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# A NEW APPROACH FOR INCREASING THE GINGIVAL THICKNESS BY USING INJECTABLE PLATELET RICH FIBRIN (i-PRF) – A CLINICAL AND RADIOGRAPHIC STUDY



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Dr. Shaily Kavi*	Part-3 Post Graduate Student, Department of Periodontology and Implantology, College of Dental Sciences and research centre, Manipur, Bopal, Ahmedabad.*Corresponding Author		
Dr. Anita Panchal	M.D.S, Ph.D (Head of Department, Department of Periodontology and Implantology, College of Dental Sciences and research centre, Manipur, Bopal, Ahmedabad.		
Dr. Rahul Shah	M.D.S Reader, Department of Periodontology and Implantology, College of Dental Sciences and research centre, Manipur, Bopal, Ahmedabad.		
Dr. Riddhi Gandhi	M.D.S Senior lecturer, Department of Periodontology and Implantology, College of Dental Sciences and research centre, Manipur, Bopal, Ahmedabad.		
Dr. Khoobi Shah	M.D.S Senior lecturer, Department of Periodontology and Implantology, College of Dental Sciences and research centre, Manipur, Bopal, Ahmedabad.		
Dr. Dhruti Acharya	Part-3 Post Graduate Student, Department of Periodontology and Implantology, College of Dental Sciences and research centre, Manipur, Bopal, Ahmedabad,		

# ABSTRACT

The thickness of the gingiva has been described as gingival biotype, which is classified as thin (<1.5 mm) and thick (>1.5 mm). Higher incidence of gingival recession is found in patients with thin biotype, therefore treatment modalities that aim at enhancing the thickness of gingiva can result in better treatment outcome of recession coverage procedures. PRF is the second generation autologous platelet concentrate without use of anticoagulant. In 2014, i-PRF was developed by modifying spin centrifugation forces. The objective of this study was to estimate the efficiency of injectable platelet rich fibrin (i-PRF) in increasing the gingival thickness. 25 systemically healthy patients were selected. Gingival thickness was measured by three techniques. [1]Visual method - probe transparency, [2]Transgingival probing with 15 no. K-file, [3]Radiographic (paralleling technique) method. The intravenous blood was withdrawn from the patients and the i-PRF was prepared. The i-PRF was injected in sites with thin gingival thickness of gingiva was measured again using above methods. A statistically significant increase in gingival thickness was observed with i-PRF. Gingival thickness increased by 0.54 mm  $\pm$  0.0854 (p < 0.05). Injection of i-PRF has proven beneficial for increasing the gingival thickness.

# **KEYWORDS**

Gingival biotype, Injectable Platelet Rich Fibrin (i-PRF), Gingival thickness, platelet concentrates.

# INTRODUCTION

Different gingival biotypes respond differently to inflammation, restorative treatment, trauma and parafunctional habits.<sup>1</sup> These traumatic events result in various types of periodontal defects which respond to different treatments. Ochsenbien and Miller iterated the value of "thick vs. thin" gingiva in restorative treatment planning.<sup>2</sup> The morphologic characteristics of the gingiva depends on various factors like the dimension of the alveolar process, the form of the teeth and the eventual inclination and position of the completely erupted teeth.<sup>3</sup>

A gingival thickness of >1.5 mm is defined as thick biotype and a gingival thickness of <1.5 mm as thin biotype.<sup>4</sup> The term periodontal biotype introduced by Seibert and Lindhe categorized the gingiva into "thick-flat" and "thin-scalloped" biotypes.<sup>5</sup> Thick gingival tissue is associated with a broad zone of the keratinized tissue and flat gingival contour suggestive of thick bony architecture and also is more resistant to inflammation and trauma. Thin gingival tissue is associated with a thin band of the keratinized tissue, scalloped gingival contour suggestive of thin bony architecture and is more sensitive to inflammation and trauma. Inflammation of the periodontium results in increased pocket formation and gingival recession in thick and thin tissues respectively.<sup>6</sup> Various invasive and non-invasive methods were proposed to measure tissue thickness.

### These include:

- 1) direct measurement<sup>7</sup>
- 2) probe transparency method<sup>8</sup>
- 3) radiographic method<sup>9</sup>

Despite their widespread use, concerns have been expressed regarding the use of anti-coagulants in PRP (Platelet rich plasma) which was initially added to centrifugation protocols in order to maintain the liquid consistency of PRP to facilitate biomaterial mixing. On the other hand, initial PRF (platelet rich fibrin) formulations lacked a liquid concentrate of proteins as standardized PRF contains the majority of its growth factor concentration encapsulated within its fibrin matrix. For these reasons, major development and advancements were recently made with the aim of developing a liquid formulation of PRF which does not contain any anti-coagulants or fibrin matrix.<sup>10</sup> In 2014, a liquid injectable-platelet-rich fibrin (i-PRF) was developed by modifying spin centrifugation forces, and by utilizing non-glass centrifugation tubes.

### AIM AND OBJECTIVE

**AIM:** To evaluate the increase in the gingival thickness using i-PRF in individuals with thin gingival thickness.

**OBJECTIVE:** To estimate the efficiency of injectable platelet rich fibrin (i-PRF) in increasing the gingival thickness.

### INCLUSION CRITERIA

- 1. Patients within the age group of 18 to 70 years
- 2. Patients having thin gingival biotype
- 3. Non smokers

#### **EXCLUSION CRITERIA**

- 1. Patients having Class IV gingival recession
- 2. Long term (more than 2 weeks) usage of antibiotics in past 3 months
- 3. Mucosal disorders like high frenal attachments and ulcers
- 4. Medically compromised patients
- 5. Patients who are under any medications that was known to influence periodontal tissues
- 6. Pregnant patients

#### **MATERIALS & METHOD**

25 subjects between the age group of 18-70 years having thin gingival biotype were selected from the Out Patient Department, Department Of Periodontics, College of Dental Sciences & Research Centre, Ahmedabad. The protocol of the study was thoroughly explained to the patients and written consent was obtained from them.

Gingival biotype was assessed on the basis of Visual method, Transgingival probing and Radiographic method. In probe

37

International Journal of Scientific Research

#### Volume - 10 | Issue - 01 | January - 2021

transparency method, the gingival biotype is considered thin if the outline of the probe is seen through the gingival margin from the sulcus. In transgingival probing method, it was measured 3 mm below the gingival margin at the attached gingiva or the alveolar mucosa using a #15 endodontic K-file with a silicone disk stop at three points i.e. mesial, mid-facial, distal. The mucosal surface was pierced at a 90° angle with slight pressure until hard tissue was reached. The silicone stop on the K-file was slid until it was in close contact with the gingiva. After removal of the K-file, the distance between the tip of the K-file and the inner border of the silicone stop was measured. In the radiographic method, Paralleling technique was used. A lead plate was used as reference for radiograph, it was positioned over the buccal gingival surface and well aligned with the long axis of tooth.

The intravenous blood was withdrawn from the patients, it was centrifuged in centrifugal machine at 700 rpm for 3-4 minutes and the i-PRF was prepared. The i-PRF was injected in sites with thin gingival thickness with the use of microneedle. The patients were recalled after a month and the thickness of gingiva was measured again.

#### PRE-OPERATIVE PHOTOGRAPHS



Figure 1: Pre – operative photograph

Figure 2: Pre – operative measurement of Gingival thickness using K-File.





Figure 3: Measurement of gingival thickness

Figure 4: Radiographic measurement of Gingival thickness

#### INTRA-OPERATIVE PHOTOGRAPHS





Figure 5: Withdrawal of blood



Figure 7: Prepared i-PRF



Figure 8: Collection of i-PRF



Figure 9: Injection of i-PRF International Journal of Scientific Research

POST-OPERATIVE PHOTOGRAPHS



Figure 10: Post operative photograph



of Gingival thickness

Figure 12: Measurement Figure 13: Radiographic measurement of Gingival

thickness

Figure 11: Post – operative

measurement of Gingival thickness using K-File

#### RESULT

A total of 25 teeth having thin biotype were selected. Table 1 shows the clinical parameters i.e. pre-op clinical gingival thickness and post-op clinical gingival thickness. Table 2 shows the radiographic parameters i.e. pre-op radiographic gingival thickness and post-op radiographic gingival thickness.

For the comparative evaluation, the paired t test was applied. The mean deviation is 0.54 mm and the standard deviation is 0.085 mm. The p value is less than 0.01. Thus the Gingival Thickness Gain is 0.54  $\pm$ 0.085 mm.

#### Table 1: Pre - Operative and Post - Operative Clinical Gingival Thickness

	Mean $\pm$ Std. Deviation
Pre – Operative	$1.213 \pm 0.112$
Post – Operative	$1.755 \pm 0.110$

Table 2: Pre - Operative and Post - Operative Radiographic **Gingival Thickness** 

	Mean ± Std. Deviation
Pre-Operative	$1.213 \pm 0.112$
Post-Operative	$1.755 \pm 0.110$

### DISCUSSION

The gingival biotype is gaining considerable attention as one of the key elements influencing esthetic treatment outcome. Patients with a thick gingiva have been shown to be relatively resistant to gingival recession following surgical and/or restorative therapy." According to a study by Müller and Eger (2002)<sup>12</sup> periodontal phenotype had been described as either thick which is associated with a square form of maxillary incisors or thin which is associated with slender tooth form.

The studies have examined how mucosal thickness and biologic width affect crestal bone loss around implants.<sup>13</sup> A study by Berglundh and Lindhe(1996)<sup>14</sup> concluded that thin gingival tissue can lead to marginal bone loss during formation of the peri-implant biologic width. According to Abrahamsson et al.  $(1996)^{15}$  thick tissues (i.e.,  $\geq 2.5$  mm) can avoid significant crestal bone recession; however, the authors recommend avoiding supracrestal placement of implants if an implant is surrounded by a thin biotype.

Ochsenbein and Ross(1969)<sup>2</sup> believed that long-tapered teeth tend to have a thin-scalloped periodontium, whereas wide-square teeth have thick-flat periodontium. Olsson and Lindhe (1991)<sup>16</sup> proposed that long-narrow teeth are more susceptible to gingival recession than short-wide teeth because of the difference in periodontal biotype. Olsson et al. (1993)<sup>17</sup> reported no significant difference between narrow- and wide-crown forms with respect to the thickness of the free gingiva.

The final aim of periodontal therapy is to restore the lost periodontal structure to its complete function and esthetics. PRF being a reservoir

#### Volume - 10 | Issue - 01 | January - 2021

of soluble growth factors and cytokines (transforming growth factor beta-1, insulin-like growth factor 1 and 2, platelet-derived growth factor, cytokine vascular endothelial growth factor, and interleukin 1, 4, and 6) that not only help in tissue regeneration but also accelerate wound healing.<sup>18</sup> Platelets also contain biologically active proteins and the binding of these secreted proteins within a developing fibrin mesh or to the extracellular matrix can create chemotactic gradients favoring the recruitment of the stem cells, stimulating cell migration, differentiation, and promoting repair. The natural fibrin framework protects growth factors from proteolysis, so they can stay active for a longer period (up to 28 days).<sup>19</sup> This leads to an effective neovascularization and an accelerated wound closing with less post operative infections.2

A systematic review by Verma UP et al (2017)<sup>21</sup> has been conducted to evaluate the use of PRF in periodontal therapy; it included 49 articles (14 in vitro, 2 animals, 33 clinical studies) and resulted that PRF is considered a therapeutic regenerative biomaterial, which could be used in periodontal surgery alone or in combination with other biomaterials (bone grafts, soft tissue grafts, pharmacologic agent) and would provide safe and promising results in enhancing clinical and radiological parameters in the management of periodontal defects. This systematic review also demonstrated that PRF enhances the Gingival Thickness and results in thick Gingival Biotype that shows greater stability during remodeling and enhances blood supply to the underlying structures.

Ozsagir ZB et al. (2018)<sup>22</sup> conducted a spilt mouth study. In this split mouth study, 10 systematically healthy patients with thin gingival biotype were randomly treated with i-PRF. A statistically significant increase in Gingival Thickness was observed. Gingival Thickness increased from 0.51 mm  $\pm$  0.148 to 0.68 mm  $\pm$  0.214 (p < 0.001). This denotes that the autologous platelet concentrates has favorable use in the field of periodontal regeneration and shows rapid healing.

A statistically significant increase in gingival thickness was observed in our study. Gingival thickness increased by 0.54 mm  $\pm$  0.0854 (p < 0.05). Thus injectable platelet rich fibrin can be used for increasing the gingival thickness in the patients with thin gingiva.

### CONCLUSION

Within the limitations of this study, we concluded that Injection of i-PRF has proven beneficial for increasing the gingival thickness.

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