

Original article

EFFECTIVENESS OF NON SURGICAL THERAPY ON PERIODONTAL POCKETS IN PATIENTS WITH MODERATE CHRONIC PERIODONTITIS SEEN AT THE UNIVERSITY OF GHANA DENTAL SCHOOL CLINIC

Vasco E¹, Kwamin F², Tormeti D¹, Ndanu TA³

¹Department of Preventive Dentistry, ²Department of Oral Pathology/Oral Medicine, ³Department of Community Dentistry, Dental School, University of Ghana, Accra, Ghana

ABSTRACT

BACKGROUND: One of the sequelae of periodontal disease is pocket formation. The extent of therapy to eradicate the disease depends on the severity of the disease. Treatment can be achieved by either non-surgical or surgical therapy. Non-surgical therapy is normally instituted first and depending on outcome, a surgical therapy can be planned for.

OBJECTIVE: The aim of this study was to determine the effectiveness of non-surgical periodontal therapy on pocket reduction in Ghanaian patients with moderate chronic periodontitis.

METHODS: The study was interventional, spanning a period of 5 months for each patient. Twenty (20) patients with pocket depth 5 – 7 mm between the ages of 30 – 81 years were treated using hand and ultrasonic instrumentation at the University of Ghana Dental School clinic (UGDS). Periodontal parameters measured include plaque scores, bleeding on probing (BOP) scores, probing pocket depth (PPD), probing attachment level (PAL) and gingival recession. Significance level was set at 0.05.

RESULTS: Patients with a mean PPD of 5.5mm at baseline was reduced to 3.5 mm at the end of the period and the mean PAL of 3.1mm reduced to 1.7 mm. The reductions were significant. Plaque scores and BOP scores were also significantly reduced. Recession recorded a mean increase which was insignificant

CONCLUSIONS: Probing pocket depth 5 – 7 mm can be reduced significantly by a mean of 2mm in Ghanaian patients with chronic periodontitis, using oral hygiene measures, scaling and root planning.

KEY WORDS: Periodontitis, Non-surgical therapy, Ghana

Correspondence address:

Dr. F. Kwamin

P. O. Box DS-621, Dansoman,
Accra, Ghana

Tel: +233208153713

tkwamin@yahoo.com

INTRODUCTION

Periodontitis is an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms or groups of specific microorganism resulting in progressive destruction of the periodontium ¹. Chronic periodontitis formerly known as adult

periodontitis is the commonest among the various forms of periodontitis. The disease is generally slowly progressive except when influenced by local environmental factors when it becomes rapidly progressive ². It begins as plaque induced gingivitis, a reversible condition that when left untreated may develop into chronic periodontitis and eventual loss of teeth³.

Gingivitis usually does not proceed to periodontitis, however gingivitis frequently precedes periodontitis and usually associated with periodontitis⁴. The progression of the disease may be continuous or by burst of activity^{5,6}.

Characteristic clinical findings in patients with untreated chronic periodontitis may include supragingival and subgingival plaque accumulation (frequently associated with calculus formation), gingiva inflammation, recession of the gingiva, pocket formation, loss of periodontal attachment, loss of alveolar bone, increased mobility, drifting and tooth exfoliation may occur⁷. In patients with poor oral hygiene, the gingiva may be slightly, to moderately inflamed. In many patients especially those who perform regular home care measures, the changes in color, contour and consistency frequently associated with gingival inflammation may not be visible on inspection and inflammation may be detected only as bleeding of the gingiva in response to examination of the periodontal pocket with a periodontal probe⁸.

Chronic periodontitis can be clinically diagnosed by the detection of chronic inflammatory changes in the marginal gingiva, presence of periodontal pocket and loss of clinical attachment. It is confirmed radiographically by evidence of alveolar bone loss. These findings may be similar to those seen in aggressive periodontitis. A differential diagnosis is based on the age of the patient, rate of disease progression over time, familial nature of aggressive disease and relative absence of local factors in aggressive disease compared with abundant plaque and calculus in chronic periodontitis⁷.

Chronic periodontitis is considered a site specific disease; the clinical signs are believed to be caused by the direct, site specific effects of subgingival plaque accumulation. As a result of this, local effect such as pocketing, attachment and bone loss may occur on one surface of a tooth while other surfaces maintain normal attachment level⁹.

According to the 1999 classification, periodontitis is classified into chronic periodontitis, aggressive periodontitis and periodontitis as a manifestation of systemic disease. Chronic periodontitis may be sub classified into localized and generalized forms. In the localized form <30% of sites are involved and in the generalized form >30% of sites are involved. The disease may be further described by its severity, it may be slight, moderate, or severe based on amount of clinical attachment loss (PAL): slight 1-2mm attachment loss, moderate 3-4mm AL, and severe 5mm or more PAL.

Globally, chronic periodontitis is most prevalent in adults but can be observed in children. It has been difficult to determine the level of oral health status of Ghanaians because of limited data. There has been only a few studies on the prevalence of periodontal disease and mostly of only 6 – 12 year old school children covering only a few selected cities¹⁰. Available data indicate a very high proportion (97%) of children with poor oral hygiene defined as percentage with stain or debris on the gingival third of two or more teeth¹¹. One study detected relatively few (4%) 12 year old with shallow periodontal pockets whilst another study detected shallow periodontal pockets (4 – 5mm) in 21% of school children although no deep pockets (6mm) were found^{12,13}. The prevalence of periodontal disease in Ghanaian adults found generalized chronic gingivitis to be universal¹⁴ and the WHO data bank by the Niigata University Graduate School of Medical and Dental Sciences – Japan, indicates that in 1991, of the 137 dentate adults between age 35 – 44 years examined 37 of them had probing pocket depth between 4- 6 mm¹⁵. The limited adult data makes it almost impossible to discuss periodontal diseases prevalence in adults in Ghana.

Chronic periodontitis generally becomes clinically significant after age 30, increasing in prevalence and severity with age¹⁶. Prevalence of attachment loss and periodontal pockets are higher in males than females^{16,17}. Males are also more likely than females to have more teeth with attachment loss and more teeth with pockets.

Periodontal diseases are managed primarily by two modalities; non-surgical and surgical therapies. Non-surgical therapy include mechanical therapy (mainly), pharmacotherapy and occlusal therapy as adjuncts to the main therapy.

Mechanical therapy can be achieved by scaling and root planing with hand or engine driven instruments. Studies have shown high success rates of non-surgical therapy in the treatment of mild to moderate periodontitis¹⁸⁻²⁰. The treatment of inflammatory periodontal disease has several major therapeutic goals. The ultimate goal of therapy is to sustain the masticatory apparatus especially teeth and their analogues in a state of health.

The elimination of periodontal pocket is to create an environment for disease control, arrest and prevent progression of disease. The extent to which this can be satisfied is dictated by professional knowledge, skill, experience and availability of appropriate biotechnical equipment and supplies. Other factors contributing to success or failure of therapy include patient compliance, severity of disease and host immune response²¹.

Scaling is defined as instrumentation of crown and root surfaces of teeth to remove plaque, calculus and stains from these surfaces. Root planing is defined as a definitive treatment procedure designed to remove cementum or surface dentin that is rough, impregnated with calculus or contaminated with toxins or microorganism². Scaling and root planing can be achieved by hand instrumentation, ultrasonic and sonic scalers, and ablative laser therapy²². It has been demonstrated that hand or ultrasonic and sonic scalers produce similar periodontal healing response with respect to probing pocket depth, bleeding on probing and clinical attachment level²³⁻²⁵. The greatest changes with respect to probing depth reduction and gain in clinical attachment can be recorded after 4 to 6 weeks, but gradual repair and maturation of the periodontium may occur over 9 to 12 months².

The teeth most affected by periodontal pocketing are the upper molars followed by the lower molars with the least being the canines, suggesting that exceptional care be given to

these most susceptible teeth for periodontal disease in order to prevent the development of irreversible damage of the periodontium²⁶.

Surgical treatment is scheduled according to the results based on re-evaluation following the non-surgical therapy to further eradicate the remaining pocket and inflammation to create a healthy environment and to stimulate regenerative potential of periodontium²⁷.

In a number of clinical studies on the outcome of periodontal therapy, the crucial role of supportive periodontal therapy (SPT) in maintaining successful results have been documented^{18,27-29}. In these studies, probing depths and clinical attachment levels were maintained as a result of a well organized professional maintenance care program – recall intervals varying between 3 - 6 months, irrespective of the initial treatment modality performed.

For patients with periodontitis, the frequency of recall visits has to be adapted to the risk of susceptibility for disease. Patients with advanced periodontitis may need SPT at regular and rather short time interval (3 – 4 months)³⁰, while for mild to moderate forms of periodontitis, one annual visit may be enough to prevent further loss of attachment³¹, but it has to be realized that a small proportion of patients will experience recurrent infections with progression of periodontal lesions in a few sites in a completely unpredictable mode.

MATERIALS AND METHODS

Study Population

The study was carried out at the University of Ghana Dental School Clinic, which is a primary referral center in Ghana.

The study population consisted of 20 patients of 30 years old and above referred to the periodontics clinic. The patients were selected consecutively as they were diagnosed of moderate chronic periodontitis over a period of 5 months (February to May 2014).

Inclusion criteria

- Patient should be 30 years old and above.

- The selected patient should have periodontal bone loss of up to one third of the root length.
- Clinical signs of gingival inflammation and probing pocket depths 5 - 7mm with calculus at one tooth site at least, in each quadrant.

Exclusion criteria

- Patients with any past medical history of chronic disease.
- Patients on medication such as antibiotics, antidiabetics, antihypertensives (calcium channel blockers), phenytoin and immunosuppressants that may modify the disease or the response to treatment.
- Patient undergoing periodontal treatment of any form or has had periodontal treatment in the past 2 years.
- Teeth with defective and sub gingival restorations
- Smokers

Method

After recruitment of patient, closed ended questionnaire was administered and basic demographic data on them was documented.

Clinical examination

Periodontal clinical examination was carried out and the following parameters recorded on the periodontal chart at each visit by the investigator for comparison with subsequent records; dental plaque, bleeding on probing, probing pocket depth and probing attachment level and gingival recession. All clinical measurements were taken from mid – buccal and mid – lingual sites and buccal aspect of interproximal contact area for mesial and distal sites of each tooth to the nearest 1 mm using Periowise probes calibrated at 3, 5, 7, 10 mm with 0.5mm diameter and round tip (Henry Schein Dental).

Dental plaque

O'leary's plaque index was used to record plaque after staining with plaque disclosing dye(32). Presence of plaque was recorded if an area of clearly visible stained material was present along the gingival margin and if this material can be removed with the side of the probe. The percentage of surfaces with plaque out of the total number of examined tooth surfaces was calculated. All teeth present were

examined. This form allows the patient to visualize his own progress in learning plaque control which has a motivating effect on patients.

Bleeding on probing (BOP)

This parameter is determined if bleeding occurs subsequent to probing. A positive score is recorded for a bleeding pocket. The proportion of bleeding surfaces out of total number of examined surfaces was calculated for each patient at each visit. All teeth present in the mouth were examined.

Probing pocket depth (PPD) and probing attachment level (PAL).

PPD was measured as the distance from the gingival margin to the base of the periodontal pocket. PPD between 5 – 7mm were selected.

PAL was measured by deducting the distance from cement-enamel junction (CEJ) to the gingival margin (GM) from the distance obtained for the corresponding PPD for sites without prior recession, where there was recession, the distance CEJ to GM was added to the corresponding PPD.

Gingival recession

This distance was taken in areas of gingival recession and was calculated as the distance from CEJ to the GM at initial examination and compared with the distance at subsequent visits.

Radiographic examination

An orthopanthomograph for each patient was examined to assess the overall pattern of bone loss and to detect any anomaly radiographically that might interfere with treatment. Periapical radiographs of selected teeth were also taken for diagnosis and further treatment planning for the patient.

Clinical procedure

Each patient was taken through oral hygiene instructions and motivation. Patients were taught circular method of tooth brushing and interdental cleaning either using a dental floss or an interdental brush of the appropriate size. Cleaning technique was tailored according to the patient's needs.

Instrumentation was started a month after oral hygiene instructions, using both hand and ultrasonic instruments. The left and right sides

of the jaws were assigned for either ultrasonic or hand instrumentation by simple randomization. Each patient was seen at 5 sessions or visits over a period of 5 months as follows:

- 0 First session; oral hygiene instruction, motivation and baseline measurements.
- 1 Second session; a month after first session. Measurements and full mouth debridement using Woodpecker ultrasonic scaler model UDS – J with P3D and P4(Guilin Woodpecker Medical Instrument Co., Ltd) and Gracey 7/8, 11/12, 13/14 (Hu – Friedy) hand instruments.
- 2 Third session; 2 weeks from the second session. Measurement of periodontal parameters and selective instrumentation
- 3 Fourth session; 6 weeks from the second session. Measurements of periodontal parameters and selective instrumentation
- 4 Fifth session; 16 weeks from second session. Measurements and instrumentation.

Instrumentation consisted of supra gingival scaling, sub gingival scaling and root planing. Local anesthesia was given when patient experienced pain during procedure. Instrumentation of surfaces of teeth were done until operator was satisfied the surfaces have been adequately instrumented.

Reproducibility

Each tooth was instrumented 4 minutes for ultrasonic scaling and 6 minutes for hand scaling. Operator was calibrated, and was found that it took an average of 4 minutes to adequately instrument a tooth using ultrasonic scaling and 6 minutes for hand scaling.

Reproducibility of probing pocket depth was 96% within the limit of 1mm when operator was calibrated using repeated probing in 3 patients. 192 sites were duplicated, 66% of sites were duplicated with no difference, 30% were duplicated with a difference of 1mm and 0.04% of sites with a difference of 2mm.

Data collection and analysis

Data was captured by interviewer administered questionnaire; a periodontal chart form (Appendix IV) was used to record all periodontal parameters taken. A different chat was used at each visit. All the data collection was done by the investigator

Microsoft access database was used to capture data and cleaning done by Excel 2007. The cleaned data was exported into Statistical Package of Social Sciences (SPSS version 16) for analysis.

Means were compared using T- test for two means and ANOVA for more than two means. Significant level was set at 0.05.

Ethical consideration

Ethical approval for the study was obtained from Ethical and Protocol Review Committee of The University of Ghana Medical School. Written and verbal informed consent was obtained from the patient to be recruited into the study. Other conditions that the patients had in their mouths apart from chronic periodontitis were referred to the appropriate departments for management as part of their treatment plan.

RESULTS

Patients between the ages of 30 – 81 years with an average of 53.5 ± 12.9 years were selected for the study, 65% of the patients aged between 40-59 years (Fig 1). A greater proportion of the patients seen were females (60%). Most of the patients treated have had formal education with the majority (50%) having tertiary education.

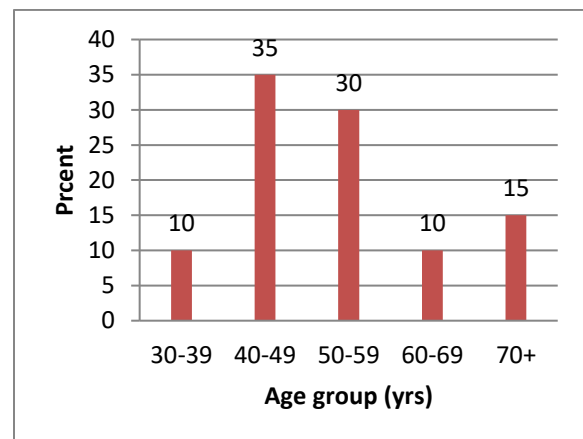


Fig 1: Age distribution of patients treated

The majority of the patients seeking treatment reported because they had mobile teeth, bleeding gingiva or pain.

A total number of 289 teeth were involved in the study. Of these teeth molar involvement recorded the highest frequency of 145 teeth (50%), then the premolars which recorded 74

teeth (26%) and the least was the incisors and canines.

Among the teeth affected, a higher percentage of the teeth were maxillary teeth (53%) as compared to the mandibular teeth which recorded 47%. There were 438 periodontal sites selected; mesial and distal sites of the teeth selected were more (95%) than buccal and lingual sites.

Dental plaque

The mean proportion of surfaces of teeth with dental plaque at baseline before oral hygiene instruction (OHI) was given was 74.6 ± 24.2 (Fig 2a).



Fig 2a: Chronic periodontitis with accumulation of plaque and calculus at the gingiva margins and recession.

One month after OHI, the mean value for the presence of plaque reduced to 70.9 ± 23.3 . Comparison of the two means shows a statistical significant difference (p -value = 0.0001) between surfaces of teeth with plaque before and after OHI only (Fig 2b).



Fig 2b: Improved oral hygiene with reduced plaque after instrumentation.

The mean dental plaque reduced significantly from treatment baseline (75%) to the last session of treatment (19%) of instrumentation (Fig 3). There was a significant reduction in plaque levels between baseline and subsequent sessions of instrumentation, p – value <0.0001.

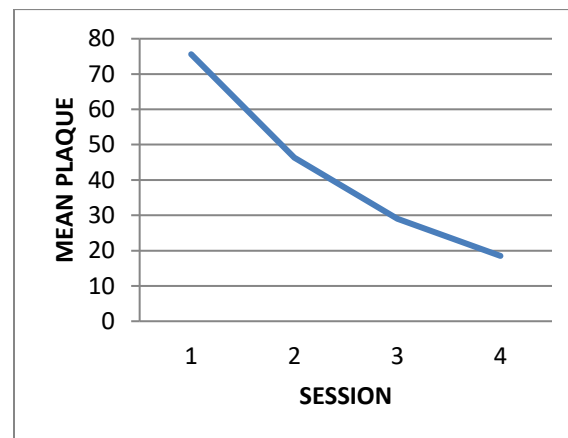


Fig 3: Mean plaque reduction after instrumentation

Bleeding on probing, (BOP)

The mean surfaces bleeding on probing before OHI at baseline was recorded at 83.4%, this figure reduced to 83.05% after initial OHI. There was an improvement of the mean percentage surfaces bleeding on probing by 0.35%. Treatment by instrumentation recorded a significant reduction of BOP from a mean of 83.8% at first session to 26.2% at the fifth session (Fig 4), p - value < 0.0001.

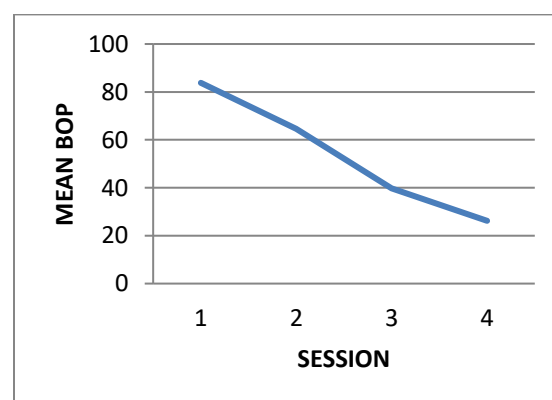


Fig 4: Reduction of mean BOP after instrumentation.

Probing pocket depth, PPD

The mean PPD at baseline before instrumentation was 5.5mm (Fig 5). This figure was reduced to 3.5mm at fifth session after

instrumentation (Fig 6). There was a significant reduction of PPD by a mean value of 2mm. There was a significant difference at all levels of intervention with a p – value < 0.0001 (Tab. 1).



Fig 5: Orthopantomogram showing deep periodontal pockets and interdental bone loss.

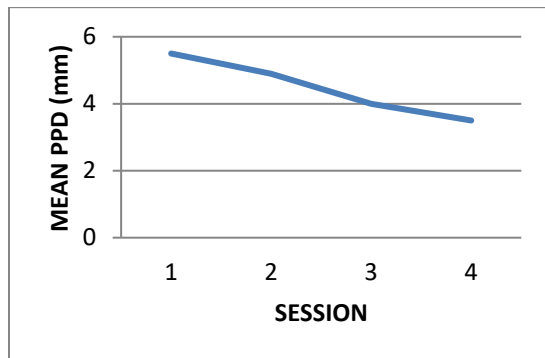


Fig 6: Mean PPD reduction after instrumentation

Table 1: Multiple comparison of mean PPD reduction at the various sessions

SESSION	SESSIONS	MEAN DIFFERENCE	P-VALUE
1	2	0.5929*	0.0001
	3	1.4670*	0.0001
	4	1.9544*	0.0001

*. The mean difference is significant at the 0.05 level

Probing attachment loss, (PAL)

There was no significant difference in the mean PAL between the baseline and the second instrumentation visit but subsequently showed significant reduction at the third and fourth visits. (Tab.2)[Fig 7].

Table 2: Multiple comparison of mean PAL at the various sessions

SESSION	SESSIONS	MEAN DIFFERENCE	P-VALUE
1	2	0.3597	0.136
	3	1.0838*	0.0001
	4	1.3830*	0.0001
3	1	-1.0838*	0.0001
	2	-0.7241*	0.003
	4	0.2992	0.215

*. The mean difference is significant at the 0.05 level

Gingival recession

The mean recession of teeth treated increased from a value of 0.26mm at baseline to 0.37mm at last session, there was no significant change from baseline to the last session of instrumentation.

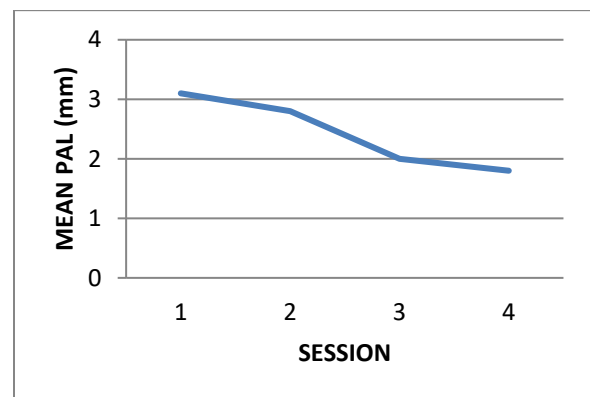


Fig 7: Mean PAL reduction with instrumentation

DISCUSSION

Changes in clinical parameters subsequent to root surface instrumentation are intimately associated with post-therapy healing. Studies^{33,34} have shown that treatment with scaling and root planing results in the regeneration of the root-epithelial interface as a long-junctional epithelial attachment which precluded the formation of a new connective tissue attachment. Re-establishment of the attachment epithelium appears to occur within one or two weeks. Concomitant with formation of the attachment epithelium are gradual reductions in inflammation and probing pocket depths.

This study sought to determine the extent to which periodontal pocket reduction takes place in Ghanaian patients with moderate chronic periodontitis. The study was carried out in 20 patients with an average age of 53.5 years with 439 sites. A greater proportion of them were females (60%) which might give the impression of higher prevalence among females. This is in contrast to a study in Nigeria which reported a higher prevalence of attachment loss and periodontal pockets in males than in females. The results obtained in the present study may be attributed to better dental clinic attendance behavior among Ghanaian females than male patients.

The literacy level of Ghana is 71.5%³⁵. This trend is expected to be followed in clinic attendance but it was observed in this study that majority of the patients (90%) had at least primary educations, and 50% of them had tertiary education. Though the sample size is too small to draw any conclusion, it can be suggested that the awareness to seek for treatment is higher among the educated than in none educated who recorded 10%.

The most reported symptoms among the patients were pain, bleeding gingiva and mobile teeth, which are symptoms consistent with periodontitis. None of them sought treatment without symptoms. This finding is consistent with a study carried out in Tanzania to compare the dental treatment demands and needs of patients; it was observed that the principal reason for utilization of dental health care services is related to discomfort^{36,37}. Thus patients do not routinely seek dental check-ups as a preventive measure.

It was found out in the analysis of the distribution of disease by tooth type that, prevalence of disease was highest in the molar teeth (50%), followed by the premolars (26%), and then incisors and canines (24%) consistent with the finding of Arowojola²⁶. This clearly shows that prevalence of disease activity increases from anterior to posterior regions of the mouth. The trend suggests a relatively reduced accessibility to cleaning in the posterior regions of the dentition compared with the anterior regions.

The maxillary teeth were more involved (53%) than the mandibular teeth (47%). The difference could be related to the differences in the ability of the patients to clean the two arches. Literature reports that the maxillary molars are more susceptible to periodontitis than other teeth³⁸ and the explanation for the difference includes anatomic characteristics and local variations in the bacterial flora.

More interproximal sites (mesial and distal) were recorded, 95% as compared to buccal and lingual sites, which recorded 5%. Accessibility to those sites are difficult using the conventional cleaning methods, thus are more susceptible to periodontal breakdown.

All the patients recorded significant reduction from a baseline mean plaque score of 75% to 70.9% with OHI measures only for a period of a month, the reduction though statistically significant, was not substantial clinically. This value further reduced significantly to an average value of 18.5% and 18.5% with instrumentation at end of 5 months of treatment. The change in plaque score was due to effectiveness of oral hygiene measures and professional removal of plaque and calculus by scaling and root planning.

The mean bleeding scores for the whole group reduced from baseline value of 83.4% to 83.05%, a mean difference of 0.35% after a month of oral hygiene measures. The difference though significant was not substantial as compared with studies by Cercek et al³⁹ where clinically significant reductions of bleeding scores were realized after 3 months of oral hygiene measures alone. Significant reduction of mean bleeding scores was realized in this study with instrumentation to 26.2% at the end of the four sessions. Individuals with low mean BOP percentages (<10%) may be regarded as patients with low risk for recurrent disease, while patients with mean BOP percentages (> 25%) are considered to be at high risk for re-infection. The mean BOP value could possibly be reduced further over time with maintenance therapy as a measure to prevent re-infection. No significant difference in the mean BOP was observed when comparing hand and ultrasonic instrumentation

because the two methods produced similar effect on BOP.

The mean PPD was reduced significantly from 5.5mm to 3.5mm with instrumentation, a mean difference of 2mm over a period of 5 months of OHI, scaling and root planing. Multiple comparisons of the mean PPD at the various sessions of intervention, showed a significant change of the mean PPD at all levels of intervention.

Also, comparing the values of the mean differences between baseline and the various sessions, the highest change was observed at the sixth week. The changes observed were similar to those of Cercek et al (1983)³⁹ and Kaldahl et al²⁹, where the mean probing depth reduction for moderately deep sites (4 – 6mm) was 1.29 mm versus 2.16 mm for deeper sites (≥ 7 mm), but they observed that little further improvement seemed to take place after 4 – 5 months. The reduction in PPD is as result of resolution of inflammation leading to shrinkage of the tissues, gingival recession and a gain in clinical attachment in the form of long junctional epithelium.

The mean PAL observed a significant reduction of 1.35mm with instrumentation over the period of therapy. Multiple comparisons of the mean differences at the various sessions observed no significant difference in the values at baseline and two weeks post-instrumentation, however, a significant difference was observed between values at baseline and sixth weeks and beyond post instrumentation. Reduction of the mean PAL depicts a gain in attachment. The desirable attachment is a connective tissue attachment that was lost to periodontitis but this attachment is usually replaced by epithelial attachment in the form of long junctional epithelium during healing after scaling and root planning. The differentiation of type of attachment can only be verified by histological means.

There was increase in the mean gingival recession of 0.11mm over the 5 months of instrumentation. The mean differences of recession at the various sessions of instrumentation were insignificant. Comparing this observation with earlier study by Badersten

et al (1981)¹⁹ in which the mean recession increase was 1.5mm (although the results were over 13 months period most of the recessions occurred within 2 – 3 months). Values obtained in the present study were far lower. The differences observed between the present study and that of Badersten et al could be due to oral hygiene practices, tissue biotype and initial gingival inflammation⁴⁰⁻⁴². The results of the present study demonstrate that improvements which are clinically significant can be obtained after oral hygiene instructions, scaling and root planing in Ghanaian patients with moderate chronic periodontitis.

CONCLUSIONS

Probing pocket depths between 5 – 7mm can be reduced significantly by a mean of 2mm using OHI measures, scaling and root planing.

Significant change in probing attachment levels was realized at 6 weeks post treatment. Prevalence of periodontal pocketing was higher in the interproximal sites, and the molar teeth were the most affected.

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Conflict of interest:

There is no conflict of interest to be declared under this study because the study was not funded by any corporate interest.

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