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Original Research Article

Radiographic Evaluation of Periodontal Osseous Defects-A Retrospective Study

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Abstract: Periodontal disease is the second most prevalent clinical entity among oral diseases, and is recognized as a serious public health problem. Osseous destruction as a result of periodontal disease is classified according to clinical criteria into horizontal (or even) and angular (or vertical) osseous destruction. The detection and accurate assessment of the location, extent and configuration of the endosseous defect is important for the determination of the tooth prognosis, the treatment plan and the maintenance procedures. Radiographic examination is a complementing mean of great importance to obtain the diagnosis of periodontitis, even though it does not reveal the real state of cellular activity, but shows the consequences upon dento alveolar structures.

Keywords: chairside, gingival bone count index, orthopantomogram, periodontal osseous defects

INTRODUCTION

The hallmarks of periodontal disease are loss of clinical attachment and loss of alveolar bone. Alveolar bone loss leads to increased tooth mobility eventualy leading to tooth loss. Osseous defects as a result of periodontal disease are classified according to clinical criteria into horizontal (or even) and angular (or vertical) osseous defects. Radiographic examination is an adjunct and of great importance to obtain the diagnosis of periodontitis, even though it does not reveal the real state of cellular activity, but shows the consequences upon dentoalveolar structures [1]. Along with clinical examination, provides a detailed assessment of the bone defect, reaching a correct diagnosis of horizontal and angular alveolar bone loss.

Radiographs are routinely used in clinical periodontal practice to support diagnosis and clinical treatment decision making, and to assess long-term outcome of periodontal therapy. Dental radiographic images are primarily useful for the study of past history of hard tissue changes. Inspite of the innumerable limitations that may be presented on radiographic exam, the various benefits overcome these limiting factors. The low cost of the exam, ease of performing it, greater potency of the more up to date X-ray appliances allied to the greater sensitivity of radiographic films that generate less radiation to the individual, are among its advantages.

In the literature, there are descriptions of several techniques for assessment of alveolar bone loss. Compass, ruler, millimeter probe, grid pattern, index and software have been used in numerous studies worldwide [2]. Nevertheless, according to Fukuda [3], there still seems to be no consensus on what would be the most appropriate measurement method for evaluating radiographically the bone level at chair side. Given this, the objective of this study was to assess the alveolar bone loss using gingival bone count index which attempts to provide uniformity in chair side radiographic assessment amongst the clinicians.

MATERIALS AND METHODS

A total of 375 orthopantomograms were collected from Department of Periodontics, College of Dental Sciences in Davangere to assess the type of bone loss using Gingival Bone Count Index in accordance with the ethical guidelines of Institutional Review Board and Rajiv Gandhi University of Health Sciences, Karnataka, India. Radiographs were supposed to meet a single criterion: The reference points (Cementum-enamel junction (CEJ) alveolar bone crest and root apex) should be visible. Criteria such as sharpness, contrast, among others, were not taken into account. The distance between the cementoenamel junction and the alveolar bone crest was recorded as a bone loss when it was greater than 2mm [4]. The crest of the alveolar bone was defined as the most coronal level where the periodontal membrane retained its normal width [5].

SELECTION CRITERIA

Teeth were excluded if any proximal overlapping was present or if any crowding of teeth was present as it would obscure the CEJ location; in the anterior area if they were technically blurred and superimposed by natural anatomical landmarks .If the bony defect for example horizontal bone loss is shared by two teeth ,mesial defect belong to the tooth to be recorded to avoid repetition of the data .If there is a vertical defect between two teeth ,the tooth with exposed root surface belongs to that tooth.

PROCEDURE

The selected radiographs were divided as <30 and > 30 years.OPG was viewed using X ray viewer .The horizontal bone loss was measured only if greater than 2mm from CEJ. Vertical bone defect was recorded till the most apical portion of the defect and mesio-distal from root surface. Furcation radioluceny was noted. Degree of severity of bone loss was measured using Gingival Bone Count Index [6].

Scoring criteria

0- No bone loss
1- Incipient bone loss , notching of alveolar crest
2- Bone loss about 1/4th of root length or pocket formation on one side
3- Bone loss about 1/2th of root length ,pocket formation on one side, not over ¾ root length , slight mobility
4- Bone loss 3/4th root length ,pocket formation on 1 side to apex,mobility moderate,
5- Bone loss complete, marked molility.

The data obtained was subjected to statistical analysis using chi square test with significant level set at ≤ 0.05.

RESULTS

A total of 375 orthopantomograms were collected from Department of Periodontics, College of Dental Sciences in Davangere to assess the type of bone loss using Gingival Bone Count Index. An overall description of the periodontal defects (horizontal bone loss, vertical bone loss, furcation) in the OPG examined is presented in the following table 1-4.

Table 1 shows the distribution of type of bone loss in <30yrs and > 30yrs age group. Bone loss was found to be less in the <30yrs age group than > 30 yrs. However, frequency of defects did not increase with age.

Table 2 shows the distribution of type of bone loss in males and females. . Bone loss was found to be less in the males than in females .Vertical defects and furcation was found to be more in males than in females which was not statistically significant.

Table 3 shows the distribution of type of bone loss in maxilla and mandible. Horizontal bone loss was found to be more in maxilla then mandible. Vertical defects and furcation defects were found to be more in mandible then maxilla. However, there was no statistically significant difference in the frequency of periodontal defects in maxilla and mandible.

Table 4 shows the degree of severity of bone loss in maxilla and mandible. There was no statistical difference in the severity of bone loss in both the arches. They were found to be affected equally.

Table-1: Age wise comparision

AGE	<30yrs	>30yrs	chi square value
No bone loss	66.42%	64.66%	p=0.22
Horizontal bone loss	27.80%	29.14%	(NS)
Vertical bone loss	3.81%	2.55%	
furcation	2.29%	1.76%	

* p value calculated using chi square test (NS) = non-significant

Table-2: Gender wise comparision

GENDER	MALE	FEMALE	chi square value
No bone loss	67.91%	65.41%	p=0.22
Horizontal bone loss	27.84%	28.55%	(NS)
Vertical bone loss	4.32%	2.89%	
furcation	2.31%	1.565%	

* p value calculated using chi square test (NS) = non-significant

Table-3: Arch wise comparision

ARCH	MAXILLA	MANDIBLE	chi square value
No bone loss	65.4%	68.18%	
Horizontal bone loss	29.6%	27.34%	p=0.241(NS)
Vertical bone loss	2.86%	4.78%	
furcation	0.9%	2.675%	

* p value calculated using chi square test (NS) = non-significant

Table-4: Degree of severity of bone loss

GINGIVAL BONE COUNT INDEX	MAXILLA	MANDIBLE	chi square value
0	67%	64.50%	
1	6.70%	7.30%	p=0.34(NS)
2	13.03%	14.45%	
3	10.38%	10.10%	
4	1.80%	3.05%	
5	0.35%	0.43%	

* p value calculated using chi square test (NS) = non-significant

DISCUSSION

Alveolar bone loss is a main characteristic of destructive inflammatory periodontal disease. Periodontal alveolar bone loss can be assessed using intraoral radiographs. However, these radiographs provide only 2 dimensional images of 3-dimensional structures. Hence, the radiographic image of interproximal bone loss may change with changing projection geometry. Additionally, evaluation of radiographs tends to underestimate the extent of alveolar bone loss as compared to the gold standard of intrasurgical measurements [6]. Digital processing and manipulation of radiographic images may enhance diagnostic interpretation of radiographs.

The detection and accurate assessment of the location, extent and configuration of the endosseous defect is important for the determination of the tooth prognosis, the treatment plan and the maintenance procedures

Findings from the epidemiologic investigations have been interpreted to demonstrate that the destructive periodontal disease (1) starts as overt gingivitis in young age, (2) affects more or less all subjects after the age of 40 and (3) is a slowly progressive disorder [8].

In the patient population examined in the present study, the frequency of periodontal defects did not increase with age. This observation is in agreement with the results of previous studies of human skull material and radiographs of patients [9]. The number of skulls with intrabony defects did not increase directly with increasing age, although periodontal disease becomes more severe with age. The number of skulls exhibiting pockets with three osseous walls increased up to the approximate age of 44 years, and then remained at about the same level with older skulls. However the average number of intrabony defects per skull was lowest in the youngest group and highest in the oldest group.

In the present study the relationship between the intrabony defect and gender was studied and it was found that there was no significant sex difference .A study was conducted by Wouters *et al*. in 1989 in 733 randomly selected dentate individuals aged 20 years and above using periapical radiographs with interproximal intrabony periodontal defect depth and width of atleast 5 and 10mm respectively, to determine the relationship between prevalence of interproximal periodontal intrabony defect and age. It was reported that the prevalence increased with age and was higher in men than in women [10]. However, the significantly lower prevalence of interproximal periodontal intrabony defect in women than in men does not support the studies of Nielsen *et al*. [11], in which no significant sex differences were reported.

In the present study it was observed that defects are more in mandible than in maxilla but found to be statistically not significant. The findings of this study are in general agreement with prior studies in that the most common location of intrabony defects is interproximal bone, mesial to maxillary and mandibular second and third permanent molars [11]. This finding might be expected, since the inability to brush and properly cleanse the posterior interproximal areas, the thickness and flatness of the bony ridge, broad proximal contact areas of the teeth and density of posterior cortical plates encourage the development of intrabony pockets.

Prichard reported that intrabony defects occur most frequently on the posterior teeth and particularly on first molars in the mandible [12]. In a similar study, Manson and Nicholson observed more intrabony defects in maxilla than in mandible [13]. However, maxillary and mandiblular teeth were affected equally [10].

In the present study it was observed that mandibular molars showed higher frequency of furcation involvement than maxillary molars but found to be statistically not significant.

Wennstrom *et al*. [14] reported that the maxillary molars showed higher frequency of furcation engagement than the mandibular molars. Furcation was detected more frequently in maxillary molars by radiographic examination than by clinical examination. On the other hand Furcation was detected more frequently in mandibular molars by clinical examination than by radiographic examination [15]. Mandibular

molars were the most frequently lost teeth followed by maxillary molars [16].

In the present study it was observed that horizontal type of bone loss was common than vertical type of bone loss.

A study by Jayakumar *et al*. [17] in 2014 reported that prevalence of horizontal type of bone loss was common than vertical bone loss. Jayakumar et al in the year 2010 conducted a radiographic evaluation of 150 orthopantomograms in the patients diagnosed with chronic periodontitis and found higher prevalence of horizontal type of bone loss than vertical type with majority being mesial defects than distal. Papapanou *et al*. [18] in the year 1988 assessed angular defects using radiographs in 531 dentate individuals and found angular defects to be 8% of all the teeth; the frequency increased with age and was higher at mesial than distal tooth surfaces; defects occurred most frequently adjacent to maxillary first premolars (14%) followed by mandibular second molars (12%) and second premolars (11%).

CONCLUSION

The clinically feasible gingival bone index recommended routinely at chair side. It is simple and easy to use. The diagnosis of periodontal defects gets objective by using this index. There was no gender difference in occurrence of periodontal defects. Mandibular osseous defects were higher than maxilla.

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