. The medication is suggested for use when closing the teeth that had been left open after an acute periapical abscess. It is also shown that it is ineffective in the presence of pus, protein breakdown products, tissue debris and p-aminobenzoic acid⁶.

Mode of application

Another important factor in the selection of an intracanal medicament is the mode of application. There are basically two methods.

1. The medicament can be placed on a cotton pellet and placed in the pulp chamber or
2. The root canal can be flooded with the prepared medicament.

After the final recapitulation, the pulp chamber in the root canals is thoroughly dried up with sterile cotton pellets and paper points. If the medicament is to be used, a bottle containing the medicament should be inverted to allow the liquid to cling to the side near the mouth of the bottle. The cover is removed and the sterile cotton pellet is lightly wiped on the inside picking up some of the liquid. The cotton pellet is then squeezed in a sterile gauze sponge. The amount of medicament remaining in the pellet is more than sufficient to render its temporary antibacterial action and the medicated pellet is placed only in the pulp chamber.

The other method is the canal flooded with the prepared medicament. Since paste preparation are less diffusible than chemical antiseptic in liquid form, it is necessary to ensure that the preparation contacts the entire root canal. The canal is

completely filled with paste. This is usually done by transferring paste to pulp chamber with a plastic instrument and then propelling it apically along the root canal with a plastic carrier.

Considerable care should be taken in sealing the pulp chamber to prevent recontamination from marginal leakage or actual loss of seal before next appointment.⁷

Recent advance in intracanal medicaments and techniques Triple antibiotic paste

Infections of the root canal system are considered to be polymicrobial consisting of both aerobic and anaerobic bacterial species. Because of the complexity of root canal infections the use of single antibiotic may not result in effective disinfection of the RCS. A combination of antibiotic may be needed to address the diverse flora encountered. A combination of antibiotic might also decrease the likelihood of the development of resistant bacterial strains. The combination that appears to be most promising consists of metronidazole, ciprofloxacin and minocycline. Sato et al evaluated the potential of this mixture to kill bacteria in the deep layers of root canal in dentin. In situ, no bacteria were recovered from the infected dentin of the root canal wall 24 hrs after the application of drug combination.¹⁷

Medicated gutta-percha

There are new gutta-percha points in the market that contain Ca(OH)₂ in a 50% to 51% concentration instead zinc oxide, which makes Ca(OH)₂ placement and removal easy.¹⁸

Bioactive glass

Research is underway in the use of bioactive glass as an intracanal medicament. In one study glass used was composed of 53% SiO₂, 23% Na₂O, 20% CaO and 4% P₂O₅ was prepared from reagent-grade Na₂CO₃, CaHPO₄, 2H₂O, CaCO₃ and Belgian sand. When used in root canals bio-active glass was found to kill bacteria but the mechanism of action was not pH related and dentin did not seem to alter its effect.¹⁸

NISIN

Nisin is a naturally occurring antimicrobial peptide and was discovered in 1928, produced by strains of *Lactococcus lactis*. Nisin is an antibiotic peptide and is a class I bacteriocin. Nisin is safe to human and is used extensively as a food preservative over 40 years. The mode of action of nisin while not completely understood is due to interaction with the phospholipid membrane of the target bacterial cell. Nisin disrupts the cellular membrane inducing leakage of small intracellular contents from the cell.¹⁹

PAD

The technique of photosensitization has been used in medicine for some time. PAD utilizes photoactive agent toloum chloride. Because of its antimicrobial effectiveness it is used in endodontic application. The activation of photosensitizer molecule by red laser emitting radiation of wavelength 635nm. The light is directed to the tip of a small flexible optical fibre that is inserted into the root canal. The maximum power setting of 100 mW ensures that the unit does not generate sufficient heat to harm the adjacent tissue. The strong oxidizer generated during the process can act on multiple targets in a microbial cell resulting in membrane damage, enzyme inactivation and genomic and plasmid DNA damage, resulting in instantaneous death. In addition, the light activated killing

of bacteria has a wide spectrum of antimicrobial activity with a minimal chance of giving rise to a resistant microbial population making it an ideal disinfectant. Fighting bio-film medicated localised human infection is one of the potential medical application of LAT(light activated therapy).¹⁸

ENDOX

The endox endodontic system has been reported to sterilize the root canal by emitting high frequency electrical impulses. Sterilization occurs as a result of fulguration and manufacture claims it is able to eliminate both pulp and bacteria from the entire root canal system. A recent study showed that the unit was not able to eliminate pulp tissue from the root canal system without mechanical cleaning. The authors could not recommend high frequency electric pulses as the sole endodontic treatment but felt that the unit may be utilized as a supplement to traditional cleaning and shaping.¹⁹

Chlorhexidine Digluconate

Chlorhexidine Digluconate has been recommended both as a root canal irrigant and an intracanal medicament. As a medicament it can be used as 2% CHX gel

Mixture of CHX and Ca(OH)₂

Lindskog et al assessed the therapeutic effect of a 4 week intracanal application of CHX gel on inflammatory root resorption in replanted infected teeth of monkeys. They reported that extent of inflammatory resorption was significantly reduced compared to non medicated teeth, suggesting that CHX may be a useful adjunct in the management of inflammatory root resorption.¹⁸

A study was conducted by Jose F Siqueira et al regarding the elimination of candida albicans infection of the radicular dentin by intracanal medicaments. Chlorhexidine mixed with zinc oxide was highly effective in killing candida albicans within dentin. These findings suggest that chlorhexidine has the potential to be used as an effective intracanal medicament.²¹

Technique

Injection syringe system

1. Placement of intracanal medicament can also be accomplished by injection syringe system.
2. Here the needle should be placed well into the canal to ensure the insertion of medicament to the apex.
3. However it had been suggested that if straight or slightly curved canal were prepared up to at least size 50, filling could be placed with a syringe system.

A study was conducted regarding calcium hydroxide dressings using different preparation and application modes, density and dissolution by stimulated tissue pressure. They concluded that canal preparation with an apical size 40 and less taper the application of medicament with a lentulospiral was more homogenous than injection syringe system.²²

CONCLUSION

Intracanal medicaments in endodontics have been used for a number of reasons both in past and currently. The drawbacks were mutagenic, carcinogenic and periradicular tissue irritation. Culture tests have improved the treatment aspect to certain extent, but the drugs were sensitive to certain groups of bacteria but not its by-products. The development of drug

resistance and cost factor made them ineffective to use in certain situation. Disinfection is a continuous process from the start of extripation of the pulp to the obturation and intracanal medicaments play a role in it. The goal would be to disinfect the canal, make it inert, dry, reduce post operative pain and prevent re-infection. The recent advances in intracanal medicaments are activated by means of combination of physical and chemical methods. Irrespective of the use of intracanal medicament in present day practice, it has gained its importance in certain conditions which facilitated the success of root canal treatment.

REFERENCES

1. Laila Gonzales Freire et al Influence of dentin on pH of 2% chlorhexidine gel and calcium hydroxide alone or in combination; Journal of Dental Traumatology 2010; 26; 276-280.
2. Decker BC. Ingles Barkland endodontics Inc 6th edition 992; 993.
3. Gary N Taylor et al, Advanced technique for intracanal preparation and filling in routine endodontic therapy DCNA ;1984;28;4;819-830.
4. Suresh Chandra B,V Gopi Krishna Grossmans endodontic practice 12th edition Wolters kluwer pvt Ltd 2010;272-276, 221-222.
5. Richard E Walton Intracanal Medicament Dental Clinic of North America 1998; 28;4;783-795.
6. Alexandra Almyroudi et al. The effectiveness of various Disinfectants used as endodontic Intracanal Medications An In Vitro study, Journal of Endodontics 2002; 28(3): 163-167.
7. Grossman L I Disinfection of the root canal Endodontic Practice 10th edition vargheses publishing House Bombay ;1998;247-259.
8. Orstarvik Intracanal Medication Hartys Endodontic clinical Practice Elsevier Limited 5th edition 95-111.
9. E Nicholas Antiseptic Medication Endodontics 3rd edition Varghese Company 150-157.
10. Frederick C S Chu et al Identification of cultivable microorganisms from root canals with Apical periodontitis following Two Visit Endodontic treatment with antibiotic/steroid or Calcium Hydroxide in infected dentinal tubules. Journal Of Endodontics 1999; 25; 6; 416-418.
11. Samuel Seltzer Pulp Irritants Microbial The Dental Pulp All India Distributors Ltd 173-193.
12. Nisha Garg Amit Garg Text book of endodontics 2nd edition Jaypee Brothers Medical Publishers (P) LTD 46-47,223-228.
13. Larz s Spanberg In vitro evaluation of the antimicrobial activity of calcium hydroxide combined with chlorhexidine gel used as intracanal medicament Oral surgery, oral medicine Oral pathology ,Oral radiology and Endodontology 2006;102;4;544-549
14. Mohammadi Z and Abbott PV. The properties and application of Chlorexidine in Endodontics, International Endodontic Journal; 2009; 42; 288-302.

15. Weins Intracanal treatment procedures basics and advanced topics 5th edition premier dental products 376-382.
16. Zahed Mohammadi, Antibiotics as Intracanal Medicaments ONLINE JOURNAL
17. Mohammadi Z and Abbott PV. On the local application of antibiotics and antibiotic-based agents in endodontics Dental Traumatology International Endodontics Journal 2009; 42; 555-567.
18. Cohen, Instrument Materials and Device 10th edition Mosyb elsevier 245-282.
19. Turner SR et al An in Vitro investigation of antibacterial effect of nisin in root canals and canal wall radicular dentin International Endodontic Journal 2004;37;664-671
20. John S Rhodes, Adadvanced Endodontics Clinical retreatment and surgery Taylor and Francis Group in Academic Division of information 2006;129-142.
21. Jose F Siqueira et al Elimination Of Candida albicans Infection Of the Radicular Dentin by Intracanal Medications Journal of Endodontics 2003;29;501-504.
22. Peters CI et al Calcium Hydroxide dressings using different preparation and application modes;density and dissolution by stimulated tissue pressure International Endodontic Journal ;2005; 38; 889-895

Source of support: Nil, Conflict of interest: None Declared