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Impact of herbal & chemical disinfectant on properties of Gutta percha

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Abstract
Introduction: The use of aseptic procedures & thorough cleaning are crucial to the effectiveness of root canal therapy. Hence the current study is conducted to assess the impact of herbal & chemical disinfectant on the properties of GP.
Material and Methods: From a sealed packet, four different groups of 60 GP cones of size F3 Pro Taper were taken out. Except for the control group, the investigational groups were cleaned with, 90% AV gel, 5.25% SH & 2% CHX. On a testing machine, the GP cones' tensile strength was determined, & a stereomicroscope was used to examine the surface roughness.
Results: From lowest to greatest, the mean tensile strength was 10.13 for 5.25 percent SH, 12.05 for 2% CHX, 12.56 for 90% AV, & 17.43 for the control group. In contrast to the control & AV groups, which had minimal surface pitting, the 5.25% SH group under stereomicroscopy had substantial surface pitting.
Conclusion: At 90%, *Aloe vera* gel may be used as a more secure GP cone disinfection.

Keywords: AV gel, chlorhexdine, disinfectant, gutta percha

Introduction
The use of aseptic procedures & thorough cleaning are crucial to the effectiveness of root canal therapy. This still holds true for obturating materials as well [1]. The tools & materials used in root canals must be sanitised according to modern notions of infection control [2]. One of the most popular & well-liked RC filling materials is gutta-percha. Although though these GP cones are made in an aseptic environment, their zinc oxide component gives them some antibacterial action [3]. It has been demonstrated that GP cones removed from sealed packages can become contaminated by a number of microorganisms, including cocci, rods, & yeasts, when left in the dental operatory environment [4]. Due to the fact that these elevated temperature sterilisation techniques were shown to cause harm to the cones, they do not lend themselves to being sterilised by moist or dry heat [5].
Owing to its thermoplastic nature, GP cones cannot be sterilised by the traditional technique that uses moist or dry heat because doing so could physically alter the GP. Hence, a quick chemical disinfection at the chairside is required [6]. Sodium hypochlorite (SH), polyvinyl pyrolidone iodine, glutaraldehyde, hydrogen peroxide, quaternary ammonium, chlorhexidine (CHX), & ethyl alcohol are the chemicals used to disinfect GP cones [7]. A secure & efficient herbal disinfectant has also been explored in addition to chemical ones. Among these, *Aloe vera* gel is discovered to be bacteriostatic next to Salmonella paratyphi, Streptococcus pyogenes, & Staphylococcus aureus & an efficient decontamination method for GP cones. [8] Hence the current study is done to assess the impact of chemical & herbal disinfectant on the properties of GP.

Material and Methods
A total of sixty F3 ProTaper GP cones were collected. The sealed packet of cones were opened under sterile circumstances, & the cones were separated into four groups.
5.25% SH was applied as a disinfectant in group I. 5.25 percent of SH was extracted, & cones were positioned for 5 minutes in a clean petri dish. The cones were dried in sterile Petri dishes with filter paper pads after being individually & aseptically rinsed with distilled water.

Aloe vera pulp was collected, dried for 48 hours at 80 °C in an oven, & then given ethanol. GP cones in group II were cleaned with AV gel for five min.

GP cones in group III were cleaned with 2% CHX for 5 min. Group IV served as the control group & did not get any disinfection.

Under a universal testing equipment, the GP cone's tensile strength was determined. Each cone was cut from its base to standardize its length to 14 mm, & 2 mm of each side were then inserted into the holders on the testing machine. Load was then used at a crosshead of 1 mm/minute until highest tensile failure was attained, & data were noted. At a magnification of 40, a stereomicroscope revealed a change in surface roughness.

ANOVA was used to assess differences in the data statistically, & the post hoc Tukey test was used for multiple comparisons.

Result

At $p<0.05$, the findings were measured as statistically significant (Table 1). At p=0.001, a one-way ANOVA test discovered that the control group's mean tensile strength was higher (17.43) than the SH group's was (10.13). Findings revealed that, after disinfection, 5.25% SH would reduce the tensile strength (10.13) of GP cones, which was significantly different from the control group (17.43) & AV gel group (12.56). Group using chlorhexidine reported a mean value of 12.05 (Table 2). At $p< 0.05$, the post hoc Tukey test's pairwise comparison yielded a statistically significant result.

On the surface of the GP cone, surface roughness & pitting were more pronounced with 5.25% SH, mild with 2% CHX, & barely detectable with AV group & control group under stereomicroscopy.

Table 1: Shows assessment of mean tensile strength value of different groups

Groups	N	Mean ±SD	F value	P value
SH	15	10.13 ±0.21	7054.72	0.001
AV	15	12.56 ±0.17		
CHX	15	12.05 ±0.10		
Control	15	17.43 ±0.06		

Table 2: Shows pairwise comparison of different groups

Groups	Groups	Mean difference	P value
SH	AV	-4.41	0.001
	CHX	-3.83	0.001
	Control	-7.36	0.001
AV	SH	4.41	0.001
	CHX	0.50	0.001
	Control	-2.78	0.001
CHX	SH	3.76	0.001
	AV	-0.50	0.001
	Control	-3.32	0.001
Control	SH	7.36	0.001
	AV	2.78	0.001
	CHX	3.32	0.001

Discussion

Dentists occasionally deal with the issue of infections that develop after sealing off the root canal space. The entrance of polluted GP cones into the RC is one of the hypotheses for this phenomena. According to a research by Gomes *et al*., [9] 5.5% of the cones were infected after removal from their boxes [10]. Since the implantation of GP is the last step in the obliteration of RC space, its sterility is crucial to preventing RC space infection [11]. Since these GP cones are thermoplastic, a brief chair-side cleaning is required. NaOCl is one of the most frequently used disinfectants in endodontic therapy & is applied in concentration ranging from 0.5% to 5.25%. The idea that immersing GP cones for at least a minute in 5.25% NaOCl is the most effective & dependable method for disinfecting them was first put forth by Senia *et al*. [12] According to the study's findings, the control group had the highest mean tensile strength (17.43), followed by the AV group (12.56), the 2% CHX group (12.05), & the 5.25% SH group (5.25%). The control group displayed good tensile strength because they weren't given any disinfectants to use. F3 ProTaper GP cones were used for this study as the minimal size for apical preparation [8].

Because *Aloe vera* gel has antibacterial properties, it performed significantly better than the CHX & SH groups. This is consistent with its antibacterial function, which has previously been connected to the management of peptic ulcers & the use of cosmetics. According to Lawrence *et al*., ascorbic acid, pyrocatechol, p-coumaric acid, & cinnamic acid are responsible for the antibacterial activity of AV [13]. The secondary metabolites that give *Aloe vera* gel its antimicrobial properties include glycoproteins, anthraquinone glycosides, prostaglandins, -lanoline acid, & mucopolysaccharides [14]. One advantage of AV gel is that it has a one-minute decontamination time for the cone. According to the study, AV may therefore be a good choice for cleaning the GP cone.

A cationic bisguanide called chlorhexidine solution at 2% kills bacteria by rupturing their cell membranes & causing the cytoplasm to precipitate. Compared to NaOCl, chlorhexidine has more qualities including substantivity & biocompatibility [15].

When stereomicroscopically seen in this study, 2% CHX causes only minor surface alterations on GP cones, & the tensile strength was determined to be higher than SH group but lower than control & AV gel groups. The quick sterilisation method, in which GP cones are submerged in 5.25% NaOCl for at least one min., is the most dependable & practical method for cleaning GP cones [16].

Because of its potent sporicidal, antibacterial & oxidising properties, sodium hypochlorite has been proven to disinfect GP cones quickly & effectively [8]. The SH group in this investigation had the lowest mean tensile strength, or [17], with a p value of 0.001. The findings of this investigation are consistent with those of Mahali *et al*., who found that regardless of the taper & size of the GP cones, the control group had the maximum tensile strength.

On the other hand, after disinfection with 5.25% NaOCl, the tensile strength of GP cones significantly decreased, & stereomicroscopy revealed pitting & abnormalities [8]. Discovered that sodium chloride crystals were produced at different quantities on the surface of SH-soaked GP cones & hypothesised that this could have an impact on apical sealing during canal filling. According to Valois *et al*., 5.25% SH caused GP cones' surfaces to deteriorate, resulting in surface imperfections & elasticity. Large interfacial gaps & surface defects increase the likelihood of leakage, & an increase in elasticity makes it harder to obturate curved canals [16].

Research work have shown that 5.25% NaOCl during chairside cleaning may cause mechanical & physical change of GP cones [13]. Consider using AV gel as an option to get a clean RC system & effective apical seal.

Conclusion

While it doesn't change the topography & tensile strength of

GP, *Aloe vera* gel at a concentration of 90% is regarded as a safer GP disinfectant, which finally results in improved sealing capability & reinforcement of the root canal. The tensile strength of GP cones would be reduced by 5.25% sodium hypochlorite solution, which also left the surface heavily pitted.

Conflict of Interest
Not available

Financial Support
Not available

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