

Evaluation of the effectiveness of newly designed motor-driven fiberglass burs versus hand instrumentation in open root planing

Tarik Y. Khamrco M.Sc.

Raed A. Badea M.Sc.

Jamal A. Mehdi M.Sc.

Abstract

The present study was performed to evaluate the effectiveness of newly designed motor-driven fiberglass burs in root planing and compare it to manual instrumentation using universal curette. Twelve patients complaining from periodontitis with deep periodontal pockets were involved in this study. A total number of 139 pocket sites received root planing by motor-driven fiberglass burs and 131 pocket sites were planed manually by curette.

The root planing procedure was opened type; it was performed by modified widman flap operation. The clinical parameters that were used in this study are (plaque index, bleeding on probing, probing pocket depth and relative attachment level). They were recorded in 4 periodic visits 2 of them before treatment and 2 after treatment to assess the improvement and to make a comparison between the two methods of treatment.

The results revealed that there was a significant improvement in all of the clinical parameters after treatment with fiberglass burs.

Also the results showed that there was no significant difference between the improvement that was implemented by the two methods of treatment.

Key word: Fiber glass bur, Hand instrumentation, Open root planing.

Introduction

Periodontal disease is a generalized term for a range of pathological conditions affecting the supporting and investing structure of the teeth ⁽¹⁾. Bacterial plaque products have been shown to be the main etiologic factor that is involved in the initiation and persistence of inflammatory periodontal disease ⁽²⁻⁴⁾.

Supragingival and subgingival calculus play a major role in the development of periodontal disease ⁽⁵⁾. However, calculus is not pathogenic by itself, but its surface irregularity and roughness provide an ideal foundation for plaque retention ⁽⁶⁾.

The pocket is a haven for bacterial activity, it contains concealed speckles of calculus covered by plaque which propagates inflammatory process and promotes the deepening of the pocket, Obviously elimination of deposits is a basic requirement for therapy, scaling and root planning together with plaque control constitute the major means by which the disease of the gingival tissue can be healed ^(7, 8).

Root planing is a technique of instrumentation by which the softened cementum is removed and the root surface is made hard and smooth. Subgingival scaling and root planning are performed as either closed or opened procedure under local anesthesia.

Two of the most widely used mechanical methods for elimination of subgingival microflora and calculus are by hand and ultrasonic instrumentations⁽⁹⁻¹²⁾.

Many studies found no consistent differences in calculus and plaque removal between ultrasonic scalers and hand curettes^(13, 14), while other studies were reported that ultrasonic were inferior to hand instruments⁽¹⁵⁾, and leave a roughened root surface⁽¹⁶⁻¹⁸⁾.

Earlier studies used older ultrasonic tips which were large and bulky. Recently thinner and more delicate tips that are designed to improve the subgingival debridement have been available. Recent studies that used the newly designed tips revealed that the use of ultrasonic scalers for periodontal debridement will result in improvement in clinical and microbial parameters at a level equal to or superior to hand instrumentation^(19, 20).

Recently, carbon fiber covered with quartz fibers was used in dentistry, used as prefabricated passive fiber post⁽²¹⁻²⁴⁾, and also fiber glass burs were introduced for root debridement.

The present study was conducted to evaluate the effectiveness of the newly designed fiber glass burs in root debridement and compare it with hand instrumentation by using curettes based on clinical parameters of periodontal disease (plaque index, bleeding on probing, probing pocket depth and relative attachment level).

Materials and Methods

The sample selections for the study were patients attending the periodontics department at the college of dentistry, AL-Mustansiria University, for treatment of periodontitis.

Twelve patients (7) males and (5) females with an age range of (37-48 years), the mean age was (45.09). All the patients have good health, free from any systemic diseases, not taken any medication that had an effect on periodontal health, had not received any periodontal treatment (scaling or root planing) in the preceding 2 years and he was not taken any systemic antibiotic for the last 3 months.

The patients selected for the study should have chronic periodontitis involving both sides jaws for a similar extent at least one pair of periodontal pocket depth (4-7) mm in contra lateral teeth.

Before baseline examination any defect restoration, overhang restoration, or caries proximally or near gingival third was treated and restored with permanent fillings. Also an alginate impression was taken and an occlusal stent was constructed by using cold cure acrylic for measurement of relative attachment level.

A split mouth randomized study was carried out before baseline examination; all patients received a supragingival debridement consisting of scaling and polishing, in addition to instruction in an effective oral hygiene regimen of daily brushing and use other dental aids. Plaque control was reinforced depending on individual needs in series of visits before baseline and clinical parameters recording.

When oral hygiene conditions were improved and mean plaque index score reached below (0.5) for selected teeth, this was considered the visit of baseline examination and the clinical parameters were recorded. The teeth in the right and left sides of the jaw were randomly assigned for either hand instrumentation or fiberglass bur use.

At first visit all the clinical parameters were recorded and considered as prebaseline visit (V0)

prior to plaque control and improvement of the oral hygiene of the individuals. The clinical parameters were recorded at day (0) (baseline visit, V1) prior to surgical operations and repeated at the third week after operations (V2), and (6-8 weeks V3) after (V2) examination.

The following clinical parameters were recorded; Plaque index, bleeding on probing, probing pocket depth and relative attachment level. All parameters were registered using periodontal probe with Williams graduate having 0.4 mm tip diameter.

For the oral hygiene measurement, the plaque index by Sillness and Loe⁽²⁵⁾ was used, for bleeding on probing, the selected site is gently probed with periodontal probe to the deepest point, if bleeding occurs within 30 seconds after probing; the site was given a positive score and negative score for non bleeding site. The probing pocket depth were measured as the distance from the gingival margin to the most apical extent of probe inserted into the gingival crevice as close as possible to the long axis of the tooth recorded to the nearest millimeter, and the probe had been allowed to fall by its own weight, each tooth was probed at four sites.

The measurement of the relative attachment level was done by the occlusal stent which was adjusted to fit to the teeth, then a vertical grooves corresponding to the probed sites were made using a fissure bur, these grooves provided a fixed reference mark probe insertion and angulations. The relative attachment level was the distance from the lower periphery of the stent to the base of the pocket, the measurement made to the nearest millimeter.

After baseline clinical parameters recording, first instrumentation procedure was done in the same visit for both treatments. The average time

of instrumentation per tooth required for each method of instrumentation was calculated. The instrumentation of periodontal pocket was performed by one experienced operator. The procedure that was performed to the working sites in both methods is opened root planing by using a modified widman flap under local anesthesia, the same procedure was used for both sides, and the only difference was in the step of root planing. This step was performed by using universal curettes in the side of conventional instrumentation while in the other side the root planing was done by using the newly designed motor-driven fiberglass burs (figure 1&2). These burs were used with an ordinary slow hand piece with continuous irrigation of the root surface with normal saline as a coolant to prevent excessive heat generation so as not to induce any harmful effect on the dentine and pulp tissue. The procedure ended until the operator felt that root surfaces were debrided and planed by using of explorer felt hard and smooth root surfaces.

Statistical analysis to compare the mean score at baseline visit (V1) and their value at each subsequent visits(V2,V3) were undertaken using the student t-test paired samples (inter- group comparison), also the differences between the two methods of instrumentation were assessed by using student t-test. Chi-square test used for comparing the percentages of bleeding on probing.

The differences were considered significant when the probability (P) level is equal to or less than 5% ($P < 0.05$) and when the probability (P) was more than 5% ($P > 0.05$) it was regarded as non significant (N.S), while values less than 0.01 were regarded as highly significant ($P < 0.01$).

Figure (1): Shows the newly designed fiberglass burs.

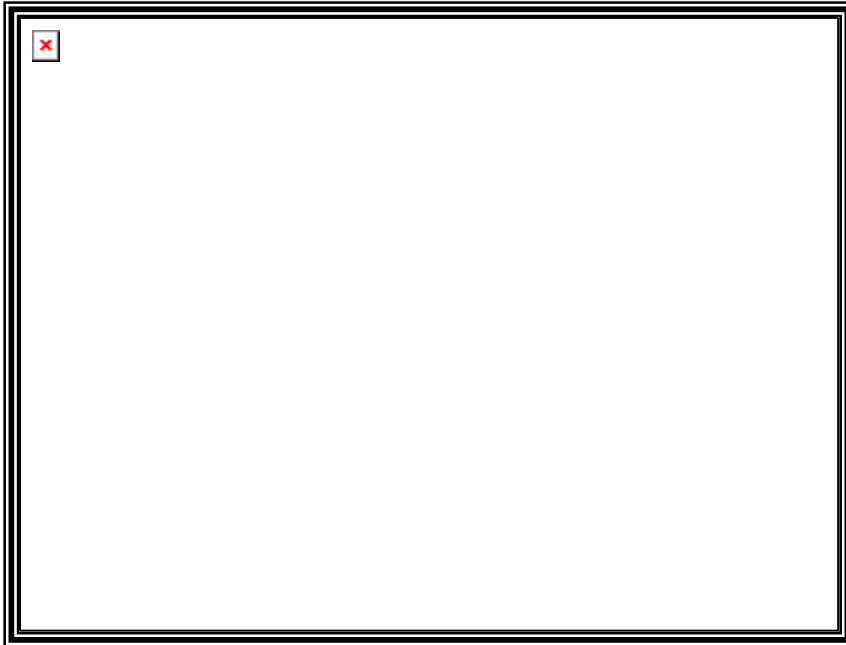


Figure (2): Shows the open flap root planing with newly designed motor-driven fiberglass bur.



Results

Twelve patients participated in this study, each patient received root planing by using fiber glass burs and hand instrumentation by curette for each working site. A total of (139) sites received root planing by fiberglass burs and (131) sites received root planing by curette. All patients completed the trial and attended all the recall visits as initially designed.

The results indicated that the mean plaque score for the patient was high in the prebaseline examination (Table 1), the mean plaque score was reduced significantly before the root planing procedure to reach a mean score below (0.5), and there was no significant difference between the two methods of treatment at all visits (Table 2).

The mean plaque score for both methods of treatment were maintained with slight decrease for fiberglass group than curette group.

The study indicated that all sites bled on probing at prebaseline examination. At the baseline examination there was significant reduction for both groups with no significant differences between them (Table 3).

After root planing there was continuous significant reduction in percentage of bleeding sites at (V2) and (V3) when compared with baseline examination (V1), with no significant differences between the two methods of treatment at all visits.

Table (4) shows the distribution of the total pocket sites (270 sites) by initial probing pocket depth in both types of treatment methods. The results

indicated that more than 2/3 of pocket depths are 5 and 6 mm.

The mean pocket depth at prebaseline examination was (7.99mm) and (8.08mm) for fiberglass bur and curette method of treatment respectively.

After the root planing procedure for the two methods of treatment, there was significant reduction for both groups of treatment at (V2) and (V3) examination (Table 5). When comparing between the two methods of treatment there was no significant difference between them at all visits.

Table (6) demonstrates the mean relative attachment level for both treatments at all visits. The study showed that the mean relative attachment level at the prebaseline and baseline examination were almost same with no significant difference between the two types of treatment. At (V2) examination after root planing, there was a significant reduction in the mean for both groups and there was continuous reduction in the mean relative attachment level at (V3) examination for both groups with significant difference from the baseline examination (V1), while there was no significant difference between the two methods of treatment at (V2) and (V3) examination. The results also indicated that the meantime required for root planing with fiberglass burs was (2.37) minutes per tooth, while in hand instrumentation (5.05) minutes per tooth with a highly significant difference between them.

Table (1): Mean plaque index for the two methods of instrumentation at different visits

Type of instrumentation	Visits	Mean	SD	* Sig.
Fiberglass	V0	2.043	0.186	N.S
	V1	0.370	0.058	
	V2	0.356	0.055	
	V3	0.328	0.034	
Curette	V0	2.032	0.109	N.S
	V1	0.373	0.056	
	V2	0.367	0.057	
	V3	0.358	0.058	

Significant: Comparison with baseline examination (V1).

NS: Not significant differences $P > 0.05$

Table (2): Comparison in mean plaque index between the two methods of instrumentation.

Visits	Fiberglass		Curette		Sig.
	Mean	SD	Mean	SD	
V0	2.043	0.186	2.032	0.109	N.S
V1	0.370	0.058	0.373	0.056	N.S
V2	0.356	0.055	0.367	0.057	N.S
V3	0.328	0.034	0.358	0.058	N.S

NS: Not significant differences $P > 0.05$

Table (3): Percentage of bleeding on probing for the two methods of instrumentation at different visits.

Visits	Fiberglass	Curette	Sig.
V0	100	100	N.S
V1	71.94	67.93	N.S
V2	29.49*	30.53*	N.S
V3	6.47*	12.21*	S

*: High significant difference from the baseline examination (V1) $P < 0.01$.

NS: Not significant

Table (4): Frequency distribution of sites according to initial probing depth among the two methods of instrumentation.

Initial pocket depth/ mm	Fiberglass No. of pockets	Curette No. of pockets
5	39	43
6	57	55
7	33	26
8	10	7
Total	139	131

significant $P > 0.05$ S: significant differences $P < 0.05$

Table (5): Mean probing pocket depth for the two methods of instrumentation at different visits.

Visits	Fiberglass		Curette		Sig.
	Mean	SD	Mean	SD	
V0	6.100	0.891	5.977	0.860	N.S
V1	5.981	0.882	5.950	0.853	N.S
V2	3.351*	0.768	3.549*	0.814	N.S
V3	2.950*	0.738	3.103*	0.782	N.S

*: High significant difference from the baseline examination (V1) and (V2) $P < 0.01$.

NS: Not significant $P > 0.05$

Table (6): Mean relative attachment level for the two methods of instrumentation at different visits.

Visits	Fiberglass		Curette		Sig.
	Mean	SD	Mean	SD	
V0	7.992	1.653	8.076	1.201	N.S
V1	7.823	1.584	7.954	1.172	N.S
V2	5.887*	1.091	6.013*	1.033	N.S
V3	5.457*	1.169	5.752*	1.194	N.S

*: High significant difference from the baseline examination (V1) and (V2) $P < 0.01$.

NS: Not significant $P > 0.05$

Discussion

This is the first study carried out to evaluate the effectiveness of using motor-driven fiberglass burs in treatment of periodontal disease (root planing).

A split mouth design was used in this study gives an advantage in that all working sites can be compared under the same conditions such as the oral hygiene of the patients, host immunity and the presence microflora.

All procedures and the type of periodontal treatment were directed towards removal of plaque which is considered as a primary etiological agent and removal of plaque retentive factors like calculus⁽²⁶⁾.

In prebaseline examination, prior to carry out the root planing all patients were subjected to supragingival scaling, professional tooth cleaning and received instructions in oral

hygiene, which were reinforced when necessary, thus a high standard of oral hygiene was maintained through out the study, so from the finding of the study there was a significant improvement in mean plaque score and it was maintained below (0.5) at all visits and for both methods of root planing.

There was no significant difference between the two methods in mean plaque score.

All examined surfaces showed bleeding on probing at prebaseline examination. After scaling, polishing and oral hygiene instructions there was significant reduction in bleeding sites. At (V2) visit there was a marked reduction in the percentage of sites that bled on probing for the two methods of instrumentation compared with the baseline examination (V1). This was in accordance with other studies that used hand and ultrasonic instrumentation⁽⁹⁾.

10, 20). There was a continuous improvement in gingival bleeding at (V3) examination with no significant differences between the two types of treatment.

The findings of the study indicated that there was a marked reduction in probing pocket depth for both types of treatment at the end of the study (V3) visit. There was no significant difference observed between the two methods of root planing. Also there was a marked improvement in relative attachment level for both methods of root planing with no significant differences between them at all visits.

The results of our study demonstrated that both methods of root debridement lead to a marked improvement in all clinical parameters.

From the findings of this study it is obvious that the use of fiberglass burs in root planing is effective in removal of calculus and detoxification of the root surfaces similar or even better than hand instrumentation, while many laboratory studies showed that ultrasonic instrumentation remove less calculus and necrotic cementum and leave rougher surface than hand instruments^(16,17,27), and other studies reported that more calculus were remained after scaling with ultrasonic devices than hand instrumentation^(28,29).

The most important difference between the two methods was in the time of instrumentation, there was a highly significant difference in the time necessary for debridement with use of fiberglass bur comparing to the use of curette. From this finding, the study indicated that the proper and effective root debridement is easier to perform and time saving with fiberglass burs which is the same finding as when use an ultrasonic scalers when comparing to hand instruments^(9, 10, 30).

We suggest further studies to compare the clinical and microbiological parameters in patients having advanced forms of periodontitis, in addition to carry out a long term studies to evaluate the treatment out come.

In conclusion during 3 months period of the study, it appeared that the use of power-driven fiberglass burs in root debridement was effective as the treatment with hand instrumentation.

References

- 1- Schenkenin H : The pathogenesis of periodontal diseases . Journal of periodontal (1999) 70 : 457-470 .
- 2- Theilade E , Wright W , Jensen S, Loe:- Experimental gingivitis in man II.A longitudinal clinical and bacteriological investigation .J periodontal Res 1966,1: 1-13 .
- 3- Socronsky SS : Relation of bacteria to the etiology of periodontal diseases . J dent Res 1970 ; 49 : 203.
- 4- Page R, Schroeder H : Pathogenesis of inflammatory periodontal diseases .A Summary of Current work . lab invest 1976; 33: 235-249.
- 5- Theilade J: Dental plaque and dental calculus . In textbook of clinical periodontology Ed: Lindhe J, 2nd ed- Copenhagen Munks geard 1989:pp: 92-128.
- 6- Driessens F, Borggrevens J, Verbeeck S, Van Dijk J , Feagin F:- ON the physio-Chemistry of plaque calcification and the phase of composition of dental calculus. J periodontal Res 1985 ; 20:329.
- 7- Garrett Js: Root planing : A perspective. J periodontol 1978; 49:553 .
- 8- Grant Da, Stern 1B , Listgarten MA:- periodontics in the tradition of Gottlieb and urban, 6th ed, the c.v. mosby company 1988,pp 650-652.
- 9- Badersten A, Nilveus R, Egeiberg J:- Effect of non surgical periodontal therapy . I . Moderately advanced periodontitis. J Clin periodontol 1981;3: 57-72.
- 10- Copulos TA, low SB , Walker CB, Trebilcock YY, Hefti AF.: Comparative analysis between a modified ultrasonic tip and hand instruments on clinical parameters of periodontal disease.J periodontal 1993; 64: 694-700.

- 11- Boretli G, Zappa U, Galf H, Case D.: short term effects of phase I therapy on crevicular cell populations. *J periodontol* 1995 ;66: 235-240 .
- 12- Lindhe J, Karring T, Lang Np.: Clinical periodontology and implant dentistry .3rd ed , Copenhagen , Munksgaard company , 1998 ,pp 447-451 .
- 13- Kopic TJ , O'Leary T, Kafrawy A: Total calculus remover : an attainable objective? *J periodontol* 1990 ; 61: 16-20 .
- 14- Brodford M , Eschler A, Repley J.: Mechanical and chemical root preparation in vitro : Efficiency of plaque and calculus removal . *J periodontol* 1991 ;62: 751-760.
- 15- Hunter R, O'Leary T,kafrawy A: The effectiveness of hand versus ultrasonic instrumentation in open flap root planing . *J periodontol* 1984 ;55 : 697-703 .
- 16- Allen E, Rhoads R: Effects of high speed periodontal instruments on tooth surfaces . *J periodontal* 1963 ;34:352-356 .
- 17- Kerry GJ: Roughness of root surfaces after use of ultrasonic instruments over hand curettes . *J periodontal* 1967; 38: 340-346.
- 18- Lie T, Meyer K: calculus removal and loss of tooth substance in response to different periodontal instruments. A scanning microscopic study .*J Clin Periodontal* 1977;4:250-262.
- 19- Drisko CH: Root instrumentation power driven versus manual scalers, which one? *Dent Clin North AM* 1998;42:229-244.
- 20- Ismail MN: Comparative analysis between perio- probe tips of piezoelectric ultrasonic scaler and hand curette on clinical parameters of periodontal disease .Msc thesis , Dental college, University of Baghdad ,2000.
- 21- Rinaldi P: Esthetic correction of PFM restoration: A case report .*Pract Periodontal Asthet Dent* 1996;8:34-36.
- 22- Paul S, Acharer P: Post and core reconstruction for fixed prosthodontic restoration. *Prac Period Asthe Dent* 1998;5:513-520.
- 23- Ferrari M,Vichi A , Mannocci F, Meson N: Retrospective study of the clinical performance of fiber posts. *AM J Dent* 2000;13:9B-13B.
- 24- Oguz Y., Tayfun A:-Microhardness of composition in simulated root canals carried with light transmitting posts and glass- fiber reinforced composites posts *J of Endodontics* 2005;31:104-106.
- 25- Silness P , Loe H: Periodontal disease in pregnancy . *Acta Odont Scand* 1964 ; 22 121
- 26- Loe H , Theilade E , Jensen S : Experimental gingivitis in man.*J Periodontol* 1965 ; 36:177-187.
- 27- Cross- Proline GN, Stach PJ , Newman SM: Effect of curette and ultrasonics on root surfaces. *Am Dent J* 1995; 8 (3) :131-139.
- 28- Moscow BS , Bressman E: Cemental response to ultrasonic and hand instrumentation. *J . Am Dent Assoc* 1964 ; 86:698-703.
- 29- Kocher t, Ruhling A , Momsen H , Plagmenn H : Effectiveness of subgingival instrumentation with power- driven instruments in the hands of experienced and inexperienced operators. A study on monkeys. *J Clin Periodontol* 1997 ; 24:498-504.
- 30- Torfason T, Kiger R,Selvic Ka and Egelberg J.: Clinical improvement of gingival conditions following ultrasonic versus hand instrumentation of periodontal pockets. *J. Clin Periodontol* 1979 ;6:165-176.