

DIFFERENCES IN AMOUNT & ARCHITECTURE OF ALVEOLAR BONE LOSS IN CHRONIC & AGGRESSIVE PERIODONTITIS ASSESSED THROUGH PANORAMIC RADIOGRAPHS

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ABSTRACT

Purpose of this study was to investigate the difference in amount and architecture (pattern) of alveolar bone loss between patients with chronic and aggressive periodontitis assessed through panoramic radiographs. One hundred patients ranging in age from 15-58 years with at least one sextant with a basic periodontal examination (BPE) score of 4 were recruited with strict selection criteria for study. Each subject was given a basic periodontal examination score from 1-6 per full mouth. Panoramic radiograph was taken for each subject using the same standard. Alveolar bone loss was measured for each tooth from most apical defect point to the cemento-enamel junction as a percent of a root length and the total alveolar bone loss percentage for each jaw were averaged. Results of this study showed that the mean age of patients with aggressive periodontitis was significantly smaller than that of chronic periodontitis patients ($P < 0.05$). Localized aggressive periodontitis group had the smallest mean age (22.71 ± 5.22 years). Mean alveolar bone loss was significantly higher in patients with aggressive periodontitis than chronic periodontitis ($P < 0.05$). There was no statistically significant difference in male / female proportions for having aggressive disease ($P > 0.05$). Correlation between basic periodontal examination and alveolar bone loss was highly significant ($r = 0.98$, $P < 0.01$).

The study concluded that patients with aggressive periodontitis had significantly higher alveolar bone loss and attachment loss in early age of life. Basic periodontal examination was significantly correlated with panoramic alveolar bone loss.

Key words: Chronic periodontitis, aggressive periodontitis, amount and architecture of bone loss, Basic periodontal examination, and panoramic radiographs.

INTRODUCTION

Periodontitis can be defined as an infectious disease, resulting in a local inflammation within the supporting tissues of the teeth, leading to progressive loss of periodontal ligament and supporting alveolar bone. It is characterised by pocket formation and/or gingival recession.

It is known that periodontitis is not a single disease but encompasses a range of diseases with varying pathology and clinical severity, dependent upon host susceptibility, bacterial aggression and interactions between these factors. It is thought to be the result of disruption of homeostatic balance between the host response and pathogenic micro-organisms.^{1,2}

Chronic periodontitis is the most common form of periodontitis, which is most commonly detected in adults, but its onset may be demonstrated at any age. The term "chronic periodontitis" was adopted since it is less restrictive than the age dependant designation of chronic adult periodontitis. For the same reason the

term "aggressive periodontitis" was adopted in place of early onset periodontitis.³

Diagnosis of periodontitis is generally based on clinical examination, radiographic findings and historical data. Periodontal examination include probing pocket depth measurements as part of complete periodontal charting or periodontal screening and monitoring as in basic periodontal examination (BPE). Different methods for the assessment of alveolar bone loss (ABL) have been widely used in periodontics. Either direct measurements with millimeter graded rulers or more advanced methods including the application of digital imaging and computer software programs have been used⁴⁻¹⁰. Radiographic examination plays an integral part in the assessment of periodontitis. Panoramic radiographs are valuable in assessing the amount and architecture of ABL; it also assesses furcation involvement as well as the presence of local factors such as calculus and overextended restorations. It is useful in treatment planning, in understanding the severity and extent of the problem. It is considered as important part of the patient's record. Integration of clinical and

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radiographic examination usually results in correct diagnosis, which is crucial for accurate management. Amount and architecture of ABL in aggressive periodontitis (AP) differ greatly from that in chronic periodontitis (CP), and for this reason this study was aimed to; 1. Investigate the difference in mean ABL between patients with chronic and aggressive periodontitis 2. Study the difference in mean age between both groups (CP, AP); 3. Study the difference in proportion between males and females for having AP and finally 4. Measure the association between basic periodontal examination (BPE) and radiographic ABL as screening parameters for occurrence of periodontal disease.

MATERIALS AND METHODS

The sample of this study, conducted in 2002 and 2003, comprised a total of 100 patients (47 males and 53 females) who were referred to periodontal clinic at Prince Rashed Ben Alhassan Hospital, Royal Medical Services–Jordan. Inclusion criteria for enrolment in the study were: 1) subjects must have no complicating medical condition or pregnancy nor they may be using any pharmacological agent known to affect the periodontium. 2) Subjects must have no history of previous specialist periodontal treatment and have no tooth loss, third molars were excluded; and 3) for each subject a BPE score of 4 at least in one sextant and clear OPG were required to participate in this study. Patients were diagnosed as having chronic periodontitis (CP) (localized or generalized; LCP, GCP) or aggressive periodontitis (AP) (localized or generalized; LAP, GAP) according to workshop for the classification of periodontal diseases and conditions.⁽³⁾ The study groups according to the age, gender, pattern of ABL and clinical diagnosis are presented in Table 1.

Clinical examination

Basic periodontal examination (BPE) was conducted for each subject. The mouth was divided into six sextants and full-mouth periodontal examination using WHO (621-C) probe was used to assess whether shallow (3-4mm) or deep (> 6mm) pockets were present. All teeth for each individual were examined and probing pocket depth (PPD) was recorded at 4 sites. Each subject was given a BPE score from 1-6 to represent full mouth.

Radiographic measurements

Alveolar bone loss was measured from panoramic radiographs according to the radiographic linear measurement procedure described by another author¹¹. ABL for each tooth was measured from its most apical point to the cemento-enamel junction (CEJ) as a percent of the root length, and the total ABL % for each jaw was averaged, then ABL % for full mouth was the average ABL% of both jaws. All clinical and radiographic parameters were measured and recorded by one periodontist (YD; the main author).

RESULTS

The patient was the unit of analysis in this study. A descriptive statistical study (mean, standard deviation) was carried out on the measurements of variables collected.

Normality of the distributions for the variables ABL, BPE and age was measured by test of normality (p-p plot). The metric data (ABL%, BPE score) were averaged for each patient. Statistically significant differences between group means were tested using student *t*-test. The Chi-square distribution or Fisher's exact test were used when concerning proportions. Simple Pearson's correlation was used for the study the possible association and interrelationships between BPE and ABL measured from OPG. The level of significance was set at $P < 0.05$.

As shown in Table 1, the study population consisted of 100 patients with a mean (\pm SD) age of 36.91 ± 10.15 years. Forty-nine were AP patients with a mean (\pm SD) age of 29.5 ± 5.9 years compared to 51 patients with CP with a mean (\pm SD) of 42.75 ± 7.51 years. The difference in mean age between both groups was statistically significant ($P < 0.05$, *t*-test). Forty-seven patients were males (20 with AP, 27 with CP) compared to 53 patients were females (29 with AP, 24 with CP). However, the difference in proportions was not statistically significant ($P > 0.05$, Fisher's exact test). AP patients were with vertical bone loss proportion significantly higher than that in CP patients (21 vs. 9) ($P < 0.05$, Fisher's exact test). Data for ABL in all cases were normally distributed, when tested by normality test plot Table 2. The mean maxillary ABL for GCP and GAP was 29.7 ± 11.25 and

TABLE 1: STUDY GROUP ACCORDING TO AGE, GENDER AND PATTERN OF ALVEOLAR BONE LOSS

Case diagnosis	LCP	GCP	LAP	GAP	Total
Age (years) (mean \pm SD)	43.33 \pm 5.77	42.18 \pm 8.25	22.71 \pm 5.22	37.24 \pm 6.3	36.91 \pm 10.15
Gender male/female	9/9	18/15	2/5	18/24	47/53
Pattern of ABL Horizontal/Vertical	17/1	25/8	0/7	28/14	70/30

TABLE 2: SUMMARY OF THE MEAN ALVEOLAR BONE LOSS IN MM

Mean (ABL)/Case diagnosis	Mandibular ABL (M±SD)	Maxillary ABL (M±SD)	Total ABL (M±SD)
LCP	7.50±2.92	8.17±5.29	7.78±3.52
GCP	23.18±10.37	29.70±11.25	26.45±9.61
LAP	30.00±20.00	33.57±10.29	31.86±13.38
GAP	47.86±18.38	55.00±16.53	51.61±15.62

55.0±16.5 respectively, while the mean mandibular ABL for GCP and GAP was 23.18±10.37 and 47.86±18.38 respectively. The difference between patient groups was statistically highly significant ($P<0.05$, t -test). The same results were found when ABL (full mouth) compared between AP and CP (localized or generalized) groups.

Significant correlation were observed between BPE and ABL in all study groups ($r=0.98$, $P<0.01$, Pearson's correlation), (correlations were significant at the level of 0.01)

DISCUSSION

The objective for this study was to investigate the difference in mean ABL between patients with chronic and aggressive periodontitis. One hundred adult periodontal patients presenting with either CP or AP, were evaluated. The results of the present study indicate that patients with AP seemed to have advanced ABL mostly of vertical pattern, while patients with CP seemed to have mild to moderate ABL mostly of horizontal pattern. The results of the present study support the findings of Baer¹² who estimated that 50-75% of the attachment of affected teeth in aggressive periodontitis (formerly known as juvenile periodontitis or early onset periodontitis) may be lost in 4-5 years and the findings of Baer and Benjamin¹³ who found that the rate of bone loss is about three to four times faster than that in typical periodontitis. The pattern of bone destruction around the affected teeth in aggressive periodontitis is mainly vertical or deep angular, while in chronic periodontitis is mainly horizontal. These findings are in agreement with other authors^{14,15}. In the present study, male to female ratio for having aggressive disease was 1:1.45. This finding is acceptable since different earlier and recent studies reported many different sex ratios e.g. Saxby¹⁶ found an almost equal male to female ratio (1.1:1), while Melvin *et al*¹⁷ found a very different sex ratio in Black and Caucasian subjects, with a male to female ratio of 1:0.52 in black subjects and 1:4.3 in Caucasians. However, most of the earlier studies reported that the condition appeared more commonly in females than males; Baer¹² found a female to male ratio was 3:1.

The controversy of the above literature may be explained on the basis of case selection which must be scrutinized before conclusion can be drawn. Again, the above studies based upon subjects presenting to the periodontal clinics, adolescent girl will figure more frequently than boys.

In the present study panoramic radiographs were used to indirectly measure the ABL with a millimeter graded ruler, ABL was measured as a proportion (%) of the root length. Some studies^{18 and 19} have reported that the assessment of ABL from intraoral radiographs usually underestimates the extent or/and the severity. However, other studies have shown that the underestimation of ABL is common on both intraoral and panoramic radiographs when compared to direct measurements during periodontal surgery.²⁰ One study have shown that panoramic radiographs underestimate the extent of ABL varying between 13% and 32%, whereas bitewing and periapical radiographs tend to underestimate ABL with 11–23% and 9–20%, respectively.²¹ Today, panoramic radiographs are used and recommended as the preferable radiographic diagnostic method and are usually supplemented with intraoral radiographs.²²⁻²⁴ Despite the old fashion perception that the intraoral radiographs for dental diagnosis are a gold standard, Panoramic radiographs still with many merits over intraoral radiographs. Panoramic radiographs usually give a wide information about the whole mouth periodontitis, this provide the examiner with a good screening parameter while intraoral radiographs just give a very limited information, panoramic radiograph shows the bilateral symmetry of ABL in both sides of the jaws, which is a characteristic of periodontitis.²⁵ One advantage of panoramic radiography is the reduction in radiation exposure. Thus, the skin entrance dose area product (DAP) for an panoramic radiographs is approximately 11.3 cGy cm² as compared to 9.3 cGy cm² for a single intraoral radiograph at the mandibular molar area using high-speed E-film²⁶. The total exposure to the occipital area by a panoramic radiograph a median surface dose value of 550 mGy has been reported, whereas the median value for an intraoral radiograph was 2.43 mGy.²⁷ Hence, it would appear beneficial to both the patient and the diagnostician if intraoral radiographs could, at least in

part, be replaced by panoramic radiographs. The above are good justifications for the use of panoramic radiographs for assessment of periodontitis ABL. Persson *et al*¹⁰ suggests that ABL measurements from intraoral and panoramic radiographs are highly comparable.

In this study, there was a significant correlation between the clinical and radiographic screening parameters. This result is in agreement with other studies.^{23, 25, 28, and 29} They found that the observed symmetric relationship between the left and right maxillary and mandibular side indicated that there is a significant symmetry in the presence of bone loss in periodontitis and in agreement with similar observations for other clinical parameters.

This study suggests that patients with aggressive periodontitis had significantly higher alveolar bone loss and attachment loss in early age of life; which enhances the need for early detection of the disease for better management and long-term maintenance of functioning dentition throughout patient's life. BPE was significantly correlated with panoramic alveolar bone loss; therefore basic periodontal examination (BPE) should be routinely undertaken for each patient before requesting a panoramic radiograph.

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