RADIOGRAPHIC FEATURES OF DEEP PARODONTIUM OF THE TEETH BORDERING AN EDENTULOUS GAP

LUMINIŢA LAZĂR[1], LIGIA BEATRICE CONTAC[2], ANA PETRA LAZĂR[3], MIRCEA SUCIU[4]

[1,4]University of Medicine and Pharmacy Tîrgu-Mureş, [2,3]Student University of Medicine and Pharmacy Tîrgu-Mureş

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Abstract**:** *Edentulism is a contributing factor in the occurrence of periodontal disease. The aim of this study was the radiological investigation of the changes in the periodontal support as a result of edentulism and those related to the position of a tooth adjacent to an edentulous gap. Materials and methods: We examined 50 mandibular and 50 maxillary retroalveolar radiographs, scale 1:1, 100 panoramic radiographs, scale 1:1, with unidental edentulism, assessed with a digital electronic caliper, 150 mm rod depth. Results: The mean values of horizontal migration of teeth in the edentulous space are 6 mm in the case of the molars, and 2 mm in premolars. Tilting was more frequent than translation. Alveolar bone resorption recorded a mean value of 1.93 mm in the maxilla, 2.30 mm in the mandible, and a maximum value of 5 mm. Conclusions: The presence of a toothless gap can lead to damage to the deep parodontium of the nearby teeth.*

INTRODUCTION

A number of factors are involved in the development of periodontal disease, edentulism being a contributing factor. Maintaining the integrity of the dental arches is important insofar as even a single extracted tooth affects the remaining teeth and the balance. It is, therefore, necessary to raise the awareness of the patient about early treatment of any dental disease, avoiding situations where extraction is mandatory. If the extraction cannot be avoided, immediate prosthesis is compulsory.

Radiographic assessment is an important part of detecting pathological changes in the periodontal support. Certain radiographic observations demonstrate a strong link between periodontal disease and tooth absence, lack of contact between teeth, the presence of defective restorations, dental malpositions (tooth rotation, tilting).(1)

Edentulous ridge atrophy occurs slower or faster depending on the specific reactivity of the body, given the capacity of the bone to respond to local irritants or exaggerated functional tasks by apposition or resorption.

The various aspects of the ridge also depend on how the extraction was performed, the age of the edentulism, healing of postextraction wounds, the type of occlusal antagonism, the constitution of the patient.

PURPOSE

The aim of this study was the radiographic investigation of the changes in the periodontal support, changes related to attachment and bone loss as a result of edentulism and those related to the position of a tooth adjacent to an edentulous gap.

MATERIALS AND METHODS

In order to conduct this study, we examined 50 mandibular retroalveolar radiographs, scale 1:1, 50 maxillary retroalveolar radiographs, scale 1:1, 100 panoramic radiographs, scale 1:1, with unidental edentululism, assessed with a digital electronic caliper, 150 mm rod depth.

The examined radiographs were collected from female and male patients, aged between 20 and 60 years old, and were selected so that they showed a unidental gap with the alveolar bone completely mineralized after extraction, the teeth bordering the gap, and another tooth located adjacent to one of the mesial or distal tooth gap.

In order to record the data of the gap bordering tooth migration, retroalveolar X-rays were used to measure the mesial-distal dimension of the edentulous space. From the average size of the mesial-distal tooth that was extracted, we subtracted the value obtained by digital caliper measurement. The measuring rod ends were positioned at maximum convexity of the distal facet of the tooth located mesially to the gap and on the facet located posteriorly to the gap. To find the mean displacement value, we collected data obtained from incomplete displacement and we divided the value to the number of the gaps. We also studied the displacement trend of the teeth located mesially and distally from the gap.

The loss of attachment of the teeth bordering a gap was assessed on retroalveolar radiographs; measurements were performed using a digital caliper from the enamel-cement limit to the point where the periodontal space appears normal on the radiograph.

To measure the level of bone resorption in the toothless gap, the normal level of the crest was mapped on radiographs, taking into account that it is at 1mm underlying the dentin-enamel boundary. Measuring rods were placed between the maximum resorption area and the mapped limit representing the level the alveolar bone was supposed to reach. The values obtained were expressed in millimeters and were compared with values obtained from measuring the interdental bone level viewed on the radiograph.

RESULTS

The mean values of horizontal migration of teeth in the edentulous space are 6 mm for molars and 2 mm for premolars. These values correspond to both maxillary and mandibular teeth. Regarding the number of fully closed gaps, of

[3]Corresponding author: Ana Petra Lazăr, Str. Narciselor, Nr. 4, Tîrgu-Mureş, România, E-mail: analazar_mvfa@yahoo.com, Phone: +40744 232672
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the total of one hundred cases, the gap was fully occupied by the migrated tooth in 9 cases. Also, no migration of the tooth in the edentulous space was observed in 12 cases.

The values obtained from measurements of the affected periodontal space and for bone resorption were expressed in mm, and are included in tables no. 1, 2, 3, and 4.

Table no. 1. The effect of periodontal space in maxillary teeth

	Tooth facing the gap	Tooth facing the neighbouring tooth	Tooth with neighbouring teeth
Number of values	50	50	50
Minimum	0.0 (mm)	0.0 (mm)	0.0 (mm)
Median	4.050 (mm)	2.165 (mm)	1.250 (mm)
Maximum	7.300 (mm)	6.200 (mm)	4.620 (mm)
Mean	4.039	2.302	1.671
Standard deviation	1.501	1.829	1.727

Figure no. 1. Different degrees of the effect on the periodontium in maxillary teeth

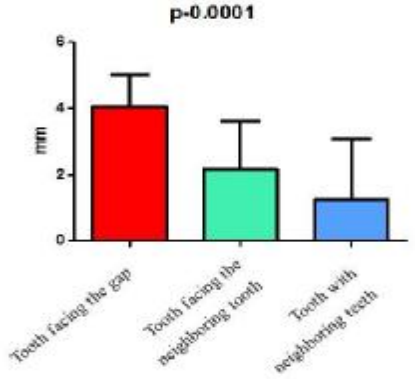

Table no. 2. The effect of periodontal space in mandibular teeth

	Towards the gap	Distally from the gap	Tooth with neighbouring tooth
Number of values	50	50	50
Minimum	0.0 (mm)	0.0 (mm)	0.0 (mm)
Median	4.350 (mm)	2.750 (mm)	0.0 (mm)
Maximum	8.000 (mm)	7.600 (mm)	6.000 (mm)
Mean	4.405	2.780	1.543
Standard deviation	1.651	2.156	1.971

Figure no. 2. Different degrees of the effect on the periodontium in mandibular teeth

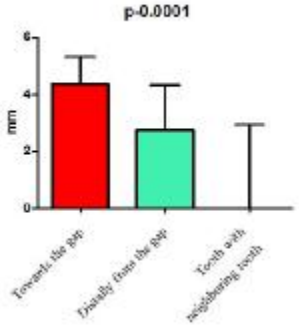

Table no. 3. Bone resorption at the level of edentulism and in the interdental space of the maxilla

Mann Whitney test		
P value		< 0.0001
	Resorption at the level of the gap	Resorption at intermediary level
Number of values	50	50
Minimum	0.000 (mm)	0.0000 (mm)
Median	1.930 (mm)	0.0000 (mm)
Maximum	5.000 (mm)	3.630 (mm)

Table no. 4. Bone resorption at the level of edentulism and in the interdental space of the mandible

Mann Whitney test		
P value		< 0.0001
	Resorption at the level of the gap	Resorption at intermediary level
Number of values	50	50
Minimum	0.0000 (mm)	0.0000 (mm)
Median	2.300 (mm)	0.0000 (mm)
Maximum	5.090 (mm)	2.000 (mm)
Mean	2.377	0.2300
Standard deviation	1.108	0.5622

Data related to the tendency of tilting and translation of teeth bordering a toothless gap are presented in tables no. 5, 6, 7, and 8.

Table no. 5. Tilting of the mesial tooth versus distal tooth in the maxilla

Frequency table & Chi-square test

p-0.04	Titled mesial tooth		
Titled distal tooth	0	1	
0 (untilted)	21	0	21 (42.0%)
1 (tilted)	22	7	29 (58.0%)
	43 (86.0%)	7 (14.0%)	50

Table no. 6. Translation of the mesial tooth versus distal tooth from the gap in the maxilla

Frequency table & Chi-square test

p-0.96	Translation of mesial tooth		
Translation of distal tooth	0	1	
0	25	1	26 (52.0%)
1	24	0	24 (48.0%)
	49 (98.0%)	1 (2.0%)	50

Table no. 7. Tilting of the mesial tooth versus distal tooth in the mandible

Frequency table & Chi-square test

p-0.66	Mesial tooth		
Distal tooth	0	1	
0	7	2	9 (18.0%)
1	32	9	41 (82.0%)
	39 (78.0%)	11 (22.0%)	50

Table no. 8. Translation of mesial tooth versus distal tooth in the mandible

Frequency table & Chi-square test

p-0.11	Translation of mesial tooth		
Translation of distal tooth	0	1	
0	45	1	46 (92.0%)
1	4	0	4 (8.0%)
	49 (98.0%)	1 (2.0%)	50

DISCUSSIONS

In our study, the periodontal space of a maxillary tooth which limits a gap was affected by a greater length (mean 4.050 mm) than in the case of a tooth with adjacent teeth present (mean 1.250 mm). Also, the side facing the toothless gap was affected to a greater extent (4.050 mm) as compared to the parodontium facing the neighbouring tooth (2.165 mm). As regards the impaired periodontal space of mandibular teeth, the

results demonstrate a stronger involvement of the parodontium of the tooth next to the gap (4.350 mm) than that of the adjacent tooth (2.750 mm), and also of the tooth with two neighbouring teeth.

Maxillary alveolar bone resorption had a mean value of 1.93 mm, and a maximum value of 5 mm. At interdental level, the bone was not affected in most cases, the mean resorption value was 0 mm, while the maximum was 3.630 mm.

A number of clinical studies have showed that tooth extraction is followed by a decrease in the alveolar crest in a coronal apical and vestibular-oral direction.(2,3,4) During post-extraction healing, it was clinically and radiographically proved that the bone records a greater loss in width, 3.87 mm, than in height, 1.67 mm.(5) A study conducted on dogs showed that the most significant changes in the alveolar bone occur in the first eight weeks after extraction, a period during which there is an intense osteoclastic activity.(6) The reduction of the post-extraction alveolar crest in adolescents is not resorption but a nodified increase, supposedly due to the decrease of the stimulation mechanisms around the extraction site.(7)

Bone loss is an element characterizing periodontal disease, as such situations that cause additional bone resorption have to be avoided.(8) Numerous studies suggest alveolar ridge preservation immediately after extraction.(9,10,11)

Our study identified a greater tendency of the distally located tooth to tilt towards the gap (58%) than towards the tooth that limits the mesial gap (14%). Translation was present in 48% of cases of the distal tooth and in only 2% of the cases of the mesial tooth. In the mandible, the distal tooth tilted to a greater extent (82%) than the mesial one (22%). Regarding the translation of mandibular teeth, although the values are low, there is a higher tendency (8%) of translation of the distal tooth versus the mesial one (2%). We also noticed that tilting was more frequent than translation, both in the maxilla and in the mandible. Values are higher in maxillary translation (48%) than mandibular one (8%).

The same high trend of tilting of the tooth located distally from the gap was observed in a study on occlusal changes occurring in adults following the extraction of a tooth in the posterior region.(12) In the change of molar position, there is a significant interaction between the degree of extrusion and tilting of the teeth without complete antagonistic contact.(13) The unilateral extraction of the first mandibular inferior molar is accompanied by a mesial tilting of the second molar, linked with a distal translation of the premolars, canine and incisors, associated with significant alveolar resorption.(14)

CONCLUSIONS

Horizontal bone resorption of the remaining ridge can be noticed. However, remodeling of this ridge will be met with certain difficulties.

Interrupting the interarch balance with the presence of a toothless gap leads to impairment of the parodontium of the teeth bordering the gap as compared to other teeth.

The implications of the study can be practical by raising awareness regarding the decision to extract or keep a tooth, as well as establishing a plan to build a prosthesis for the gapped area. Of particular importance is to inform the patient and explain the changes that occur after extraction so that a prosthesis can be built in due time before the occurrence of periodontal complications or changes of position which would be difficult to correct.

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