

## **RADIOGRAPHIC ASSESSMENT OF TOOTH LOSS IN PERIODONTAL DISEASE**

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### **ABSTRACT**

The diagnosis of periodontal disease is established after obtaining a medical history and a detailed clinical examination, corroborated with complementary examinations of the patient. Assessment of the supporting periodontium are necessary and even mandatory imaging explorations, which provide information about the type of alveolar lysis, its size, possible involvement of the interradicular area, the relationship of bone lysis with proximal carious lesions, fillings and incorrectly adapted dental crowns.

### **Keywords:**

Tooth loss, Alveolar bone, Periodontal disease, OPG, X-ray

### **INTRODUCTION**

The periodontium has a complex structure composed of gingival tissue, periodontal ligament, cement and alveolar bone. Attaching the tooth to the bone is one of the essential functions of the periodontium. Periodontal diseases have different symptoms, with the presence and resorption of the alveolar bone in most cases. Alveolar bone resorption, the support of the teeth, leading to their loss from the dental arches. On the other way, tooth loss is responsible of the resorption of alveolar bone [1]. For each type of periodontal disease there are different evolutions. For a correct diagnostic and treatment plan, a good understanding of the existing etiology and risk factors is required. The diagnosis of periodontal disease is made after obtaining a medical history and a detailed clinical examination, corroborated with complementary examinations of the patient. In order, to evaluate periodontium, imaging explorations are necessary, which provide information about the type of alveolar lysis, the degree of damage to the periodontal structures,

possible involvement of the interradicular area, the relationship of bone lysis with proximal carious lesions, fillings and incorrectly adapted sheaths [2].

Periodontitis is a widespread inflammatory disease, evidenced by slow evolution associated with periods of exacerbation. Untreated, it initially affects the gingival tissues, later leading to tooth loss. Periopathogenic bacteria present on the surface of the teeth but more importantly in the gingival sulcus (subgingival plaque) are responsible for initiating the inflammatory response. Inflammatory periodontal pathogenesis of dental support structures is associated with tooth loss [3].

Severe periodontitis is estimated to affect more over 700 million people globally and it refers to advanced destruction of periodontal tissue and the presence of vertical bone defects with or no furcation involvement. Severe periodontitis could be associated with masticatory dysfunction. This condition is characterized by loss of masticatory function because of tooth

hypermobility and in the most cases by tooth loss [4].

Periodontal tissue regeneration involves cell types, such as: fibroblasts for soft connective tissue, cementoblasts for cementogenesis, osteoblasts for osteogenesis, and endothelial cells for angiogenesis. Two important types of cells are found in bone. The first is the osteoblast, whose function is to synthesize the components of the organic matrix and to direct events that result in mineralization. Osteoclast, another type of cell, has the function of resorption and modeling of bone, osseolysis that manifests itself either in physiological conditions. Local secreted factors such interleukins may similarly affect bone resorption. Cytokines are involved in bone pathology and it's associated with bone destruction observed in inflammatory conditions such as periodontal disease [5, 6,7].

To describe the extent of bone destruction, the clinician should be guided by radiographs and data from clinical examinations. Determining bone loss using intraoral x-rays and orthophantomographs (OPG X-ray) is important to make an accurate diagnosis and plan appropriate treatment therapy [8].

With the progression of periodontal destruction and the involvement of furcation areas, the severity of periodontitis increases and treatment is less effective due to limited access. The reduced effectiveness of periodontal therapy was mainly found in teeth with multiple roots with the involvement of the furcation, despite the chosen treatment method. In conclusion, it is important to prevent and treat periodontitis before the furcation areas are involved [9].

In most cases, the initial stages of endodontic pluriradicular bone resorption are delineated in the spongy bone, which can often only be seen if it has affected the cortical bone. Radiography is not very helpful in determining the cause, when it is radiologically highlighted that the bone

resorption extends to the level of the alveolar ridge or in the vicinity of the apex [10]. Periapical radiolucencies are often accidentally discovered in imaging investigations of the neck and head. Most apical radiolucencies are the result of pulpal diseases. Radiolucency near the teeth can be observed in other diseases of odontogenic or neodontogenic cause. Endo-periodontal lesions are often encountered and occur due to vascular and anatomical connections between the pulp and the periodontium [11].

## **MATERIALS AND METODS**

We conducted statistical studies on a database on the role of imaging in assessing the periodontal condition, especially the appreciation of edentulism and tooth loss of patients. The study was performed on a group of 30 OPG X-ray that belong to patients with different degrees of periodontal lesions.

The subjects were chosen according to several criteria, such as:

- pregnant women were excluded;
- have not used antibiotics and anti-inflammatory drugs in the last 3 months.

The radiographic analysis for the assessment of the periodontal damage was performed on OPG X-ray and the main elements on which we insisted were: bone lysis, endo-periodontal lesions, tooth absence, characteristics of the edentulous space.

## **RESULTS**

Patients gender distribution:

The gender of the patients divided the studied group into two subgroups, the first consisting of 18 men and the second consisting of 12 women (W), resulting in a percentage of 60% for the male (M) gender.

Patients age group distribution:

Age groups (years)	Number of cases	Percentage (%)
21-35	8	27%
36-45	11	36%
46-55	5	17%
56-68	6	20%

Table 1 - Distribution by age groups of patients

A higher share of edentations was observed, in the age groups of 36-45 years, than in the other age categories.

*Statistical study of patients with teeth affected by periodontal disease in a percentage greater than 50% (ratio of bone lysis to root length > 50%).*

Out of the total of 30 OPG X-ray studied, only 17 of them show the bone lysis-root length ratio > 50%. The following graph shows the number of patients who have an x-ray of the bone lysis-root length ratio > 50%, as well as their gender distribution.

*Statistical study of patients with incisors lost due to periodontal damage.*

For this study, we focused on the lower incisors, as they are the most likely to present a form of periodontal disease. Of the 30 OPG X-ray studied, 7 of them showed the lack of an incisor up to 3 incisors, as follows:

- 3 of them show the lack of a single lower incisor;
- 3 of them have the absence of 2 lower incisors;
- 1 of them has the absence of 3 lower incisors.

The following table shows the gender distribution of patients with lower incisors:

Patients gender distribution	Patients total number	Patients number with the loss of 1-3 incisors	Patients number with the loss of 1 incisor	Patients number with the loss of 2 incisors	Patients number with the loss of 3 incisors
Patients number	30	7	3	3	1
Men	18	3	2	1	0
Women	12	4	1	2	1

Table 2 – Patients gender distribution with the loss of incisors

*Statistical study of patients with molars 1 lost due to periodontal affections:*

For this study we focused on the first molars, as they also proved to be susceptible to a form of periodontal disease. Of the 30 OPG X-ray

studied, 5 of them showed the absence of molar, as follows:

- 3 of them show the absence of a single molar at the mandibular arch;
- 2 of them show the absence of 2 molars on the mandibular arch

Patients gender distribution	Patients total number	Patients number with the loss of 1-2 molars	Patients number with the loss of 1 molar	Patients number with the loss of 2 molars
Patients number	30	5	3	2
Men	18	4	2	2
Women	12	1	1	0

Table 3 – Patients gender distribution with the loss of molars

*Statistical study of patients with endo-periodontal lesions.*

Of the 30 OPG X-ray studied, only 6 showed endo-periodontal lesions. As a distribution by gender, 4 women and 2 men presented this form of endo-periodontal lesion.

The results obtained in the study, both as a percentage and by gender distribution:

	Cases number	(%)	Gender distribution		(%)	
			W	M	W	M
Patients total number	30	100%	12	18	40%	60%
Patients with bone lysis to root length ratio > 50%	17	56%	7	10	41%	59%
Patients with incisors lost through periodontal damage	7	24%	4	3	58%	42%
Patients with molars lost by periodontal damage	5	17%	2	3	7%	10%
Patients with endo-periodontal lesions	6	20%	4	2	66%	34%

Table 4 - Results obtained by gender

The results of the study, distributed by age groups:

	Cases number	Distribution by age groups (years)			
		21-35	36-45	46-55	56-68
Patients total number	30	8	11	5	6
Patients with bone lysis to root length ratio > 50%	17	0	8	4	5
Patients with incisors lost through periodontal damage	7	1	1	1	4

Patients with molars lost by periodontal damage	5	0	1	2	2
Patients with endo-periodontal lesions	6	0	2	2	2

Table 5 - Results obtained by age groups

The results obtained in the study, distributed as a percentage by age groups:

	Cases number	Cases number (%)	Distribution by age groups (%)			
			21-35	36-45	46-55	56-68
Patients total number	30	100%	27%	36%	17%	20%
Patients with bone lysis to root length ratio > 50%	17	56%	0%	47,05%	23,52	29,41%
Patients with incisors lost through periodontal damage	7	24%	14,28%	14,28%	14,28%	57,14%
Patients with molars lost by periodontal damage	5	17%	0	20%	40%	40%
Patients with endo-periodontal lesions	6	20%	0%	33,33%	33,33%	33,33%

Table 6 - Results obtained as a percentage by age groups

Of the cases evaluated on OPG X-ray, approximately 56% have teeth with periodontal damage in percentage > 50%, and of these the male gender is more affected.

### DISCUSSION

An essential step in preventing tooth loss is early detection of periodontal disease. Based on the evaluation of clinical and paraclinical parameters we obtain the correct and completely necessary diagnosis [12]. An appropriate method for assessing the presence or absence of bone defects and alveolar bone height is diagnostic imaging in association with information obtained by probing the gingival tissues [13]. However, the diagnostic method using radiography and periodontal clinical probe showed limitations in their accuracy, such as:

- the depth of probing is dependent on the probing force or the site anatomy;
  - radiographs may exaggerate / underestimate the value of bone loss, due to projection errors;
  - the main disadvantage of intraoral radiography is the overlapping of anatomical structures;
  - another disadvantage of these radiographs is the absence of three-dimensional information.
- Due to the drawbacks listed above, a true distinction between the vestibular and oral cortical bone is often prevented, thus complicating the assessment of periodontal bone defects and the implications of the furcation [14].
- Despite the limitations highlighted and the questionable role in the diagnostic value, intraoral radiographs are the most conventional technique used in dental practice. The study conducted by White and Pharoah confirmed that

digital radiographs overestimated the lost bone [15].

Authors, such as Harrington and Steiner, have shown that periodontal disease can affect the dental pulp through the apical foramen and dentinal canals, near furcation area, when the accessory canals are exposed [16]. Storrer and Pereira also showed that the pulp remains unaffected, while both the lateral / accessory canals and the apical foramen were not affected by periodontal disease [17].

Depending on the etiology, the endo-periodontal lesion may respond to both endodontic and periodontal therapy, as there may be isolated cases of the disease, or one of the lesions is the cause or result of the other, associating during

their evolution [18]. However, clinicians need additional information to determine periodontal status and the level of inflammation, such as OPG X-ray or another different methods of imaging investigations [19].

## CONCLUSIONS

Periodontal damage is a major diagnostic concern due to its prevalence and complications such as dental mobility and subsequent tooth loss. An essential stage in the interpretation and diagnosis of periodontal disease is periodontal probing, but clinicians need additional imaging investigations.

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