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EVALUATING THE CLINICAL OUTCOME OF MODIFIED MINIMALLY INVASIVE NON-SURGICAL THERAPY VS TRADITIONAL NON-SURGICAL PERIODONTAL THERAPY– A SPLIT MOUTH RANDOMIZED CONTROLLED CLINICAL STUDY

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ABSTRACT

BACKGROUND: Nonsurgical periodontal therapy (NSPT), a gold standard therapy for periodontitis has undergone miraculous evolution. One of such improvisations is Modified Minimally invasive nonsurgical therapy (M-MINST). Also, these minimally invasive techniques combined with patient blood derivatives like platelet concentrates to enhance the regeneration.

AIM AND OBJECTIVE: The present split mouth trial aims to compare and evaluate Modified Minimally Invasive Non-surgical Therapy (M-MINST) and Traditional Non-surgical Periodontal Therapy (T-NSPT)

MATERIAL AND METHODS: The study sample included 20 patients with 40 periodontal pocket sites. The samples were divided into two groups; Group I or the test site included 20 sites which were treated with Modified Minimally Invasive Non-surgical Therapy (M-MINST) combined with I-PRF and Group II or control group included 20 sites treated with Traditional Non-surgical Periodontal Therapy (T-NSPT) along with I-PRF. Clinical outcomes; Probing Pocket Depth, Clinical Attachment Level, Bleeding On Probing were assessed at baseline, and first month. Patient related outcomes; Verbal Rating Scale (VRS), Wound Healing Index were assessed at 1st week, 2nd week and first month.

RESULTS: Bleeding on Probing, Wound healing index scores, Verbal rating scale scores were comparatively lesser in the test group than the control group. A statistically significant difference was noted in Probing depth, clinical attachment level at both groups at different time periods.

CONCLUSION: Both groups are found to be equally effective. M-MINST along with I-PRF was found to yield better results than T-NSPT, especially in terms of bleeding on probing, wound healing and verbal rating scale.

KEYWORDS: Chronic periodontitis, Injectable platelet-rich fibrin, I-PRF, Traditional Non-surgical Periodontal Therapy, Modified Minimally invasive nonsurgical therapy, M-MINST

INTRODUCTION

Periodontitis is inflammation of the supporting structures surrounding the teeth. In dental practice, it is a commonly encountered disease of the oral cavity. Its prevalence increases with aging and causes deleterious effects on supporting periodontium of the tooth. (Mehrotra, and Singh, 2023)

Globally as estimated by Who, 11% of the adult population are affected by Periodontitis. (Kassebaum NJ et al, 2014, and Frencken JE et al, 2017) Nonetheless, in a recent systematic review reported that in the Indian population, the

overall prevalence of periodontal disease was 51% and 19% suffered from severe periodontitis.(Janakiram C et al, 2020)

An array of treatment modalities ranging from simple nonsurgical therapy to autogenous graft augmentation have been performed for this highly prevalent disease. (Kwon T et al, 2021) Nonsurgical periodontal therapy (NSPT) is the first preferred step in the management of periodontal Diseases. This makes them the "Cornerstone or cause related periodontal therapy". This gold standard therapy has undergone miraculous evolution to enhance its drawbacks. (Kwon T et al, 2021, Drisko CH, 2000, and Rakhewar et al, 2021)

One of such improvisations is Minimally invasive nonsurgical therapy (MINST), utilizing delicate instruments for periodontal debridement with minimal tissue trauma and microscope/loupes to implement magnification of the surgical area. (Ribeiro FV et al, 2000, Anoixiadou S et al,2023) MINST has evolved more in recent years as modified minimally invasive surgical therapy (M-MIST) with simplified papilla preservation incisions and use of a subpapillary access. (Cortellini P et al, 2011)

In M-MINST technique, anesthesia is specifically given as infiltration not as intrasulcular anesthesia. Also, Lignocaine without adrenaline is preferred. These slight refinements from MINST technique reduces the tissue trauma, and also a stable blood clot which subsequently enhances the healing and regeneration of the periodontal tissues. Nibali et al reported that M-MINST was superior compared to surgical treatment of intrabony defects. (Cortellini P et al, 2011, Nibali L et al 2019)

Literature reveals that various studies have exploited the regenerative effects of autogenous blood borne products like PRF in the treatment of periodontitis. The mechanism of action of these products are well established. (Rakhewar et al, 2021 and Vuckovic et al, 2020).

A recent study has shown that application of I-PRF in initial periodontal therapy has displayed significant clinical improvement. (Rakhewar et al, 2021) To our knowledge, no studies have compared the Clinical effectiveness of M-MINST and Traditional non-surgical periodontal therapy. Hence the present study focuses on this lacunae. Also, the present study aims to exploit the I-PRF by incorporating it in both treatment groups.

MATERIAL AND METHODS

Study design, and study setting:

The present study is a Split Mouth clinical trial, conducted on patients who came to the Department of Periodontology and Oral Implantology, Sree Balaji Dental College And Hospital, Chennai, India. Prior to the study, Institutional Review Board clearance (SBDCH-IRB-PG/ 24-03/05) and Ethical clearance (SBDCH-IEC-CT-/12-04/31) was obtained.

Study population:

The study sample included 20 patients with 40 periodontal pocket sites. The samples were segregated into two groups based on the treatment they received. Group I or the test site included 20 sites which were treated with M-MINST combined with I-PRF. Group II or control group included 20 sites treated with T-NSPT along with I-PRF.

Selection criteria:

Systemically healthy patients aged between 20 to 55 years with stage II periodontitis (grades A to C) (according to 2017 AAP Classification) with periodontal pockets that are equally distributed on either side of the jaw were included. Those who underwent periodontal treatment in the last 1 year, patients with prosthetics, patients with history of any uncontrolled systemic disease, medical or psychiatric conditions were excluded. Pregnant or lactating women or patients who underwent any antibiotic therapy or steroid therapy in the past 3 months, Smokers and those with history of alcohol or drug abuse were excluded from the study.

Clinical Procedure: Under aseptic conditions, the procedures of the study were conducted on an outpatient basis. After selecting the test and control sites, M-MINST and T-NSPT will be performed on either side. For I- PRF Preparation, 10 ml of whole venous blood was withdrawn from the patient and was centrifuged at 700 (rpm) for 3 minutes. The top most layer that is in liquid state was aspirated as I-PRF with an insulin syringe.

For the anesthesia in the test site in one quadrant, Lignocaine without adrenaline is given as infiltration. With the aid of 3.5X Magnification loupe, mini Gracey curettes (½, ⅞, GDC) and ultrasonic scaling tips (Model P-1 and P-2,Woodpecker) using subpapillary access, subgingival debridement was done. Stable blood clot is formed in the defect following which I-PRF is filled into the pocket sites using insulin syringe. (Fig 1)

For the control group on the opposite side, SRP was done with traditional ultrasonic tips (Model G-1 and G-2,Woodpecker) and standard Gracey curettes (½, ¾, ⅝, ⅞, 9/10, 11/12, 13/14,Hu-Friedy,Chicago,IL,USA) under LA.

Stable blood clot is formed in the defect following which I-PRF is filled into the pocket sites using insulin syringe.(Fig 2)
Clinical outcomes like Probing Pocket Depth, Clinical Attachment Level, Bleeding On Probing were assessed at baseline, and first month. Patient related outcomes such as Verbal Rating Scale (VRS), Wound Healing Index were assessed at 1st week, 2nd week and first month.

RESULTS

In the test group, bleeding on Probing at baseline line was comparatively lesser than the control group, however no differences were noted in other clinical parameters. The values of the clinical parameters assessed at baseline and 1st month in both groups were statistically significant (Table 1). A statistically significant difference was noted in intergroup comparison for bleeding on probing at different time periods (Table 2). The wound healing index scores were lesser in the test site at all the time intervals compared to the control site, and a statistically significant difference was noted in both the groups (Table 3). Verbal rating scale scores were lesser in the test group in the first week, however no difference was noted in the second and third week and was statistically significant (Table 4). A statistically significant difference was noted in intergroup comparison for wound healing index scores at different time periods (Table 5).

DISCUSSION

In recent years, the field of periodontitis has undergone explicit advancements. However, scaling and root planning are the primary therapy for each patient. (Kim WJ et al 2021, and Zhang C et al) Recently, Modified Minimally invasive nonsurgical therapy (M-MINST), a technique with reduction in surgical trauma, operative time and postoperative discomfort is introduced. This M-MINST is a improvised successor technique of MINST which applies a subpapillary access for debridement, eventually avoids the coronal part of the interdental papilla and thereby preserves the papilla. **(**Cortellini P et al, 2011, Zhang C et al, 2020 and Rakhewar et al, 2021)
Also, due to minimal tissue trauma, a stable blood clot is formed in debrided periodontal pockets. These blood clots hastens the healing and regeneration of the periodontal tissues increasing the success rate of the treatment.
Few studies like Cortellini et al **(**Cortellini P et al, 201) and Nibali et al (Nibali L et al 2019) reported that the clinical and radiographic improvements of M-MIST were superior irrespective of its combination with or without regenerative materials. Nibali et al (2021), introduced M-MINST technique where he has given the subpapillary access, Lignocaine without adrenaline and initiated a stabilized clot formation that could fill up the defects especially intrabony defects. The present study has utilized this technique of M-MINST along with I-PRF to reduce the tissue trauma and optimize the healing pattern. (Nibali L et al 2019)
Rakewar et al demonstrated the application of I-PRF with T-NSPT as an adjuvant therapy has shown improvement in all clinical parameters. The present study has utilized I-PRF in both the groups owing to their antimicrobial, antiinflammatory and immunological properties to enhance the clinical outcome. (Rakhewar et al, 2021)
A meta-analysis performed by Barbato has provided concrete evidence on the clinical effectiveness of M-MINST. Barbato reported that both MINST and M-MINST showed promising results in treatment of intrabony Pocket. (Barbato L et al, 2020) This could be attributed as the papilla preservation improving the wound stability.(Madi M and Elakel AM 2010, Harrel SK, 1995, and Barbato L et al, 2020)
Chung et al compared the MINST with CNST and has analyzed the comfort feedback and gingival recession outcomes. In concordance with this, we compared M-MINST with T-NSPT along with I-PRF has proved statistical results favorable for M-MINST when compared T-NSPT. (Chung WC et al, 2022)
Also in the recent decades, the incorporation of autogenous blood borne products has been done in almost all fields of dentistry. Especially in the field of periodontics, to achieve periodontal tissue regeneration, blood derivatives like PRP and PRF to enhance the regeneration have been utilized. The PRF is a hassle free autologous product, swiftly prepared with centrifuge apparatus, and requires minimal armamentarium. The blood drawn for PRF was an acceptable and less invasive procedure according to the patient compared to the second surgical site as in connective tissue graft. (Chandran et al, 2014, and Barbato L et al, 2020)
From the healing point of view, the growth factors in the PRF have shown to stimulate and induce vascularization in the surgical site, hastening the healing process and leading to reduced tissue necrosis promoting soft-tissue reattachment. (Chandran et al, 2014, and Barbato L et al, 2020) I-PRF is a new injectable formulation of PRF that enables easier manipulation as it is a platelet concentrate in liquid state.[12]

Various literature has provided concrete evidence on the positive benefits of PRF. A recent systematic review has summarized the positive effects of PRF in improvisation in pocket probing depth (PPD), increase in clinical attachment level (CAL), and degree of defect bone fill.(Harrel SK, 1998)
Both the procedures compared in this study, are nonsurgical and minimally invasive techniques; the difference being in the placement of the incision. We have incorporated i-PRF with M-MINST so as to ensure that the surgical procedures are comparable. The noteworthy findings of this trial is that M-MINST along with I-PRF was superior to T-NSPT, especially in terms of bleeding on probing, wound healing and verbal rating scale.

CONCLUSION

Both groups are found to be equally effective. M-MINST along with I-PRF was found to yield better results than T-NSPT, especially in terms of bleeding on probing, wound healing and verbal rating scale. The better results may be due to minimal tissue trauma and blood clots formed in the periodontal pocket following the M-MINST which could have produced superior wound healing and reduction of gingival inflammation.

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Fig 1; M-MINST case pictures (a) pre-op, (b) Using Mini curette ⅞, (c) Using P1 scaler tip, and (d) Injecting I-PRF.

Fig 2; Control group case pictures (a) pre-op, (b) Using Gracey curette, (c) Using G1 scaler tip, and (d) Injecting I-PRF.

Table 1; Clinical parameters assessed at different time period

Clinical parameters	**Time interval**	**M-MINST test site (N=20)**	**Wilcoxon Signed Ranks Test for M-MINST Z value**	**M-MINST P value**	**T-NSPT test site (N=20)**	**Wilcoxon Signed Ranks Test for T-NSPT Z value**	**T-NSPT P value**
Bleeding on probing	At baseline	1.30	-3.964c	0.02*	1.82	-3.964c	0.01*
	At 1st month	0.13			0.04		
Probing Pocket depth	At baseline	6.37	-4.17c	0.03*	6.37	-4.023c	0.04*
	At 1st month	3.42			3.55		
Clinical attachment level	At baseline	6.68	-4.023c	0.01*	6.64	-3.941c	0.03*
	At 1st month	3.56			3.58		

Table 2; Mann Whitney test for intergroup comparison for clinical parameters at different time period

Clinical parameters	**Time interval**	**M-MINST mean rank**	**T-NSPT mean ranks**	**Mann Whitney test statistics for intergroup comparison Z**	**P value**
Bleeding on probing	At baseline	13.48	27.53	129.500	0.00*
	At 1st month	19.95	21.05		

Probing Pocket depth	At baseline	20.75	20.25	-38.500	0.242
	At 1st month	18.33	22.68		
Clinical attachment level	At baseline	20.13	20.88	-15.00	0.547
	At 1st month	20.88	21.63		

Table 3; Wound Healing Index assessed at different time period in both the groups

Clinical parameters	**Time interval**	**M-MINST test site (N=20)**	**Friedman test ranks for M-MINST**	**M-MINST Chi square test**	**T-NSPT test site (N=20)**	**Friedman test ranks for T-NSPT**	**M-MINST Chi square test**
Wound Healing Index	1 week	0.745	3.00	36.567 (0.02*)	0.890	2.73	25.396 (0.01*)
	2 week	0.4590	1.63		0.72	1.80	
	3 week	0.4005	1.38		0.64	1.48	

Table 4; Verbal rating scale assessed at different time period in both the groups

Clinical parameters	**Time interval**	**M-MINST test site (N=20)**	**Cochran test frequencies for M-MINST**	**M-MINST Cochran test Q**	**T-NSPT test site (N=20)**	**Cochran test frequencies for T-NSPT**	**T-NSPT Cochran test Q**
VRS	1 week	1.15	17	6.00 (0.05*)	1.75	5	26.533 (0.00*)
	2 week	1.00	20		1.10	18	
	3 week	1.00	20		1.00	20	

Table 5; Mann Whitney test for intergroup comparison for patient related outcomes (VRS and wound healing index) at different time period

Clinical parameters	**Time interval**	**M-MINST mean rank**	**T-NSPT mean ranks**	**Mann Whitney test statistics for intergroup**	**P value**

				comparison Z	
Wound Healing Index	1 week	14.53	26.48	243.000	0.00*
	2 week	12.15	28.85		
	3 week	13.93	27.08		
VRS	1 week	17	5	14.20	0.487
	2 week	3	15		
	3 week	20	20		