



Evaluation of Periodontal Status of Adjacent Teeth to Posterior Single-Tooth Implant during a One-Year Period after Restoration: A Cross-Sectional Study

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Abstract

Objective: To evaluate the periodontal status of teeth adjacent to the posterior single tooth implant during one year after restoration. **Material and Methods:** In this cross-sectional study, 36 patients, which were systematically and had received the implant(s) of single posterior teeth over the past year were selected. The teeth adjacent to single-posterior tooth implants were evaluated regarding bleeding on probing, mobility, gingivitis and periodontal pockets during the follow up period of 3, 6 and 9 months under the supervision of two specialists. To investigate the relationship between periodontal statuses, the Chi-square test was used, and the Kruskal-Wallis test was used to assess statistical significance of periodontal indexes in the period under assessment. The p-value of less than 0.05 was considered significant. **Results:** There was no significant relationship between the variable of bleeding on probing, mobility, gingivitis and periodontal pocket in the studied distal and mesial teeth. Out of studied patients, after 9 months, only 11.1% had one of the periodontal problems, as a result, 88.9% of crowns replacement of single-posterior tooth does not make any periodontal damages to adjacent teeth. **Conclusion:** Crowns replacement of implant does not have any destructive impact on periodontal condition of adjacent teeth.

Keywords: Dental Implants, Single-Tooth; Periodontics; Crowns.

Introduction

The success of implant therapy depends on utilizing a coordinated approach including the accurate treatment planning, accurate surgical technique and precise prosthesis [1]. Posterior single tooth replacement techniques include: 1) removable partial dentures, 2) prosthesis bonded with resin, 3) fixed partial denture and 4) implant-supported prosthetic [2].

From 1993 to the present, replacement of missing single teeth with implants is the most reliable way to replace it. The ultimate goal of the implant is meeting the patient's demand to replace one or more missing teeth beautifully, functionally, effectively and in a stable form [3].

Some of the advantages of single-tooth replacement with dental implants can be the lack of scratch to the adjacent tooth, the ease of keeping hygiene levels of the adjacent teeth, improving aesthetics, preservation of bone in the edentulous area and mental aspects [4,5].

The first permanent molar is a tooth that is lost due to decay, root treatment failure or breakdown. In adult patients, often one or two covers are seen to preserve teeth, and they are placed instead of the old extensive dental restorations. Decay is the greatest cause of failure and root treatments is listed in second place. Due to mentioned factors, the teeth will be exposed to fall out and lead to losing posterior single tooth in adults [6,7].

Lack of the missing tooth replacement(s) may have problems such as tipping, extrusion, buildup of plaque, caries and periodontal disease for the adjacent teeth [6]. However, the various studies have reported the loss of teeth adjacent to the edentulous space during 8-12 years to be 12-45% [8-10].

In a previous study, it was reported that the teeth adjacent to coated implant have less decay, less sensitivity and less plaque retention, compared with non-treatment of edentulous and there is lower evidence of missing them within 10 years [11]. The literature shows that dental implantation replacement reduces the loss rate of marginal bone in adjacent teeth [12]. The positive effects of placing the implants in maintaining interdental papilla in the important areas in terms of beauty were reported [13].

Some authors have studied periodontal status of teeth adjacent to implants covers a year after the placement of crowns showing that the interdental papilla tissue volume has increased in the region [14]. The condition of the soft tissue around the implant-based coating 3 years after insertion was analyzed and revealed that after insertion of the coatings, the tissue became more stable and more favorable [1].

Since no study has not been done on periodontal status of teeth adjacent to implanted single posterior teeth after insertion of coated implants in Iranian society and in the region of East Azerbaijan to carefully assess, this research aimed to evaluate bleeding probing, mobility, gingivitis and periodontal pockets of the teeth adjacent to single posterior teeth up to one year after implant coating placement.

Material and Methods

Study Design and Data Collection

In this cross-sectional study, 36 patients of 19 to 45 years who are healthy systematically, and last year received posterior single tooth implant were selected out of the visitors to the Implants sector of Dental School of Tabriz, Iran, and private offices.

Implants were selected with diameters over 3.7 mm from the type of Implantium (Dentium Co. Ltd., Gwanggyo-ro, Korea) that are placed through a two-stage surgical procedure. In addition, healing time of 5 months has been considered for implants.

To place coated implant, Open impression method was used. Molding material were the incremental-type silicon Panasil initial contact X-Light - Panasil Putty Fast (Kettenbach GmbH & Co., Eschenburg, Germany), respectively. Implant coatings were selected from PFM type. To attach coatings of implant Tempo-Bond NE cement (Kerr Corporation, Orange, California, USA) was used. Margin of coated implants was 0.5 mm below the gum.

The condition of teeth adjacent to single-posterior tooth implants was evaluated regarding periodontal conditions during the follow up period of 3, 6 and 9 months under the supervision of the author of the thesis and two specialists (a specialist of periodontics and a specialist of prosthodontics).

Gingivitis was determined by color and texture [15], bleeding on probing (BOP) [16], periodontal pocket (by probing) (more than 2 mm) [17] and mobility by the end of the two mirrors (zero was considered as No, and grades one, two and three were Yes [18]).

Exclusion criteria included systemic complex situations like high blood pressure, diabetes, thyroid disease, pregnancies, diseases and drugs that reduce the flow of saliva and any other weakening illnesses and local conditions, such as fibrous dysplasia, State Deformans, history of radiation to the neck or head, smoking and untreated periodontitis and gingivitis. Dental criteria for inclusion were intact adjacent teeth in terms of periodontal disease before posterior implantation (s) proper plaque control by the patient and passage of implant healing time.

Statistical Analysis

To investigate the significant relationship between periodontal status during the assessment, the Chi-square test was used and Kruskal-Wallis test was used to assess statistical significance between periodontitis (bleeding on probing, mobility, gingivitis and periodontal pockets) in the periods under assessment. The p-value of less than 0.05 was considered significant.

Ethical Aspects

This research has been approved by Ethics Committee of Vice Chancellor for Research of Tabriz University of Medical Sciences by an ethical code of 13950560.

Results

There was no significant relation between the variables of bleeding of probing in periodic assessments in distal and mesial teeth (Table 1).

Table 1. Comparison of bleeding on probing in three follow-up of 3, 6 and 9 months.

Time	Distal Teeth		Mesial Teeth		Patients Involved with a Complication	
	n	%	n	%	n	%
3 months	4	11.1	4	11.1	5	13.9
6 months	3	8.3	2	5.5	4	11.1
9 months	2	5.5	3	8.3	3	8.3
p-value	0.874		0.589			

There was no significant relationship between variable of gingivitis in periodic assessments in distal and mesial teeth (Table 2).

Table 2. Comparison of gingivitis during the three follow-up of 3, 6 and 9 months.

Time	Distal Teeth		Mesial Teeth		Patients Involved with a Complication	
	n	%	n	%	n	%
3 months	3	8.3	2	5.5	3	8.3
6 months	3	8.3	1	5.5	3	8.3
9 months	2	5.5	3	8.3	3	8.3
p-value	0.695		0.695			

None of the mesial and distal teeth had mobility in the period under assessment. There was no periodontal pocket in any of the distal teeth in the period under assessment (Table 3). The results showed that among the variables under assessment in the mesial teeth, periodontal pocket is not statistically significant ($p = 0.364$).

Table 3. Comparison of periodontal pocket during the three follow-up of 3, 6 and 9 months.

Time	Distal Teeth		Mesial Teeth		Patients Involved with a Complication	
	n	%	n	%	n	%
3 months	0	0.0	0	0.0	0	0.0
6 months	0	0.0	0	0.0	0	0.0
9 months	0	0.0	1	2.8	1	2.8

None of the patients had loosening of adjacent teeth. Only 5.5% developed gingivitis and bleeding on probing simultaneously in both the mesial and distal teeth of implants. One person (2.8%) in the mesial dental implants has periodontal pockets and 2.8% developed gingivitis and bleeding on probing simultaneously in the mesial dental implants. A total of 36 patients after 9 months: 4 cases (11.1%) had one of the complications of periodontal disease. As a result, 88.9% patient with posterior single-tooth implants made no periodontal problem to adjacent teeth (Table 4).

Table 4. Frequency of periodontal complications after 9 months.

Time	Distal teeth		Mesial teeth		Patients Involved with a Complication	
	n	%	n	%	n	%
Bleeding on probing	2	5.5	3	8.3	3	8.3
Swelling of the gum	2	5.5	3	8.3	3	8.3
Clearance	0	0.0	0	0.0	0	0.0
Periodontal pockets	0	0.0	1	2.8	1	2.8
Overall complications	4	11.1	7	19.4	4	11.1

Discussion

Replacement of missing teeth has long been a problem for human society that it is replaceable using fixed teeth-based prosthesis single- dental implants. Replacing missing teeth with a fixed partial denture is declining because of problems made for abutment teeth [2].

The most common problem with teeth fixed partial denture is with base teeth. Decay and the need for a root restoration of base teeth is the most common cause of failure. When fixed partial dentures are placed on natural tooth, Pontic acts as a warehouse for plaque. As a result, about 20% of base teeth are decayed and 15% of them are in need of root canal treatment [19]. Several studies have reported high success rate of implants – 95.4% [20], 95.5% [21] and 97% [11].

In this study, periodontal status of adjacent teeth (mesial and distal), single posterior tooth implant to check bleeding on probing, mobility, gingivitis and periodontal pockets were evaluated one year after the insertion of coated implant by the two specialists (a specialist in periodontics and an expert of prosthetic).

According to the results, there is no significant relation between variable of bleeding on probing, mobility, gingivitis and periodontal pockets during the assessment of distal and mesial teeth. In other words after the insertion of coated implants, periodontal status of teeth adjacent became the more stable. The results of the present study are comparable to the results of the studies in this field.

The teeth adjacent to coated implant have less decay, less sensitivity and less plaque retention, compared with non-treatment of edentulous and there is lower evidence of missing them within 10 years [11]. As the main reason of periodontal diseases is plaque, therefore reduction of plaque entanglement in adjacent teeth by implant indirectly leads to stability condition in periodontal condition of adjacent teeth that is similar to the results of the present study [15].

In 2001, some authors evaluated the clinical and radiographic papilla of teeth adjacent to single-tooth implants in the anterior maxilla. The results showed the positive effects of implants on maintaining interdental papilla in important areas in terms of beauty that are aligned with the results of the present study in fixing periodontal conditions of teeth adjacent to implants [22].

Literature shows that shrinkage of soft tissue that covers the buccal average was 6.0 mm, and the interdental papilla tissue volume has increased in the region that this volume was about 0.375 mm. The results are not aligned with the results of the present study that can be because of difference in type of operation technique, healing time, region and species and gender of examined groups in this study [14].

The condition of the soft tissue around the implant-based coating 5 years after insertion was evaluated and indicated that after insertion of coatings, tissue are more stable and more favorable that are aligned with the results of present study. However, there is a difference that in the mentioned study, the soft tissue around the implants were studied that influence on the adjacent teeth indirectly [23].

The results showed that 88.9% of the posterior implant coatings do not make any periodontal damage on adjacent teeth, whereas in previous studies the success rate of single-posterior tooth implant in all areas of mouth was reported as 97% during 20 years [5]. Other research has shown that success rate for single posterior teeth implants was 97% [11]. The difference in results of the present study with the mentioned studies can be because of surgical technique used, diameter and length of implant and systemic conditions of the person under surgery. In future studies, it is recommended: adjacent teeth to edentulous space to be considered as a control group; study done within a longer time and other conditions of adjacent teeth such as decay to be investigated.

Conclusion

There is no significant relation between variable of bleeding on probing, mobility, gingivitis and periodontal pockets during the assessment of distal and mesial teeth. In other words after the insertion of coated implants, there is no any destructive effect on periodontal status of adjacent teeth.

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