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# Hyaluronic Acid Gel in Periodontics: A Step Toward Localised Precision Care Among Smokers

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## Abstract

Mechanical removal of plaque and calculus remains the cornerstone of periodontitis treatment, effectively disrupting the biofilm and reducing microbial load. However, achieving complete bacterial eradication and optimal periodontal healing is particularly challenging in smokers, as smoking is a well-established risk factor for periodontal disease progression and impaired healing. To enhance periodontal therapy, adjunctive treatments such as local drug delivery (LDD) agents have gained attention for their ability to provide sustained antimicrobial and anti-inflammatory effects directly at the site of infection. Among these, hyaluronic acid (HA) gel has emerged as a promising option due to its biocompatibility, wound-healing properties, and potential to modulate periodontal inflammation. This case report highlights the role of HA gel as a local drug delivery modality in the management of periodontitis in a smoker, emphasizing its clinical benefits and therapeutic potential despite the challenges posed by tobacco use.

**KEYWORDS**: Hyaluronic Acid, Local Drug Delivery, Periodontitis, Smoking, Scaling and Root Planing.

## Introduction

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. [1] Goodson et al., in 1979 first developed the concept of Local Drug Delivery (LDD) in the management of periodontitis. [2] LDD agents offer several advantages over systemic antibiotics, such as lower dosage requirements, reduced frequency of administration, direct targeting of the infection site, minimally invasive application, prevention of gastrointestinal disturbances, and adaptability to various delivery methods. Effective LDD agents must meet specific criteria, including biocompatibility, biodegradability, sustained release over an extended period, ease of administration, and non-irritability at the delivery site.

Hyaluronic acid (HA) is a glycosaminoglycan found in the extracellular matrix of connective tissue. It consists of repeating non-sulfated disaccharide units composed of D-glucuronic acid and N-acetyl-D-glucosamine, linked by (1-3) and (1-4) glycosidic bonds. HA plays a crucial role in various biological functions, including ion exchange filtration, facilitating cell migration, maintaining tissue space, providing hydration, supporting tissue repair, promoting wound healing and angiogenesis, exhibiting anti-inflammatory properties, and inducing heat shock proteins. [4]

Preliminary clinical trials on hyaluronic acid (HA) in dentistry date back to 1997. A study by Vangelisti, Pagnacco et al., (1997) demonstrated that hyaluronate exhibits anti-inflammatory, bacteriostatic, and anti-edematous properties, highlighting its potential role in the treatment of both gingivitis and periodontitis. [3] Periodontal treatment in smokers requires a comprehensive approach, as smoking has been shown to reduce the effectiveness of conventional therapies, delay wound healing, and impair immune response. Studies indicate that smokers exhibit deeper periodontal pockets, greater attachment loss, and increased alveolar bone destruction compared to non-smokers. While mechanical debridement remains essential, adjunctive therapies such as local drug delivery agents, regenerative procedures, and strict maintenance protocols are

often necessary to achieve favorable outcomes. [5]

Hence, the aim of this case report is to demonstrate the clinical application and effectiveness of hyaluronic acid gel as a local drug delivery agent in periodontal therapy, highlighting its role in promoting healing, reducing inflammation, and enhancing overall treatment outcomes in a smoker.

**CASE REPORT**

A 54-year-old male patient, with a history of smoking, presented with the chief complaint of dental deposits. Clinical examination revealed Generalized Chronic Periodontitis with probing depths of 5–6 mm. Thorough Scaling and Root Planing (SRP) were performed, leading to a reduction in probing depths to 4–5 mm. An orthopantomogram (OPG) showed generalized horizontal bone loss. Given the patient's history of smoking, which is a known risk factor for periodontal disease and impaired healing, Local Drug Delivery (LDD) was planned as an adjunct to SRP to enhance periodontal therapy. One week after mechanical debridement, hyaluronic acid gel (Gengigel®) was administered in persistent residual pocket areas. (Figures 1 & 2) The patient was provided with oral hygiene instructions and demonstrated good compliance with the therapy. At the four-week follow-up, a significant reduction in probing depths was observed, indicating clinical improvement despite the challenges posed by smoking.


Figure 1: Hyaluronic acid gel

Figure 2: Placement of hyaluronic acid gel in areas of persistent pockets

**DISCUSSION**

Hyaluronic acid (HA) has emerged as an effective adjunct in periodontal therapy, demonstrating significant benefits in both smokers and non-smokers. Its biocompatibility, anti-inflammatory properties, and ability to promote wound healing make it a valuable addition to conventional mechanical debridement techniques such as scaling and root planing (SRP). The efficacy of HA as an adjunctive therapy has been explored in various clinical and microbiological studies, highlighting its role in improving periodontal outcomes.

Gontiya and Galgali (2012) conducted a clinical and histological study demonstrating the beneficial effects of HA in periodontitis treatment. The study concluded that HA application led to improved clinical parameters, including a reduction in probing pocket depth (PPD) and clinical attachment level (CAL) gain. [1] Similarly, Shah et al. (2022) compared the adjunctive use of metformin gel and chlorhexidine gel with SRP in chronic periodontitis and reported enhanced periodontal healing with locally delivered agents, reinforcing the importance of adjunctive therapies in periodontal management. [2]

The role of HA in periodontal therapy and post-surgical healing has been extensively reviewed by Shukla and Pebbili (2022), who emphasized its capacity to accelerate tissue repair and modulate the inflammatory response. [3] This aligns with findings from EL-EMAM et al. (2024), where a randomized controlled trial demonstrated that locally delivered HA gel significantly improved clinical outcomes in stage II and III periodontitis

cases. Microbiological analysis further confirmed a reduction in periodontal pathogens, indicating HA's antimicrobial potential. [4]

In the context of smoking, Vajawat et al. (2022) specifically investigated the effects of locally delivered HA in smokers and non-smokers with chronic periodontitis. Their study revealed that while both groups benefited from HA adjunctive therapy, smokers exhibited a relatively slower response compared to non-smokers, likely due to the compromised vascularization and immune response associated with tobacco use. [5] However, the adjunctive use of HA still resulted in notable improvements in PPD reduction and CAL gain, suggesting its efficacy even in compromised healing conditions.

The controlled release of locally delivered drugs, including HA, has been recognized as a promising approach in periodontal therapy. Amato et al. (2023) highlighted that controlled-release drug delivery systems can enhance drug bioavailability at the targeted site, improving therapeutic outcomes. This controlled release mechanism ensures prolonged HA retention in periodontal pockets, allowing sustained anti-inflammatory and regenerative effects. [6] Additionally, Shah et al. (2016) compared the effects of HA as an adjunct to SRP versus SRP alone and found a statistically significant improvement in clinical parameters in the HA-treated group. The study reinforced that HA enhances periodontal healing by reducing inflammation and promoting tissue regeneration, further supporting its use as an effective adjunct in periodontal therapy. [7]

Overall, the collective evidence supports the use of HA as a valuable adjunct in both smokers and non-smokers undergoing periodontal therapy. While smoking remains a significant challenge in periodontal treatment due to its negative impact on healing and host response, the use of HA has shown promise in mitigating these effects. The ability of HA to enhance wound healing, reduce inflammation, and provide antimicrobial benefits makes it a promising therapeutic agent in the management of periodontitis, regardless of smoking status. Further research is warranted to explore optimized formulations and delivery methods to maximize its clinical efficacy.

**CONCLUSION**

Hyaluronic acid has proven to be a beneficial adjunct in periodontal therapy, demonstrating efficacy in both smokers and non-smokers. Its ability to promote wound healing, reduce inflammation, and improve clinical parameters makes it a valuable addition to conventional periodontal treatment. While smoking poses challenges to periodontal healing, studies have shown that HA can help mitigate these effects and enhance treatment outcomes. The evidence supports the integration of HA as a local drug delivery agent in periodontal therapy, highlighting its therapeutic potential. Future research should focus on optimizing its formulation, delivery methods, and long-term effects to further establish its role in periodontal care.

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