International Scholars Journals

African Journal of Dentistry ISSN 3216-0216 Vol. 6 (5), pp. 163-170, July, 2018. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

The effect of local application of hyaluronan gel as an adjunctive to scaling and root planing in chronic periodontitis patients

Basheer Omer[1], Asim Satti[2], Bakri Gismalla[1] and Nada Hashim[1]

[1]Faculty of Dentistry, University of Khartoum, Khartoum, Sudan.
[2]Faculty of Dentistry, University of Science and Technology, Omdurman, Sudan.

Accepted 29 May, 2018

Abstract

Background: Chronic Periodontitis is a common disease which might lead to tooth loss if it is not treated. Non-surgical mechanical therapy is the cornerstone of periodontal treatment. Increasing pocket depth and complicating anatomical factors limit the effectiveness of scaling and root planing (SRP) thereby compromising the results. Hyaluronic Acid (HA) is a recent addition to the local chemotherapeutic agents used in oral diseases. HA has shown good results in patients with chronic gingivitis and it has been used as a scaffold in periodontal tissue regeneration. The aim of this study was to evaluate the adjunctive effect of local application of HA gel following scaling and root planing in chronic periodontitis patients. Method:This is a randomized split mouth clinical trial where a total of 33 patients diagnosed with chronic periodontitis were enrolled. All patients received full mouth SRP and pockets more than 4 mm were selected for HA application. The selected sites were randomly divided into Group A (experimental group) and Group B (control group). For the experimental sites 1 ml of 0.2% hyaluronic acid was applied. Periodontal parameters (PI, GI, PPD, CAL) were recorded at baseline and 6 weeks postoperatively. Results: There was a significant decrease in the mean PDD and mean CAL values from baseline to 6th week in test group (P = 0.001) however no significant difference was observed in mean PPD and CAL among control group (p=0.292, 0.06) respectively. Conclusion: The adjunctive application of HA may have positive effects on probing depth reduction and attachment gain.

Key words: Chronic periodontitis, Non-surgical periodontal therapy, Hyaluronic acid.

INTRODUCTION

Periodontitis is an inflammatory disease of the supporting tissues of the teeth instigated by specific microorganisms or groups of specific microorganisms resulting in progressive destruction of the periodontal ligament and alveolar bone with pocket formation due to apical shift of the junctional epithelium (Offenbacher, 1996).

Periodontitis of advanced severity can result in tooth mobility, occasional pain and discomfort, compromised ability to masticate food, and eventual tooth loss (Charles, 2008).

The main goal of periodontal therapy is to eliminate inflammation, arrest progression of periodontal disease, improve esthetics, and create an environment conductive to maintenance of periodontal health (Plessas, 2014). Strategies for treating periodontitis principally focus on addressing the etiologic bacteria or biofilm. According to the mechanical model, the bacterial biofilm is disrupted and removed via Nonsurgical periodontal therapy (NSPT) (Charles, 2008). Nonsurgical periodontal therapy (NSPT) is the foundation stone of periodontal therapy and the first endorsed approach to the control of periodontal infections.

Corresponding author E-mail: nadatawfig@yahoo.com

Scaling and root planing (SRP) are the thorough cleaning of the root surfaces to remove dental plaque and calculus from periodontal pockets as well as to smoothen the tooth root to remove bacterial toxins (Drisko, 2001). Nonsurgical periodontal therapy remains the gold standard for treating periodontal patients. It results in the reduction of inflammation, pocket depth reduction and clinical attachment gain (Plessas, 2014).

However, conventional mechanical debridement procedures do not remove all periodontopathic bacteria from the subgingival environment, especially those in inaccessible areas such asfurcations, grooves, concavities, and deep pockets (Tanwar et al., 2016).

In addition, SRP of diseased root surfaces can open dentinal tubules, allowing invasion by periodontal pathogens into the exposed tubules, and possibly then serve as a reservoir for re-infection of the pocket (Giuliana et al.,1997).

The distinct probability of less than ideal results from SRP and pocket re-infection by residual microbes is a potent argument for the use of adjunctive treatment modalities in addition to SRP (Drago,1992).

In addition to the better-known antimicrobials and biomaterials, there are number of substances which are less well known and less used at present, and at the same time, have the potential to augment results of periodontal therapy. One such molecule is 'Hyaluronic acid' (Dahiya & Kama, 2013).

Hyaluronic acid (HA) is a naturally occurring linear polysaccharide of the extracellular matrix of connective tissue, synovial fluid, and other tissues. It has various physiological and structural functions, which comprise cellular and extracellular interactions, interactions with growth factors and tissue lubrication.

Extensive studies have proven that Hyaluronic acid is an ideal biomaterial for cosmetic, medical, and pharmaceutical applications (Dahiya & Kamma, 2013).

In the field of periodontology, HA has shown anti-inflammatory, anti-edematous, and anti-bacterial effects for the treatment of periodontal disease (Pagnacco et al., 1997, Moseley et al., 2002).

As a result of its non-toxicity, biocompatibility and numerous biochemical & physiochemical properties, the topical application of hyaluronic acid based biomaterials, to periodontal pockets would offer beneficial effects in accelerating its healing and reducing its depth (Moseley et al., 2002).

It is available as spray form, gel form and mouthwash form. As it is a newer drug few studies have been carried out using 0.2% hyaluronic acid gel (AFTA MED®) marketed by BIOPLAX, London, UK, in treatment of chronic periodontitis.

The aim of this study was to evaluate the adjunctive effect of local application of hyaluronan gel following SRP in chronic periodontitis patients.

MATERIAL AND METHODS

This randomized, controlled design study was conducted on patients attending the Department of Oral Rehabilitation at Faculty of Dentistry, University of Khartoum, and Periodontal clinics at Khartoum Dental Teaching Hospital. Thirty-three patients comprising of males and females, age ranging from 22-62 years, were selected.

Patients who were diagnosed as suffering from chronic periodontitis according to 1999 classification of periodontal diseases and conditions with a probing depth ≥4 mm were selected (Armitage, 1999).

The study protocol was approved by the National Medicines and Poisons Board and the Research Ethics Committee, Faculty of Medicine, University of Khartoum.

A written informed consent was obtained from all patients prior to their participation in this study.

Patients having history of any local and/or systemic antibiotic therapy, within the past 3 months, any immunocompromised condition or chronic illness like diabetes, smokers, pregnant and lactating females, as well as those with a history of periodontal surgical intervention were excluded from this study.

Sampling Technique

In this randomized single-blinded study, 33 patients were included. The different treatment modalities were control group, scaling alone; and experimental group; both scaling and topical applications of HA gel. The allocation of different treatment protocols to different groups was done randomly, and the patient was blinded for the treatment protocol.

After choosing the patients, demographic information was recorded in specially designed proforma.

Data Collection Tools and Techniques

Data was collected by the investigator (Basheer Mohammed) and recorded on data collection sheets.

Training was done for calibration of the examiner to reduce the intra-examiner variability.

Kapa test was performed to assess the intra examiner reliability.

Examination and application of HA was done by one examiner, and the outcome of the treatment was taken by the same examiner. The randomization code was concealed until the results were analyzed.

Clinical examination

The clinical examination was done in a dental chair, using dental mirror and Michigan O periodontal probe.

The following periodontal parameters were recorded for each patient:
1. Gingival index (GI) (Loe & Silness, 1963).
2. Plaque index (PI) (Silness & Loe,1964).
3. PD the distance from the gingival margin to the base of the pocket.
4. CAL the distance from the Cemento-enamel junction to the base of the pocket.
After recording of clinical parameters, initial periodontal therapy including scaling and root planing was performed.
The periodontal examination was carried at baseline and after 6 weeks of the scaling and root planing and HA application.

Scaling and Root Planing and application of HA

All patients received full mouth SRP at baseline in one or two sessions carried out within 24 hours using ultrasonic scaler and curettes until a hard smooth surface was reached and this was determined by an explorer (no.23 Explorer).
Periodontal pockets ≥4 were detected in each half of the upper and lower jaws. These selected sites were randomly divided into (experimental group) and (control group).
Treatments were sequenced in a split-mouth design protocol rather than in parallel and therefore the possibility of crossover effects minimized.
For the experimental sites 1 ml of 0.2% hyaluronic acid gel (AFTA MED®) marketed by BIOPLAX, London, UK, was added following SRP.
The duration of the study was 6 weeks, scaling + gel application was performed in experimental group while the control group received only scaling.
The 0.2% HA gel was applied intrasulcularly by using of a disposable acid itching syringe. The gel was placed intrasulcularly until the level of the gingival margin, where it could be retained in the sulcus to a better extent.
After 6 weeks, the patient was recalled and periodontal clinical parameters (PI, GI, PPD, CAL) were assessed and recorded at all sites.

Statistical analysis

- Statistical Package for the Social Sciences® (SPSS) computer software version 22 was used for analysis of the data obtained.
- Independent T test, Paired sample T test were used for comparison of means.
- P value of less than 0.05 was considered significant.
- Confounding variables were statistically controlled.
- Data was presented in frequencies, tables and graphs.

RESULTS

A total of 33 patients, mean age 41.1 ±9.6 (range 22-62 years) were enrolled in this randomized clinical trial. There were no idler cases and all subjects maintained their appointments. None of the patient treated with this method, showed any unpleasant side effect. Split mouth method was used and in each patient sites with pocket depth ≥4 mm were randomly subjected to conventional periodontal treatment (control) while others were treated by using adjunctive treatment with Hyaluronan (HA).

Clinical data

Plaque Index (PI)

At baseline, the mean plaque index values were 1.52±0.51 and 1.48±0.57 in the test and control groups, respectively, with no statistically significant difference (P =0.8) (Table 1). The mean plaque scores for the test group at 6th week post-treatment was 1.06±0.24, with 0.97±0.39 in the control group at the same intervals (Figure1). Within each group, there was a significant difference in the mean plaque scores from baseline to follow-up (6 weeks) in both the test and control groups (p=0.001) (Table 2 and 3). Suggesting falls in the plaque scores with each recall visit.

Gingival index (GI)

At baseline, the mean gingival indices were 1.67± 0.54 and 1.48 ±0.57 in the test and control groups respectively, without statistically significant differences (P = 0.186).
The mean gingival index for the test group at 6th week was 0.73±0.52 while in the control group, the mean gingival index at the same period was 0.88 ± 0.55, the difference was not statistically significant (p=0.251) (table 1).
Within each group, there was a significant mean difference in the mean GI values from baseline to follow-up (6 weeks) in both test and control groups (P = 0.001) (figure2).

Probable Pocket Depth (PDD)

The mean PD values at baseline for the control and test groups were 5.45 ± 0.97 mm and 5.64± 1.29 mm, respectively, whereas at 6-week interval, the means were 5.33 ± 0.99 mm and 4.15 ± 1.92mm, for control and test groups respectively.

Table 1. Comparison between periodontal parameters at teeth receiving scaling and root planing with and without HA at baseline and 6 weeks post treatment.

		HA	Control	
		Mean± SD	***Mean±SD***	***P value***
Before	***PI***	**1.52±0.51**	**1.48±0.57**	**0.820**
	GI	**1.67±0.54**	**1.48±0.57**	**0.186**
	PDD	**5.64±1.29**	**5.45±0.97**	**0.521**
	CAL	**5.91±0.91**	**5.73±1.13**	**0.474**
After	***PI***	**1.06±0.24**	**0.97±0.39**	**0.263**
	GI	**0.73±0.52**	**0.88±0.55**	**0.251**
	PDD	**4.15±1.92**	**5.33±0.99**	**0.003****
	CAL	**4.88±1.08**	**5.42±0.97**	**0.035***

Independent samples' T test, **P value is significant.

Table 2. Periodontal parameters at teeth receiving scaling and root planing with HA at baseline and 6-weeks post treatment.

	Before	**After**		**95% Confidence Interval of the Difference**		
	Mean±SD	***Mean±SD***	***Mean diff***	***Lower***	***Upper***	***P value***
PI	**1.52±0.51**	**1.06±0.24**	**0.45**	**0.25**	**0.65**	**0.001****
GI	**1.67±0.54**	**0.73±0.52**	**0.94**	**0.72**	**1.16**	**0.001****
PPD	**5.64±1.29**	**4.15±1.92**	**1.48**	**0.73**	**2.24**	**0.001****
CAL	**5.91±0.91**	**4.88±1.08**	**1.03**	**0.53**	**1.54**	**0.001****

Paired samples T test **P value is significant.

At baseline, there was no significant difference in mean pocket depth values in control and test groups (P =0.521) (table1).

Within each group, there was a significant decrease in the mean PDD value from baseline to 6th week in test group (P = 0.001), however, no significant difference was observed in mean pocket depth values among the control group (p=0.292) (figure3). When comparing the two groups at the 6th week, a significant reduction in the mean pocket depth was shown in test group (4.82±1.57) mm, as compared to 5.27±1.01 mm in the control group (p= 0.003) (table 1).

Clinical Attachment Level (CAL)

The mean CAL at baseline for the test and control groups was 5.91 ±.91 mm and 5.73 ± 1.13 mm, respectively, whereas at 6th week, the mean CAL value for test group was 4.88 ± 1.08 mm and 5.42±.97 mm for control.

Table 3. Periodontal parameters at teeth receiving scaling and root planing at base line and 6-weeks post treatment.

	Before	After	95% Confidence Interval of the Difference			
	Mean±SD	*Mean±SD*	*Mean*	*Lower*	*Upper*	*P value*
PI	**1.48±0.57**	**0.97±0.39**	**0.52**	**0.28**	**0.75**	**0.001****
GI	**1.48±0.57**	**0.88±0.55**	**0.61**	**0.36**	**0.86**	**0.001****
PPD	**5.45±0.97**	**5.33±0.99**	**0.12**	**-0.11**	**0.35**	**0.292**
CAL	**5.73±1.13**	**5.42±0.97**	**0.30**	**-0.02**	**0.63**	**0.067**

Paired samples T test, **P value is significant.

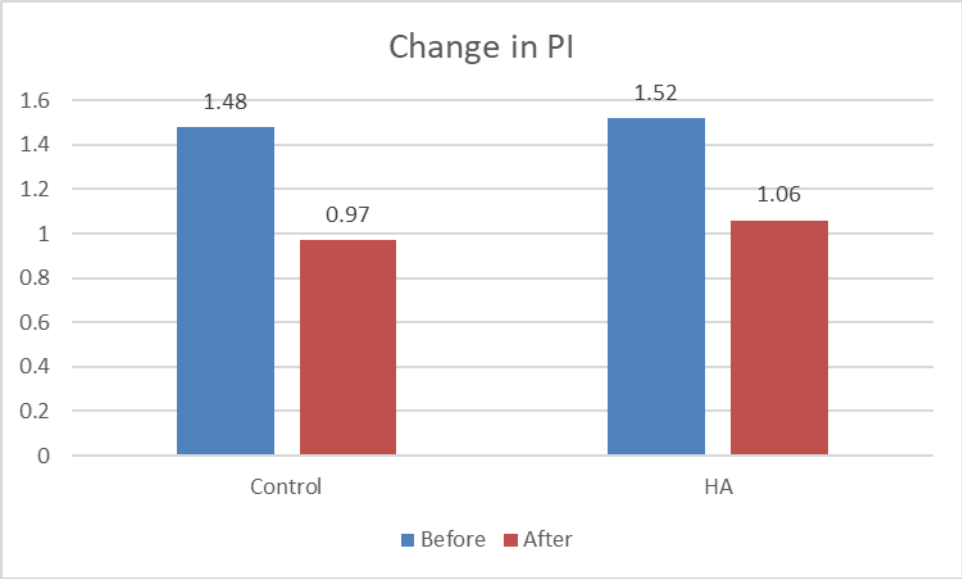

Figure 1. Comparison of mean plaque indices at teeth receiving scaling and root planing with HA and without HA(control) at base line and 6-weeks post treatment.

At baseline, no statistically significant difference was shown in the mean Clinical Attachment Level (CAL) in the test and control groups (P =0.474) (table 1).

Within each group, there was a significant decrease in the mean CAL from baseline to 6th week in test groups (P =0.001). Yet, no difference was observed in the control group (p=0.06) (figure4).

Between the two groups, comparison at 6th week revealed that CAL values in the test and control groups were 4.88±1.08 mm and 5.42 ± .97 mm, respectively, with a significant difference between the two groups (P < 0.03). In other words, the gain in CAL in the test group was higher than that in the control group (Table 1)

DISCUSSION

Nonsurgical therapy remains the keystone of successful periodontal treatment (Drisko, 2001).

Nevertheless, the ability of the clinician to gain access to deep pockets, during SRP, often results in a significant variation in its effectiveness (Killoy,1998).

To overcome these limitations, a number of studies were held using different adjunctive treatments to scaling and root planing (Rams & Slot,1996, Van Winkelhoff et al.,1996, Dodwad et al., 2012). However, the outcomes obtained from these studies have been questioned for their clinical superiority as compared to scaling and root planing and have accentuated on the need for further researches to reach a definitive conclusion.

Hyaluronic Acid (HA) has been used lately as one of the local chemotherapeutic agents in the treatment of oral diseases (Rajan et al., 2014).

HA has anti-inflammatory and anti-bacterial effects. These properties make it a good choice to be used as an adjunct to mechanical therapy in the treatment of periodontal diseases (Sukumar & Drizhal, 2007).

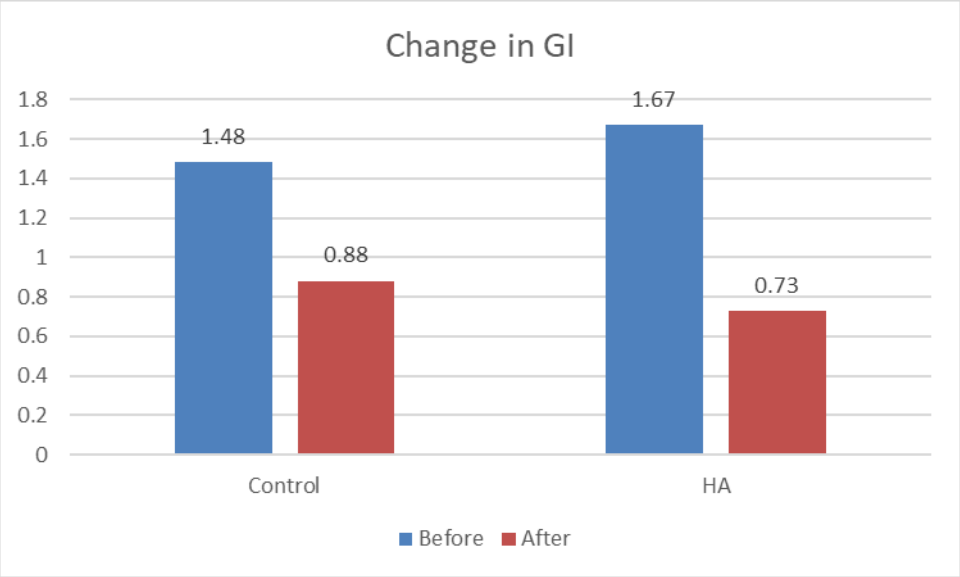

Fig. 2. Comparison of mean gingival indices at teeth receiving scaling and root planing with HA and without HA (control) at base line and 6-weeks post treatment.

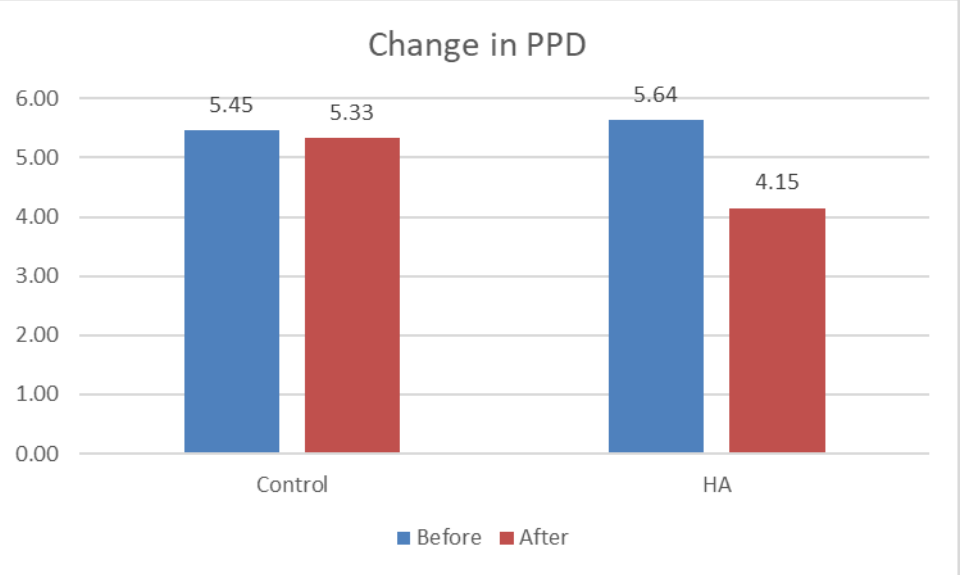

Fig. 3. comparison of mean pocket depth (PPD) at teeth receiving scaling and root planing with HA and without HA (control) at base line and 6-weeks post treatment.

The current study was designed to evaluate the effect of the topical application of HA gel in addition to the non-surgical periodontal treatment (SRP). The periodontal parameters were compared between the baseline and six weeks' post-treatment in both control sites and HA sites.

The results of our study revealed a significant difference between the periodontal parameters PI and GI in both test and control groups before and after treatment.

However, the PPD and CAL did not show a remarkable improvement in the control group. On the other hand, in the HA group there was a significant difference in all the periodontal parameters PI, GI, PPD and CAL before and six weeks after the SRP and application of the HA gel.

These observations were recorded in the absence of remarkable differences in oral hygiene standards between the two groups, suggesting the positive and beneficial

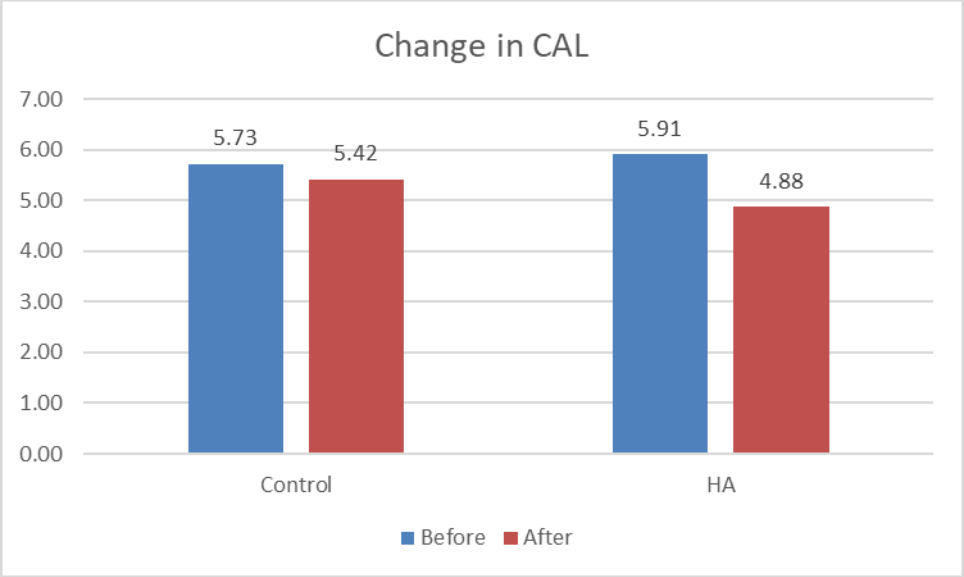

Figure 4. Comparison of mean clinical attachment loss (CAL) at teeth receiving scaling and root planing with HA and without HA (control) at base line and 6-weeks post treatment.

effects of HA in the treatment of periodontal diseases. Moreover, the results of this study agree with results reported in other studies. For instance, Johannsen et al. also reported significant reductions of BOP and PPD after the adjunctive use of HA gel immediately post SRP and 1 week afterwards (Johannsen et al., 2009).

Also, a similar finding to ours was reported by Rajan et al. who found a significant reduction in BOP and PPD scores in the HA group. Although they also found improvement in these parameters in the control group, however the improvement was greater in the HA group(Rajan et al.,2014).

In contrast to our results, a study carried out among a Chinese population has reported a negative influence ofthe application of HA (0.2%) on the periodontal parameters after 6 and 12 weeks in chronic periodontitis patients(Xu et al.,2004).

Although we used the same concentration of the HA in our study, but this dissimilarity could be attributed to the immense difference in the study design such as the severity of the disease in the subjects, as well as the mode and frequency of application.

CONCLUSIONS

Hyaluronan application asanadjunct to non-surgical periodontal treatment seems to have a beneficial effect on surrogate outcome variables of periodontal inflammation, i.e., GI, PD and CAL.Thus, hyaluronan is emerging as a boon prospect in the treatment of periodontitis.However, further studies witha larger sample size are further requiredin this field to validate the assessment of the result of the said periodontal therapy.

REFERENCES

Armitage GC. Development of a Classification System for Periodontal Diseases and Conditions. Ann. Periodontol 1999; 4:1-7.

Charles M. Microbes, Inflammation, Scaling and Root Planing, and the Periodontal Condition. The Journal of Dental Hygiene 2008; 83:4-9.

Dahiya P and Kama R. Hyaluronic Acid: A Boon in Periodontal Therapy. N Am J Med Sci. 2013. 5: 309–315.

Dodwad V, Vaish S, Mahajan A, Chhokra M. Local drug delivery in periodontics: A strategic intervention. Int J Pharm PharmSci 2012; 4:30-4.

Dragoo M. A clinical evaluation of hand and ultrasonic instruments on subgingival debridement I. With unmodified and modified ultrasonic inserts, Int J PeriodontRestor Dent 1992;12:311.

Drisko CH. Non-surgical periodontal therapy. Periodontol 2000 2001; 25:78-9.

Giuliana G, Ammatuna P, Pizzo G, Capone F, D'Angelo M. Occurrence of invading bacteria in radicular dentin of periodontally diseased teeth: microbiological findings. J Clin Periodontol. 1997; 24:478-485.

Johannsen A, Tellefsen M, Wikesjo U, Johannsen G. Local delivery of hyaluronan as an adjunct to scaling and root planing in the treatment of chronic periodontitis. J Periodontol. 2009; 80:1493-7.

Killoy WJ. Chemical treatment of periodontitis: Local delivery of antimicrobials. Int Dent J 1998; 48:305-15.

Loe H, Silness J. Periodontal Disease in Pregnancy. I. Prevalence and Severity. ActaOdontol Scand. 1963; 21:533-51.

Moseley R, Waddington RJ, Embery G. Hyaluronan and its potential role in periodontal healing. Dent Update 2002; 29:144-8.

Offenbacher S. Periodontal diseases: Pathogenesis. Ann periodontal 1996; 1:821-78.

Pagnacco A, Vangelisti R, Erra C, Poma A. Double-blind clinical trial versus placebo of a new sodium-hyaluronate-based gingival gel. AttualTer In. 1997; 15:1–7.

Plessas A. Nonsurgical Periodontal Treatment: Review of the Evidence. OHDM 2014; 3:71-80.

Rajan P, Baramappa R, Rao NM, Pavaluri AK, P I, Rahaman SM. Hyaluronic Acid as an adjunct to scaling and root planing in chronic periodontitis. A randomized clinical trial. J ClinDiagn Res. 2014; 8:11-14.

Rams TE, Slots J. Local delivery of antimicrobial agents in the periodontal pocket. Periodontol 2000 1996; 10:139-59.

Sillness J, Loe H. Periodontal Disease in Pregnancy. Ii. Correlation between Oral Hygiene and Periodontal Condtion. ActaOdontol Scand. 1964; 22:121-35.

Sukumar S, Drizhal L. Hyaluronic acid and periodontitis. ActaMedica 2007; 50:225-8.

Tanwar J, Hungund SA, Dodani K. Nonsurgical periodontal therapy: A review. Journal of Oral Research and Review2016; 8:39-44.

Van Winkelhoff AJ, Rams TE, Slots J. Systemic antibiotic therapy in periodontics. Periodontol 2000 1996; 10:45-78.

Xu Y, Hofling K, Fimmers R, Frentzen M, Jervoe-Storm PM. Clinical and microbiological effects of topical subgingival application of hyaluronic acid gel adjunctive to scaling and root planing in the treatment of chronic periodontitis. J Periodontol. 2004; 75:1114-8.