

## PREVALENCE AND DISTRIBUTION OF VERTICAL OSSEOUS DEFECTS IN PATIENTS BEING TREATED FOR CHRONIC PERIODONTITIS

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### ABSTRACT:

**Background:** The aim of the study was to determine the prevalence and distribution of vertical osseous defects in patients who underwent open flap debridement.

**Methods:** A total of 83 subjects were examined for prevalence of vertical defects using direct observation during periodontal surgery. All patients required periodontal surgery in one or more segments. The diagnosis of periodontitis was made after clinical and radiographic examination. Periodontal surgery was performed on each patient and full thickness mucoperiosteal flaps were elevated to gain access to root and osseous structures. The vertical osseous defects were explored surgically using mouth mirror, explorer and a periodontal probe.

**Results:** A total of 141 vertical osseous defects were detected in the 677 teeth assessed during surgical exposure. Of these 81 vertical defects were found in the maxilla and 60 vertical defects were found in the mandible. Craters accounted for almost 44% of the total defects. The posterior maxilla had the highest percentage of teeth with vertical defects (26.23%) while the mandibular anterior segment had the lowest percentage of vertical defects.

**Conclusion:** The posterior maxilla had the highest percentage of vertical osseous defects which can be explained by the fact that greater thickness of supporting bone allows formation of a greater number of infrabony defects. Craters were found to be the most common defect.

**KEYWORDS:** Vertical defects; Craters; Periodontal disease; Intrabony defect; Infrabony defect; Bone resorption

### INTRODUCTION

Periodontitis is a common type of periodontal disease that results from extension of the inflammatory process initiated in the gingiva to the supporting periodontal tissues.<sup>1</sup> Periodontitis results in resorption of the bone supporting the teeth and leads to change in the normal architecture of the alveolar process. These bony changes vary in form, severity and distribution not only between individuals but also within the same individual.<sup>2</sup>

At any given time, the processes of bone synthesis and bone breakdown are going on simultaneously and the status of the bone represents the net result of a balance between the two processes.<sup>3</sup> This

normal biologic process of bone formation and bone resorption helps to maintain the height and architecture of the alveolar bone in health.

In disease, the equilibrium between bone formation and bone resorption is lost. The inflammatory process involved in various types of periodontitis along with other local and systemic modifying factors results in substantial destruction of the supporting alveolar bone.<sup>3</sup>

The bone loss in periodontal disease results in an irreversible change. Horizontal bone loss may be more common than vertical bone loss.<sup>4</sup> The mode of

treatment of periodontal defects varies with its type and nature depending on the architecture and remaining walls of bone.

The extent, architecture and severity of osseous defects is usually assessed by a combination of radiographic and clinical assessment but the exact architecture is best determined by direct vision during surgical intervention.<sup>5-13</sup> Hence, in the present study an attempt has been made to assess the prevalence of vertical osseous defects using direct vision during periodontal surgery.

Materials and methods

The present study was conducted in the Department of Periodontics, College of Dental Surgery, Manipal, India. The study was conducted for a period of 6 months and a total of 83 patients were evaluated for the prevalence and distribution of vertical osseous defects using direct observation during periodontal surgery.

All 83 patients were treated by flap debridement. All patients required periodontal surgery in one or more segments. The diagnosis of periodontitis was made after clinical and radiographic examination. None of these patients had received previously surgical treatment. Full thickness mucoperiosteal flaps were elevated to gain access to root surfaces and osseous structures. Thorough defect degranulation and scaling and root planing was performed. The vertical osseous defects were evaluated using mouth mirror, explorer and periodontal probe in the surgically exposed areas. The presence of 1, 2, 3 walls, combination defects and interproximal craters were recorded. No attempt was made to quantify the extent of the vertical defects. Only the presence or absence of vertical defects was recorded. Anterior sextant was defined as starting from the mesial of the central incisor to the distal of the canine. Any defect distal to that was included in the posterior sextant.

In deciding the morphology the following classification was used (Papapanou et al 2000)<sup>4</sup>

- 1. Interdental crater-a concavity in the interdental bone confined within the facial and lingual walls.
- 2. Infrabony defect with one osseous wall\_ Infrabony defect with one bony wall remaining.

- 3. Infrabony defect with two osseous walls- Infrabony defect surrounded by two bony walls.
- 4. Infrabony defect with three osseous walls - Infrabony defects surrounded by three bony walls.
- 5. Combination defects- The number of walls in the apical portion of the defect is greater than in its coronal portion.

Statistical Analysis:

Percentages of defects and distribution of types of defects were compared between the maxilla and mandible and between segments using Chi square tests on the raw data.

Results

The present study involved population who visited the Department of Periodontics, College of Dental surgery, Manipal.This study consisted of a total of 83 subjects who were treated by flap debridement during a period of 6 months. The study subjects were between the ages of 22-60 years. These patients provided a sample of 677 teeth. The subjects consisted of 60 males (72.29%) and 23 females (27.71%).Among the subjects examined, most of them belonged to the age group of 30-44 years (55.42%). (Table.I)

Table.1 Distribution of subjects according to age group

Age group(yrs )	No. of subjects (%)
15-29	21(25.30)
30-44	46(55.42)
45-60	16(19.28)
Total	83

Table.2 Prevalence of defects by segments

Arch	No. of teeth examined	Teeth with defects (%)
Maxillary posterior	263	69(26.23)
Maxillary Anterior	102	12(11.76)
Mandibular Posterior	237	54(22.78)
Mandibular anterior	75	8(8)

A total of 141 vertical osseous defects (20.82%) were detected in the 677 teeth assessed during surgical therapy. Of these, 81 defects were detected in the maxilla and 60 defects were detected in the mandible. (Table.II).

Prevalence of defects in the maxillary and mandibular anterior and posterior sextant is shown in table 2.The sextants are listed with the highest percentage of vertical defects to the lowest percentage of as follows: posterior maxilla (26.23%), posterior mandible (22.78%), maxillary anterior (11.76%) and mandibular anterior (8%) The comparison between maxilla and mandible showed no significant difference for the posterior (Chi square =1.829, P=0.1867) and anterior segments (chi-square=2 and p=0.2061).

The number of defects by remaining long walls is listed in Table.III. Craters accounted for almost 44% of the total defects while combination defects comprised the lowest proportion. There was no significant difference in the distribution of bone defects between the maxilla and mandible both for the posterior (chi-square=0.46, p=0.98) and anterior segment (Chi-square=0.93), p=0.91)

Table.3 Number of defects according to the tooth type

Tooth type	Arch	No.of teeth examined	No. of defects (%)
Incisors	Maxillary	51	4(7.84)
	Mandibular	36	3(8.33)
Canines	Maxillary	51	3(5.88)
	Mandibular	39	8(20.51)
Premolars	Maxillary	120	27(22.50)
	Mandibular	107	24(22.43)
Molars	Maxillary	141	45(31.91)
	Mandibular	132	27(20.45)
Total		677	141(20.82)

In the posterior maxillary sextant, craters accounted for the highest percentage (43.47%) while the combination defects were found in the lowest proportion (8.69%) (Table.IV).In the posterior mandibular segment craters were found most frequently with an even distribution of other defects. In the mandibular anterior region, crater was the most common type of defect followed by an equal distribution of other defects. No combination defect was found in anterior mandible. In the maxillary anterior region, craters accounted for about 41.67%

of the defects while 3 wall defects formed the lowest proportion. (Table IV).

Table.4 Distribution of type of defects

Type	Number (%)
Crater	62(43.97)
1 wall	21(14.89)
2 walls	30(21.27)
3 walls	17(12.06)
combination defects	11(7.8)
Total	141(100)

Distribution of one wall, two wall, three wall, and combination defects differed with the tooth type. One wall defects were predominantly found in premolars and least commonly seen in the incisors (Table.5).Two wall defects were also found predominantly in premolars. No two wall defects were found in the incisors (Table.5).Three wall defects, craters and combination defects were predominantly found in the molars (Table.5).

Table.5 Distribution of types of defects by Sextant

Type	Number in Maxillary posterior(%)	Number in Maxillary anterior(%)	Number in Mandibular posterior(%)	Number in mandibular anterior(%)
Crater	30(43.47)	5(41.67)	24(44.45)	3(50)
1 wall	9(13.04)	2(16.67)	9(16.67)	1(16.67)
2 walls	15(21.74)	3(25)	11(20.38)	1(16.67)
3 walls	9(13.04)	1(8.34)	9(11.12)	1(16.67)
Combination defects	8(8.69)	1(8.34)	4(7.40)	0
Total	69	12	54	6

Discussion

Direct observation of alveolar bone during periodontal surgery is a practical method of accurately assessing bone morphology. An evaluation of the reliability of conventional radiographs to accurately determine bone loss and topography is less than ideal.<sup>14-15</sup>

The present study demonstrated the prevalence and distribution of vertical osseous defects using direct observation during periodontal surgery. The prevalence of vertical defects was found to be 22.10 % in the maxilla and 19.23% in the mandible. The prevalence differed in the anterior and posterior

sextants both in the maxilla and the mandible. The majority of previous studies<sup>17-22</sup> was based on the examination of dry skulls and radiographs. The prevalence in these studies varied from 8% to 51%. A great variation in these studies may be due to the difference in the method of examination. Very few studies<sup>23, 24</sup> have been conducted using direct observation during periodontal surgery. A prevalence of 15.4% in the maxilla and 22.4% in the mandible have been noted in other studies.<sup>24</sup>

The present study showed a higher prevalence of vertical bone defect in the posterior sextants compared to the anterior sextant. This is in agreement with previous studies.<sup>20,23,24</sup> The thin alveolar process both in the maxillary and mandibular anterior segments generally results in horizontal bone resorption.

In posterior sextants, the present study showed a higher percentage of bony defects in the maxilla than in the mandible. This is in agreement with the study by Manson and Nicholson<sup>24</sup> where they found greater bony defects per segment in the maxilla than in the mandible. Greater percentage of defects in the posterior segment is probably due to the greater thickness of supporting bone which results in greater number of infrabony defects. Although no studies are available that correlate thickness of the alveolar bone with infrabony defects, it would be reasonable to speculate that since the radius of the effect of bacteria plaque is suggested be approximately 1.5-2mm<sup>26, 27</sup> bone thinner than 1.5-2mm might be completely lost resulting in horizontal bone loss. In contrast, bone loss in areas of thicker bony plates may result in vertical defects.. This could also explain the fact that greater number of three wall, combination defects and craters occur in the posterior region.

The crater was by far the most common defect which is in agreement with previous studies.<sup>20, 23, 24</sup> In the present study craters accounted for almost 44% of the total defects. The finding that craters represented 44% of the defects in posterior maxillary sextant was in agreement with Vrotsos et al.<sup>23</sup>

## CONCLUSION

The posterior maxilla had the highest percentage of vertical osseous defects while mandibular anterior segment had the lowest percentage of vertical osseous defects possibly explained by the fact that greater thickness of supporting bone allows

formation of a greater number of vertical defects. There is an increase of vertical defects from the anterior to the posterior areas. Molars were the most commonly affected teeth. The interdental crater was found to be the most common bone defect in chronic periodontitis.

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