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RESEARCH ARTICLE

TREATMENT OF LOCALIZED GINGIVAL RECESSION USING VESTIBULAR INCISION SUBPERIOSTEAL TUNNEL ACCESS TECHNIQUE IN CONJUNCTION WITH ALBUMIN PLATELETRICH FIBRIN

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Abstract

Background: The current randomized control study(RCT)was carried out to compare the efficacy of albumin plateletrich fibrin (Alb-PRF) also referred to as (extended plateletrich fibrin (ePRF))membrane compared to the de epithelized free gingival graft (DFGG) in combination withvestibul ar incision subperiosteal tunnel access technique (VISTA) for treatment of localized gingival recession type 1 (RT1).

Methods: Thirty patients aged above 18 were randomly allocated for localized gingival recession (GR) treatment into two main groups (VISTA and DFGG) or (VISTA and e-PRF). The primary outcome was to evaluate therecession depth (RD) improvement, while the secondary outcomes included the changes ofprobing depth (PD), clinical attachment level (CAL),plaque index (PI) and gingival index (GI).All the study outcomes were evaluated3 and 6 months postoperatively.

Results: Both groups achieved highly significant clinical improvements from baseline to 6 months ($P<0.001$). While VISTA+DFGG demonstrated a statistically superior recession depth reduction at 3 months ($P = 0.028$), both groups yielded statistically comparable results at the final 6-month follow-up for recession depth (0.40 ± 0.27 mm vs 0.49 ± 0.37 mm; $P = 0.390$) and clinical attachment level (1.59 ± 0.55 mm vs 1.62 ± 0.52 mm; $P = 0.749$). No significant inter-group differences were observed for probing depth, plaque index, and gingival index at any evaluation period ($P > 0.05$).

Conclusion: It was concluded that DFGG remains the gold standard for root coverage, although e PRF membrane combined with VISTA shows pr omising,less invasive potential for gingival augmentation and regeneration

Introduction:-

Gingival recession (GR) is characterized by the displacement of the marginal gingival tissues in an apical direction relative to the cemento-enamel junction.Although this condition does not necessarily lead to tooth loss, it is often viewed as a significant aesthetic issue for patients.It is frequently linked to root surface exposure, which can result in

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dentin hypersensitivity and the formation of both carious and non-carious cervical lesions.In advanced stages, recession may cause substantial root abrasion and, in rare circumstances, may eventually contribute to tooth loss.(1)The causes of GR are diverse, ranging from aggressive tooth brushing and poor orthodontic management to malpositioned teeth, defective restorations, plaque-related inflammation, a thin biotype, and periodontal disease.(2)To standardize diagnosis, several classifications for gingival recession have been proposedover the years. Currently, the Cairo classification is the most frequently utilized system because it includes interproximal attachment loss, offering improved diagnostic accuracy and prognostic value.(3)Cairo categorized gingival recession into threetypes, Recession type 1 (RT1) is defined by the absence of interproximal CAL, whereas in recession type 2 (RT2), interproximal CAL is equal to or less than buccal CAL. In recession type 3(RT3),interproximal CAL exceeds buccal CAL.(1)

Various surgical techniques are available for GR management. The coronally advanced flap (CAF) is a widely utilized method, offering predictable results for GR. CAF is frequently combined with various grafting materials, including connective tissuegraft (CTG), enamel matrix derivatives (EMD), platelet-rich fibrin (PRF), and xenogeneic collagen matrix (XCM).(4)Although the CAF remains the gold standard for GR treatment, advancements in surgical techniques have introduced new approaches for more predictable treatment such as the double papilla technique, tunnel technique (TUN)and its modifications.(5)A significant advancement is the VISTA (vestibular incision subperiosteal tunnel access) method, a minimally invasive surgical procedure designed to protect blood supply and reduce tissue trauma, resulting in consistent root coverage and excellent aesthetics. Clinical study by Zadeh has demonstrated promising results with VISTA, establishing it as a valuable option in contemporary periodontal plastic surgery.(6)Although traditional connective tissue grafts are successful, they require a secondary donor site for harvesting, which often increases patient pain and surgical morbidity.(7)

To overcome the issues of traditional grafting, several alternative materials have been developed. However, substitutes like allografts and xenografts, while avoiding palatal harvesting, introduce significant drawbacksuch as substantial financial cost.(8)In regenerative therapy, autologous platelet derivatives like PRP and PRF are frequently employed because they contain high concentrations of platelets, white blood cells, and multiple growth factors.(9)Even though PRF provides a more sustained release of growth factors than PRP, both materials usually resorb quickly (within 2-3 weeks), which can restrict their performance when used as sole regenerative barriers.(10)Recent advancements have led to extended-PRF generation (e-PRF or Alb-PRF), which might significantly prolongs resorption times (4–6 months), thereby preserving longer regenerative potential and enhancing biological activity. Alb-PRF membranes show considerable promise as viable alternatives to collagen membranes in guided bone regeneration (GBR), with documented clinical applications including extraction site coverage, lateral sinus lifts, and treatment of multiple GR.(10)Nevertheless, a demanding need still exists for optimal and regenerative approaches. While the VISTA technique offers excellent outcomes and Alb-PRF (e-PRF) shows superior biological properties, their combined synergistic effect for GR treatment is largely unexplored inprevious literatures. Thus this study aimed to address this significant research gap by clinically evaluating and comparing the effectiveness of e-PRF membrane versus DFGG when combined with the VISTA technique for localized GR treatment.

Materials and Methods:-

Study Design:-

This clinicalcomparativestudywas designed as two-arm parallel randomized control trial (RCT). A total of thirty participants withlocalized gingival recession classified asCairo recessiontype1 (RT 1).(11) Participants were divided into study group VISTA + e-PRF and control group VISTA +DFGG.Following a comprehensive discussion of all procedures, participants provided signed informed consent. The study protocol was approved by the ethics committee (Ref: A0801024OM) and registered on ClinicalTrials.gov (ID: NCT07079293).

Eligibility criteria:-

Inclusion criteria were patients with Cairo recession type 1 (RT1) (i.e. GR without interproximal attachment loss). Participants weresystemically healthy, non-smokers with good oral hygieneand no history of mucogingival surgery. Exclusion criteria includedinterproximal bone loss, pregnancy or lactation,immunocompromised status, fixed prostheses, cervical caries or restorations at the treatment site, and poor oral hygiene.

Sample size calculation:-
The sample size was calculated using G*Power 3.1.9.4, based on root coverage data from a previous study.(12)With an effect size of 0.95, an alpha of 0.05, and 85% power, a minimum of 13 participants per group was required to compensate for potential dropouts.

Intervention:
Pre-operative phase:
Six weeks prior to surgery, all participants received professional nonsurgical periodontal therapy and individualized oral hygiene instructions.

Surgical procedures:
The VISTA technique was performed as described by Zadeh.(6)Following the administration of local anesthesia (4% articaine), a 15c surgical blade (Smi, Belgium) was used to perform a vestibular access incision.Specialized tunneling instruments (Helmut Zepf, Germany) were then utilized to elevate a subperiosteal tunnel.For participants in the control group (figure 1), a free gingival graft (FGG) was obtained from the palatal donor site under local anesthesia.The graft was de-epithelialized extra-orally using a 15c blade to produce a DFGG with a thickness ranging from 1 to 1.5 mm.(13)The DFGG was then placed through the tunnel and secured with a horizontal suture. To prevent apical relapse, 5.0 Vicryl sutures (Ethicon, US) were anchored to each tooth by acid-etching the facial enamel, washing, and drying, then placing flowable composite (Estelite universal flow composite, Tokuyama America) over the knot. Finally, the access incision was closed with 5.0 Vicryl sutures.(6)For the e-PRF group(10) (figure 2), 10 mL of whole blood was collected in additive-free tubes (Vacutest, Italy) and centrifuged at 700g for 8 minutes (DLAP DM0424, China).The resulting platelet-poor plasma (PPP) uppermost layer was collected and heated at 75°C for 10 minutes, then cooled for 2 minutes to create an injectable albumin gel.Concurrently, the liquid platelet-rich fibrin (liquid-PRF) and buffy coat were collected. This liquid-PRF was then mixed with the prepared albumin gel using a luer-lock connector. After approximately 5 minutes for fibrin polymerization, the resulting e-PRF membrane was obtained(14), placed through the tunnel, adapted, and secured with sutures.

Post-operative phase:
After the procedure, participants were advised to refrain from mechanical brushing at the surgical area for 14 days and to follow a soft diet. A 0.1% chlorhexidine rinse (OROVEX-H®, Egypt) was prescribed thrice-daily. Antibiotics (Augmentin® 1000 mg, UK) and analgesics (Brufen® 600 mg, Egypt) were administered twice daily for five days. At one week, the site was professionally cleaned, and palatal sutures were removed (control group). Gingival recession site sutures were removed at 7-14 days. Follow-up visits were scheduled at 1, 3, and 6 months for outcome assessment and oral hygiene reinforcement.

Clinical assessments:-
Periodontal outcomes were assessed at baseline, three and six months post-surgery using a UNC15 probe (Sedradent, Egypt). The primary outcome was the recession depth reduction(15)whileSecondary outcomes included changes in probing depth(16), clinical attachment level(17), plaque index(18) and gingival index.(19)

Statistical Analysis:
Data were analyzed using IBM SPSS v.20.0. Categorical data were presented as numbers and percentages, while quantitative data were described by mean, standard deviation, median, and IQR. The Shapiro-Wilk test verified data normality. Statistical significance was set at the 5% level ($p < 0.05$)

Results:-
Thirty participants, all over 18 years of age and suffering from Cairo RT1, were randomized to the DFGG (n=15) and e-PRF (n=15) groups. The DFGG group (Group I) and the e-PRF group (Group II) were both treated using the VISTA technique in conjunction with their respective materials. The demographic data presented in Table 1 indicates that there were no statistically significant differences between the control group and the study group in terms of either sex distribution or mean age. The p-value; $p > 0.05$ for both age and sex, indicating that the two groups were comparable in these baseline characteristics.Table 2 reveals the primary andsecondary outcomes. Regarding the mean RD, the baseline was comparable between the VISTA+DFGG (2.63 ± 0.77 mm) and VISTA+e-PRF (2.54 ± 0.38mm) groups, with no statistically significant difference (P=0.609). Following the surgical intervention, both treatment modalities achieved a highly significant reduction in RD over the 6-month study period ($P0 < 0.001$). Notably, the VISTA+DFGG group demonstrated superior clinical performance exhibiting significantly

lower RD values at the 3-month interval (0.50 ± 0.31 mm vs. 0.74 ± 0.31 mm; P=0.028) compared to the VISTA+e-PRF group. However, at the 6-month interval, there was no statistically significant difference between the two groups (0.40 ± 0.27 mm vs. 0.49 ± 0.37 mm; P=0.390).

In terms of CAL, both groups showed highly significant longitudinal improvements from baseline to the final follow-up (P0 < 0.001). The baseline CAL was comparable between the VISTA+DFGG (4.04 ± 0.83 mm) and VISTA+e-PRF (3.90 ± 0.40 mm) groups, with no statistically significant difference (P=0.462). By 6 months, both groups achieved a gain in attachment, resulting in a mean CAL of 1.59 ± 0.55 mm in the VISTA+DFGG group compared to 1.62 ± 0.52 mm in the VISTA+e-PRF group, with no statistically significant difference between them (P=0.749). Conversely, PD remained relatively stable throughout the study, with no statistically significant differences observed between the two groups at any time point (P > 0.05) or within either group over the three periods (P0 > 0.05).Regarding the PI and GI, inter-group comparisons revealed no statistically significant differences for either index at baseline, 3 months, or 6 months (P > 0.05), indicating that both surgical protocols resulted in comparable outcomes for these parameters throughout the follow-up phases. However, longitudinal changes within the groups varied. For the PI, neither group exhibited statistically significant changes over the 6-month duration (P0 > 0.05). For the GI, the VISTA+DFGG group showed no significant longitudinal changes (P0 > 0.05), whereas the VISTA+e-PRF group exhibited a statistically significant change over time (P0 = 0.003).

Tables & Figures:-

Table (1): Demographic characteristics of study populations

Demographic data	VISTA+DFGG (n = 15)	VISTA+e-PRF (n = 15)	p
Sex, N (%)			
Male	6 (40.0%)	(8) 53.3%	0.464
Female	9 (60.0%)	(7) 46.7%	
Age (years)			
Mean ± SD	32.80 ± 10.63	35.20 ± 12.47	0.575
Range	21 – 53	21 – 64	

Data was expressed using Mean ± SD. SD: Standard deviation
P: P value for Comparison between the two studied groups

Table (2): Comparison between the two studied groups according to primary and secondary outcomes in each period

Outcomes	Periods	VISTA+DFGG (n = 15)	VISTA+e-PRF (n = 15)	P
Recession Depth (RD)	Baseline	2.63 ± 0.77	2.54 ± 0.38	0.609
	After 3M	0.50 ± 0.31	0.74 ± 0.31	0.028*
	After 6M	0.40 ± 0.27	0.49 ± 0.37	0.390
	P0	<0.001*	<0.001*	
Probing Depth (PD)	Baseline	0.89 ± 0.24	0.97 ± 0.39	0.870
	After 3M	0.80 ± 0.23	0.89 ± 0.28	0.980
	After 6M	0.79 ± 0.22	0.87 ± 0.27	0.939
	P0	0.268	0.073	
Clinical Attachment Level (CAL)	Baseline	4.04 ± 0.83	3.90 ± 0.40	0.462
	After 3M	1.76 ± 0.70	1.95 ± 0.52	0.345
	After 6M	1.59 ± 0.55	1.62 ± 0.52	0.749
	P0	<0.001*	<0.001*	

Plaque Index (PI)	**Baseline**	**0.17 ± 0.12**	**0.19 ± 0.11**	**0.695**
	After 3M	**0.21 ± 0.12**	**0.23 ± 0.11**	**0.597**
	After 6M	**0.24 ± 0.14**	**0.29 ± 0.15**	**0.270**
	P0	**0.186**	**0.055**	
Gingival Index (GI)	**Baseline**	**0.35 ± 0.26**	**0.36 ± 0.15**	**0.907**
	After 3M	**0.42 ± 0.30**	**0.46 ± 0.20**	**0.849**
	After 6M	**0.46 ± 0.39**	**0.59 ± 0.15**	**0.346**
	P0	**0.536**	**0.003***	

Data was expressed using Mean ± SD. SD: Standard deviation
P: P value for Comparison between the two studied groups
P_0: P value for comparison between the three studied periods in each group

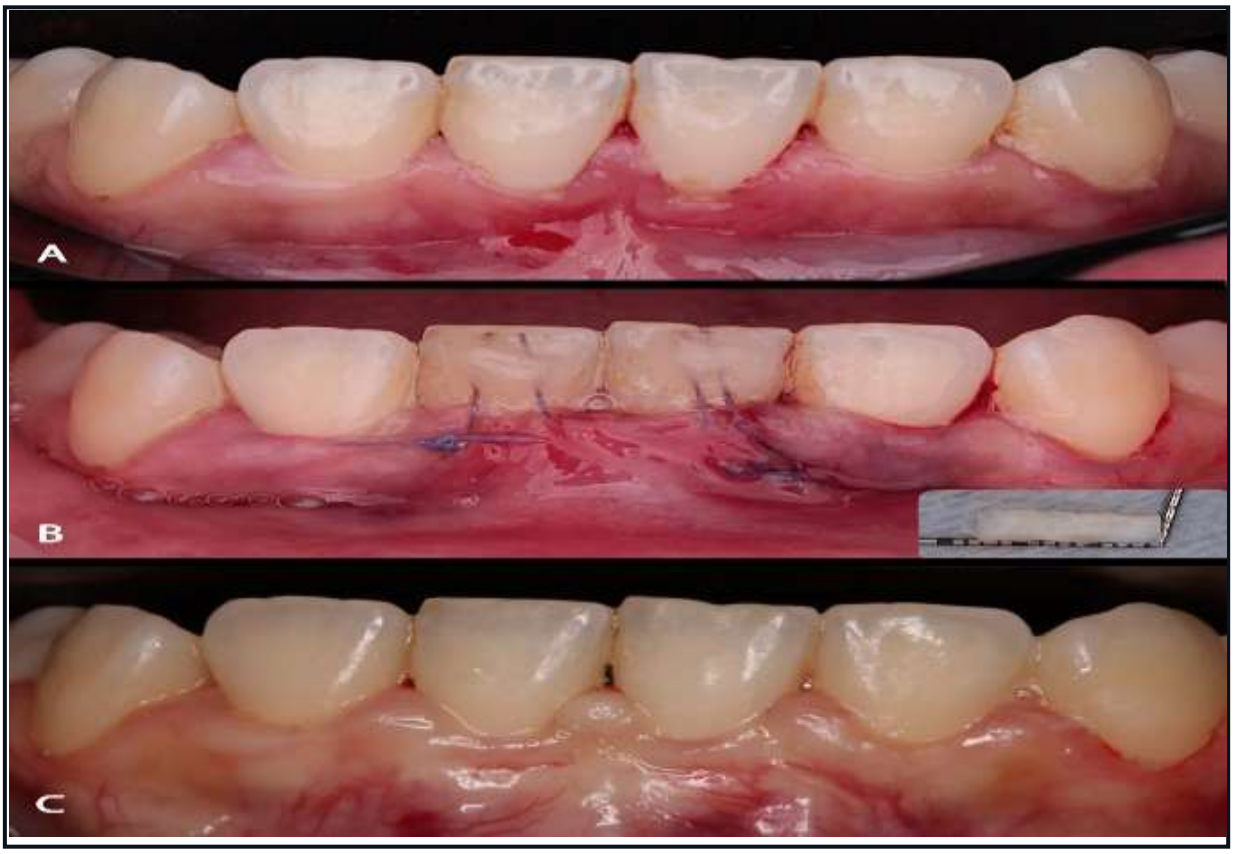

Figure 1: show clinical view of the surgical procedures in the control group (VISTA + DFGG) (A) preoperative view of RT1 defect (B)immediately after surgery with DFGG in the corner of picture(C)six months follow up

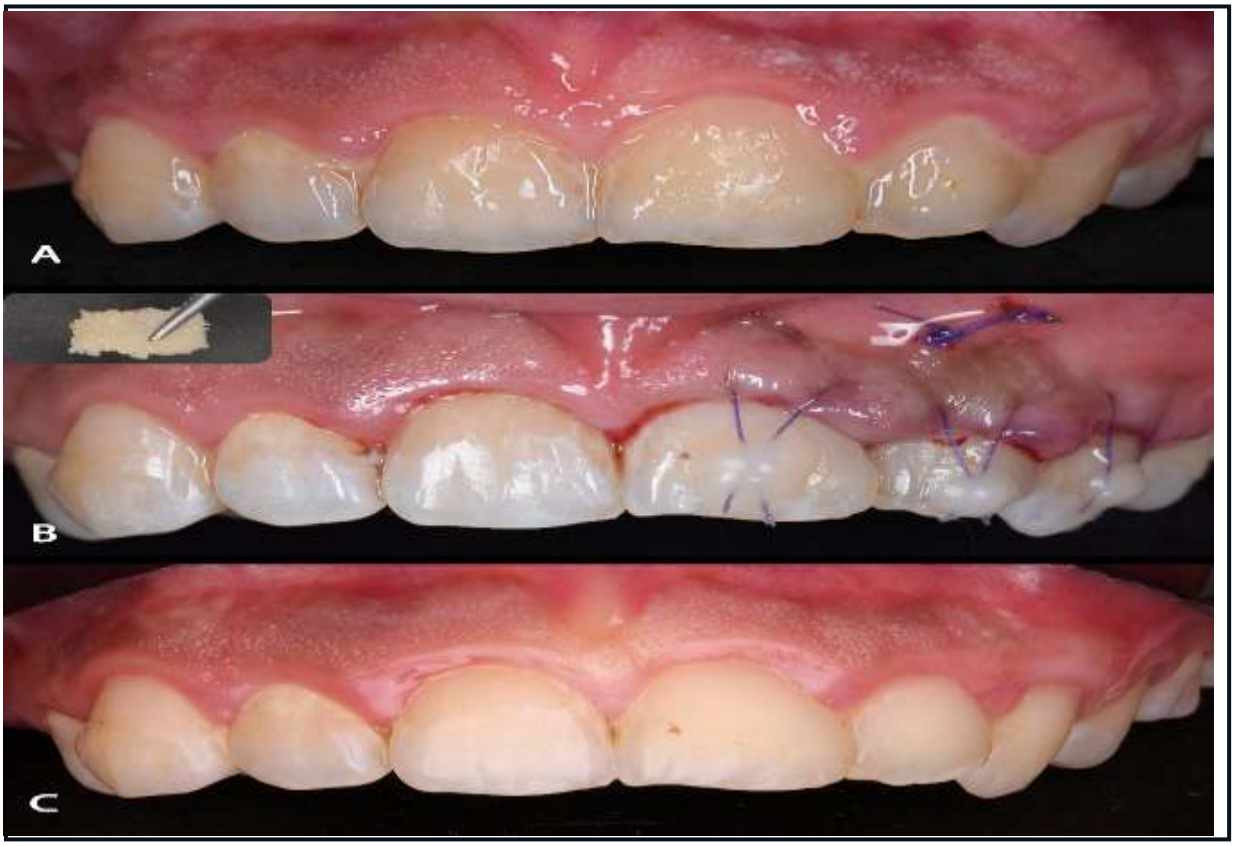

Figure 2: show clinical view of the surgical procedures in the study group (VISTA + e-PRF) (A) preoperative view of RT1 defect(B)immediately after surgery with PRF membrane in the corner of picture (C)six months follow up

Discussion:-

This randomized controlled clinical trial aimed to evaluate the efficacy of VISTA combined with DFGG compared to VISTA with e-PRF for the treatment of localized gingival recession.(6) Our primary findings demonstrated that both modalities achieved highly significant longitudinal improvements in Recession Depth (RD) and Clinical Attachment Level (CAL) from baseline to 6 months ($P0 < 0.001$). While the VISTA+DFGG group exhibited a statistically superior reduction in RD at the 3-month interval ($P=0.028$), this difference was transient. By the final 6-month follow-up, both groups yielded statistically comparable results for RD ($P=0.390$) and CAL ($P=0.749$). Furthermore, Probing Depth (PD), Plaque Index (PI), and Gingival Index (GI) showed no significant differences between the two treatment groups at any observation period.Autologous grafts, such as connective tissue grafts (CTG) and DFGG, have traditionally been considered the gold standard for gingival recession coverage due to their robust clinical outcomes.(20) This is supported by recent studies, such as the randomized clinical trial by Abu-Ta'a (2023), which compared Coronally Advanced Flap (CAF) with either Advanced Platelet-Rich Fibrin (A-PRF) or CTG and concluded that CTG yielded significantly better reductions in recession depth and width.(21) Similarly, a systematic review by Balčiūnaitė et al. (2020) acknowledged that while standard PRF is an effective and less invasive alternative, autologous grafts remain the established gold standard for achieving predictable root coverage.(20)

While these referenced studies utilized different generations of platelet concentrates (such as A-PRF and standard L-PRF), they were specifically selected for our comparative analysis because they share the same fundamental biological rationale as e-PRF.(22) All these PRF concentrates are autologous biomaterials designed to entrap platelets and leukocytes within a fibrin matrix, thereby serving as reservoirs for the sustained release of essential growth factors, including Platelet-Derived Growth Factor (PDGF), Transforming Growth Factor-beta (TGF-β), and Vascular Endothelial Growth Factor (VEGF).(23) Our 3-month results partially align with the historical findings of these

studies, as the DFGG group initially provided significantly lower RD values. This early superiority can be attributed to the immediate structural coverage provided directly by the transferred autogenous donor tissue.

However, the comparable outcomes observed at 6 months in our study challenge the notion that autologous grafts are always statistically superior in the long term, highlighting the unique physical advantage of extended PRF (e-PRF). Although standard platelet concentrates (like PRF and A-PRF) successfully secrete growth factors, their primary limitation has historically been their rapid resorption rate, typically dissolving within a 2- to 3-week timeframe. This rapid degradation often limits their ability to act as a long-term barrier. In contrast, the e-PRF used in our study overcomes this limitation by incorporating a heated platelet-poor plasma (PPP) layer that denatures albumin, restructuring it into a denser tridimensional matrix. This specific modification dramatically extends the biodegradation period of the membrane up to 4 to 6 months.(10)

Consequently, this prolonged stability allows for the slow, gradual release of the entrapped growth factors (PDGF, TGF-β, VEGF) over an extended period, stimulating sustained cellular migration, fibroblast proliferation, and continuous collagen synthesis.(10, 24) This extended regenerative window effectively explains the progressive clinical improvement observed in the VISTA+e-PRF group. While autologous grafts like DFGG remain the unparalleled gold standard for providing robust structural volume, the sustained biological stimulation from e-PRF significantly narrowed the initial clinical gap observed at 3 months. Ultimately, e-PRF yielded highly satisfactory and statistically comparable outcomes for both RD and CAL by the 6-month mark.

The surgical technique itself also played a critical role in facilitating these favorable outcomes. The VISTA approach provides minimally invasive access through a vestibular incision, enabling the elevation of a subperiosteal tunnel that preserves the anatomical integrity of the interdental papillae and minimizes tension on the gingival margin during coronal advancement.(6, 21) By combining VISTA with e-PRF, the surgical site benefits from both minimized surgical trauma and extended biological stimulation. Crucially, this combination eliminates the necessity for a secondary surgical donor site, addressing one of the main drawbacks of DFGG and CTG, which is postoperative patient morbidity, pain, and discomfort.(20)

Regarding the secondary clinical parameters, our results demonstrated stable Probing Depths (PD) throughout the study, with no significant longitudinal changes for either group. This is in agreement with existing literature, such as the study by Abu-Ta'a (2023), indicating that both autologous grafts and PRF-based recession therapies successfully maintain periodontal health without inducing pathological pocket formation.(21) Furthermore, the Plaque Index (PI) remained stable and exceptionally low across all observation periods for both groups ($P > 0.05$), confirming that the minimally invasive VISTA protocol effectively preserves the anatomical integrity of the interdental papillae, thereby not creating plaque-retentive areas or hindering patients' oral hygiene practices.

Interestingly, while the Gingival Index (GI) showed no significant inter-group differences, the VISTA+e-PRF group exhibited a statistically significant longitudinal increase from baseline to 6 months ($P0=0.003$). However, the final mean GI value (0.59 ± 0.15) remains strictly within the clinical parameters of healthy, non-inflamed gingival tissues. Biologically, this slight longitudinal shift in visual gingival scores should not be interpreted as pathological plaque-induced inflammation. Rather, recent evidence by Kargarpour et al. (2021) suggests that liquid PRF and heated albumin gels actually possess potent in vitro heat-sensitive anti-inflammatory activity.(25)Therefore, this minor visual change in gingival erythema is more likely attributed to the robust angiogenesis and hypervascularization stimulated by the sustained and prolonged release of Vascular Endothelial Growth Factor (VEGF) from the e-PRF matrix, which naturally enhances local blood perfusion during the extended tissue remodeling phase.(24)

Conclusion:-

The use of e-PRF in conjunction with the VISTA technique provides a highly effective and minimally invasive alternative to DFGG for the treatment of localized gingival recession. By utilizing modified heating protocols, e-PRF shares the powerful growth factor release mechanism of previous PRF concentrates but overcomes their rapid resorption limitations(10). While it may not entirely replicate the absolute volumetric gain of an autologous graft, e-PRF offers sustained regenerative benefits that yield reliable long-term clinical outcomes for recession reduction and attachment gain, while significantly enhancing patient comfort by eliminating donor-site morbidity.

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Competing interests:
Non

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