



Alummouth Wash as an Adjunctive Treatment in Chronic Periodontitis

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Abstract

The term of (Alum) refers to various isomorphous double sulfates composed of trivalent and univalent metals, especially aluminum potassium sulfate, $KAl(SO_4)_2 \cdot 12H_2O$, Alum as a compound has been used in past to treat different oral and medical conditions. Using of alum as a mouth wash in periodontology was not completely explored and only a few studies were carried out regarding this subject. This study was carried out to observe the effect of alum as an adjunctive therapy in periodontitis.

One hundred twenty patients with chronic periodontitis were randomly allocated into four groups. The first group treated with conventional root planing procedure using periodontal curette. The other three groups were treated with the same conventional procedure followed by twice a day mouth rinse with different concentrations of Alum solutions for three weeks after root planing. Means of PLI, GI & PD were calculated for the participants before treatment and three weeks after.

Results of this research showed a significant decrease in all study parameters in all groups with significant differences between the two different modalities of treatment.

Alum solution can be a good adjunctive treatment for chronic periodontitis, but more studies are needed on both short and long terms.

Key words: Shab. Aluminum sulphate. Periodontitis. Mouth wash.

Introduction

The term of Alum refers to various isomorphous double sulfates composed of trivalent and univalent metals, especially aluminum potassium sulfate, $KAl(SO_4)_2 \cdot 12H_2O$, which is usually available as a white crystalline compound ⁽¹⁾. In aqueous solution, alums show all the chemical properties that their components show separately. These salts are widely used in water purification, leather tanning, modifying concrete, and preparation of lakes, clarifying of turbid liquids and also as astringent agents. Alum has been used

in China and Egypt for over two thousand years. Because alum is a compound found in nature, peoples ingest between 20 to 60 milligrams of alum per day through the water they drink, the foods they eat and the air they breathe. In its natural form, alum is the third most abundant element in nature, after oxygen and silicon. It is one of the basic building blocks of our universe. It makes up almost 8% of the earth's crust, surpassed in quantity only by oxygen at 47% and silicon at 28%. It is found in soil and clays that only

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produce metallic aluminium products when processed. Even so, the alunite molecules are too large for the body to absorb physically. This is confirmed by the fact that alum weighs over 36 times as much as water and it is impossible through natural means to get water to permeate the skin. Nowadays markets are filled with different types of alum preparations as gel, rocks, soap and crystals intended to be used for different cosmetic and medical purposes especially as an effective deodorant or as a cream for treatment of dermatitis. The medical uses of aluminum also include intravesical alum irrigation as safest and most effective method of treatment for intractable hematuria. Systemic absorption is reported to be minimal with negligible reported deaths following its use⁽²⁾.

In dentistry, Aluminum salts have demonstrated anticaries activity in a number of laboratory and animal studies and were proved to be significant in caries inhibition and in decreasing level of *St.mutans* in saliva in prolonged daily use as a mouth rinse⁽³⁻⁵⁾. In other study sodium-potassium aluminum silicate cleaning and polishing agents were compared with conventional prophylaxis abrasives and were found to be highly compatible with fluoride when formulated into a fluoride prophylaxis paste, especially with stannous fluoride, a larger reduction in enamel solubility and greater fluoride uptake were obtained with representative commercial prophylaxis pastes⁽⁶⁾. In a recent Iraqi study, the effect of different concentrations of alum solutions on bacterial adherence mechanism was studied and found to be slightly less in comparison to 0.1 chlorhexidine solutions⁽⁷⁾.

In periodontology, Using of alum as mouth wash was also been practiced, but only a few studies was

carried out regarding this subject^(8, 9). In these studies a positive effect of alum on gingival health was observed and an inhibitory effect on oral microbiota was recorded⁽¹⁰⁾. In 2004, Liu et al study the cytocompatibility and cytotoxic effect of three different extracts of gingival retraction cords on human gingival fibroblasts. Gingival retraction cords impregnated with aluminium sulphate (Gingi-Aid), dl-adrenaline HCl (Gingi-Pak) and non-drug-impregnated cord (Gingi-Plain) were eluted with culture medium for 10 min and 24 h. Cytotoxicity was judged using a tetrazolium bromide reduction assay. Results of this study demonstrated that gingival retraction cords applied alone almost completely inhibited cell viability ($P \leq 0.05$). In addition, the results also showed that the eluates from aluminium sulphate-impregnated cord, dl-adrenaline HCl-impregnated cord and non-drug-impregnated cord were cytotoxic to primary human gingival fibroblast cultures⁽¹¹⁾.

In our country and according to our knowledge there is only a single pilot study was carried out in this field. In this study alum solutions of 0.01 concentrations were used for intrapocket irrigation after conventional root planing procedure. Results of this study demonstrated that alum may be a good adjunctive aid in treatment of deep pockets⁽¹²⁾. For these reasons the present study was carried out to observe the proposed effectiveness of different concentrations of alum mouth washes in combination with conventional root planing procedure.

Materials and Methodes

The sample of this research composed of 120 adult patients (60 males & 60 females) with age range of (35-45). This sample was selected from

patients attending the researchers' private clinics in Baghdad. All of them were complaining of chronic periodontitis, each of them has periodontal pockets of 5 mm or more in depth. All of them were healthy with no history of any systemic disease or medication intake. The sample then randomly allocated into four groups, each group composed of 30 patients (15 females & 15 males). The first group treated with conventional root planing procedure using periodontal curette. The other three groups were treated with the same conventional procedure followed by twice a day mouth rinse with different concentrations of Alum solutions (0.01 in second group, 0.015 in third group and 0.02 in fourth group). This mouth rinse was continuing for three weeks after root planing. Alum solutions used in this study were prepared in the department of basic science / college of dentistry/ Al Mustansiria University by dissolving an accurate amount of a commercially available Alum crystals using molar concentration formula in deionized water, then mixed by ultrasound mixer for 20 minutes. The solution then filtered by using GF/ C glass filter and packed in dark glass well tight plastic caps and properly stored until being used⁽¹³⁾.

Each patient was examined for PLI, GI⁽¹⁴⁾ and PD immediately before treatment and again three weeks after. These clinical exams were carried out by the researchers themselves at their private clinics on dental chair using WHO periodontal probes and plain mouth mirrors. Before starting this study the researchers were successfully pass an intra and inter examiner calibration with other qualified and well trained dentists. Means of PLI, GI and PD were calculated to be subjected for statistical analysis using SPSS V.15 program for widows.

Results

Tables (1-4) show that study parameters were improved after treatment in all groups. For PLI from **2.40 to 0.93, 2.40 to 0.81, 2.61 to 0.79, & 2.60 to 0.73** in first, second, third & fourth groups respectively. For GI from **1.98 to 0.93, 1.95 to 0.84, 2.50 to 0.71, & 2.50 to 0.61** in first, second, third & fourth groups respectively. And also for PD from **5.96 to 3.60, 5.92 to 3.44, 5.95 to 3.29 & 5.90 to 3.11** in first, second, third & fourth groups respectively. The other observation that we can refer to is: these improvements is successively greater in the last three groups in comparison to first one.

Table (5) shows the comparative significance of study parameters before and after treatment in each group. Paired t test shows that the observed improvements are highly significant ($p \leq 0.01$) for all parameters after conducting the treatment modality in each group in comparison to those recorded before the treatment.

For more detailed figure, the after treatment parameters were compared between different groups (1st & 2nd, 1st & 3rd, 1st & 4th, 2nd & 3rd, 2nd & 4th and 3rd & 4th). Results of these comparisons show that the differences in PLI scores were significant ($p \leq 0.05$) between 1st & 2nd groups while the other two parameters (GI & PD) were highly significant. The differences in PLI and GI scores were highly significant ($p \leq 0.01$) between 1st & 3rd groups, while the differences in PD scores were significant ($p \leq 0.05$). On the other hand, the differences in PLI, GI and PD scores were highly significant ($p \leq 0.01$) between 1st & 4th, 2nd & 3rd, 2nd & 4th and 3rd & 4th groups. For more details see table (6).

Discussion

In our society alum solution (Shab) was used in past and nowadays as an oral medication to treat oral ulcers and inflamed gingiva because of its antibacterial and astringent properties. It is well known that mouthwashes with a high salty concentration can kill bacteria by creating a hypertonic environment. Plaque removal by root planing (as an example of mechanical mode) or by salty mouth wash (as an example of chemical mode) plays an important role in improving periodontal health status as they directly remove or inactivate the microbial dental plaque which is the primary cause of periodontal disease^(15, 16). Studies that document the effect of plaque removal on improvement of periodontal health were largely distributed throughout periodontal literature^(17- 19). Result of the present study came in agreement with these mentioned facts as it employs both mechanical and chemical antiplaque approaches. The gradual observed improvements with increasing the concentration of alum solution can be accepted logically because salty solutions with high concentration have stronger antibacterial effects than those with low concentration. In a previous study carried out early in this year, a greater improvement in PLI, GI & PD in patients treated by conventional root planing accompanied by alum intra-pocket irrigation in comparison to those treated by conventional root planing alone, but these differences were statistically non significant⁽¹²⁾. In contrast, in the present study one can see that the improvement in means of all used parameters was greater in patients using alum mouth wash after conventional root planing and also this improvement was found to be statistically highly significant. The astringent property of the alum

solution that causes tissue shrinkage and decreased bleeding may add an advantage to its antibacterial property that leads to faster wound healing. These tissue shrinkage and decreased bleeding tendency due to astringent property may be also counted for the greater reduction of GI & PD scores in patients using alum solutions as an adjunctive treatment. The researchers think (as they found) that combination of conventional root planing procedures with an easily formulated and available alum mouth wash may yield better results at least on short term treatment. On other hand an argument here may arise as tissue shrinkage may lead to restriction of blood supply to affected area and cause a delay in healing process. In fact, such logical argument needs to be investigated and the decreased blood flow to the affected area must be evaluated against antibacterial action of Alum to arise with an acceptable decision about its using as adjunctive treatment in periodontal therapy.

Conclusion

Using of alum solution as a mouthwash following conventional root planing procedures clearly helps in improvement of clinical parameters of periodontal health in comparison to conventional root planing alone. This study also shows that increasing concentration of alum solution will yield better results. Alum solutions of 0.02 concentrations were found to be better than other concentrations in improving of periodontal health after conventional root planing. More studies on both short and long time follow up may be mandatory to enrich our knowledge in this important subject in periodontology.

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Table (1): study parameters before and after treatment in the 1st group (Conventional root planing)

Parameters	Mean	Std. Deviation	Std. Error Mean
PLI (B)	2.4067	0.32100	0.05860
PLI (A)	0.9300	0.33201	0.05777
GI (B)	1.9800	0.23100	0.04218
GI (A)	0.9333	0.18815	0.03435
PD (B)	5.9667	0.61495	0.11227
PD (A)	3.6000	0.60743	0.11090

PLI (Plaque Index). GI(Gingival Index). PD (Pocket Depth). B (before). A (after)

Table (2): study parameters before and after treatment in the 2nd group (0.01 alum solution)

Parameters	Mean	Std. Deviation	Std. Error Mean
PLI (B)	2.4083	0.25015	0.04567
PLI (A)	0.8100	0.32201	0.05879
GI (B)	1.9503	0.45900	0.08380
GI (A)	0.8467	0.32201	0.05879
PD (B)	5.9233	0.39973	0.07298
PD (A)	3.4433	0.31303	0.05715

PLI (Plaque Index). GI(Gingival Index). PD (Pocket Depth). B (before). A (after)

Table (3): study parameters before and after treatment in the 3rd group (0.015 alum solution)

Parameters	Mean	Std. Deviation	Std. Error Mean
PLI (B)	2.6133	0.31186	0.05694
PLI (A)	0.7900	0.29752	0.05432
GI (B)	2.5033	0.25291	0.04618
GI (A)	0.7100	0.21292	0.03887
PD (B)	5.9500	0.62076	0.11334
PD (A)	3.2933	0.50646	0.09247

PLI (Plaque Index). GI(Gingival Index). PD (Pocket Depth). B (before). A (after)

Table (4): study parameters before and after treatment in the 4th group (0.02 alum solution)

Parameters	Mean	Std. Deviation	Std. Error Mean
PLI (B)	2.6000	0.24495	0.04472
PLI (A)	0.7367	0.24563	0.04485
GI (B)	2.5000	0.25461	0.04649
GI (A)	0.6100	0.17090	0.03120
PD (B)	5.9000	0.60743	0.11090
PD (A)	3.1167	0.46763	0.08538

PLI (Plaque Index). GI(Gingival Index). PD (Pocket Depth). B (before). A (after)

Table (5): comparative significance of study parameters before and after treatment in each individual group

Group	Parameters	Paired Differences			t-value	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean		
1st (conventional root planing)	PLI (B) - PLI (A)	1.49667	0.35109	0.06410	23.349	0.000(HS)
	GI (B) - GI (A)	1.24667	0.24316	0.04439	28.081	0.000(HS)
	PD (B) - PD (A)	2.36667	0.54033	0.09865	23.991	0.000(HS)
2nd (0.01 alum solution)	PLI (B) - PLI (A)	1.70333	0.42789	0.07812	21.803	0.000(HS)
	GI (B) - GI (A)	1.59333	0.56320	0.10283	15.495	0.000(HS)
	PD (B) - PD (A)	1.54000	0.22530	0.04113	37.439	0.000(HS)
3rd (0.015 alum solution)	PLI (B) - PLI (A)	1.59833	0.36777	0.06715	23.804	0.000(HS)
	GI (B) - GI (A)	1.20333	0.27604	0.05040	23.877	0.000(HS)
	PD (B) - PD (A)	2.05667	0.79943	0.14596	14.091	0.000(HS)
4th (0.02 alum solution)	PLI (B) - PLI (A)	1.86333	0.32746	0.05979	31.167	0.000(HS)
	GI (B) - GI (A)	1.39000	0.34973	0.06385	21.769	0.000(HS)
	PD (B) - PD (A)	2.78333	0.81031	0.14794	18.814	0.000(HS)

PLI (Plaque Index).GI (Gingival Index).PD (Pocket Depth).B (before).A (after).HS (highly significant)

Table (6): comparative significance of study parameters after treatment between different study groups

Compared groups	Parameters	Paired Differences			t-value	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean		
1 st & 2 nd	PLI (A)	0.1033	0.27852	0.05085	2.032	0.050 (S)
	GI (A)	-0.1766	0.25418	0.04641	-3.807	0.0019 (HS)
	PD (A)	-0.6833	0.64971	0.11862	-5.761	0.000(HS)
1 st & 3 rd	PLI (A)	0.10000	0.14384	0.02626	3.808	0.001(HS)
	GI (A)	-0.0133	0.04342	0.00793	-1.682	0.0103(HS)
	PD (A)	-0.2933	0.83043	0.15161	-1.935	0.050(S)
1 st & 4 th	PLI (A)	0.17333	0.22273	0.04066	4.262	0.000(HS)
	GI (A)	0.12333	0.23879	0.04360	2.829	0.008(HS)
	PD (A)	0.48333	0.88165	0.16097	3.003	0.005(HS)
2 nd & 3 rd	PLI (A)	0.10000	0.14384	0.02626	3.808	0.001(HS)
	GI (A)	0.16333	0.24980	0.04561	3.581	0.001(HS)
	PD (A)	0.39000	0.55295	0.10096	3.863	0.001(HS)
2 nd & 4 th	PLI (A)	0.17333	0.22273	0.04066	4.262	0.000(HS)
	GI (A)	0.30000	0.34441	0.06288	4.771	0.000(HS)
	PD (A)	1.16667	0.57135	0.10431	11.184	0.000(HS)
3 rd & 4 th	PLI (A)	0.07333	0.14840	0.02709	2.707	0.011(HS)
	GI (A)	0.13667	0.26325	0.04806	2.844	0.008(HS)
	PD (A)	0.77667	0.75598	0.13802	5.627	0.000(HS)

PLI(Plaque Index).GI(Gingival Index).PD(Pocket Depth).A(after).S(significant).HS(highly significant)