The effect of Hyaluronic Acid as an Adjunct after Scaling and Root Planning in the Treatment of Chronic Periodontitis

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Abstract

The aim of this study is to evaluate the effect of the subgingival application of 0.8% hyaluronic acid (HA) gel as an adjunct to scaling and root planing (SRP) in the treatment of chronic periodontitis. Twenty patients with chronic periodontitis were recruited to participate in a study and divided to Group 1 (G1) treated with 8% hyaluronic acid gel as an adjunctive to scaling and root planning (HARP) and Group 2 (G 2) treated with scaling and root planning only. Plaque index (PL.I) Gingival index (G.I) and bleeding on probing (B.O.P) were evaluated pretreatment (baseline) (1st visits), one week (2nd visits), and 4 weeks (3rd visit) post-treatment. Subgingival plaque sample were taken for microbiologic analysis at baseline and 4 weeks post-treatment. Intragroup comparison result between visits for Group 1showed that there was highly significant different for BOP, CFU, and no significant different for PLI and GI between 2nd and 3rd visit. For G 2, there was highly significant different for GI and significant for PLI and BOP, and non-significant different CFU, between 2nd and 3rd visit. Intergroup comparison for clinical parameter and bacteriological result between visits Showed that there was highly significant different in1st visit for PLI, BOP and CFU in 3 rd visit. It can be conclude that the local application of hyaluronic acid gel (0.8%) in conjunction with scaling and root planning have a beneficial effect on clinical periodontal parameter and may prevent recolonization of periodontal pathogens in patients with chronic periodontitis

Key words: *Chronic periodontitis; hyaluronic acid; root planning; microbiology.*

Introduction

Chronic periodontitis is an inflammatory and infectious diseases of all tissues supporting structure of the teeth, leading to the progressive destruction of deep periodontal tissues. They are irreversible and are accompanied by apical migration of the junctional epithelium along the root, leading to the appearance of periodontal pockets and gingival recessions [(1)]. The effective methods of treating periodontitis are Scaling and Root Planning (SRP)[(2)], which is the first-line treatment for periodontitis and stopping the inflammatory process through destabilizing and removing the subgingival pathogenic biofilm and restoring an environment compatible with periodontal health [(3)]. Gontiya and Galgali indicated that subgingival application of chemotherapeutic agents may be used as an adjunct to nonsurgical therapy because SRP is technically demanding and is not always efficient in eradicating all periodontal pathogens and in lessening inflammation [(4)]. Hyaluronan is one of the chemotherapeutic agents that used in treatment of periodontal diseases [(5)]. Hyaluronan, anon-sulfated glycosaminoglycan, is widely distributed throughout connective tissue and epithelial and neural tissues. It is a critical component of the extracellular matrix and contributes significantly to tissue hydrodynamics and cell migration and proliferation. Hyaluronan is also produced by fibroblasts in the presence of endotoxin; it cause inhibition of tissue destruction and facilitates healing so it plays an important anti-inflammatory role [(6,7)]. It has already been used in the treatment of the inflammatory process in various domains such as orthopedics, dermatology and ophthalmology. In dentistry, it played a role in treatment of the temporomandibular joint disorders, and more

recently it used in the treatment of periodontal disease due to its anti-inflammatory, anti-oedematous and anti-bacterial effects [8]. The topical and systemic application of HA offers a lot of benefit effects in the regulation of the host response because it's non-toxic, biocompatible, and it has numerous biochemical and physio-chemical features [9]. The aim of the present study was to evaluate the effect of a hyaluronan gel used in adjunct with SRP clinically and bacteriologically in the treatment of chronic periodontitis.

Material and Method

Twenty patients aged 35 to 50 years who attending the Department of Periodontics at the College of Dentistry, University of Baghdad were recruited for the study. all the patients should not had history of any systemic diseases., periodontal therapy including scaling or root planning, anti-inflammatory or antimicrobial therapy was taken within the previous 3 months and non-smokers. All the patients have chronic periodontics not less than 4 periodontal sites with pocket depth of 4mm or greater, radiographic evidence of bone loss and have at least 20 teeth. The subjects gave their written informed consent to participate in the study. The patients were divided into two groups according to type the treatment as following

- Group 1 (G1): ten patients were treated with 8% hyaluronic acid gel as an adjunct to scaling and root planning by applying of 0.5 ml of HA to the base of the pocket.

- Group 2 (G2): ten patients were treated with SRP only.

Before baseline examination, full mouth supragingival scaling was done and oral hygiene instructions was given, concerning instruction in the modified Bass technique of brushing and the use of appropriate interdental cleaning aids. The following clinical periodontal parameters was recorded respectively: Plaque index [10], gingival index [11] and bleeding on probing. Bacterial Sample was carried out after recording of clinical periodontal parameters. The site dried with air blast and cotton, isolated with cotton rolls to avoid contamination saliva. Subgingival plaque from periodontal pocket was excavated by gracey curette without touching adjacent tissue. The bacterial sample was suspended in 1 ml sterile thioglycolate solution in 5 ml. screw cupped bottle by vigorously agitating the tip of the instrument in the solution, and then incubated for 24 hours until evidence of growth is noted as shown by turbidity of the broth. Subcultures on blood agar solid media supplied with selective materials in the plates then plates were transported into an anaerobic jar with anaerobic gas pack incubated anaerobically for 72 hours. After incubation the total number of colony forming units (CFU) per sample was determined. The clinical parameters and bacterial samples were recorded at day 0 (baseline 1st visit) prior to treatment and were repeated after one week (2nd V), and 4 week (3ed V) after treatment. During this period reinforcement of plaque control and any additional instruction were given to maintain good oral hygiene during the study period. For statistical Analysis Mean, Median, Mann –Whitney U test, Z test and Kruskal test were used, level of significant was 0.05.

Result

The Clinical periodontal parameters (which included PLI and G.I) and Bacteriological examination (CFU) was reduced in 3rd visit in compared to 1st visit for both groups as shown in Table

Table 1: Descriptive analysis of PLI , G.I and CFU of both groups in deferent time interval

	Variables	Visits	Median	Mean	S.D.	Min.	Max.
G 1	PLI	1st	1.11	1.08	0.61	0.81	1.44
		2nd	0.58	0.64	0.23	0.36	1.12
		3rd	0.48	0.56	0.24	0.27	0.92
	GI	1st	1.05	1.02	0.21	0.75	1.43
		2nd	0.47	0.53	0.33	0.15	1.15
		3rd	0.58	0.52	0.18	0.22	0.71
	CFU	1st	138	149.60	38.78	103	214
		2nd	125	130.20	23.45	92	168
		3rd	99.5	103.80	26.67	76	164
G 2	PLI	1st	0.735	0.77	0.08	0.71	0.95
		2nd	0.625	0.65	0.09	0.56	0.84
		3rd	0.575	0.58	0.06	0.5	0.65
	GI	1st	0.835	0.81	0.10	0.66	0.97
		2nd	0.645	0.67	0.09	0.61	0.88
		3rd	0.585	0.59	0.04	0.53	0.67
	CFU	1st	162.5	163.20	62.67	73	244
		2nd	154	160.00	51.15	98	250
		3rd	166.5	163.20	56.30	88	277

Also The % of Bop (score 1) in the 3 rd visit was reduced in compared to 1st visit for both groups as shown able (2).

Table 2: Percentage of BOP in both groups at deferent time interval.

	Visits	%
G1	1st	74.95
	2nd	29.47
	3rd	22.79
G 2	1st	74.45
	2nd	30.47
	3rd	24.80

Intragroup comparison for clinical parameter and bacteriological result between visits for G1 was showed in table (3).

The result showed that there was highly significant different for PLI, GI, BOP and significant different for CFU between 1st and 3rd visit.

Table 3: Intragroup comparison for clinical parameter and bacteriological result for group 1 between visits using Wilcoxon signed ranks test.

Variables		1st vs. 2nd	1st vs. 3rd	2nd vs. 3rd
PLI	Z-test	-2.507	-2.814	-1.586
	p-value	0.012 (S)	0.005 (HS)	0.113
GI	Z-test	-2.405	-2.814	-0.256
	p-value	0.016 (S)	0.005 (HS)	0.798
BOP	Z-test	-2.803	-2.803	-2.803
	p-value	0.005 (HS)	0.005 (HS)	0.005 (HS)
CFU	Z-test	-1.734	-2.550	-2.803
	p-value	0.083	0.011 (S)	0.005 (HS)

Intragroup comparison for clinical parameter and bacteriological result between visits for G 2 was showed in table (4).

There was highly significant different for PLI, GI and BOP and no significant in CFU between 1st visit and 3rd visit

Table4: Intragroup Comparison between the visits using Wilcoxon signed ranks test for (G 2).

Variables		1st vs. 2nd	1st vs. 3rd	2nd vs. 3rd
PLI	Z-test	-2.809	-2.814	-1.992
	p-value	0.005 (HS)	0.005 (HS)	0.046 (S)
GI	Z-test	-2.609	-2.809	-2.814
	p-value	0.009 (HS)	0.005 (HS)	0.005 (HS)
BOP	Z-test	-2.803	-2.803	-2.395
	p-value	0.005 (HS)	0.005 (HS)	0.017 (S)
CFU	Z-test	-0.765	-0.153	-0.255
	p-value	0.444	0.878	0.798

Intergroup comparison for clinical parameter and bacteriological result between visits was showed in table (5)

It was found that's there was highly significant different in1 st visit for PLI, while BOP and CFU in 3 rd visit

Table5: Intergroup Comparison between groups using Kruskal-Wallis H test.

Variables	Visits	HARP	RP	Comparison		
		Mean	Mean	X2	d.f.	p-value
PLI	1st	1.08	0.77	17.081	2	0.000 (HS)
	2nd	0.64	0.65	0.668	2	0.716
	3rd	0.56	0.58	2.358	2	0.308
GI	1st	1.02	0.81	4.242	2	0.120
	2nd	0.53	0.67	2.908	2	0.234
	3rd	0.52	0.59	1.266	2	0.531
BOP	1st	74.95	74.45	0.375	2	0.829
	2nd	29.47	30.47	9.511	2	0.514
	3rd	22.79	24.80	1.329	2	0.009 (HS)
CFU	1st	149.60	163.20	0.194	2	0.908
	2nd	130.20	160.00	1.251	2	0.535
	3rd	103.80	163.20	8.734	2	0.003 (HS)

Discussion

The result showed that there was significant reduction in all clinical parameters for all groups. The inter comparison groups showed that there was significant difference in Bop at deferent time interval when compare G1 and G2 .This observation is in concert with previous reports who found that HA could be used as an adjunct to mechanical therapy, it can accelerate tissue healing because it has anti-inflammatory and anti- edematous properties[12]. Al-Shammari found that The local application of 0.8% hyaluronan gel with SRP have a positive effect on periodontal health in chronic periodontitis patients after 6 and 12 weeks[13]. Johannsen *et al* [14], Gontiya, Galgali [15] and Polepalle *et al* [16] who found a significant improvement in all clinical gingival parameters following subgingival application of a 0.8% HA gel in addition to root debridement (SRP). This beneficial effect of HA on gingival inflammation is also observed by Pilloni *et al* [17] when used as an adjunct to mechanical home plaque control. Also this observation is in concert with previous reports who found that the

improvement gingival health after the supragingival application of various hyaluronan formulations in subjects with gingivitis [18]. The result of this study Disagree with Xu *et al* [19], who investigated the effect of a subgingivally administrated hyaluronan gel in combination with SRP, found no differences between the hyaluronan and control groups relative to BOP and PLI. The improvement in periodontal parameter was more noticeable in the test group in comparison to the control group, suggesting a positive effect of HA on wound healing. HA has numerous roles in the initial inflammatory stages, such as improved inflammatory cell infiltration into the inflammatory site, in order to speed up the gingival immune response. HA has a role in migration and adherence of polymorphonuclear leukocytes and macrophages at the inflamed site, and phagocytosis and destruction of microbial pathogens. So HA directly prevents proliferation of anaerobic pathogenic bacteria. It also indirectly acts to moderate inflammation and stabilize the granulation tissue by preventing degradation of the extracellular matrix (ECM) proteins by enzymes-protease of inflamed cells [8]. Because its complex interactions with the extracellular matrix and its components, HA is a candidate for use in the restoration of periodontal integrity. Hyaluronan administration to periodontal wound sites could achieve comparable beneficial effects in periodontal tissue regeneration and periodontal disease treatment **[7].**

The result showed that there was significant reduction of anaerobic bacterial count for G1, For G2 there was initial reduction for bacterial count and then count of bacteria increase after 4 week. This agreement with Zijnge *et al* [20], who conducted that after the initial reduction of total bacterial load in periodontal pocket followed by increased again in weeks and months after treatment and this may result of more intention paid to oral hygiene by patient before entering the study .

This result showed that HA had antibacterial effect and this in agreement with many studies [21,14,16]. HA seemed to be able to stabilize these low counts for a longer period and prevent the early regrowth of these bacterial species. In addition, Eick *et al* [22] concluded that HA stabilizes low rates of periodontal microbial flora, and prevents the re-growth of certain bacteria . Palak D Batavia **found** that there was reduction of organisms from slightly positive (+) to undetected (-) after topically and intrasulcularly application of HA [23]. This study is compatible with Xu *et al* [19] who concluded that HA was applied once a week in vivo, and no influence was seen on the counts of periodontopathogenic bacteria. High molecular-weight HA gel reduces cell proliferation in gingival epithelial cells, fibroblasts and lymphocytes, decrease the inflammatory process, and improves periodontal lesions in patients with chronic periodontitis[24].

Conclusion

The local application of hyaluronic acid gel have beneficial effect on periodontal health, also have antibacterial effects on periodontal pathogenic bacteria as an adjunct to SRP.

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