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ORIGINAL ARTICLE

Evaluation of biochemical and clinical effects of hyaluronic acid on non-surgical periodontal treatment: a randomized controlled trial

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Abstract

Background Recent studies reported that hyaluronic acid (HA) has anti-inflammatory, anti-edematous, and anti-bacterial activities in dentistry, particularly in gingival disorders caused by subgingival plaque microorganisms.

Aims This study aimed to evaluate the early term effects of HA as an adjunct to scaling and root planing (SRP) on clinical parameters, periodontal inflamed surface area (PISA), and adenosine deaminase (ADA), catalase (CAT), and glutathione (GSH) levels in gingival crevicular fluid (GCF) in periodontitis.

Methods A total of 24 periodontitis patients per group were included in this randomized controlled study. The study population was divided into four groups: in Group 1: SRP+ saline; in Group 2: SRP + HA gel; in Group 3: SRP+ HA mouth rinse; and in Group 4: SRP + HA mouth rinse + HA gingival gel were applied. At baseline and week 4, clinical parameters and PISA were calculated. Also, biochemicals' (ADA, CAT, and GSH) levels were determined by spectrophotometric analysis.

Results There was a statistically significant improvement in clinical parameters and PISA in all four groups in control sessions ($p < 0.05$). There was a significant decrease in ADA in GCF and significant increases in CAT and GSH levels after SRP ($p < 0.05$) in all four groups. The groups that were administered only gel (2nd and 4th) were different from other groups in terms of ADA, CAT, and GSH levels at 1st week ($p < 0.05$).

Conclusion HA application as an adjunct to SRP did not affect the clinical results, although, in the control sessions following the application, the results were favorable for the biochemical data in gel-applied groups.

Trial registration ClinicalTrials.gov.tr (NCT03754010)

Keywords Hyaluronic acid · Periodontics · Periodontitis · Periodontal treatment

Introduction

Periodontitis is an oral disease characterized by microbially associated, host-mediated inflammation in the periodontium. In the pathophysiology of periodontitis, the loss of marginal periodontal ligament fibers is observed, junctional epithelium migrates apically which causes biofilm to spread in the apical direction along the root surface [1]. A large number of periodontal classifications have been used in periodontics to evaluate the severity of the periodontal disease. In 2008, Nesse et al. [2] developed a new method: Periodontal inflamed surface area (PISA) helps to quantify the inflammation and infectious burden caused by periodontal disease. The PISA values show the amount of inflamed periodontal tissue, while the amount of inflamed periodontal tissue reflects the severity of the periodontal disease. In the treatment of periodontal diseases, scaling and root planing (SRP) have been shown to be effective. Using the SRP treatment, the bacterial mass in the periodontal pocket is reduced, and a less pathogenic flora is restored [3].

Hyaluronic acid (HA) is a high-molecular-weight polysaccharide component from the glycosaminoglycan family, which is found in various body fluids investigated commonly, such as gingival crevicular fluid (GCF), saliva, serum, and

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Does Adjunctive Use of Hyaluronic Acid Improve Clinical Outcome of Mechanical Therapy for Cases of Mild Aggressive Periodontitis?

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Hyaluronic acid is an essential component of the periodontal ligament matrix and it has shown a number of clinical therapeutic properties, especially an anti-inflammatory effect on the gingival tissue. The aim of this study is to evaluate the potential benefits of using hyaluronic acid gel in topical application as an adjunct to mechanical therapy in the management of aggressive periodontitis. Results show an obvious improvement of clinical parameters, especially regarding the evolution of healing of the gingival tissue after periodontal therapy. Nevertheless, the antimicrobial effect needs to be proven in further studies.

Keywords: hyaluronic acid, aggressive periodontitis, periodontal pathogens, gingival inflammation

Aggressive periodontitis is a complex infectious periodontal disease that is characterized by a rapid and severe destruction of the periodontium leading to early tooth loss if left untreated [1]. It is associated with the presence of certain microbial species, such as Aggregatibacter actynomicetemcomitans, Porphyromonas gingivalis, Treponema denticola and Tannerella forsythia [2].

Current protocols suggest that early recognition of aggressive periodontitis and mechanical therapy combined with the use of antibiotic therapy, as a first phase of periodontal treatment, may lead to significant clinical improvements in the disease evolution [3]. However, the growing development of resistance to antibiotics, shown by multiple periodontal pathogens, as well as drug interactions, may be a considerable reason to limit the use of systemic antibiotics, especially if this particular form of periodontal disease has just set on [4]. Locally applied therapy has the advantage of a high concentration of the antimicrobial avoiding a considerable number of side effects [5,6] .

Hyaluronic acid (HA) is an extracellular component of the connective tissue. Studies have shown that it plays an important role in post-inflammatory tissue-regeneration and it has a number of clinical therapeutic properties. HA as a bactericidal agent is still controversial [7]. Hyaluronan gel is effective in controlling inflammation and gingival bleeding. Studies have documented reduction in the depth of gingival pockets along with a significant reduction in epithelial and lymphocyte cell proliferation with the use of HA gel [8]. 0.2% Hyaluronan containing gel has a beneficial effect in the treatment of plaque induced gingivitis [9]. The topical application of an HA-containing preparation represents a potentially useful adjunct in the therapy of gingivitis, although its use does not diminish the need for plaque reduction as a primary therapeutic measure [10].

The purpose of this study was to evaluate the clinical effects of a 0.2 % HA gel used as an adjunct in multiple applications after SRP in patients diagnosed with mild aggressive periodontitis.

Experimental part

A written signed consent for each patient and the approval of the Ethics Commission were obtained, after informing the subjects about the nature of the study.

The study was designed as a split-mouth study, on twenty three young patients diagnosed with mild generalized aggressive periodontitis. The mean age of the subjects was 31.17, 14 females and 9 males were selected based on the clinical diagnosis. Patients with previous periodontal treatment or use of antibiotics in the last 6 months as well as systemic health problems or pregnancy were excluded. Inclusion criteria was the presence of at least 20 natural teeth and at least two sites in each quadrant with a minimum probing depth of 5 mm. Four sites for each patient, with a minimum probing depth of 5 mm, were chosen as control and test sites, in different quadrants, in the molar and premolar area. Incisors and canines were excluded to avoid carry-over effects between test and control sites.

The following clinical parameters were recorded at baseline, 8 and 12 weeks after mechanical therapy for the selected sites: bleeding on probing (BOP), recession (REC), suppuration (SUP), plaque score (PS), probing depth (PD) and clinical attachment level (CAL). The measurements were performed by a single examiner with a conventional periodontal probe. BOP, SUP and PS for the two test and control sites, were assessed as present or absent. A score of 0 for absent and 1 for present was assigned to each site. PD and REC were measured in mm with a conventional periodontal probe, while CAL was calculated in mm, based on the previous measurements.

Subgingival plaque samples were taken with sterile paper points from the selected test and control sites prior to clinical examination, at baseline and at 8 and 12 weeks. Four pathogens, Aggregatibacter actynomicetemcomitans (Aa), Porphyromonas gingivalis (Pg), Treponema denticola (Td) and Tannerella forsythia (Tf) were determined in each plaque sample by polymerase chain reaction (PCR). The PCR results were expressed as total counts of selected periodontal pathogens.

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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 (PLI) 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

PERBEDAAN EFEKTIVITAS TOPIKAL GEL ASAM HIALURONAT DAN GEL METRONIDAZOL TERHADAP PENYEMBUHAN JARINGAN PERIODONTAL SETELAH KURETASE PADA PERIODONTITIS KRONIS

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ABSTRAK

Periodontitis adalahperadanganpadajaringanpendukunggigi yang disebabkanolehbakteriplak.Kuretasemerupakansalahsatuprosedurdalamterapi periodontitis. Asamhialuronat mempunyai sifat bakteriostatik,antiinflamasi, meningkatkan proliferasi, metabolisme dan migrasi sel.Metronidazoleefektifterhadapbakteri anaerob sub gingiva yang berperanterhadapkerjadinya periodontitis. Penelitianinibertujuanuntukmengetahuiperbedaanefektifitastopikal gel asamhialuronatdan gel metronidazoleterhadap penyembuhan jaringan periodontal setelahkuretase pada periodontitis kronis.

Subjekpenelitianadalah penderita periodontitis kronisdenganrikedalamanpoket periodontal 4-6 mm.Penelitiandibagi 2 kelompokyaitutopikal gel asamhialuronatdan gel metronidazol,tiapkelompokdengan 15 poket periodontal. Pengambilan data PD,CAL, dan BOPpadahari ke-0 dan ke-21. Kuretase dan aplikasitopikal gel asam hialuronat dan gel metronidazol sesuai dengan kelompok perlakuan dilakukan pada hari ke-0. Data PDdan CALdianalisisdengan uji *Mann Whitney* sedangkandata *BOP* diuji dengan *Chi Square*.

Hasilpenelitianmenunjukkan rerata penurunan*PD* kelompok gel asam hialuronat lebih besar dibanding kelompok gel metronidazol(1,27:0,75). Rerata penurunan *CAL* kelompok gel asam hialuronat lebih besar dibanding kelompok gel metronidazol(1,06:0,67). Hilangnya *BOP*kelompok asam hialuronat *gel* lebih besar dibanding kelompok gel metronidazol(14:12). Uji statistikmenunjukkan hasil p<0,05, yang berarti terdapat perbedaan bermakna dalam penurunan *PD*, penurunan *CAL* dan hilangnya *BOP*.

Kesimpulan penelitian ini adalah topikal gel asamhialuronatlebih efektif dalam penyembuhan jaringan periodontaldibanding gel metronidazolesetelah kuretase padaperiodontitis kronis.

Kata kunci : Periodontitis kronis, kuretase, gel asamhialuronat, gel metronidazol,penyembuhan jaringan periodontal.

ABSTRACT

Periodontitis is an inflammation on the supporting tissues of the tooth. Curettage is a procedure in the treatment of periodontitis. Hyaluronic acid has bacteriostatic effect, anti-inflammatory, increases proliferation, metabolism, and cell migration. Metronidazole effective for an anrob sub-gingival bacteria that contributs to periodontitis. This study aimed to determine differences in the effectiveness of topical hyaluronic acid gel and metronidazole gel on periodontal tissue healing after curettage in chronic periodontitis.

Subjects were patients with chronic periodontitis with 4-6 mm periodontal pocket depth. Study divided into 2 groups: topical hyaluronic acid gel and metronidazole gel, each group with 15 periodontal pockets. Retrieval data PD, CAL and BOP on days 0 and 21st. Curettage and topical application of hyaluronic acid gel and metronidazole gel according to treatment group performed on day 0. Data PD and CAL were analyzed by Mann Whitney test and BOP was tested by Chi Square.

The results showed a mean reduction PD in hyaluronic acid gel group larger than metronidazole gel group (1,27:0,75). The mean reduction CAL in hyaluronic acid gel group larger than metronidazole gel group (1,06:0,67). Loss of BOP hialuronat acid gel group larger than metronidazole gel group (14:12). Statistical tests in both treatment groups showed the results of p < 0.05, which means there is a significant difference in the reduction in PD , CAL and loss of BOP. The conclusion of this study is topical hyaluronic acid gel more effective in the healing of periodontal tissues than metronidazole gel after curettage in chronic periodontitis.

Keywords : Chronic periodontitis, curettage, hyaluronic acid gel, metronidazole gel, periodontal healing.

Evaluation of the efficacy of an hyaluronic acid-based biogel on periodontal clinical parameters. A randomized-controlled clinical pilot study

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Summary

Hyaluronic acid (HA) is an ubiquitous form of non-sulphated glycosaminoglycan of the extracellular matrix of all mammalian connective tissues. It is mainly present during tissue's formation or during most of normal tissue's repair processes. Cell migration, adhesion and differentiation are only part of several unique biological characteristics of HA which have been under investigation in the past decades.
Aim of the study. Evaluate the possible positive effect of an esterified form of HA on gingival tissues in mild chronic periodontitis patients, seeking for the reduction of all the periodontal disease clinical parameters (PLI (Plaque Index), BOP (Bleeding on Probing), PPD (Probing Pocket Depth), CAL (Gingival Index), PAL (Probing Attachment Level).
Materials and methods. The study is an open, intra-patient, controlled, single center pilot clinical trial including 10 adult patients with mild chronic periodontitis and shallow pockets (< 4 mm) in at least two different quadrants. One quadrant was treated with HA gel after regular toothbrushing (test), the other without (control).
Results. Although oral hygiene itself had a similar positive influence on the improvement of all the clinical indexes for test and control, the treatment with HA gel showed a greater effect almost always statistically significant. BOP in the HA gel treated areas had a decrease of 32.7% and CAL of 26.5%, whereas controls 75.8% and 79.0% respectively. The difference at (1%) in both areas was statistically significant (p<0.01) in favour of the HA gel treated zone. Also PAL and PI were reduced more with gel than with oral hygiene alone, although they did not reach a statistical significant difference.
Conclusion. It appears that an esterified gel form of HA has shown an effect in reducing the gingival inflammation when used as an adjunct to mechanical home plaque control and that it could be successfully used to improve the periodontal clinical indexes. The pilot study will gain substantial scientific significance when both a higher number of patients can be utilized and also by adding any possible further biological information, as with immunocytochemistry and histology.

Key words: extracellular matrix, hyaluronan, periodontal disease.

Introduction

In normal conditions the gingival tissues carry out typical functions of fibrous tissues, although presenting features very similar to soft tissues.
The "ground substance", which is the supporting structure of the extracellular matrix and is formed by a highly structured net of proteoglycans in perfect equilibrium one another, gives the gingival tissues a typical firm consistency. In this context, hyaluronic acid or hyaluronan (HA), an ubiquitous non-sulphated glycosaminoglycan, plays a fundamental role (2). In fact, it has been shown that among gingival diseases, periodontal disease is characterized by the loss of the normal gingival properties. Many studies show that the most important alterations are related to the reduction of the normal structural balance of the extracellular matrix (21,24).
In particular, the endogenous hyaluronan component results to be lacking within the epithelium and the gingival connective tissue with a consequent structural failure and loss of normal features of the gingiva. (2,4,7). It was demonstrated that in patients with chronic periodontitis, there is a rapid loss of high molecular weight of hyaluronic acid due to enzymatic digestive processes (3). Hyaluronidase, an enzyme released by micro-organisms of bacterial plaque, plays an essential role in such mechanism (14). The supply of constituents that can be utilized by the regenerating tissues in order to re-establish their internal structure is, therefore, strictly necessary. (10).
In the dental literature, HA has been shown to be bacteriostatic with respect to periodontal pathogens (18) and effective *in vitro* when both intramembranous and endochondral models of osteogenesis are utilized (12,17). More

Effectiveness of adjunctive subgingival administration of amino acids and sodium hyaluronate gel on clinical and immunological parameters in the treatment of chronic periodontitis

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Summary

Aims. The aim of this clinical trial was to compare clinical and biochemical healing outcomes following ultrasonic mechanical instrumentation versus ultrasonic mechanical instrumentation associated with topical subgingival application of amino acids and sodium hyaluronate gel.
Methods. Eleven systemically healthy subjects with moderate-severe chronic periodontitis, who had four sites with pocket probing depth and clinical attachment level greater than or equal to 5 mm were randomly assigned to two different types of treatment: two pockets were treated with ultrasonic debridement (Control Group) and two pockets with ultrasonic mechanical instrumentation associated with 0,5 ml of amino acids and sodium hyaluronate gel (Test Group). Probing depth, clinical attachment level, plaque index and bleeding on probing were recorded at baseline, 45 and 90 days. Levels of calprotectin and myeloperoxidase activity in gingival crevicular fluid were assessed at baseline and on day 7 and 45.
Results. Statistical significance was found between baseline and day 45 in relation to probing depth reduction and bleeding on probing between groups for both of the tested treatments. Significant reductions in μg/sample of calprotectin and myeloperoxidase were found after 1-week and an increase at 45 days in both groups. There were no statistically significant differences between other variables evaluated in this study.
Conclusions. These data suggest that subgingival application of hyaluronic acid following ultrasonic mechanical instrumentation is beneficial for improving periodontal parameters.

Key words: hyaluronic acid, periodontitis, calprotectin, myeloperoxidase.

Introduction

A successful treatment of periodontal disease is based on an adequate maintaining of infection control in the subgingival area. According to recent systematic reviews (1,2), there is no major difference in the efficacy of debridement techniques of plaque and calculus from root and tooth surfaces using manual or ultrasonic instrumentation. Ultrasonic mechanical instrumentation combined with effective self-performed supragingival plaque control measure, allows infection control by altering the subgingival ecological environment through disruption of the microbial biofilm and suppression of the inflammation (3).
The goal is frequently not completely attainable; it is nearly impossible to expect to set the root completely free from calculus specially in deeper pockets. Probing of the root surface for detection of remaining deposits is an unreliable method to determine whether adequate debridement has been achieved, while clinical signs of resolution of the inflammatory lesion would indicate sufficient removal of biofilm/calculus (4).
Several recent studies have demonstrated additional improvements in clinical parameters using local or systemic antimicrobial agents (5-7).
Nevertheless, antibacterial agents locally or systemically applied in periodontal pockets, proved to be more effective only when they were used in combination with ultrasonic mechanical instrumentation. Physical disruption of the biofilm is fundamental for the control of periodontal diseases (8). The use of systemic antibiotics should be limited because of the development of resistant organ-

QUINTESSENCE INTERNATIONAL
PERIODONTOLOGY

Treatment of infrabony periodontal defects using a resorbable biopolymer of hyaluronic acid: A randomized clinical trial

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Objective: This randomized clinical study examined the use of hyaluronic acid to treat infrabony periodontal defects over a period of 24 months. **Method and Materials:** Forty subjects with a two-wall infrabony defect (probing depth (PD) ≥ 7 mm; clinical attachment level (CAL) ≥ 7 mm) were selected. The defects were randomly divided into two groups: sites treated with hyaluronic acid (test group) and those treated with open flap debridement (control group). **Results:** The 12- and 24-month evaluations were based on clinical and radiographic parameters. The primary outcome variable was CAL. Test defects showed a mean CAL gain of 1.9 ± 1.8 mm, while the control defects yielded a significantly lower gain of 1.1 ± 0.7 mm. PD reduction was also significantly higher in the test group (3.6 ± 1.2 mm) than in the control group (3.0 ± 0.5 mm). Frequency distribution analysis of the study outcomes indicated that hyaluronic acid increased the predictability of clinically significant results (CAL gains ≥ 2 mm and PD reduction ≥ 2 mm) in the test group compared with the controls. **Conclusions:** The treatment of infrabony defects with hyaluronic acid offered an additional benefit in terms of CAL gain, PD reduction, and predictability compared to treatment with open flap debridement. *(Quintessence Int 2013;44:231–240; doi: 10.3290/j.qi.a29064)*

Key words: hyaluronic acid, infrabony periodontal defect, periodontal disease, periodontal regeneration, randomized clinical trial

Successful tissue regeneration requires not only reparative cells with the potential to differentiate between the phenotypes needed to restore the damaged site, but also a microenvironment that supports the proliferation and differentiation of those cells.[1] Over the past decade, considerable progress has been made in the biomaterials and techniques available for simple and predictable periodontal tissue regeneration. The ultimate goal of periodontal therapy is the regeneration of structures lost to disease. Regeneration requires both clinical improvements and knowledge of the underlying biology; treatment decisions must be made using a sound biologic rationale and histologic evidence.[2] Regenerative procedures have been shown to support substantial improvements in clinical parameters compared to open flap debridement (OFD) in the treatment of infrabony defects.[3] The grafting of biomaterials and application of biologic agents have been used with varying degrees of success to reconstruct lost attachment in deep intraosseous defects. The predictability of periodontal regeneration seems to be influenced by multiple factors related to the patient, defect morphology, and surgical procedure.[4] Previous studies have investigated the regenerative treatment of periodontal infrabony defects, and a variety of treatment approaches to

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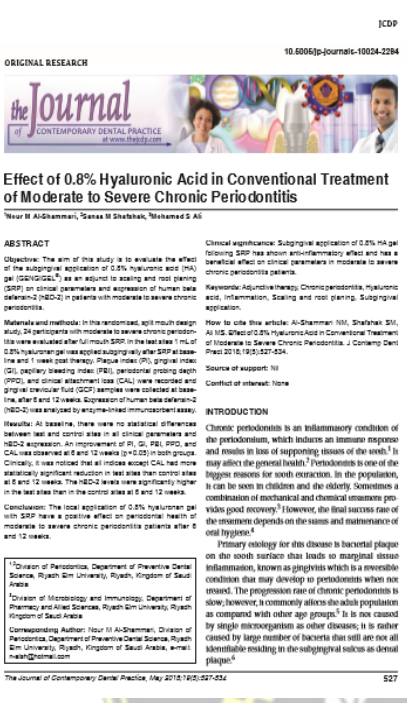
A comparison in postoperative healing of sites receiving non-surgical debridement augmented with and without a single application of hyaluronan 0.8% gel

By



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ORIGINAL RESEARCH

the Journal of CONTEMPORARY DENTAL PRACTICE

Effect of 0.8% Hyaluronic Acid in Conventional Treatment of Moderate to Severe Chronic Periodontitis

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ABSTRACT

Objective: The aim of this study is to evaluate the effect of the subgingival application of 0.8% hyaluronic acid (HA) gel (GUNGIRAL®) as an adjunct to scaling and root planing (SRP) on clinical parameters and expression of human beta defensin-2 (hBD-2) in patients with moderate to severe chronic periodontitis.

Materials and methods: In this randomized, split mouth design study, 24 participants with moderate to severe chronic periodontitis were evaluated after full mouth SRP. In the test sites 1 mL of 0.8% hyaluronan gel was applied subgingivally after SRP at baseline and 1 week post therapy. Plaque index (PI), gingival index (GI), papillary bleeding index (PBI), periodontal probing depth (PPD), and clinical attachment loss (CAL) were recorded and gingival crevicular fluid (GCF) samples were collected at baseline, after 6 and 12 weeks. Expression of human beta defensin-2 (hBD-2) was analysed by enzyme-linked immunosorbent assay.

Results: At baseline, there were no statistical differences between test and control sites in all clinical parameters and hBD-2 expression. An improvement of PI, GI, PBI, PPD, and CAL was observed at 6 and 12 weeks (p<0.05) in both groups. Clinically, it was noticed that all indices except CAL had more statistically significant reduction in test sites than control sites at 6 and 12 weeks. The hBD-2 levels were significantly higher in the test sites than in the control sites at 6 and 12 weeks.

Conclusion: The local application of 0.8% hyaluronan gel with SRP have a positive effect on periodontal health of moderate to severe chronic periodontitis patients after 6 and 12 weeks.

Clinical significance: Subgingival application of 0.8% HA gel following SRP has shown anti-inflammatory effect and has a beneficial effect on clinical parameters in moderate to severe chronic periodontitis patients.

Keywords: Adjunctive therapy, Chronic periodontitis, Hyaluronic acid, Inflammation, Scaling and root planing, Subgingival application.

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INTRODUCTION

Chronic periodontitis is an inflammatory condition of the periodontium, which induces an immune response and results in loss of supporting tissues of the teeth.[1] It may affect the general health.[2] Periodontitis is one of the biggest reasons for tooth extraction. In the population, it can be seen in children and the elderly. Sometimes a combination of mechanical and chemical treatments provides good recovery.[3] However, the final success rate of the treatment depends on the status and maintenance of oral hygiene.[4]

Primary etiology for this disease is bacterial plaque on the tooth surface that leads to marginal tissue inflammation, known as gingivitis which is a reversible condition that may develop to periodontitis when not treated. The progression rate of chronic periodontitis is slow; however, it commonly affects the adult population as compared with other age groups.[5] It is not caused by single microorganism as other diseases; it is rather caused by large number of bacteria that still are not all identifiable residing in the subgingival sulcus as dental plaque.[6]

Original Article

Evaluation of effectiveness of hyaluronic acid in combination with bioresorbable membrane (poly lactic acid-poly glycolic acid) for the treatment of infrabony defects in humans: A clinical and radiographic study

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Abstract:

Background: The combination of biomaterials, bone graft substitutes along with guided tissue regeneration (GTR) has been shown to be an effective modality of periodontal regenerative therapy for infrabony defects. Therefore, the present randomized controlled clinical study was undertaken to evaluate the effectiveness of hyaluronic acid (HA) in combination with bioresorbable membrane for the treatment of human infrabony defects. Materials and Methods: Twenty four infrabony defects in 20 systemically healthy patients were randomly assigned to test (HA in combination with bioresorbable membrane) and control (bioresorbable membrane alone) treatment groups. Probing pocket depth (PPD), relative attachment level, and relative gingival margin level were measured with a computerized Florida disc probe at baseline and at 6 months follow-up. Radiographic measurements were also evaluated at baseline and at 6 months of postsurgery. Results: At 6 months, the mean reduction in PPD in test group and control group was 4.58 mm and 2.67 mm, respectively. Significantly higher clinical attachment levels with a gain of 2.26 mm was found in the test group as compared to control group. In addition, statistically significant greater reduction of radiographic defect depth was observed in the test group. Conclusion: Regenerative approach using hyaluronic acid in combination with GTR for the treatment of human infrabony defects resulted in a significant added benefit in terms of CAL gain, PPD reductions and radiographic defect fill, as well as LBG, compared to the GTR alone.

Key words:

Guided tissue regeneration, hyaluronic acid, infrabony defects

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INTRODUCTION

Human case studies and studies using discriminating animal models have pointed to a considerable native biologic potential for regeneration of the periodontal attachment, that is, formation of new cementum, alveolar bone, and a functionally oriented periodontal ligament (PDL).[1-4] Critical clinical components for successful outcomes are: (1) We and reliably create the early healing sequence, (2) space provision to allow the migration and proliferation of cells from the PDL and alveolar bone along the periodontally exposed root and (3) conditions favoring primary intention healing, that is, the wound space remains protected from bacterial contamination and infection.

A large body of clinical studies has applied the principles of guided tissue regeneration (GTR) to resolve periodontal infrabony defects.[5-9] Outcomes from such studies have been rather variable, suggesting that the understanding of the fundamental biology for periodontal regeneration is incomplete, or its clinical application is difficult to master or complicated by events compromising periodontal wound healing.

In the last few years, various biomaterials have been tested to achieve periodontal regeneration in different types of periodontal

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ORIGINAL ARTICLE

Local application of hyaluronan gel in conjunction with periodontal surgery: a randomized controlled trial

Karim M. Fawzy El-Sayed · Moushira A. Dahaba · Shadw Aboul-Ela · Mona S. Darhous

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Abstract Hyaluronic acid application has been proven to be beneficial in a number of medical disciplines. The aim of the current study was to clinically evaluate the effect of local application of hyaluman gel in conjunction with periodontal surgery. Fourteen patients with chronic periodontitis having four interproximal intrabony defects (≥3 mm) with probing depth values >5 mm were included in this split-mouth study. Following initial nonsurgical periodontal therapy and re-evaluation, defects were randomly assigned to be treated with modified Widman flap (MWF) surgery in conjunction with either 0.8% hyaluronan gel (test) or placebo gel (control) application. Clinical attachment level (CAL), probing depth (PD), gingival recession (GR), plaque index (PI), and bleeding on probing (BOP) values were taken at baseline and 3 and 6 months. Differences between test and control sites were evaluated using a Wilcoxon signed-rank and a McNemar test. A Friedman and a Cochran test were used to test equal ranks over time. Statistically significant differences were noted for CAL and GR ($P<0.05$) in favor of the test sites. No significant differences were found regarding PD, BOP, or PI values ($P>0.05$). Hyaluronan gel application in conjunction with periodontal surgery appears to result in significant improvement of CAL and in a reduction in GR. Hyaluronan gel application appears to improve the clinical outcome of MWF surgery.

Keywords Periodontal surgery · Hyaluronic acid · Clinical attachment level · Gingival recession

Introduction

The ultimate goal of periodontal treatment is the regeneration of the supporting tissues lost due to periodontal disease [1]. Regeneration refers to the reproduction or reconstitution of a lost or injured part, in contrast to repair, which describes the healing by tissues that do not fully restore the architecture or the function of the lost part [2]. In periodontitis, as destruction reaches the deeper structures, regeneration becomes unpredictable.

However, in contrast to regeneration, periodontal repair remains a readily obtainable goal. A variety of surgical procedures have been advocated to enhance periodontal tissue reparative response and to provide an environment, in which new attachment can readily occur. Those include the modified Widman flap (MWF) [3], the excisional new

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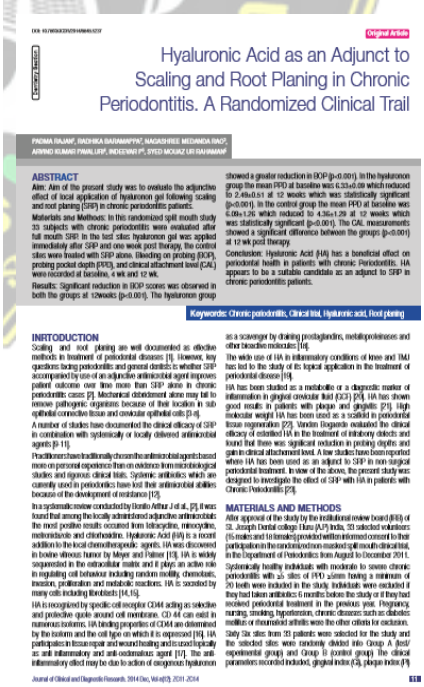

Original Article

Hyaluronic Acid as an Adjunct to Scaling and Root Planing in Chronic Periodontitis. A Randomized Clinical Trail

PADMA RAJAM, RACHANA BAVANANDAN, NAGASHREE MEDANCA BADP, ARVIND KUMAR PAUL,BDS,MDS,DNB,FICD, RIDZWAN P, SYED MOOAZ UR RAHAMAN

ABSTRACT

Aim: Aim of the present study was to evaluate the adjunctive effect of local application of hyaluronan gel following scaling and root planing (SRP) in chronic periodontitis patients.

Materials and Methods: In this randomized split mouth study 33 subjects with chronic periodontitis were evaluated after full mouth SRP. In the test sites hyaluronan gel was applied immediately after SRP and one week post therapy, the control sites were treated with SRP alone. Bleeding on probing (BOP), probing pocket depth (PPD), and clinical attachment level (CAL) were recorded at baseline, 4 wk and 12 wk.

Results: Statistical reduction in BOP scores was observed in both the groups at 12weeks (p=0.001). The hyaluronan group showed a greater reduction in BOP (p=0.001). In the hyaluronan group the mean PPD at baseline was 6.33±0.09 which reduced to 2.49±0.61 at 12 weeks which was statistically significant (p=0.001). In the control group the mean PPD at baseline was 6.09±1.26 which reduced to 4.36±1.29 at 12 weeks which was statistically significant (p=0.001). The CAL measurements showed a significant difference between the groups (p=0.001) at 12 wk post therapy.

Conclusion: Hyaluronic Acid (HA) has a beneficial effect on periodontal health in patients with chronic Periodontitis. HA appears to be a suitable candidate as an adjunct to SRP in chronic periodontitis patients.

Keywords: Chronic periodontitis, Clinical trial, Hyaluronic acid, Root planing

INRTODUCTION

Scaling and root planing are well documented as effective methods in treatment of periodontal diseases [1]. However, key questions facing periodontitis and general dentists is whether SRP accompanied by use of an adjunctive antimicrobial agent improves patient outcome over time more than SRP alone in chronic periodontitis cases [2]. Mechanical debridement alone may fail to remove pathogenic organisms because of their location in sub epithelial connective tissue and alveolar epithelial cells [3-5].

A number of studies have documented the clinical efficacy of SRP in combination with systemically or locally delivered antimicrobial agents [6-11].

Practitioners have traditionally chosen the antimicrobial agents based more on personal experience than on evidence from microbiological studies and rigorous clinical trials. Systemic antibiotics which are currently used in periodontics have lost their antimicrobial abilities because of the development of resistance [12].

In a systematic review conducted by Bonito Arthur J et al., [8], it was found that among the locally administered adjunctive antimicrobials the most positive results occurred from tetracycline, minocycline, metronidazole and chlorhexidine. Hyaluronic Acid (HA) is a recent addition to the local chemotherapeutic agents. HA was discovered in bovine vitreous humor by Meyer and Palmer [13]. HA is widely sequestered in the extracellular matrix and it plays an active role in regulating cell behaviour including random motility, chemotaxis, invasion, proliferation and metabolic reactions. HA is secreted by many cells including fibroblasts [14,15].

HA is recognized by specific cell receptor CD44 acting as selective and protective ligate around cell membrane. CD 44 can exist in numerous isoforms. HA binding properties of CD44 are determined by the isoform and the cell type on which it is expressed [16]. HA participates in tissue repair and wound healing and is used topically as anti inflammatory and anti oedematous agent [17]. The anti-inflammatory effect may be due to action of exogenous hyaluronan as a scavenger by shielding prostaglandin, metalloproteinases and other bioactive molecules [18].

The wide use of HA in inflammatory conditions of knee and TMJ has led to the study of its topical application in the treatment of periodontal disease [19].

HA has been studied as a metabolite or a diagnostic marker of inflammation in gingival crevicular fluid (GCF) [20]. HA has shown good results in patients with plaque and gingivitis [21]. High molecular weight HA has been used as a scaffold in periodontal tissue regeneration [22]. Vanden Bogaerde evaluated the clinical efficacy of esterified HA in the treatment of infrabony defects and found that there was significant reduction in probing depths and gain in clinical attachment level. A few studies have been reported where HA has been used as an adjunct to SRP in non-surgical periodontal treatment. In view of the above, the present study was designed to investigate the effect of SRP with HA in patients with Chronic Periodontitis [23].

MATERIALS AND METHODS

After approval of the study by the institutional review board (IRB) of St. Joseph Dental college Eluru (AP) India, 33 selected volunteers (16 males and 16 females) provided written informed consent to their participation in the randomized non-masked split mouth clinical trial, in the Department of Periodontics from August to December 2011.

Systemically healthy individuals with moderate to severe chronic periodontitis with ≥5 sites of PPD ≥4mm having a minimum of 20 teeth were included in the study. Individuals were excluded if they had taken antibiotics 6 months before the study or if they had received periodontal treatment in the previous year. Pregnancy, nursing, smoking, hypertension, chronic diseases such as diabetes mellitus or rheumatoid arthritis were the other criteria for exclusion.

Sixty Six sites from 33 patients were selected for the study and the selected sites were randomly divided into Group A (test/experimental group) and Group B (control group). The clinical parameters recorded included, gingival index (GI), plaque index (PI)

Original Article

Dentistry Section

Evaluation of Gengigel® Application in the Management of Furcation with Coronally Advanced Flap through Surgical Re-Entry- A Split Mouth Clinical Study

SUGANDHA GUPTA¹, SURESH D REDDEE², AKANKSHA GUPTA³, KANU JAIN⁴

ABSTRACT

Introduction: One of the challenging and unique periodontal problem of Grade II furcation defect has been managed through different treatment modalities in the past. A successful approach is based on complete closure of the defect. Different regenerative approaches have been tried.

Aim: This study was carried out with an aim to evaluate the role of Gengigel® (0.8% hyaluronic acid) as a potential material for regeneration of lost attachment apparatus.

Materials and Methods: A total of 20 sites with Grade II furcation defects from 10 patients were selected using random sampling technique. These were divided into Group A (placement of hyaluronic acid) and Group B (without placement of hyaluronic acid) according to treatment modality. Furcation defect assessment was done in vertical and horizontal depth preoperatively and postoperatively at six months through surgical-re-entry. Recorded data was subjected to the statistical analysis unpaired and paired t-tests for intergroup and intragroup comparisons respectively.

Results: Mean plaque index, gingival index and bleeding index score showed statistically highly significant and significant results respectively, for both the groups at baseline and six months. Mean difference in probing pocket depth and Relative Attachment Level (RAL) were statistically highly significant, whereas, mean difference of gingival position margin was non significant for both the groups, at baseline and six months. Mean difference in horizontal component at baseline and six months was statistically highly significant for both the groups. Mean difference in vertical component at baseline and six months was statistically significant for both the groups. On comparison, the mean difference in vertical and horizontal component of Group A and Group B at six months was statistically not significant.

Conclusion: Both Gengigel® with coronally positioned flap and coronally positioned flap alone are effective in the treatment of Grade II furcation defects. The combination of Gengigel® with coronally positioned flap leads to better results in hard tissue measurement as compared to coronally positioned flap alone.

Keywords: Hyaluronic acid, Periodontitis, Regeneration

INTRODUCTION

One of the most challenging aspects in periodontal therapy is the regeneration of periodontium within the furcation defect. An enormous and rapid loss of clinical attachment is seen in teeth with involvement of furcation as compared to single rooted tooth [1]. For the re-establishment of a healthy periodontal tissue, it is important to treat subgingival plaque and calculus thoroughly by their removal. But there is diminished effectiveness of this conventional treatment in cases of furcation involvement in molars [2]. A diminished efficacy of routine periodontal treatment is seen in cases of furcation involvement in molars [3]. The lack of adequate access to instrumentation and difficulty in maintaining care due to intricate furcation anatomy leads to persistence of pathogenic bacteria and thus compromised results [3].

Grade II furcation involvement presents a distinctive clinical problem as they are difficult to be managed. Various different techniques have been employed and tested over the past three decades for management of Grade II furcations [4-6]. The closure of furcation depends upon the successful regeneration of the lost attachment apparatus [2,5-8].

A high molecular weight polysaccharide, hyaluronic acid also known as hyaluronan or hyaluronate, has been studied as a promising mediator for periodontal regeneration recently. It has a significant role in the mineralized and non-mineralized periodontal tissues for the functioning of their extracellular matrices [9]. It has a multifunctional role in periodontics including stimulation of cell migration, proliferation and differentiation and acceleration of wound healing by stimulating angiogenesis. It is used in surgical procedures due to its osteoinductive potential [10]. According to Sitzmann T et al., hyaluronic acid shows great promise in the development of engineered tissues and biomaterials for a variety of biomedical needs including orthopedic, cardiovascular, pharmacologic and oncologic applications [11]. Nadiger S and Khanid VI observed anti-inflammatory effect of Gengigel® (0.8% hyaluronic acid) for treating gingivitis [12].

Considering its various functions and properties, an attempt has been made to evaluate the efficacy of Gengigel® in the treatment of furcation defects with coronally positioned flap. Its comparison has also been made with the surgical outcome using coronally advanced flap without Gengigel®. Surgical re-entry procedure has also been performed to assess the effect of Gengigel® on furcation defect [13].

MATERIALS AND METHODS

The present study was carried out as per Helsinki's declaration [15] and with the approval of Institutional ethical committee. The subjects for this randomized controlled split mouth study were selected from the outpatient department of Department of Periodontics, MM College of Dental Sciences and Research, Mullana, Ambala, Haryana, India (sample size was determined based on the pilot study conducted on six sites which were included in the study). This clinical study was conducted over a period of 18 months.

Patients of either sex with age range of 25-60 years, who were

Original Article

Effect of hyaluronan on periodontitis: A clinical and histological study

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Abstract:

Background: Conventional non-surgical periodontal therapy consists of supra- and subgingival tooth debridement. However, it is a technically demanding procedure and is not always efficient at eradicating all periodontal pathogens and in reducing inflammation. Therefore, local subgingival application of other chemotherapeutic agents may be used as an adjunct to non-surgical therapy. The aim of this study was to investigate the clinical and histological outcomes of local subgingival application of 0.2% hyaluronic acid gel (GENGIGEL®) as an adjunct to scaling and root planing (SRP) in chronic periodontitis patients. Materials and Methods: One hundred and twenty sites were chosen from 20 patients with chronic periodontitis (criteria being periodontal pockets ≥6mm). Experimental sites additionally received HA gel subgingivally at baseline. 1st, 2nd, and 3rd weeks. Clinical parameters were reassessed at 4th, 8th, and 12th week. At 4th week recall, a gingival biopsy was obtained from test and control site for histologic examination. Results: Intra-group analysis of all the clinical parameters at all sites from baseline to 4th, 8th, and 12th week showed statistically significant changes. Experimental sites showed statistically significant improvement in Gingival Index and Bleeding Index at 8th and 12th week when compared with controls. However, no statistically significant differences were observed in the PPD and RAL between control and experimental sites at 4th, 8th, and 12th week time interval. No statistically significant association was found between the histological grading of the clan biotrex and HA treatment. Conclusion: Subgingival treatment of 0.2% HA gel along with SRP provided a significant improvement in gingival parameters. However, no additional benefit was found in periodontal parameters. Histologically, experimental sites showed reduced inflammatory infiltrate, but it was not statistically significant.

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Key words: Gingival biopsy and inflammatory infiltrate, hyaluronic acid gel, scaling and root planing, subgingival application

INTRODUCTION

Periodontal tissues represent a unique system, where epithelial, non-mineralized, and mineralized connective tissues exist in harmony. This integrity is essential in providing an effective barrier against microbial invasion and preventing the destruction of the underlying periodontal tissues by bacterial toxins and enzymes. The integrity, however, is lost during chronic inflammation associated with periodontal disease leading to detrimental effects upon the extracellular matrix components of underlying periodontal tissues, including collagens, proteoglycans, and glycosaminoglycans.

Non-surgical mechanical therapy is the cornerstone of periodontal treatment. However, increasing pocket depth and complicating anatomical factors limit the effectiveness of scaling and root planing (SRP), thereby compromising the results. In addition to the better-known antimicrobials and biomaterials, there are a 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'.

Hyaluronic acid is a polysaccharide present in the connective tissue of vertebrates, a polymer of glucuronic acid and N-acetylglucosamine, and is a member of glycosamine family with a high molecular weight. Hyaluronic acid (Hyaluronan) is an indispensable component of intact, healthy gingiva, and oral mucosal tissue [Figure 1]. It has many properties that make it a potentially ideal molecule for assisting wound healing by inducing early granulation tissue formation, inhibiting inflammation, promoting epithelial turnover and also connective tissue angiogenesis.[4]

The application of exogenous hyaluronic acid and hyaluronan based biomaterials has been successful in manipulating and accelerating wound healing process in a number of medical disciplines, as evident in ophthalmology, dermatology, and rheumatology.[4] Hyaluronan is also a key component of chronic wounds during the series of stages associated with the wound healing process in both mineralized and non-mineralized periodontal tissues. The wound tissue in the early inflammatory phase of injury is rich in hyaluronan, originating from extracellular matrix cells (keratinocytes and fibroblasts in gingiva and periodontal ligament.

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Original Article

To compare the effect of the local delivery of hyaluronan as an adjunct to scaling and root planing versus scaling and root planing alone in the treatment of chronic periodontitis

Srishti Anil Shah, Harchad Narayan Vijayakar, Silvia Victor Rodrigues, Chirag Javerohand Mehta, Dipika Kalyan Mitra, Rohit Ajay Shah

Department of Periodontology, TPCT's Terna Dental College, Navi Mumbai, Maharashtra, India

Abstract:

Background: Hyaluronan is a critical component of the extracellular matrix and contributes significantly to tissue hydrodynamics and cell migration and proliferation. Studies have demonstrated its anti-inflammatory, antibacterial, and regenerative effects. The present study aimed to assess the clinical effects of the subgingival application of 0.8% hyaluronic acid gel as an adjunct to scaling and root planing (SRP) in the treatment of generalized chronic periodontitis. Materials and Methods: Patients with chronic periodontitis were recruited to participate in a study with a split-mouth design and provided informed consent. One hundred sites were included in the study and divided into fifty test sites and fifty controls sites. These were assessed for plaque index (PI), gingival index (GI), pocket probing depths, and relative attachment level (RAL) at pretreatment (baseline), 1, and 12 weeks posttreatment. The patients received full-mouth SRP. A 0.8% hyaluronan gel was administered subgingivally in the test sites at baseline and after 1 week. Significant differences between test and control were evaluated using the Mann–Whitney analysis of variance (test) followed by Bonferroni post hoc test. Results: A significant reduction in PI and GI was observed in both groups at 12 weeks ($P < 0.05$). Significant reduction in the pocket probing depths and gain in RAL was observed in both the groups as compared to baseline ($P < 0.05$). The hyaluronan group compared to control at 12 weeks showed statistically significant reduction in the probing pocket depth and gain in RAL ($P < 0.05$). Conclusion: The subgingival application of 0.8% hyaluronan gel in conjunction with SRP may have a beneficial effect on periodontal health in patients with chronic periodontitis.

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Key words: Dental plaque, hyaluronan, periodontitis

INTRODUCTION

Chronic periodontitis is a multifactorial disease, where putative periodontopathogens trigger chronic inflammatory and immune responses. Bacteria associated with periodontal diseases are usually found in biofilms protecting them from antimicrobial agents.

Conventional, non-surgical periodontal therapy consists of supragingival and subgingival tooth debridement. Mechanical debridement is usually effective in both disturbing the biofilm and reducing the bacterial load. Sometimes, it may not be sufficient to control the disease due to complex anatomy of the root and the centrum of the lesion.[1] In addition, certain microorganisms have the ability to invade and reside within the gingival tissues providing a reservoir for the bacteria that rapidly repopulate the pocket. The base of the pocket is difficult to access by periodontal instrumentation and hence mechanical methods alone are insufficient.[2-4]

To overcome this, systemic antimicrobials delivery was initiated to augment the effects of conventional mechanical periodontal therapy. However, side effects including hypersensitivity, gastrointestinal disturbance, and the development of bacterial resistance have been reported with systemic antimicrobials.[5] Some studies also reported poor results of the drug to achieve an adequate concentration at the site of action.

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Original Article

To compare the effect of the local delivery of hyaluronan as an adjunct to scaling and root planing versus scaling and root planing alone in the treatment of chronic periodontitis

Srishti Anil Shah, Harchad Narayan Vijayakar, Silvia Victor Rodrigues, Chirag Javerohand Mehta, Dipika Kalyan Mitra, Rohit Ajay Shah

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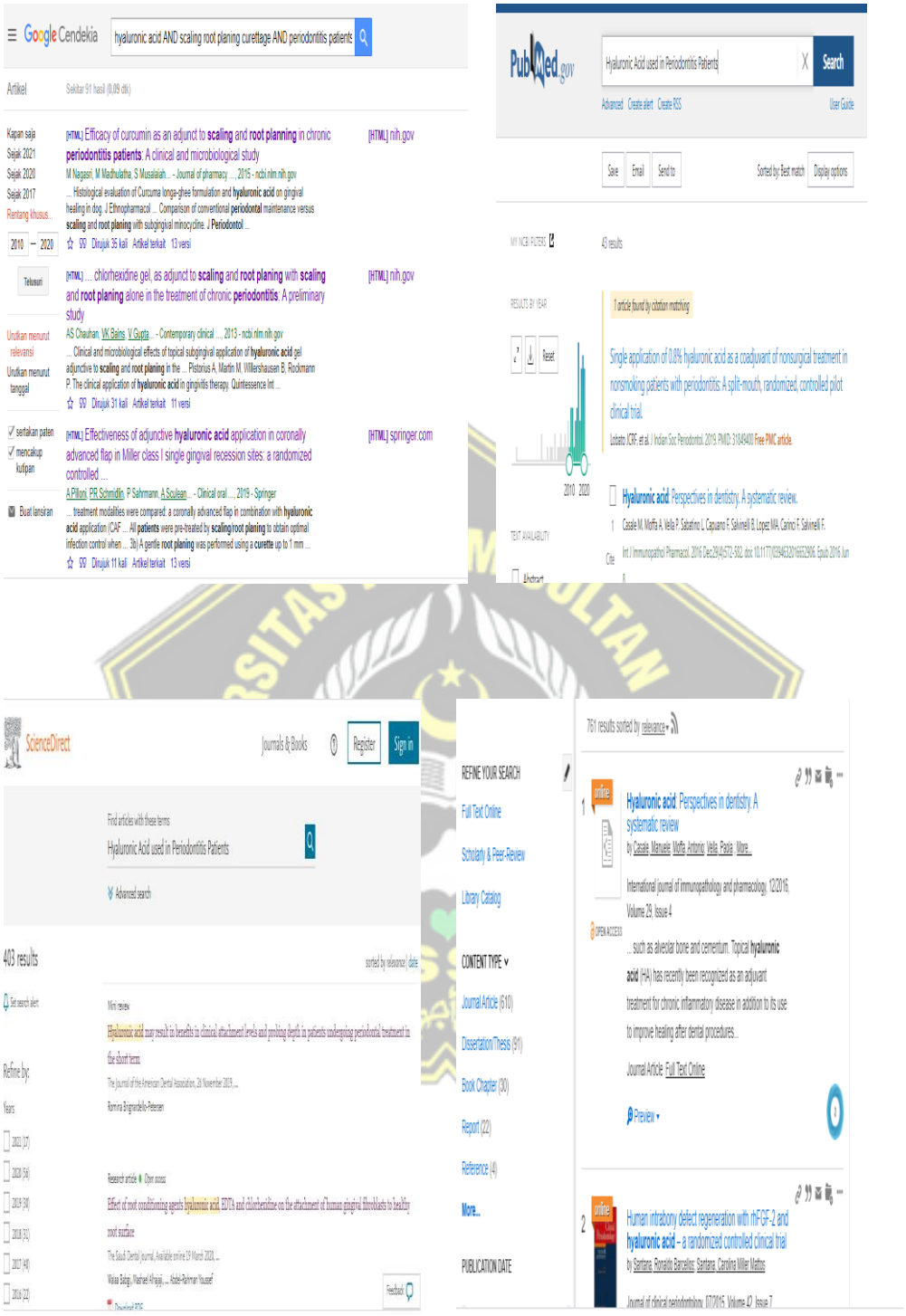
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