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COMPARATIVE EVALUATION OF HAND SCALING VERSUS ULTRASONIC SCALING IN THE TREATMENT OF CHRONIC PERIODONTITIS: A COMPARATIVE STUDY

General Surgery

Dr. Jaimini K. Patel Post Graduate Student, Department of Periodontology, K M Shah Dental College, Sumandeep Vidyapeeth, Vadodara, India

Dr. Jasuma J. Rai* Professor, Department of Periodontology, K M Shah Dental College, Sumandeep Vidyapeeth, Vadodara, India *Corresponding Aurthor

Dr. Nidhi K. Shah Post Graduate Student, Department of Periodontology, K M Shah Dental College, Sumandeep Vidyapeeth, Vadodara, India

ABSTRACT

Introduction: Chronic Periodontitis is an infectious condition that can result in the inflammatory destruction of periodontal ligament and alveolar bone. The aim of the study was to critically evaluate hand scaling and ultrasonic scaling in the local population.
Method: 35 patients were selected for this Split mouth randomized single blind study. Group I received scaling and root planing (SRP) with Ultrasonic Device and Group II received SRP with hand instruments. Plaque Index (PI), Gingival Index (GI), Pocket Probing Depth (PPD) and Clinical Attachment Level (CAL) were assessed at baseline before scaling and root planing, and after 1 month, and 3 months interval.
Result: showed that there was a significant difference in all clinical parameters at baseline to 1 month, 3 months and 1 month to 3 month in group I and group II (p value ≤0.001). No statistical significant difference was seen in all clinical parameters between the two groups. The mean difference of time taken for the treatment procedure is approximately two times more in SRP with hand instruments as compared to ultrasonic scaling. (p value ≤0.001).
Conclusion: There was a comparable results in reduction in all clinical parameter with both the treatment modalities except the time required for ultrasonic scaling.

KEYWORDS

Chronic Periodontitis, Hand Scalers, Ultrasonic scalers, Probing Pocket Depth, Clinical Attachment level

1. Introduction

A major objective of periodontal therapy is to remove soft and hard supra and sub-gingival deposits from the root surface in order to stop disease progression. [1] Treatment of periodontitis is directed primarily towards the reduction of pathogens embedded in the sub-gingival biofilm. [2]

In the past, the removal of hard deposits was primarily performed with hand instruments because sonic and ultrasonic instruments (power driven) were originally designed for gross scaling and removal of supra-gingival calculus and stains. [3] Scaling and root planing (SRP) with hand instruments was necessary to remove tenacious calculus deposits to produce roots as smooth as possible for removal of the endotoxins previously thought to be deeply embedded into the root surfaces. Based on current evidence endotoxin is a weakly adherent surface phenomenon and that sonic and ultrasonic instruments can be used to accomplish root detoxification and wound healing without over instrumentation of root and extensive cementum removal. [4]

Currently the use of ultrasonic or hand instruments for therapy has been critically evaluated and both therapies have been shown to be effective in reducing supra and sub-gingival plaque [5] and endotoxins from root surfaces[6] Hand instruments; e.g., Gracey curetts, necessitate specific blade angulations for proper instrumentation of root surfaces. Ultrasonic instruments are effective at any angle, yet the size of the tip prohibits access to the pockets and the furcation. The aim of the study was to evaluate ultrasonic and hand instrumentation for the removal of sub-gingival plaque and calculus on the effect on Plaque Index (PI), Gingival Index (GI), Clinical Attachment Level (CAL) and Pocket Probing Depth (PPD).

2. Materials and Method

A Split mouth randomized single blind study was carried out in the Department of Periodontology, K M Shah Dental College and Hospital, Sumandeep Vidyapeeth. The study was started after Institutional Ethics Committee approval was obtained. All patients were individually informed about the nature of the proposed treatment, its risks and benefits, and signed informed consent was obtained.

2.1 Sample size:

Based on sample size formula N = (Z*SD/d-) ^2 (where, SD = 0.3 d = 0.2) minimum 70 observations (35 per group) were required for present study to get mean difference in reduction of mean GI (Gingival Index) at 3 month with 80% power at 5% risk.

2.2 Methodology:

Inclusion criteria:

- Systemically healthy patients with untreated moderate to advanced periodontitis
- Age between 25 to 70 years
- Presence of >12 scorable teeth (not including third molars and teeth with orthodontic appliances, bridges, crowns, or implants)
- Presence of at least four teeth with a probing depth (PD) >4 mm, clinical attachment loss (CAL) >2 mm.

Exclusion criteria:

- Systemic illnesses (i.e., diabetes mellitus, cancer, human immunodeficiency syndrome, bone metabolic diseases, or disorders that compromise wound healing, radiation, or immunosuppressive therapy)
- Pregnancy or lactation
- Systemic antibiotics taken within the previous 2 months
- Use of non-steroidal anti-inflammatory drugs, confirmed or suspected intolerance to 5-nitroimidazole derivatives or amoxicillin
- Participants with a history of smoking

2.3 Randomization and Blinding:

Randomization was done by using coin toss method. All participants in the Group I received SRP with ultrasonic device and Group II received SRP with hand instruments. SRP with ultrasonic device and hand instruments were done by primary investigator (JKP) and clinical parameters were assessed by a clinical examiner (NKS) who was blinded to the allocation. Records were maintained at baseline before SRP, after 1 month, and after 3 months interval. PD and CAL were measured using a pressure sensitive University of North Carolina (UNC) -15 probe.

2.4 Statistical tests:

Descriptive analysis and inferential analysis were performed in this study. For intergroup analysis Independent T test and paired T Test were performed. For association between clinical parameters Pearson correlation test was used.

3. Result

All the patients came for follow up, there was no dropout in the study. At baseline there was no difference between the groups in any of the clinical parameter measured. (P≥0.05) 3.1Intra group analysis

Table 1 & 2 showed statistically significant difference in all clinical parameters (PI, GI, PPD, CAL) at baseline to 1 month, baseline to 3 months and 1 month to 3 month in group I and group II (p ≤0.001)

3.2 Inter group analysis:

Table 3 shows no significant difference in PI score between the two group at baseline, 1 month and 3 month with the P value being 0.806, 0.841 and 0.309 respectively. There was difference in PI score at baseline to 1 month, baseline to 3 months and 1 month to 3 month which was not statistically significant.

Table 4 showed there was no statistical significant difference in GI score between the two group at baseline, 1 month and 3 month (p value 0.815, 0.882, and 0.818) and the comparison of GI score between baseline to 1 month, baseline to 3 months and 1 month to 3 month also showed no statistical significant difference.

It was seen that there was no statistical significant difference in PPD between the two groups at any of the timelines. (P value = 0.896, 0.947 and 0.675 respectively) (Table 5) and the comparison PPD at baseline to 1 month, baseline to 3 months and 1 month to 3 month was not statistically significant

Table 6 shows no statistical significant difference in CAL between the two groups the timelines studied. (p value = 0.372, 0.53 and 0.825 respectively). The comparison of CAL between baseline to 1 month, baseline to 3 months and 1 month to 3 month also showed no statistical significant difference. The time required for scaling between the two groups was statistically significant where the time required for scaling with hand instruments was approximately twice more than that of the ultrasonic scaler (p value ≤0.001)

4. Discussion

Periodontal therapy aims at arresting periodontal infection and maintaining a healthy periodontium. The first step of periodontal treatment is removing bacterial deposits and calculus from the tooth surfaces and obtaining a biologically acceptable root surface while protecting the healthy dental tissues. In the past, this was done by handheld instruments (sickle and curettes) [7]. These instruments produced a smooth root surface, but considerable manual dexterity is required for their effectiveness. [8] Ultrasonic instruments are simple to use, but it is often difficult to achieve smooth and calculus free root surface. [9]

In our study we compared four clinical parameters: PI, GI, PPD and CAL. Plaque index was described by Silness P and Loe H in 1964 [10] which measures the thickness of plaque on the gingival one third and demonstrates good validity and reliability. Gingival index developed by Loe H and Silness P in 1963 [10] was for assessing the severity of gingivitis and the advantage of this index is good sensitivity and reproducibility.

PPD is an indicator of loss of attachment and it provides an accurate estimate of the size of denuded root surfaces and deeper pocket indicate the greater disease progression. [11] Clinical attachment level is the approximation of the loss of connective tissue attachment from the root surface. This measurement is important because it provides the clinician with an objective site by site assessment of the amount of periodontal damage. Sequential measurements of clinical attachment levels are particularly useful when the clinician wants a follow up on the patient's treatment to determine whether further attachment loss or gain has occurred. [11]

In this study clinical parameters were assessed at baseline, after 1 month and 3 month because the reevaluation of initial therapy should be between 3 - 4 weeks after the completion of initial periodontal therapy i.e. SRP. This time interval has been proven scientifically to allow optimal gingival healing to occur. [3]

Reduction in PI was statistically significant at baseline to 1 month, baseline to 3 months and 1 month to 3 month in both the groups which was similar to the study done by Obeid PR et al (2004). [3] Study done by Scluean A et al (2005) [1] showed there is no statistical significant difference in GI between the two group which was similar to our study and it also showed significant difference at baseline to 1 month, baseline to 3 month and 1 month to 3 month.

In our study there was no significant difference between the two groups in the reduction of PPD which was contrast to the study done by Zarandi A et al (2016) [12] which showed more reduction in PPD with the hand scaling than with the ultrasonic scaling and was similar to the study done by Chapper A et al (2005) [13], Obeid PR et al (2004) [3] and Dahiya P et al (2013) [14].

Gain in CAL showed there was no statistical significant difference between the two groups which was similar to the study done by Tunkel J et al (2002) [12] , Scluean A et al (2004) [1], Chapper A et al (2005) [13], Obeid PR et al (2004) [3], Dahiya P et al (2013) [14] and Zarandi A et al (2016) [15]

The time needed for SRP with ultrasonic device was less than time required for SRP with hand scalers which was similar to the study done by Tunkel J et al (2002) [12] and Obeid PR et al (2004) [3] Recently designed micro ultrasonic tips, which are smaller in diameter and able to penetrate the pocket approximately 1 mm farther than hand instruments. Taken together, the use of ultrasonic scalers for periodontal treatment will result in improvements in clinical parameters at a level equal to or superior to hand scalers. [9]

5. Conclusion:

Mechanical debridement of the periodontal pocket significantly reduces the risk of tooth loss, slow down the rate of periodontal disease progression, and improve gingival health. Ultrasonic scalers have been proved to be useful as it cuts shorts the time of the procedure and enhances both the patient and operator comfort. Within the limitation of our study ultrasonic scalers showed similar results to hand instrumentation when clinical outcomes were considered. Further research is required with a larger sample size with longer period of follow up.

Table 1: Intragroup analysis for group I using Paired t test

	N	*Mean*	*Std. Deviation*	*Paired Differences*		*P VALUE*
				Mean Difference	*Std. Deviation*	
PI Baseline	35	1.623714	0.476699	0.522	0.207106	**<0.001**
PI 1M	35	1.101714	0.460859			
PI Baseline	35	1.623714	0.476699	1.156	0.421874	**<0.001**
PI 3M	35	0.467714	0.159523			
PI 1M	35	1.101714	0.460859	0.634	0.398425	**<0.001**
PI 3M	35	0.467714	0.159523			
GI Baseline	35	1.982571	0.325254	0.570857	0.222636	**<0.001**
GI 1M	35	1.411714	0.300279			
GI Baseline	35	1.982571	0.325254	1.057143	0.267698	**<0.001**
GI 3M	35	0.925429	0.197206			
GI 1M	35	1.411714	0.300279	0.486286	0.277108	**<0.001**
GI 3M	35	0.925429	0.197206			

PPD Baseline	35	5.655143	0.657779	1.388	0.374863	**<0.001**
PPD 1M	35	4.267143	0.547785			
PPD Baseline	35	5.655143	0.657779	1.770857	0.455233	**<0.001**
PPD 3M	35	3.884286	0.540029			
PPD 1M	35	4.267143	0.547785	0.382857	0.309626	**<0.001**
PPD 3M	35	3.884286	0.540029			
CAL Baseline	35	6.558286	0.655643	0.998571	0.373624	**<0.001**
CAL 1M	35	5.5597	0.35365			
CAL Baseline	35	6.558286	0.655643	1.049714	0.383333	**<0.001**
CAL 3M	35	5.5086	0.35191			
CAL 1M	35	5.5597	0.35365	0.05114	0.04484	**<0.001**
CAL 3M	35	5.5086	0.35191			

Table 2: Intragroup analysis for group II using Paired t test

	N	*Mean*	*Std. Deviation*	*Paired Differences*		*P VALUE*
				Mean Difference	*Std. Deviation*	
PI Baseline	35	1.596286	0.451912	0.516286	0.199353	**<0.001**
PI 1M	35	1.08	0.439853			
PI Baseline	35	1.596286	0.451912	1.165429	0.424945	**<0.001**
PI 3M	35	0.430857	0.140511			
PI 1M	35	1.08	0.439853	0.649143	0.407412	**<0.001**
PI 3M	35	0.430857	0.140511			
GI Baseline	35	1.997714	0.20116	0.575714	0.224739	**<0.001**
GI 1M	35	1.422	0.277752			
GI Baseline	35	1.997714	0.20116	1.083429	0.215351	**<0.001**
GI 3M	35	0.914286	0.206957			
GI 1M	35	1.422	0.277752	0.507714	0.203515	**<0.001**
GI 3M	35	0.914286	0.206957			
PPD Baseline	35	5.676571	0.706903	1.400571	0.363552	**<0.001**
PPD 1M	35	4.276	0.565577			
PPD Baseline	35	5.676571	0.706903	1.848571	0.492223	**<0.001**
PPD 3M	35	3.828	0.576316			
PPD 1M	35	4.276	0.565577	0.448	0.307751	**<0.001**
PPD 3M	35	3.828	0.576316			
CAL Baseline	35	6.709429	0.747789	1.090857	0.426721	**<0.001**
CAL 1M	35	5.6186	0.42281			
CAL Baseline	35	6.709429	0.747789	1.182286	0.535065	**<0.001**
CAL 3M	35	5.5271	0.34611			
CAL 1M	35	5.6186	0.42281	0.09143	0.18121	**0.005**
CAL 3M	35	5.5271	0.34611			

Table 3: Intergroup analysis of plaque index (PI) using independent t test

	GROUP	*N*	*Mean*	*Std. Deviation*	*t*	*df*	*P VALUE*
PI Baseline	GROUP I	35	1.623714	0.476699	0.247	68	0.806
	GROUP II	35	1.596286	0.451912			
PI 1M	GROUP I	35	1.101714	0.460859	0.202	68	0.841
	GROUP II	35	1.08	0.439853			
PI 3M	GROUP I	35	0.467714	0.159523	1.026	68	0.309
	GROUP II	35	0.430857	0.140511			

Table 4: Intergroup analysis of gingival index (GI) using independent t test

	GROUP	*N*	*Mean*	*Std. Deviation*	*t*	*df*	*P VALUE*
GI Baseline	GROUP I	35	1.982571	0.325254	-0.234	68	0.815
	GROUP II	35	1.997714	0.20116			
GI 1M	GROUP I	35	1.411714	0.300279	-0.149	68	0.882
	GROUP II	35	1.422	0.277752			
GI 3M	GROUP I	35	0.925429	0.197206	0.231	68	0.818
	GROUP II	35	0.914286	0.206957			

Table 5: Intergroup analysis of pocket probing depth (PPD) using independent t test

	GROUP	*N*	*Mean*	*Std. Deviation*	*t*	*df*	*P VALUE*
PPD Baseline	GROUP I	35	5.655143	0.657779	-0.131	68	0.896
	GROUP II	35	5.676571	0.706903			
PPD 1M	GROUP I	35	4.267143	0.547785	-0.067	68	0.947
	GROUP II	35	4.276	0.565577			
PPD 3M	GROUP I	35	3.884286	0.540029	0.422	68	0.675
	GROUP II	35	3.828	0.576316			

Table 6: Intergroup analysis of clinical attachment level (CAL) using independent t test

	GROUP	*N*	*Mean*	*Std. Deviation*	*t*	*df*	*P VALUE*
CAL Baseline	GROUP I	35	6.558286	0.655643	-0.899	68	0.372
	GROUP II	35	6.709429	0.747789			
CAL 1M	GROUP I	35	5.5597	0.35365	-0.632	68	0.53
	GROUP II	35	5.6186	0.42281			
CAL 3M	GROUP I	35	5.5086	0.35191	-0.223	68	0.825
	GROUP II	35	5.5271	0.34611			

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