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Comparative Evaluation of The Effect of Local Delivery of Hyaluronic Acid and iPRF As An Adjunct To Scaling and Root Planing in The Treatment of Generalized Chronic Periodontitis – A Split Mouth Study

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Abstract

Background: Periodontitis is an inflammatory condition affecting the tissues that support teeth, brought on by specific micro-organisms. Local drug delivery system into the pocket achieves a greater concentration of drug locally, providing bactericidal action for periopathogens.

Aim of the study: The purpose of the study was to compare and evaluate the effect of local delivery of hyaluronic acid and iPRF as an adjunct to scaling and root planing in the treatment of generalized chronic periodontitis – a split mouth study.

Materials and Method: 24 patients within age group of 30-60 years visiting the OPD at the Department of Periodontology and Oral Implantology, Luxmi Bai Institute of Dental Sciences & Hospital were included in the study. Subjects were divided into two groups, GROUP A (24 patients)- Treated with SRP + 1% hyaluronic acid and Group B (24 patients)- Treated with SRP + iPRF. All the patients were evaluated on the basis of clinical parameters (GI, PI, PPD and CAL) at the baseline, 4th and 6th week interval.

Conclusion: It is concluded that the PD and CAL improved in Group B (SRP+iPRF) as compared to Group A(SRP+1%HA) at the end of the 6th week whereas PI and GI changes were statistically similar in both the groups.

Keywords: hyaluronic acid, non-surgical, periodontitis, professional mechanical plaque removal, injectable platelet-rich fibrin.

Introduction

Periodontitis is a chronic inflammatory condition affecting the supporting structures of the teeth, characterized by progressive destruction of the periodontal ligament and alveolar bone. It results from the host's immune-inflammatory response to specific bacterial biofilms accumulating on tooth surfaces. This complex disease is influenced by various environmental, behavioral, and genetic risk factors. Clinically, periodontitis manifests as increased probing depths, gingival recession, and loss of clinical attachment.

The cornerstone of periodontal therapy is the elimination of bacterial biofilms through scaling and root planing (SRP), often supported by proper oral hygiene measures. While SRP remains the first line of treatment, its effectiveness may be limited in deep pockets or areas with complex root anatomy. Consequently, adjunctive therapies such as local drug delivery systems (LDDs) have gained prominence. These provide higher local drug concentrations with minimal systemic side effects and have been shown to enhance the therapeutic outcomes of SRP.

Hyaluronic acid (HA), a naturally occurring glycosaminoglycan, exhibits anti-inflammatory, bacteriostatic, and regenerative properties. It contributes to tissue hydration, fibroblast proliferation, and extracellular matrix stability, playing a key role in periodontal wound healing and regeneration.

Injectable platelet-rich fibrin (iPRF), an autologous platelet concentrate, is rich in growth factors such as PDGF, TGF-β1, VEGF, and EGF. It provides a fibrin matrix that acts as a scaffold, promoting cell migration, angiogenesis, and tissue regeneration. Its injectable form allows easy application into periodontal pockets during non-surgical therapy.

Given their regenerative potential, both HA and iPRF have been explored as adjuncts in periodontal treatment. This study aimed to compare the clinical efficacy of HA and iPRF as adjuncts to SRP in the non-surgical management of generalized chronic periodontitis, using a split-mouth design to evaluate outcomes such as plaque index, gingival index, clinical attachment level, and probing pocket depth.

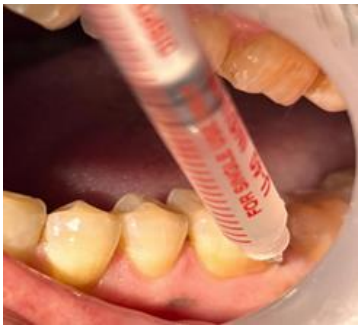
Materials and Methodology

Twenty four patients with generalised chronic periodontitis with the pocket depth of >=5mm were selected amongst patients visiting the Department of Periodontology and Oral Implantology, Luxmi Bai Institute of Dental sciences and Hospital, Patiala. The goal of the study was explained to the patients, and a written consent form was taken. The study was approved by the ethical committee of Luxmi Bai Institute of Dental Sciences and Hospital, Patiala.

The inclusion criteria included Patients with good oral and systemic health between the age group of 30 and 60 years, patients who readily gave the informed consent for the study, patients with a minimum number of 20 teeth, patients with generalized chronic periodontitis, with the site having maximum pocket pocket depth (≥5 mm) in either premolar or molar tooth in the contralateral quadrants.

The exclusion criteria included patients undergoing orthodontic treatment, immuno-compromised patient, patients with a history of recent periodontal surgery,

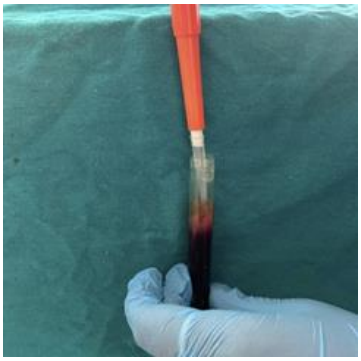
pregnant women or lactating mothers, patients who consumed tobacco in any form or were chronic smokers or alcoholics, patients who were taking or had consumed vitamin supplements, anti-inflammatory agents, antibiotics or statins in the previous 3 months.



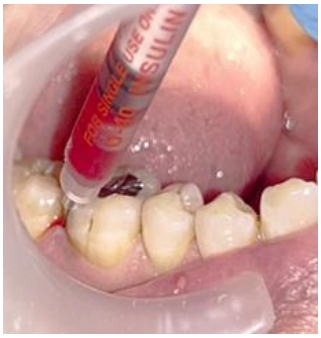
Administration of HA in group A

Sample collection

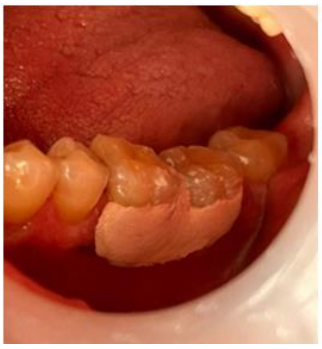
Digital centrifuge machine



Procuring of iPRF from centrifuged blood



Administration of iPRF in Group B



Coepak placement in Group A and Group B

Full mouth SRP was performed in all the subjects. The site having maximum pocket depth (≥5mm) in either premolar or molar tooth in the contralateral quadrants was selected for the administration of HA and iPRF.

Clinical parameters that were recorded at baseline, 4th week and 6th week were:

1. (CAL) Clinical attachment loss using customized acrylic stent
2. (PPD) Pocket probing depth using William's Periodontal Probe
3. (GI) Gingival index by Loe H and Silness J, 1963
4. (PI) Plaque index by Turesky – Gillmore – Glickman modification of Quigley Hein, 1970.

PI, GI, PPD and CAL were recorded immediately before the treatment ie at baseline (day 0), and PI and GI were recorded at the end of 4th and 6th week and CAL and PPD were recorded at 6th week interval.

Formulation of iPRF: blood samples were taken in 10 ml tube and iPRF preparation was done. The blood without anticoagulant was centrifuged at 700 rpm for 3 minutes

(60g) at room temperature by a centrifuge machine. The upper liquid layer was taken as iPRF by using a syringe.

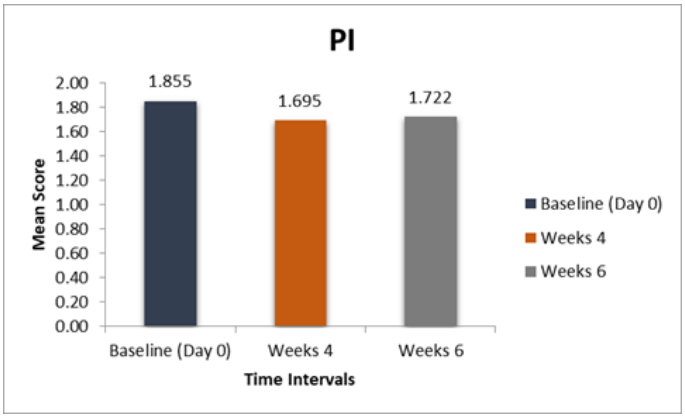
HA and iPRF were injected in the pockets and the sites were secured with coe pak for the retention of the material. Patients were recalled at 4th and 6th week for recording clinical parameters.

Results

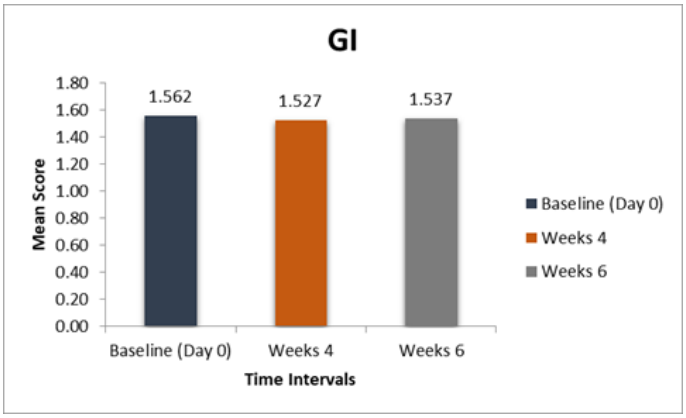
In the intragroup analysis, both HA and iPRF groups exhibited statistically significant improvements in PI scores and GI scores

Intergroup comparisons for PI and GI showed equivalent improvement in plaque control and reduction in gingival inflammation, suggesting that both HA and iPRF, when used as an adjunct to SRP, contribute to improved periodontal health by reducing plaque accumulation and gingival inflammation. However, their effects on PI scores and GI scores were comparable, as intergroup differences were not statistically significant.

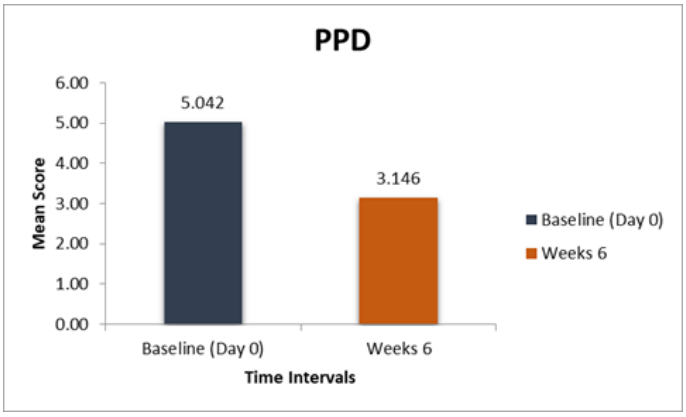
On the other hand, CAL and PPD showed significant improvements in both intragroup and intergroup comparisons.



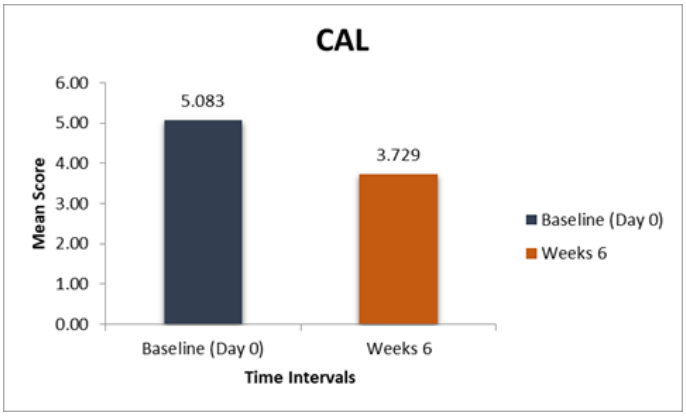
Graph 1: Graph showing comparison of plaque index at baseline (day 0), 4th week and 6th week and difference between 0-4th week, 0-6th week and 4th-6th week in Group A



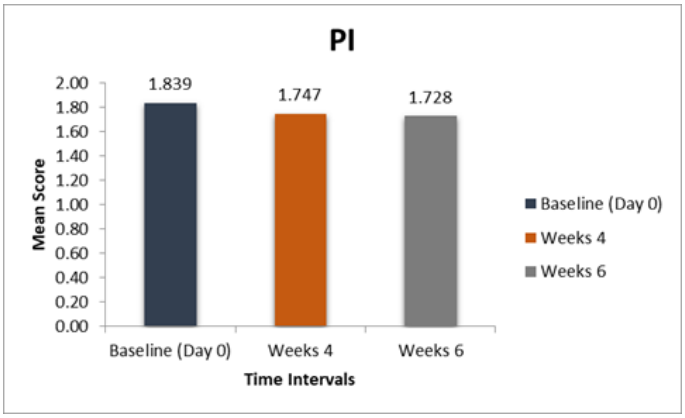
Graph 2: Graph showing comparison of gingival index at baseline (day 0), 4th week and 6th week and difference between 0-4th week, 0-6th week and 4th-6th week in Group A



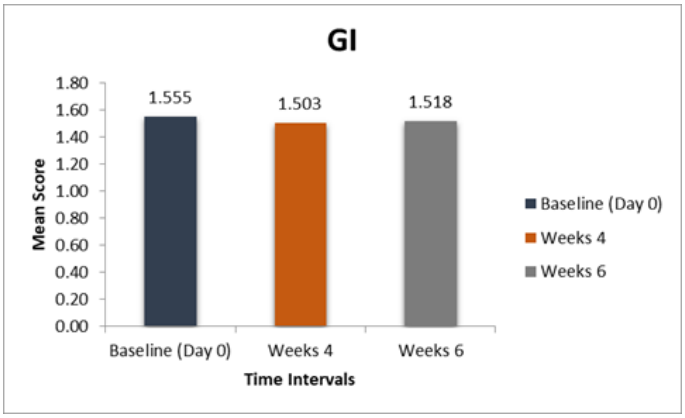
Graph 3: Graph showing comparison of pocket probing depth at baseline (day 0) and 6th week in Group A



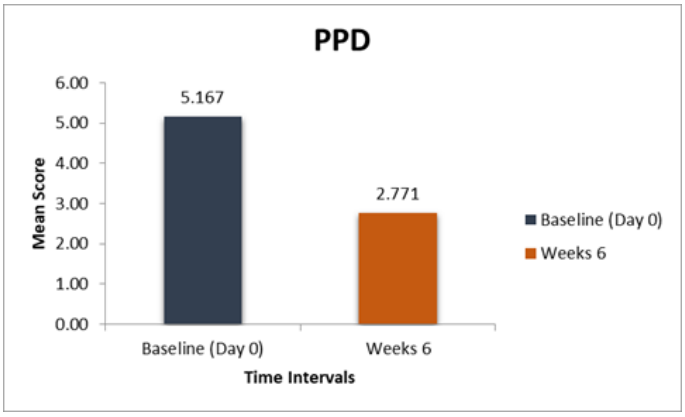
Graph 4: Graph showing comparison of clinical attachment level at baseline (day 0) and 6th week in Group A



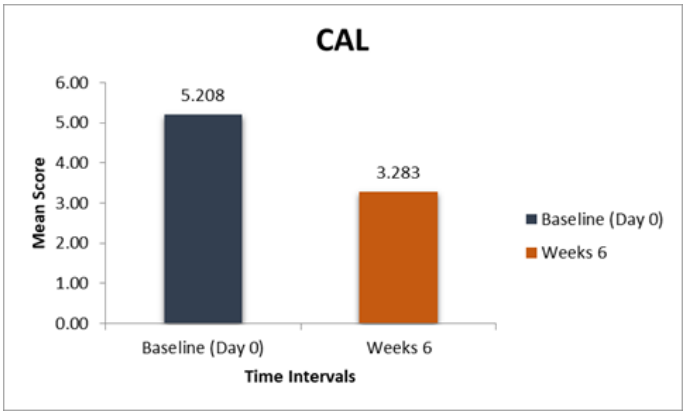
Graph 5: Graph showing comparison of plaque index at baseline (day 0), 4th week and 6th week and difference between 0-4th week, 0-6th week and 4th-6th week in Group B



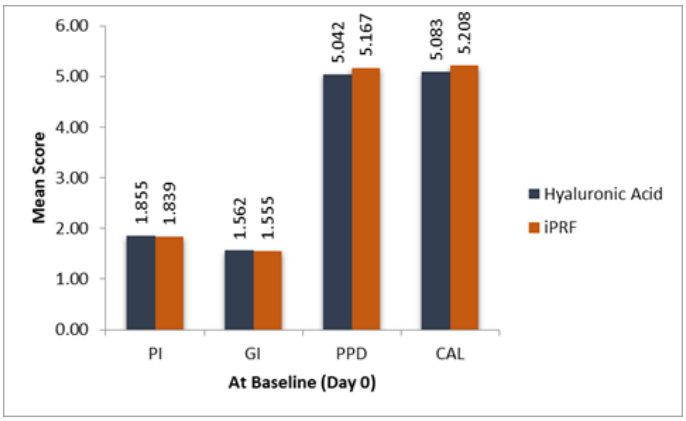
Graph 6: Graph showing comparison of gingival index at baseline (day 0), 4th week and 6th week And difference between 0-4th week, 0-6th week and 4th-6th week in Group B



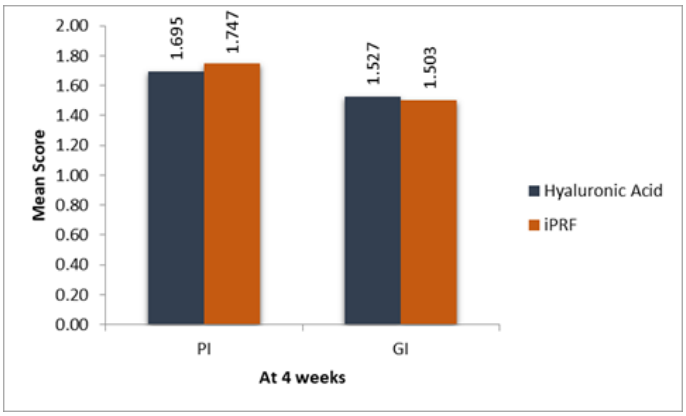
Graph 7: Graph showing comparison of pocket probing depth at baseline (day 0) and 6th week in Group B



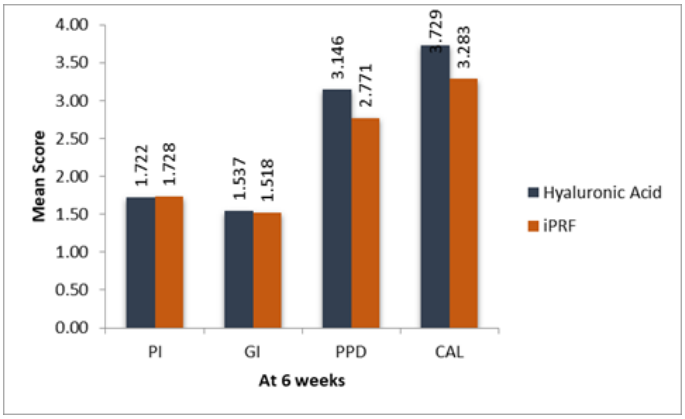
Graph 8: Graph showing comparison of clinical attachment level at baseline (day 0) and 6th week in Group B



Graph 9: Graph showing intergroup comparison of plaque index, gingival index, pocket probing Depth and clinical attachment level in Group A and Group B at baseline (day 0)



Graph 10: Graph showing intergroup comparison of plaque index and gingival index in Group A and Group B at 4th week



Graph 11: Graph showing intergroup comparison of plaque index, gingival index, pocket probing

Depth and clinical attachment level in Group A and Group B at 6th week

In Group A, plaque index score at baseline, 4th week and 6th week were 1.855±0.552, 1.695±0.567 and 1.722±0.575 respectively. Gingival index score at baseline, 4th week and 6th week were 1.562±0.370, 1.527±0.366 and 1.537±0.359 respectively. Probing depth score at baseline and 6th week were 5.042±0.204 and 3.146±0.345 respectively. Clinical attachment level at baseline and 6th week were 5.083±0.282 and 3.729±0.510 respectively.

In Group B, Plaque index score at baseline, 4th week and 6th week were 1.839±0.575, 1.747±0.553 and 1.728±0.581 respectively. Gingival index score at baseline, 4th week and 6th week was 1.555±0.390, 1.503±0.389 and 1.518±0.378 respectively. Probing depth score at baseline and 6th week were 5.167±0.381 and 2.771±0.294 respectively. Clinical attachment level at baseline and 6th week were 5.208±0.509 and 3.283±0.516 respectively.

The mean value of PI score in Group A was 1.855±0.552 and in Group B was 1.839±0.575 at baseline (day 0), [p value = 0.932]. The mean value of PI score in Group A was 1.695±0.567and in Group B was 1.747±0.553 at 4th week, [p value = 0.751]. The mean value of PI score in Group A was 1.722±0.575 and in Group B was 1.728±0.581 at 6th week, [p value = 0.970]. The mean value of GI score in Group A was 1.562±0.370 and in Group B was 1.555±0.390 at baseline (day 0), [p value = 0.952]. The mean value of GI score in Group A was 1.527±0.366 and in Group B was 1.503±0.389 at 4th week [p value = 0.828]. The mean value of GI score in Group A was 1.537±0.359 and in Group B was 1.518±0.378 at 6th week, [p value = 0.861]. The mean value of PPD score in Group A was 5.042±0.204 and in Group B was 5.167±0.381 at day 0 (baseline), [p value = 0.163]. The mean value of PPD score in Group A was 3.146±0.345 and in Group B was 2.771±0.294 at 6th week, [p value = 0.000]. The mean value of CAL in Group A was 5.083±0.282 and in Group B was 5.208±0.509 at baseline (day 0), [p value= 0.298]. The mean value of CAL in Group A was 3.729±0.510 and in Group B was 3.283±0.516 at 6th week [p value = 0.004].

Discussion

Periodontitis is a chronic inflammatory disease that affects the supporting structures of the teeth. Its progression is associated with dysbiotic biofilms and a heightened systemic inflammatory burden. It is identified by the loss of periodontal tissue support, represented clinically by clinical attachment loss (CAL), periodontal pockets, gingival bleeding, and radiographically by alveolar bone loss. While scaling and root planing (SRP) remains the gold standard, its limitations have led to the administration of systemic and local antimicrobials. But disadvantages of systemic antimicrobials showed the allergic reactions, super infection, toxicity, drug interactions and patient compliance and most importantly, bacterial resistance. To avoid the undesirable effects of systemic antibiotic administration adjunctive therapies such as local drug delivery systems (LDDs), which offer high local drug concentrations with minimal systemic side effects have been introduced.

Hyaluronic acid (HA) is a naturally occurring polysaccharide with viscoelastic, anti-inflammatory, and wound-healing properties. It promotes tissue hydration and repair and has been explored in periodontal therapy due to its biocompatibility and regenerative potential. HA has several advantages in the healing of wounds, gingiva, and alveolar bone, it has been used to repair both mineralized and non-mineralized periodontal tissues.

Injectable platelet-rich fibrin (iPRF), a second-generation platelet concentrate, is rich in growth factors such as PDGF, EGF, IGF-1, and TGF-β. . iPRF was developed as an advanced product of PRF by altering the centrifugation protocol by lowering the centrifugation speed to 700 rotations per minute (RPM). This results in segregation of the blood into 2 compartments: the top layer being the liquid platelet rich fibrin (Liquid PRF) and the bottom red blood cells. Its slow centrifugation technique preserves regenerative cells and cytokines, making it highly suitable for enhancing soft and hard tissue healing.

This study compared HA and iPRF as adjuncts to SRP in a split-mouth design over six weeks. Both groups showed significant reductions in PI and GI, confirming the anti-inflammatory benefits of adjunctive therapies. However, iPRF demonstrated significantly greater improvements in CAL and PPD, supporting its regenerative superiority. These findings align with previous research by Miron et al. (2016) and Vučković et al. (2020), highlighting iPRF's enhanced healing due to its sustained growth factor release. . HA has anti-inflammatory properties as well but lacks i-PRF's potent antimicrobial effects because of the absence of antimicrobial peptides (AMPs) like defensins, cathelicidins or lactoferrin which help combat bacterial infections. i-PRF enhances neovascularization, ensuring better blood supply to healing tissues. This accelerated vascular growth promotes improved nutrient delivery, aiding in faster and more effective regeneration. Growth factors in i-PRF stimulate fibroblast activity, promoting collagen synthesis. This leads to improved tissue strength, better attachment gain, and enhanced periodontal stability. i-PRF is autologous, minimizing the risk of adverse reactions or rejection

Thus, iPRF, with its superior biological activity, can be considered a more effective adjunct than HA in non-surgical periodontal therapy.

The limitation of this study is that no histological analysis was done as it would require surgical intervention. Blinding was not possible due to the typical specification of the number of appointments (HA applied twice after 1 week whereas i-PRF was applied only once). The sample size included in this study was limited and extrapolation of these results to larger sample size would be much better. It is recommended that further studies in this field may involve larger sample size and more experimental studies are needed to be conducted to analyse the efficacy of HA and iPRF for regular use in clinical practice.

Conclusion

Thus, the present study demonstrated that both hyaluronic acid (HA) and injectable platelet-rich fibrin (iPRF), when used as adjuncts to scaling and root planing (SRP), significantly improved clinical periodontal parameters. While both therapies contributed to reductions in plaque and gingival inflammation, iPRF showed superior outcomes in terms of clinical attachment level (CAL) gain and probing pocket depth (PPD) reduction. This can be attributed to the sustained release of growth factors and enhanced regenerative potential of iPRF. Therefore, iPRF emerges as a promising and effective adjunctive modality in the non-surgical management of chronic periodontitis, offering better

periodontal healing and clinical outcomes compared to HA.

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