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Comparison of Effectiveness of 2% Propolis Solution Versus 0.2 % Chlorhexidine Mouthwash as a Subgingival Irrigant Following Scaling and Root Planing: A Clinical and Microbiological Study

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Abstract: ***Naturopathy has gained a lot attention is the last decade. Uses of natural products are not only considered safe, but also non-invasive. Propolis is a resin-like material made by bees from the buds of poplar and cone-bearing trees. Propolis has antibiotics, anti-inflammatory and antifungal property. When used as an adjunct to scaling and root planing, propolis is effective in reducing bacterial count. Sothe aim of this study is to compare the efficiency of propolis with the gold standard, which is chlorhexidine. Aim: To evaluate and compare the efficiency of 2% propolis solution with 0.2% chlorhexidine when used as a subgingival irrigant. Materials and method: 10 patients were be selected from the OPD of a dental college, above the age of 18 years with mild to moderate periodontitis according to AAP International Workshop for Classification of Periodontal Disease, 1999.The patients were divided into 2 groups: Group a (control): Subgingival irrigation with the help of 0.2% chlorhexidine solution. Group b (experimental group): Subgingival irrigation with the help of 2% propolis solution. The patients were divided into 2 groups: Group a (control): Subgingival irrigation with the help of 0.2% chlorhexidine solution. Group b (experimental group): Subgingival irrigation with the help of 2% propolis solution. A detailed case history was taken. Sub gingival samples was taken from the site with maximum probing depth and send for microbiological analysis. Scaling and root planing followed by subgingival irrigation of the entire mouth with the help of irrigating needles was performed in group a with 2% propolis and group b 0.2% chlorhexidine. Irrigation was repeated after 7 days and the 14 days following the 1st sitting. sample was taken from the site and send for microbiological analysis the data collected will be anaylised for suited statically analysis. Results: Propolis treatment significantly reduced pocket probing depth andbacterial count. But on statistical analysis, there was no significant difference in the pocket probingdepth and bacterial count aftertreatment of patients with propolis orchlorhexidine. Conclusion: 2% propolis is a viableoption for 0.2% chlorohexidine intreatment of chronicperiodontitis***

Keywords: Periodontitis, Propolis, Chlorhexidine, pocket probing depth, microbacterial count, scaling, root planing

1. Introduction

Periodontitis is defined as an inflammatory disease of supporting tissues of teeth caused by specific microorganisms or groups of specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with periodontal pocket formation, gingival recession or both.[1] Periodontitis is caused mainly due to dental plaque. Dental plaque represents a classic example of both a biofilm and a microbial community, in that it displays emergent properties, i.e., plaque displays properties that are more than the sum of its constituent members, and microbial communities are ubiquitous in nature and usually exist attached to a surface as a spatially organized biofilm.[2] Aggregatibacteractinomycetemcomitans, Tanneralla forsythia and Porphyromonasgingivalis are considered key periopathogens, but species such as Prevotella intermedia, Campylobacter rectus, Peptostreptococcus micros, Fusobacterium nucleatum, Eubacteriumnodatum, Streptococcus intermedius and spirochetes are also linked with periodontal destruction. [3]Periodontal destruction primarily develops when the microbial load within a periodontal pocket overrules the local and systemic host defense mechanisms. Such an imbalance can result from a non-specific increase in the total amount of bacteria, an outgrowth/overgrowth of pathogenic species above a certain threshold level, and/or a reduction in the efficiency of the immune response.[4]According to periodontal disease classification system recommended by the 1999 International Workshop for Classification of Periodontal Disease and Conditions , chronic periodontitis can be classified as mild , moderate and severe. While mild to moderate periodontitis can be usually treated by non-surgical therapy, severe periodontitis needs surgical intervention. Nonsurgical therapy aims to eliminate both living bacteria in the microbial biofilm and calcified biofilm microorganisms from the tooth surface and adjacent soft tissues and to create an environment in which the host can more effectively prevent pathogenic microbial recolonization using personal oral hygiene methods.Scaling and root planing, is a procedure involving removal of dental plaque and calculus (scaling or debridement) and then smoothening, or planing, of the (exposed) surfaces of the roots, removing cementum or dentine that is impregnated with calculus, toxins, or microorganisms, the etiologic

agents that cause inflammation. This helps to establish a periodontium that is in remission of periodontal disease.[5]Augmenting scaling and root planing or maintenance visits with adjunctive chemotherapeutic agents for controlling plaque and gingivitis could be as simple as placing the patient on an antimicrobial mouth rinse and/or toothpaste with agents such as fluorides, chlorhexidine or triclosan.[6] Subgingival irrigation may also be done by different agents such as water, saline, and antiseptics/antimicrobial agents. These irrigants can be delivered to the site with the commercially available subgingival irrigation systems. These systems have been developed to deliver the antiseptic/antimicrobial agents deep into the periodontal pocket.[7] 0.2% chlorhexidine (CHX) a cationic polybiguanide (bisbiguanide)[8] is the gold standards ofmouthwashes as it has the best anti-microbial and anti-inflammatory properties. The mechanism of action of chlorohexidine is that chlorhexidine salts dissociate and releases the positively charged chlorhexidine cation. CHX has a bactericidal effect is a result of the binding of this cationic molecule to negatively charged bacterial cell walls. There is an instant adsorption of CHX to Phosphate containing compounds. CHX binds with the phospholipids in the inner cell membrane effecting cell wall integrity causing leakage of the lesser molecular weight components viz. potassium ions. If the concentration is increased and the action continues, then CHX becomes bactericidal in nature.Hence at low concentrations of chlorhexidine, has a bacteriostatic effect and at high concentrations, there is bactericidal effects due to membrane disruption results in cell death[17]. Chlorhexidine however has some side effects, especially on long term use like, discolouration of mouth, increase of Tartar formation onthe teeth, taste problems such as decreased taste or change in taste, tooth discoloration. The serious side effects of Chlorhexidine are mouth ulcer, white patches or sores inside the mouth or on the lips, swelling of salivary glands, signs of an allergic reactionwhich may include difficulty in breathing or swelling of face,lips,tongue and throat.[18]

Propolis, sometimes called bee glue, is a natural resinous substance collected by honey bees (Apismellifera L.) from plant buds and bark exudatePropolis is the third most important component of bee products. It is composed mainly of resin (50%), wax (30%), essential oils (10%), pollen (5%), and other organic compounds (5%)[9]. Propolis has antimicrobials, anti-inflammatory and antifungal properties. Due to its strong, anti-infective activity, propolis has often been called a “natural antibiotic”. Propolis reduces insoluble polysaccharide and hence there is a reduction the bulk of plaque which in turn reduces inflammation by the action on arachnoid pathway and reduction of prostaglandin. Propolis acts both against Gram-positive and Gram-negative, as well as aerobic and anaerobic bacteria. The anti-microbial activity of propolis should be considered on two levels. First, it is connected with the direct action on the microorganism, and the other with stimulation of the immune system resulting in activation of natural defences of the organism. However, only a few studies have examined the antimicrobial properties of propolis against periodontopathogens. [12]Propolis mouthwash is usually available and used in 1, 2.5, 5 and 10% concentrations. Naturopathy has gained a lot attention in the past few decades as of natural products are considered safe. Hence, the effectiveness of propolis as compared to the gold standard, chlorhexidine needs to be assessed. So, the aim of this study was to compare the effectiveness of 2% propolis solution with 0.2% chlorhexidine when used as a subgingival irrigating agent in the treatment of chronic periodontitis.

2. Materials and Methods

10 patients, above the age of 18 years, suffering from mild to moderate periodontitis, and fulfilling the inclusion and exclusion criteria were selected from the OPD of a dental college.

Inclusion criteria

1) Patients with mild to moderate periodontitis.
2) Systemically healthy patients.
3) Patients willing to participate in the study.
4) Patients with no history of use of oral antiseptics or mouthwashes in the past 6 months.
5) Patients with no history of use of antibiotics and anti-inflammatory therapy in the past 6 months.

Exclusion criteria

1) Patients with any habit like history of tobacco use in smoked or smokeless form
2) Patients who have undergone any periodontal therapy in the past 6 months.
3) Patients with any history alcohol or substance abuse

The patients were informed about the study and their written consent was taken.

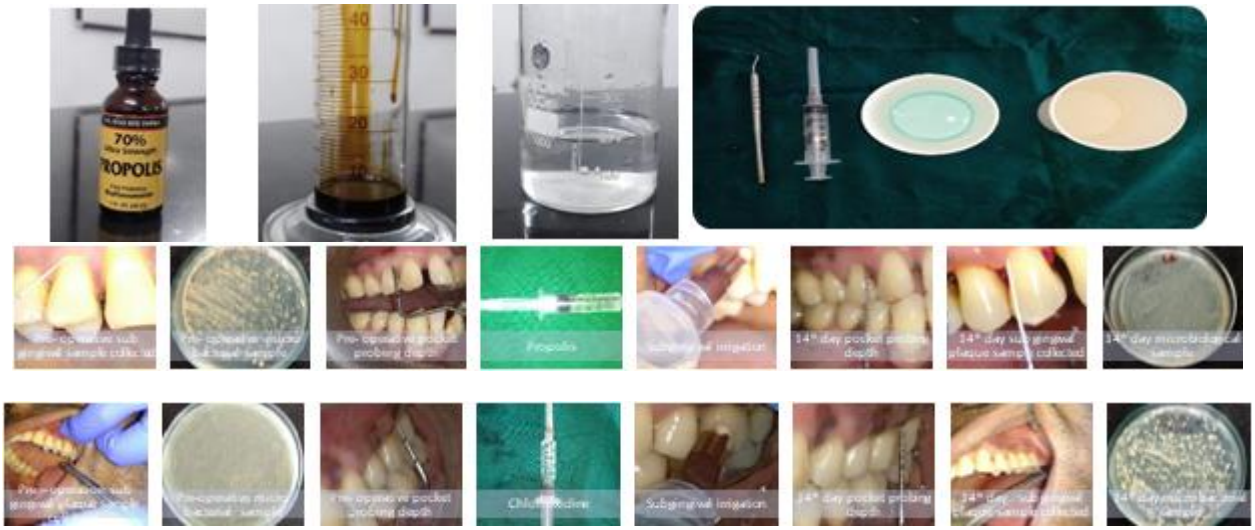
The patients are divided into 2 groups by coin toss methods:

- Group A (Control group): Scaling and root planing followed by subgingival irrigation with the help of 0.2% chlorhexidine solution.
- Group B: Scaling and root planing followed by Subgingival irrigation with the help of 2% propolis solution.

A detailed case history was takenand probing pocket depthswere assessed and pre-operative sub gingival plaque samples were collected in Luria broth and send for microbiological analysis.

Scaling and root planing was carried out, following which subgingival irrigation wasdone . In patients belonging to group A the sub gingival irrigation was carried out with 0.2% chlorohexidine and in patients belonging to group B the subgingival irrigation was carried out with 2% propolis solution.

This irrigation was repeated on day 7 and day 14. On the 14th day, the pocket probing depth was reassessed and the sub gingival plaque samples were collected and sent again for microbiological analysis.



3. Results

Group A (Control)

Paired-T test to assess if treatment affected probing depth and microbial count significantly.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PPD before (in mm)	5.00	5	.707	.316
	PPD after (in mm)	3.80	5	.837	.374
Pair 2	Bacterial count before (CF U/ml)	330.00	5	22.361	10.000
	Bacterial count after (CF U/ml)	304.00	5	20.736	9274

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PPD before (in mm) & PPD after (in mm)	5	.845	.071
Pair 2	Bacterial count before (CF U/ml) & Bacterial count after (CF U/ml)	5	.970	.006

Paired Samples Test

		Paired Differences					t	df	Sig. (2-taled)
		Mean	Std. Deviation	Std. Error Mean	95% confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PPD before (in mm) - PPD after (in mm)	1.200	.447	.200	.645	1.755	6.000	4	.004
Pair 2	Bacterial count before (CF U/ml) - Bacterial count after (CF U/ml)	26.000	5.477	2.449	19.199	32.801	10.614	4	.000

The mean probing depth before treatment was 5.00 mm and the bacterial count before treatment was 330 CFU/ml and post treatment probing depth post treatment was 3.80mm and bacterial count post treatment was 304 CFU/ml. The mean difference between pre and post treatment on the pocket probing depth was 1.20 mm and the microbiological count was 26.00 CFU/ml. Therefore, statically, chlorhexidine treatment significantly reduced Probing depth and bacterial count, statistically.

Group B

Paired-T test to assess if treatment affected probing depth and microbial count significantly.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PPD before (in mm)	4.60	5	.548	.245
	PPD after (in mm)	3.20	5	.447	.200
Pair 2	Bacterial count before (CF U/ml)	336.00	5	20.736	9.274
	Bacterial count after (CF U/ml)	300.00	5	15.811	7.071

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	PPD before (in mm) & PPD after (in mm)	5	.408	.495
Pair 2	Bacterial count before (CF U/ml) & Bacterial count after (CF U/ml)	5	.762	.134

Paired Samples Test

		Paired Differences					t	df	Sig. (2-taled)
		Mean	Std. Deviation	Std. Error Mean	95% confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PPD before (in mm) - PPD after (in mm)	1.400	.548	.245	.720	2.080	5.715	4	.005
Pair 2	Bacterial count before (CF U/ml) - Bacterial count after (CF U/ml)	36.000	13.416	6.000	19.341	52.659	6.000	4	.004

The mean probing depth before treatment was 4.60 mm and the bacterial count before treatment was 336 CFU/ml and post treatment probing depth post treatment was 3.20 mm and bacterial count post treatment was 300 CFU/ml. The mean difference between pre and post treatment on the pocket probing depth was 1.40 mm and the microbiological count was 36.00 CFU/ml. Therefore, Propolis treatment significantly reduced Probing depth and bacterial count, statistically .

Independent t-test to check if difference in probing depth after propolis treatment is significantly different than chlorhexidine treatment.

Group Statistics

Group		N	Mean	Std. Deviation	Std. Error Mean
PPD difference	Propolis	5	1.40	.548	.245
	Chlorhexidine	5	1.20	.477	.200

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PPD difference	Equal Variances assumed	1.524	.252	.632	8	.545	.200	.316	-.529	.929
	Equal Variances not assumed			.632	7.692	.545	.200	.316	-.534	.934

The mean probing depth difference was 1.40 mm for propolis and 1.20mm for chlorhexidine. Therefore, there is no significant difference in probing depth after treatment of patients with propolis or chlorhexidine.

Independent t-test to check if difference in Bacterial count after propolis treatment is significantly different than chlorhexidine treatment

Group Statistics

Group		N	Mean	Std. Deviation	Std. Error Mean
Bacterial count difference	Propolis	5	36.00	13.416	6.000
	Chlorhexidine	5	26.00	5.477	2.449

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Bacterial count difference	Equal Variances assumed	8.393	.020	1.543	8	.161	10.000	6.481	-4.945	24.945
	Equal Variances not assumed			1.543	5.297	.180	10.000	6.481	-6.382	26.382

The mean microbial count difference was 36.00 cfu/ml for propolis and 26.00 cfu/mlfor chlorhexidine. Therefore, there is no significant difference in bacterial count after treatment of patients with propolis or chlorhexidine.

4. Discussion

Chronic periodontitis is an inflammatory disease of the gingiva which is either treated by non-surgical periodontal therapy or by surgical therapy. Non-surgical therapy includes scaling and root planing and may be enhanced by the use of an adjunct which such as a chemical plaque controlagents.

Of all of the chemical plaque control agents, chlorohexidine is considered as the gold standard due its antiplaque and anti-inflammatory actions. However, chlorhexidinehas certain disadvantages especially on prolonged use, such as alteration in taste, tooth discoloration, oral ulcerations, unilateral, or bilateral parotid swelling.

Propolis, which is derived from bee honey, has high anti-plaque and anti-inflammatory actions. But, being a natural products, propolis has no such side effects. Hence this paper aimed to study the effectiveness of 2% propolis as a subgingival irrigation when compared to 0.2% chlorohexidine as a subgingival irrigant as an adjunct to non-surgical therapy (SRF). The parameters that were studied for this study were the pocket probing depth, which clinically reflects the inflammatory condition of the periodontium, and the reduction in total microbial count to assess the antimicrobial action.

The results showed that both 0.2% chlorohexidine and 2% propolis were effective in treatment of mild to moderate periodontitis when used as a subgingival irrigant as an

adjunct to scaling and root planing. Also, there was no difference statistically between the two irrigants. Our study's results was in agreement with the studies done by Anea Jain Pundir el at (2017), Gebrara et al (2003) and Coutinho(2012) , but MURRAY et al and Ozan et al found different results .This difference is results may be due to the difference in the study methodology.

5. Conclusion

Within the limitations of the study, we can conclude that both 0.2% chlorohexine and 2% Propolis significantly reduced pocket probing depth and bacterial count when used as a subgingival irrigant in the treatment of mild to moderate chronic periodontitis following scaling and root planing. Also, there was no statistical difference between the outcome of the two irrigants . Hence 2% propolis seems to be a viable option for 0.2% chlorohexidine for use as a subgingival irrigant following scaling and root planing in mild to moderate periodontitis

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