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Shahid Ali Wani
MDS, Department of Conservative Dentistry and Endodontics, Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow, Uttar Pradesh, India

Yumnam Pushpa Devi
MDS, Department of Conservative Dentistry and Endodontics, Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow, Uttar Pradesh, India

Deepankar Dass
MDS, Department of Conservative Dentistry and Endodontics, Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow, Uttar Pradesh, India

Ritu Priya
MDS, Department of Conservative Dentistry and Endodontics, Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow, Uttar Pradesh, India

Corresponding Author:
Shahid Ali Wani
MDS, Department of Conservative Dentistry and Endodontics, Sardar Patel Post Graduate Institute of Dental and Medical Sciences, Lucknow, Uttar Pradesh, India

To compare the antimicrobial efficiency of three different intracanal medicament against candida albicans

Shahid Ali Wani, Yumnam Pushpa Devi, Deepankar Dass and Ritu Priya

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Abstract
Introduction: The removal of germs, especially fungi, from the intricate three-dimensional root canal system is a crucial aspect of endodontic treatment. Antimicrobial flora in the endodontic canal is treated with intracanal medications. There is prevalence of C.albicans in oral cavity. The aim of this study is to compare the antimicrobial efficiency of three different intracanal medicament against C. albicans.
Material and Methods: There were 75 teeth removed for orthodontic purposes were randomly assigned to one of three exploratory groups (n = 25), and the following intracanal medications were used: GA-Ca(OH)2, GB-Leder mix paste, and GC-silver nanoparticles (SNP). After loading the various intracanal medications, all groups were randomly separated into three uniform subgroups (n = 5), and they were subsequently incubated for varied lengths of time at a temperature and humidity of 37 °C and 100%, respectively. A 0.1 mL aliquot of the microbial suspension was respectively plated on SDB agar. The number of CFU was determined and reported for groups A, B, and C after the incubation periods of 24 hours, 7 days, and 14 days, respectively.
Results: There was a notable dissimilarity between the groups A, B, and C (p<0.01). Group C was associated with a decreased amount of CFU at all three different meantime.
Conclusion: SNP alone was significantly better in its antimicrobial efficacy against *C. albicans* over the period of 24 hours, 7 days, and 14 days.

Keywords: Antimicrobial, calcium hydroxide, candida albicans, intracanal medicament

Introduction
During endodontic therapy, the elimination of bacteria and the total removal of pulp tissue from the root canal system is of major magnitude. Mechanical prepping, irrigation, microbial control, and full root canal system filling are the key factors affecting root canal success. Pulp necrosis and periradicular lesions are thought to be caused by microorganisms, bacteria, and their products. Due to the complexity of their anatomical structures and the difficulties that instruments and irrigants have in gaining access, they may survive endodontic operations. Effective antimicrobial medications must be used for a defined amount of time in order to predictably eradicate any remaining root canal germs [1].
Candida albicans, a dimorphic fungus that may exist in a variety of morphological forms, is the most common fungus in the oral cavity. In healthy persons, C. albicans is present in the oral cavity between 30 and 40 percent of the time, while this percentage rises to 95 percent in HDV patients [2]. A root canal resistant pathogen with an incidence of 6-18% is C. albicans. The most prevalent species of fungi grown from failed endodontically treated teeth's root canals is Candida albicans. It might be feasible for the yeast to exploit dentin as a food supply and encourage colonisation in the root canal as a result of its collagenolytic activity [3].
In order to clean the root canals during regeneration operations, intracanal medicament is employed [4]. The justification for employing intracanal medicament in this trial is that the local immune system cannot access an infected root canal, and systemic antibiotic therapy results in a limited concentration of drug in the canal space that is unlikely to suppress bacterial growth. As a result, administering antibiotics locally inside the root canal system may be a more efficient way to do so [5].

Hence the aim of this study is to compare the antimicrobial efficiency of three different intracanal medicament against candida albicans.

Material and Methods

75 teeth extracted due to orthodontic reasons were taken for the study. Periapical radiograph of teeth were taken to determine any abnormality related to teeth.

The steps of the procedure are

1. Preparation of tooth - An intraoral periapical radiograph was taken after the teeth in the experimental groups had been decoronated to a uniform length of 15 mm using a diamond disc and water cooling. Using a crown-down approach using an X-smart endomotor and handpiece, cleaned and shaped the canals to a size F3 with the help of the ProTaper Universal rotary file system, stopping only 1 mm short of the root apex. Between each use of a file, the area was irrigated with a 5.25% sodium hypochlorite solution using a 27-G open-ended standard-tip needle, and then with 17% ethylenediaminetetraacetic acid (EDTA). Using absorbent paper points, we dried the cleaned root canals. Two coats of varnish were applied to the specimens' exteriors, and self-cure glass ionomer cement was used to secure the specimens' peaks. In order to sterilise the teeth, we placed them in 2 mL microtubes and placed them in an autoclave for 15 minutes at 121 °C and 15 lbs of pressure [6].
2. Contamination with C.albicans- The microorganisms isolated from patients were employed in the study. After 24 hours of isolation, the fungi were suspended in 5 mL of Sabouraud Dextrose Broth (SDB) and incubated at 37 °C for 4 hours. Under sterile circumstances, 90 root specimens were transferred to cell culture well plates (with 24 wells per plate). In order to stabilise the root specimens, they were placed in well plates containing 2% sterile agar media. Under sterile conditions, micropipettes were used to transfer 10 mL of the fungal suspension into each canal of the laminar flow hood. Once the intracanal medication groups' corresponding specimens had been injected, they were placed in SDB and incubated anaerobically at 37 °C for 24 hours. The cell growth plates were then recapped, sealed with numerous layers of paraffin, and incubated at 37 °C for 21 days. To keep the fungi alive, 10 mL of new SDB was supplied every other day [7].
3. Antimicrobial activity of medicaments- After the well plates had been incubated for their allotted time, the media was aseptically removed. The teeth were subsequently randomly assigned to one of three treatment groups (n = 25), each receiving a different intracanal medication.

   Group A: 0.1 g $Ca(OH)_2$ per 1 mL of distilled water

   Group B: 0.1 g Leder mix paste

   Group C: 100 ppm of preformed SNP of 10 nm size per 1 mL of distelled water.

   Preformed SNP (10 nm in size) at 100 parts per million (3 ppm) in sterile water (1 mL).
   In all experimental groups, medicines were injected into the canals using a 3 mL syringe and 27 gauge needle under sterile conditions. The canal openings were sealed with sterile aluminium foil. The teeth were then placed in paraffin-lined well plates to prevent contamination. When the various medicines were loaded, the groups were randomly split into three equal subgroups (n = 5), each of which was incubated at 37 degrees Celsius and 100% humidity for 24, 7, and 14 days.
4. Microbiological sampling - To get the microbiological sample, a sterile #30 paper point was inserted into the canal and left there for 60 seconds before being removed and placed in a micro test tube with 1 mL of physiological saline solution and vortexed for 30 seconds. The number of colony forming units was counted in groups 1, 2, and 3 after 24 hours, 7 days, and 14 days of incubation, using a light microscope at 400x magnification [8].

Results

Table 1 provides descriptive information for three groups at various time points. After 24 hours, 7 days, and 14 days, a highly significant value (<0.01) was discovered in the antibacterial efficacy of several intracanal medication groups against C. albicans. At each of the three separate time points, group C (SNP) had a significantly lower number of microbiological colonies on the experimental plates than did groups A (Ca(OH)2) and B (Leder mix). Table 2 compares all three groups at various time points, showing group 3 < group 2 < group 1.

Table 1: Shows descriptive statistics of three groups at a different time interval

Time interval	Groups	N	Mean ± SD
At 24 hours	Group A	5	12.72±0.01
	Group B	5	1.13±0.03
	Group C	5	0.45±0.01
	Total	15	4.14±5.06
After 7 days	Group A	5	5.07±0.01
	Group B	5	1.57±0.02
	Group C	5	0.5 7±0.03
	Total	15	4.43±5.01
After 14 days	Group A	5	9.31±0.01
	Group B	5	0.58± 0.02
	Group C	5	0.08±0.01
	Total	15	3.36±4.33

Table 2: Shows comparison among three groups at a different time interval

Time interval		Sum of squares	Df	Mean square	P value
At 24 hours	Between groups	3006.43	2	1503.21	0.000
	Within group	0.01	25	0.00	
	Total	3006.43	28		
At 7 days	Between groups	3004.26	2	1502.13	0.000
	Within group	0.02	25	0.00	
	Total	3004.28	28		
At 14 days	Between groups	2072.25	2	1036.12	0.000
	Within group	0.01	25	0.00	
	Total	2072.25	28		

Discussion

Root canal irrigating solutions and intracanal medications are used to clean out the root canals of bacteria in order to improve the effectiveness of instrumentation [9]. Both

systemic and topical antibiotics are applied in dentistry. In contrast to local delivery of antibiotics, which can be utilised as intracanal medications to reduce systemic side effects and problems, insignificant concentrations of antibiotics enter the root canal during systemic administration. A single irrigant, medication, or antibiotic would not be able to effectively sterilise the root canal due to the complexity of root canal infection. Combining irrigants or medications reduces the emergence of bacterial strains that are resistant to treatment, creates a synergistic effect that extends the duration of the antimicrobial impact, and maintains the release of medications [10].

Since its invention, calcium hydroxide has been examined for its alkaline pH, ionic activity, diffusion via dentinal tubules, impact on apical microleakage, and root canal insertion. Using a needle, root canal instrument, GP, or paper points, calcium hydroxide is usually made by combining the powder with a liquid and injecting it into the root canal. Ca(OH)2 powder should be mixed with sterile water or glycerin to create a paste [11]. The optimal vehicle should deliver calcium and hydroxyl ions gradually and slowly.

Hence, the need for intracanal medication prompted the development of nanoparticles in the field of endodontics. Due to their capacity to bind with proteins and enzymes and subsequently interfere with the integrity of the bacterial cell wall, SNP (AgNP) have bactericidal properties [12]. According to Roe *et al*., coating SNP on catheters as an antibiofilm agent boosted its effectiveness against the bacteria Escherichia coli, Staphylococcus aureus, and the fungus C. albicans [13]. AgNPs with a size of 10 nm were chosen in the current investigation because smaller particles have more surface area and stronger antibacterial effects. The antibacterial efficiency of silver is improved when it is included in the copolymer as opposed to pure silver nitrate. This behaviour has been attributed to silver inactivation by nutritional broth or by the bacteria themselves [14].

Silver's ability to kill microbes has long been known. In recent years, the usage of silver or silver salts as essential elements to control microbial proliferation has become more widespread. They are actually present in a huge variety of everyday items that we use [15]. Drugs like Leder mix can enter the cementum and dentinal tubules, where they diffuse into the periapical and periodontal tissues. The principal pathway for active substances to reach the periradicular tissues, according to Abbott *et al*., is through the dentinal tubules, whereas the apical foramen is not as crucial as a supply route [16].

Antibiotic and corticosteroid-containing medications are quite helpful during root canal therapy. When a patient complains of extreme soreness to percussion following canal instrumentation, the corticosteroid component lowers periapical inflammation and pain, whereas antibiotics have antibacterial qualities. An antibiotic/corticosteroid combination (Leder mix) has been widely used as a crucial pulp dressing and a root canal medication in paste and cement types in various regions of the world. According to this study, at each of the three different time intervals, considerably fewer microbiological colonies were seen on the experimental plates in group C (SNP) than in groups A (Ca(OH)2) and B (Leder mix).

Conclusion

All three groups were thought to have antibacterial qualities within the parameters of the investigation, however the SNP alone had significantly greater antimicrobial efficiency against C. albicans over the course of 24 hours, 7 days, and 14 days. SNPs will exhibit noticeably greater efficacy when combined with other medications than when taken alone. For this strategy to be validated, more research is needed.

Conflict of Interest
Not available

Financial Support
Not available

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