



COMPARATIVE EVALUATION OF INJECTABLE-PLATELET RICH FIBRIN AND HYALURONIC ACID INJECTIONS IN THE TREATMENT OF GINGIVAL BLACK TRIANGLES.

Periodontology

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ABSTRACT

Introduction : Gingival black triangles are cosmetic deformities which occur due to loss or absence of interdental papilla, so reconstruction of interdental papilla have always been a challenging task in esthetic dentistry. This study aims to compare injectable platelet rich fibrin and hyaluronic acid injections in the treatment of gingival black triangles.

Material and Methods : 40 sites were divided into two groups ; Group A and Group B. In Group A, Injectable platelet rich fibrin was deposited whereas in Group B hyaluronic acid injections were deposited. All the sites were examined for gingival index, plaque index, Papillae presence index and Black triangle area at baseline, 1 month and 3 months follow up.

Results : On statistical analysis of the recorded data, results revealed statistical significant difference in both the groups in Papillae presence index and Black triangle area from baseline to 1 month and 3 months follow up.

Conclusion : Injectable Platelet rich fibrin can be a viable alternative to hyaluronic acid injections in the treatment of gingival black triangles.

KEYWORDS

gingival black triangles, hyaluronic acid injections, Injectable-Platelet rich FBRIN

INTRODUCTION

Interdental papilla reconstruction is one of the most elusive goals in Periodontics and accounts for one of the most challenging procedures in esthetic dentistry.

Gingival black triangles are cosmetic deformities which refer to an absence of papilla resulting in black spaces or open embrasures which impair esthetic features, phonetics, and food accumulation.¹

Management techniques to treat gingival black triangles have always been inconsistent among dentists. Limited blood supply in interdental papilla is one of the major concerns in the tissue's reaction to any traumatic injury or intervention. Low blood supply to interdental papillae makes them very delicate, fragile and sensitive to recession, which makes restoring the receded papillae unpredictable.²

This study was done to check the clinical efficacy of Injectable –Platelet Rich Fibrin (I-PRF) in comparison to commercially available Hyaluronic acid injections for interdental papilla reconstruction.

MATERIAL AND METHODS

The study population of forty subjects who are in the age (18-55 years) with interdental papillary loss were selected randomly from the outpatient section of the Department of Periodontics and Implantology, Hitkarini Dental College and Hospital, Jabalpur (India). The present study was approved by ethical committee of the institute. A written informed consent which explained the complete procedure of the study was signed by each patient.

Selection Criteria

A. INCLUSION CRITERIA

(1) Patients with Papillae Presence Index 2 (PPI 2) and Papillae Presence Index 3 (PPI 3) interdental papillary loss with no radiographic evidence of bone loss (Cardaropoli et al, 2004).³

Papillae Presence Index 2 (PPI 2) : Papilla is not completely present but interproximal CEJ is not visible.

Papillae Presence Index 3 (PPI 3) : Papilla is not completely present and interproximal CEJ is visible.

(2) Age group between 18-55 years.

(3) Patients with good general health, without any history of systemic disease or under medication

B. EXCLUSION CRITERIA

- (1) Patients showing unacceptable oral hygiene during pre-surgical (Phase -I) period.
- (2) Smokers, pregnant women, nursing mothers
- (3) Diastema
- (4) PPI4

Material Used

Injectable PRF

Injectable Platelet-rich fibrin (I-PRF) represents a new step in the platelet gel therapeutic concept. Developed in France by Choukroun et al in 2001, the PRF production protocol attempts to accumulate platelets and released cytokines in a fibrin clot. I-PRF demonstrated the ability to release higher concentrations of various growth factors and induced higher fibroblast migration and expression of PDGF, TGF- β , and collagen1.⁴

Preparation

The required quantity of blood is drawn into 10-ml test tubes without an anticoagulant and centrifuged immediately. Blood is centrifuged for 3 min at 2,700 rpm. I-PRF can be obtained from the top most layer of the preparation using insulin syringes. (Figure 1)

After centrifugation, the blood is separated into a:

- Yellow orange upper phase (I-PRF)
- A red lower phase (red cell fraction).

Hyaluronic Acid Filler Injection

HA was discovered in 1934 from cow's eye by Karl Meyer and John Plamer and was first used in 1942 by Endre Balazs as a substitute for

egg white in bakery products. Hyaluronic acid (HA) is a high molecular weight, non-sulphated glycosaminoglycan component which is produced during various phases of cell's life cycle. HA is one of the major and critical component of connective tissue. It contributes in cell migration, tissue hydrominics and proliferation, and improves healing properties of the tissue. It also acts as barrier to various gram negative bacteria.⁵

Commercially available Reyoungel Hyaluronic Acid injection from Bioha Laboratories – England was used in the present study. (Figure 2)

Study Design

Informed consent: written informed consent form explaining the nature of the study and procedure signed by the patient.

Phase I therapy: Consisting of Oral Hygiene Instructions, scaling, root planing and with chlorhexidine mouth rinse (0.2%) twice daily for 10 days.

Maintenance phase: Evaluation of initial phase-I therapy.

Baseline recording of clinical parameters

1. Plaque Index (Silness and loe,1964)
2. Gingival Index (Loe and Silness, 1963)
3. Papillae Presence index (Cardaropoli et al,2004)
4. Black triangle area

Pre-surgical Protocol

Re-evaluation of Phase I therapy will be done.

The selected sites were assigned to either Group A, Group B

Procedure

Clinical photographs were taken prior to the procedure using Sony H300 professional camera.

Group A - I-PRF (Injectable-Platelet Rich Fibrin) was injected in deficient interdental papillary region. (Figure 3- Figure 7)

Group B - Commercially available hyaluronic acid injection (Reyoungel hyaluronic acid injection from Bioha Laboratories - England) was deposited in deficient inter-papillary region. (Figure 8- Figure 12)

Immediate post operative photographs were taken with the same camera.

Maintenance Phase

After 1 Month and 3 months

- Clinical photographs were taken using professional camera and area of Black Triangle was calculated using Image J Software.
- Recording of clinical parameters (Plaque Index, Gingival Index, Papillae Presence Index).
- Reinforcement of oral hygiene instructions.

Black triangle area

- Clinical photographs were used to measure the surface area of the lost papilla, using image analysis software (Image J software). Images were imported into the software and values were analysed further.

Calculation of area

- The area of interest were calculated
- At baseline (Prior to injection)
- At 1 month follow up
- At 3 months follow up
- Papilla loss was calculated by measuring the surface area of the visible black triangle using Image J Software by importing image to the software and utilising analytical tool which further gave the results of surface area of the visible black triangle in pixels.(Figure 13)

STATISTICAL ANALYSIS:

The obtained data was compiled systematically and coded in MS Excel sheet and subjected to statistical analysis with Statistical software IBM SPSS statistics 22.0 (IBM Corporation, Armonk, NY, USA) . Student t test was used to compare the difference in indexing value between the groups. The Comparison of indexes at different time period in same group was compared with the help of Repeated Measures ANOVA and Post Hoc Benferoni test. Level of significance was fixed at $p=0.05$.

RESULT:

The mean plaque and gingival index shows significant decrease in

index values in both treatment groups. (Table 1&2) The comparison between the groups shows non significant difference in Plaque Index and Gingival index values between groups A and B at different time interval. (Table 3, Graph 1&2)

The mean value of Papillae Presence Index of patients in Group A at baseline was 2.25 ± 0.44 , at one month interval was 1.05 ± 0.22 and at three month interval was 1.05 ± 0.22 . The mean value of Papillae Presence index of patients in Group B at baseline was 2.20 ± 0.41 , at one month interval was 1.25 ± 0.44 and at three month interval was 1.25 ± 0.44 . The test result shows significant decrease in Papilla Presence index values in both the groups. (Table 1&2) The Papillae Presence Index (PPI) shows non significant difference between groups A and B at different time interval. (Table 3, Graph 3)

The mean value of Black triangle area (BTA) of patients in Group A at baseline was 376.45 ± 46.46 pixels, at one month interval was 89.90 ± 25.92 pixels and at three month interval was 85.95 ± 24.56 pixels . The mean value of BTA in Group B at baseline was 371.70 ± 55.46 pixels, at one month interval was 119.60 ± 56.48 pixels and at three month interval was 116.05 ± 56.77 pixels. The test result shows significant decrease in Black triangle area values in both the groups. (Table 1&2) The non significant difference was seen between the groups at baseline while significant difference was seen at 1 month and 3 month interval. Black triangle area decreases significantly in group A in comparison to group B (Table 3, Graph 4)

DISCUSSION

Gingival black triangles are cosmetic deformities which refer to an absence of papilla which results in black spaces or open embrasures which impair esthetic features, phonetics, and also food accumulation.¹

Various surgical techniques have been proposed and experimented in past, for reconstruction of lost interdental papilla and are mostly invasive with unpredictable outcomes.

Arunachalam LT et al in 2012 reported a case with the use of platelet rich fibrin (PRF) in the reconstruction of interdental papilla in the maxillary anterior region. Platelet Rich Fibrin was tucked and packed in to the pouch after creation of a semilunar pedicle flap and the entire gingivopapillary unit was displaced coronally. Optimal fill in interdental region was noted at 3 and 6 months postoperatively. It was concluded that use of PRF may thus be the panacea for interdental papilla augmentation.⁶

Aspalli S et al in 2015 presented a case report of a 30 year old male patient with unesthetic smile due to loss of interdental papilla in the maxillary left central and lateral incisor region. A pouch was created with a semilunar incision and Platelet Rich Fibrin was prepared and inserted into the pouch and the entire gingivopapillary unit was displaced coronally. Optimal fill was observed at 1,3 and 6 months follow up with excellent esthetic response. They concluded that PRF with proper technique may thus be a pancea for interdental papilla regeneration.⁷

Moreover, the success rate of surgical augmentation of interdental papilla relies mostly on the gingival biotype. Therefore, a number of nonsurgical and minimally invasive techniques have been developed in recent years to preserve and restore the lost interdental papilla.

Though many solutions have been proposed to correct lost interdental tissues, no gold standard technique have been followed so far due to the absence of long-term clinical trials, results and predictability.⁸

This study was done to check the clinical efficacy of Injectable –Platelet Rich Fibrin (I-PRF) in comparison to commercially available Hyaluronic acid injections for interdental papilla reconstruction.

Ghanaati et al in 2018 for the first time reported a case of Application of Liquid Platelet-rich Fibrin for Treating Hyaluronic Acid-related Complications with 2 years of follow up and concluded that PRF injections promoted wound healing and minimized the scar formation in skin.⁹

Use of Injectable Platelet rich fibrin (I-PRF) in comparison with Hyaluronic acid injections intra-orally for filling of Gingival Black Triangles (GBT) was done for the first time in research.

Results revealed statistical significant difference in Papillae Presence Index and reduction in Black triangle area in both the Groups at 1 and 3 months interval from baseline.

When the comparison was done in between the groups then Injectable Platelet rich Fibrin (I-PRF) showed equally significant results as Hyaluronic acid at 1 month and 3 months time interval.

This study was an attempt to check the efficiency of autologous Injectable Platelet rich fibrin (I-PRF) in comparison to commercially available Hyaluronic acid injections in reconstruction of small deficient interdental papilla, with PPI2 and PPI3 type of interdental loss (Cadarpoli et al,2004) where-in Gingival Black Triangles did not exceeded Cemento-enamel Junction (CEJ), and Injectable Platelet rich fibrin (I-PRF) has shown to be equally efficient in interdental papilla regeneration as Hyaluronic acid injections.

The reduction in relative centrifugation force in preparation of Injectable Platelet rich fibrin(I-PRF) aids in its formation and is purely rich in transforming growth factor- β , fibroblast growth factor, platelet derived growth factors and insulin like growth factors and their slow release in I-PRF can be attributed to high efficacy of I-PRF in regeneration of lost gingival tissues at interdental region.¹⁰

Growth factors can influence some critical functions, such as cell division, matrix synthesis and tissue differentiation by receptor–ligand binding and aids in gingival regeneration.

I-PRF has various advantages when compared with Hyaluronic acid, firstly being autologous reduces the risk of immune mediated adverse reactions, secondly being readily available and easy to prepare, thirdly being cost effective.

Hyaluronic acid is also a potent filler to improve open gingival embrasures. Hyaluronic acid forms a major component of connective tissue and contributes to tissue hydrodynamics, cell migration, proliferation and improves healing properties of the tissue.¹¹

Its physiological, structural and biochemical properties prove that it provides elasticity and stability to tissues and is critically beneficial in tissue regeneration.¹²

But the injections of Hyaluronic Acid which are currently available in market are expensive which increases the cost of the treatment and proves to be a burden to patient. Also, they cannot be used in patients who are allergic to Hyaluronic acid already.

Therefore, in minimally invasive dentistry Injectable Platelet rich fibrin(I-PRF) can be considered as a viable alternative to Hyaluronic acid injections in the treatment of Gingival Black Triangles.

Limitations and future considerations

Present study included the sample size of 40 sites in both groups and both injections were used after completion of phase I therapy. For future consideration, the sample size can be larger and evaluation of both injections can be done by repeated applications with longer follow up period.



Withdrawal of blood



Centrifugation Machine

Figure 1 : Preparation of I-PRF



Prepared I-PRF



Figure 2 : Reyoungel Hyaluronic Acid Injection



Figure 3 : Pre-operative (Baseline GROUP A) Black triangle w.r.t 31,41



Figure 4 : Intra-operative I-PRF Injection in black triangle area w.r.t. 31,41



Figure 5 : Immediate Post-operative picture w.r.t 31,41



Figure 6 : 1 month follow up w.r.t 31,41



Figure 7 : 3 Months follow up w.r.t 31,41



Figure 8 : Pre-operative (Baseline GROUP B) Black triangle w.r.t 32,33



Figure 9 : Intra-operative Hyaluronic Acid Injection in Black Triangle w.r.t 32,33



Figure 10 : Immediate Post-operative picture w.r.t 32,33



Figure 11 : 1 Month Follow up w.r.t 32,33



Figure 12 : 3 Months Follow up w.r.t 32,33

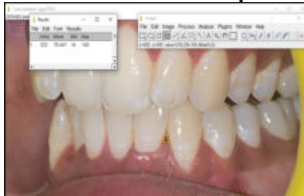


Figure 13 : Calculation of Black Triangle Area by Image J software w.r.t 32,33

Table 1: Comparison of Different Indexes at different time interval in Group A

Indexes	Baseline	1 month	3 months	F value	P value
PI	0.74±0.39	0.61±0.37	0.55±0.35	14.62	0.001*
GI	0.68±0.36	0.55±0.33	0.49±0.30	19.55	0.001*
PPI	2.25±0.44	1.05±0.22	1.05±0.22	171.00	0.001*
BTA	376.45±46.46	89.90±25.92	85.95±24.56	521.45	0.001*

*significant, Repeated Measures ANOVA test

Table 2: Comparison of Different Indexes at different time interval in Group B

Indexes	Baseline	1 month	3 months	F value	P value
PI	0.75±0.41	0.61±0.37	0.55±0.35	22.29	0.001*
GI	0.72±0.36	0.58±0.33	0.48±0.36	34.44	0.001*
PPI	2.20±0.41	1.25±0.44	1.25±0.44	361.00	0.001*
BTA	371.70±46.46	119.60±25.92	116.05±24.56	1520.74	0.001*

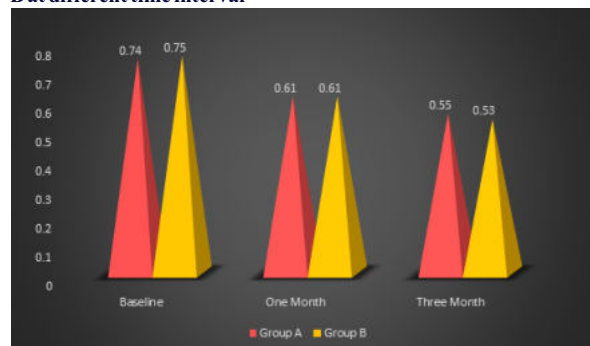
*significant, Repeated Measures ANOVA test

Table 3 : Comparison of Different indexes between Groups at different time interval.

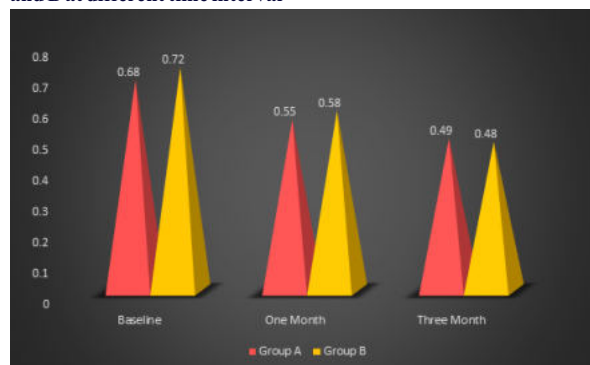
Index	Time Period	Group A	Group B	T value	P value
Plaque Index	Baseline	0.74±0.39	0.75±0.41	0.08	0.93
	1 Month	0.61±0.37	0.61±0.37	0.04	0.97
	3 Month	0.55±0.35	0.53±0.36	0.13	0.89
Gingival Index	Baseline	0.68±0.36	0.72±0.36	0.34	0.73
	1 Month	0.55±0.33	0.58±0.32	0.29	0.77
	3 Month	0.49±0.30	0.48±0.32	0.05	0.96
Papillae Presence Index	Baseline	2.25±0.44	2.20±0.41	0.37	0.71
	1 Month	1.05±0.41	1.25±0.44	1.79	0.08
	3 Month	1.05±0.41	1.25±0.44	1.79	0.08
Black triangle area	Baseline	376.45±46.46	371.70±55.46	0.29	0.77
	1 Month	89.90±25.92	119.60±56.48	2.13	0.042*
	3 Month	85.95±24.56	116.05±56.77	2.17	0.039*

*significant, paired t test

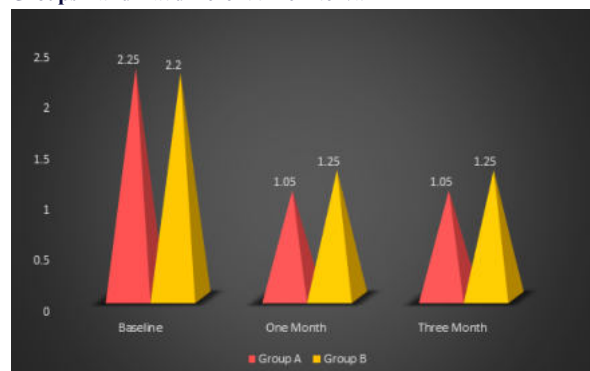
Graph 1: Comparison of Plaque Index between the Groups A and B at different time interval



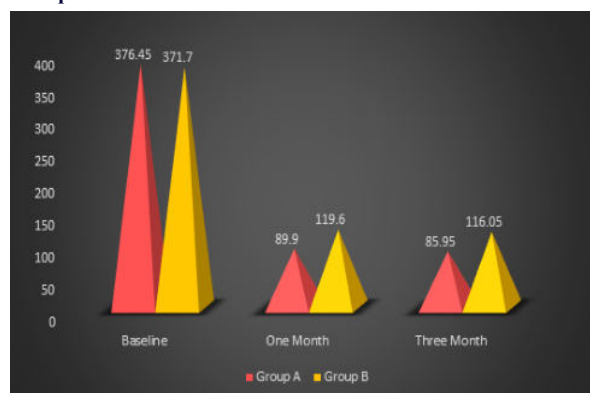
Graph 2: Comparison of Gingival Index between the Groups A and B at different time interval



Graph 3: Comparison of Papillae Presence Index between the Groups A and B at different time interval



Graph 4: Comparison of Black Triangle Area (BTA) between the Groups A and B at different time interval



CONCLUSION

A clinical and pictorial analysis was done to evaluate the efficacy of Injectable-Platelet Rich Fibrin (I-PRF) in comparison with Hyaluronic Acid Injections to reconstruct deficient interdental papilla and concluded that I-PRF can be a viable alternative to Hyaluronic acid in treatment of Gingival Black Triangles.

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