Prosthetic restoration types of dental implants

Dental implantların protetik restorasyon tipleri

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SUMMARY

Aim: The aim of this study was to evalute the prevalence of different prosthetic restoration types of dental implants in a Turkish subpopulation.

Materials and Methods: A retrospective evaluation was conducted by examining the digital patient record system of the faculty. Age, gender, edentulism, implant sites, replaced tooth numbers and restoration types were recorded. Descriptive statistical methods and Chi-square test were used to analyze data. An alpha level of 0.05 was used for all statistical analyses.

Results: There were 368 patients with 1143 implants which were placed to maxilla in 116 patients (31.5%), mandible in 179 patients (48.6%), and maxilla and mandible in 73 patients (19.8%). They were in anterior region in 58 patients (15.8%), posterior region in 245 patients (66.6%), and anterior and posterior region in 65 patients (17.7%). Two hundred and nine patients (56.8%) had single-unit fixed partial dentures (S-FPDs), 83 patients (22.6%) had multi-unit fixed partial dentures (M-FPDs), 44 patients (12%) had both S-FPDs and M-FPDs, and 32 patients (8.7%) had overdentures.

Conclusions: The great majority of patients treated with dental implants had S-FPDs. Only 8% of patients had overdentures. The most implant treated sites were mandible and posterior regions.

Key words: Implant, prosthetic, restoration types, prevalence.

ÖZET

Amaç: Bu çalışmanın amacı, Türk toplumundaki farklı dental implant üstü protetik restorasyon sıklığı ve tiplerinin incelenmesidir.

Gereç ve Yöntem: Yeditepe Üniversitesi Dişhekimliği Fakültesi Protetik Diş Tedavisi Anabilim Dalı'nda, dijital kayıt sistemi incelenerek retrospektif bir değerlendirme yapıldı. Hastaların yaşı, cinsiyeti, dişsiz ve implant uygulanmış bölgeleri, yerine konan eksik diş sayısı ve restorasyon tipi kaydedildi. Elde edilen verilerin istatistiksel analizinde tanımlayıcı yöntemler ve Ki-Kare testi kullanıldı. Anlamlılık p< 0,05 düzeyinde değerlendirildi.

Bulgular: Çalışmaya toplamda 368 hastaya ait ve 116 hastanın (%31,5) üst çenesine, 179 hastanın (%48,6) alt çenesine ve 73 hastanın (%19,8) hem alt hem üst çenesine yerleştirilen toplam 1143 adet implant dahil edilmiştir. İmplantlar 58 hastada anterior bölgeye (%15,8), 245 hastada posterior bölgeye (%66,6) ve 65 hastada hem anterior hem de posterior bölgeye (%17,7) yerleştirilmiştir. 209 hastanın (%56,8) tek üyeli sabit protez (S-FPDs), 83 hastanın (%22,6) çok üyeli sabit protez (M-FPDs), 44 hastanın (%12) hem S-FPDs hem de M-FPDs ile tedavi edildiği gözlenmiştir. 32 hastada (%8,7) overdenture protez varlığı tespit edilmiştir.

Sonuç: Dental implantlarla tedavi edilen hastaların büyük çoğunluğunda protetik restorasyon tipi olarak tek üyeli sabit protez tercih edilmiştir. İmplant kullanılarak en sık tedavi edilen alanlar alt çene ve posterior bölgelerdir.

Anahtar kelimeler: İmplant, protetik, restorasyon tipi, sıklık

INTRODUCTION

Tooth loss is defined as 'a failure to retain teeth as a result of disease or injury' in Medical Subject Headings.[1] When anterior teeth are missing, esthetic and speech can be adversely affected and mastication problems may be arised from posterior tooth missing.[2] Prosthetic restorations are indicated for the replacement of missing teeth.[3] The modalities available to treat single tooth loss or partial edentulism include multiple options using tooth or implant supported fixed partial dentures (FPDs) and tooth supported removable partial dentures (RPDs).[2] Patients with complete edentulism can be treated with conventional complete dentures, overdentures supported by dental implants or implant supported FPDs.[4] Each of these prosthetic designs has inherent risks and benefits.[5]

The use of osseointegrated implants in treatment of single tooth missing is an accepted and satisfactory treatment which has definite advantages including esthetics and function with long-term predictability.[6] The systematic reviews indicated that survival rates of implant supported single crowns were 94.5% after 5 years[7] and 89.4% after 10 years.[8] The adjacent teeth have also the highest survival rate.[9] In partial edentulism with posterior tooth missing, the use of implants has advantages in comparison with RPDs; implants improve retention, stability, masticatory function, patient comfort and decrease bone resorption and mucosal irritation.[3] For completely edentulous patients, there is a wide variety of implant supported prosthetic restorations.[10] Fixed or removable (overdenture) prostheses are considered with various designs depending on the number of implants.[11] The use of two interforaminal implants has been recommended for basic standard treatment modality.[12] When compared with conventional complete dentures, implant supported overdentures have been described to have superior retention.[13,14]

In order to estimate costs of health insurance, information on the various treatment options and prevalence data in a clinical situation is important for public health planners. To the authors' knowledge, there are no data available on the epidemiologic evaluation of prosthetic restoration types of dental implants in a Turkish subpopulation in Istanbul. Therefore, the aim of the present study was to assess the prevalence of 3 different prosthetic restoration alternatives of implants; single-unit FPDs (S-FPDs), multi-unit FPDs (M-FPDs) or overdenture in a Turkish patient group. The hypothesis was that there would be a difference in the restoration types of dental implants.

MATERIALS AND METHODS

This study was conducted in a Turkish subpopulation, consisting of a sample of patients attending to Department of Prosthodontics, Faculty of Dentistry, Yeditepe University, Istanbul, Turkey from January 2010 to December 2012. The retrospective evaluation was performed by examining the digital record system of the faculty which involved all patient files in assistant professor clinic. The labarotary record system of the prosthetic department was also evaluated. Patients who had undergone implant treatment were selected. Age, gender, edentulism (complete/partial), implant sites (maxilla/mandible, anterior/posterior), replaced tooth numbers and prosthetic restoration types (S-FPDs, M-FPDs or overdenture) were recorded. SPSS for Windows 15.0 (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis. Descriptive statistical methods and Chi-square test were used to analyze data. An alpha level of 0.05 was used for all statistical analyses.

RESULTS

From the sample of 368 implant treated patients with 1143 implants, 135 (36.7%) were males and 233 (63.3%) were females. Patients ranged in age from 20 to 89 years, with mean age of 51.77 ± 14.36 years. All FPDs were cement retained and metal-ceramic crowns, and all overdenture attachment type was ball attachment.

The distribution of edentulism, implant region and restoration types are shown in Table 1.

Table 1: Distribution of the edentulism, implant region and restoration types

		n	%
Edentulism	Partial	312	84.8
	Complete	56	15.2
Jaw	Maxilla	116	31.5
	Mandible	179	48.6
	Maxilla+mandible	73	19.8
Region	Anterior	58	15.8
	Posterior	245	66.6
	Anterior+posterior	65	17.7
Restoration type	Single unit FPD	209	56.8
	Multi unit FPD	83	22.6
	Single unit + multi unit	44	12.0
	Overdenture	32	8.7

Three hundred and twelve patients (84.8%) were partially edentulous and 56 patients (15.2%) were complete edentulous. The implants were placed to maxilla in 116 patients (31.5%), mandible in 179 patients (48.6%), and maxilla and mandible in 73 patients (19.8%). The implants were in anterior region in 58 patients (15.8%), posterior region in 245 patients (66.6%), and anterior and posterior region in 65 patients (17.7%). Two hundred and nine patients (56.8%) had S-FPDs, 83 patients (22.6%) had M-FPDs, 44 patients (12%) had both S-FPDs and M-FPDs, and 32 patients (8.7%) had overdentures.

The distribution of implant sites is shown in Table 2. The most common implant site was lower right first molar (33.2%) followed by lower left first molar (30.2%), upper right first molar (19.8%) and upper left first molar (18.8%). Only 11 patients (3%) had implants on lower left central incisor with the lowest percentage.

There was no significant effect of gender factor on restoration types ($p>0.05$), however, 40% of patients who had

overdentures were in age group of 70 and over (p<0.05). When the effect of jaw on restoration types was evaluated, it was observed that implants for overdenture were inserted in mandible with statistically significant difference compared to maxilla (96.9%) (p<0.01).

Table 2: Distribution of the implant sites

Region	İmplant site	n	%
Upper right	central incisor	25	6.8
	lateral incisor	16	4.3
	canine	29	7.9
	1st premolar	54	14.7
	2nd premolar	45	12.2
	1st molar	73	19.8
	2nd molar	14	3.8
Upper left	central incisor	26	7.1
	lateral incisor	17	4.6
	canine	33	9.0
	1st premolar	55	14.9
	2nd premolar	50	13.6
	1st molar	69	18.8
	2nd molar	16	4.3
Lower left	central incisor	11	3.0
	lateral incisor	17	4.6
	canine	51	13.9
	1st premolar	26	7.1
	2nd premolar	54	14.7
	1st molar	111	30.2
	2nd molar	31	8.4
Lower right	central incisor	12	3.3
	lateral incisor	13	3.5
	canine	49	13.3
	1st premolar	41	11.1
	2nd premolar	44	12.0
	1st molar	122	33.2
	2nd molar	39	10.6

Implants for single unit and multi unit restorations together were significantly higher both in maxilla and mandible (70.5%) (p<0.01). On the other hand, when the effect of region (anterior/posterior) on restoration types was evaluated, it was observed that 100% of implants were inserted in anterior region for overdenture with statistically significant difference compared to other restoration types (p<0.01). Implants for S-FPDs were significantly higher in posterior region (88%) (p<0.01) (Table 3).

Table 3: The effect of jaw and implant region on restoration type

		Restoration types				p
		Single unit	Multi unit	Single unit + Multi unit	Overdenture	
		n (%)	n (%)	n (%)	n (%)	
Jaw	Maxilla	79 (37.8)	32 (38.6)	4 (9.1)	1 (3.1)	0.001**
	Mandible	104 (49.8)	35 (42.2)	9 (20.5)	31 (96.9)	
	Maxilla+ mandible	26 (12.4)	16 (19.3)	31 (70.5)	0 (0)	
Region	Anterior	19 (9.1)	6 (7.2)	1 (2.3)	32 (100.0)	0.001**
	Posterior	184 (88.0)	38 (45.8)	23 (52.3)	0 (0)	
	Anterior+ posterior	6 (2.9)	39 (47.0)	20 (45.5)	0 (0)	

*Chi-square test **p<0.01*

DISCUSSION

This is the first study which evaluates the prevalence of different prosthetic restoration types of dental implants in a Turkish subpopulation. The hypothesis that there was a difference in the restoration types of dental implants was accepted. Based on the results obtained, the great majority of patients with implants had single unit FPDs (56.8%), and only 8.7% of patients had overdentures. The reason for such a result might be the difference in edentulism prevalence. Three hundred and twelve patients (84.8%) were partially edentulous and 56 patients (15.2%) were complete edentulous, and this may be explained by decreasing tooth loss as a result of improve¬ments in preventive dentistry.[15]

For a single missing tooth, an implant retained crown or a tooth supported FPD may be constructed as a definitive treatment option.[5] Although tooth supported FPDs are easy to perform and completed in a short time with lower cost,[9] replacement of a single tooth with an implant is also an accepted treatment method. However, as the implant numbers increase, the cost, treatment period, additional surgical procedures (ogmentation, sinus lift) and need for patient cooperation also increase. On the other hand, implant therapy is not financially supported by dental insurance in Turkey.[6] Therefore, these factors may hinder patients to select extensive implant treatment. In this study, the great majority of patients had single unit FPDs (56.8%) and abovementioned factors may be the reason of this result.

When the distribution of implant sites was evaluated, it was found that the mandibular first molar was the most frequent implant among patients; 33.2% of patients had implants on their lower right first molar and 30.2% of patients had implants on their lower left first molar. This result may be attributed to fact that first molar teeth are the first permanent teeth to erupt and they might be more susceptible to extraction due to caries and endodontic treatment.[16] On the other hand, only 3% of patients had implants on their lower central incisor. The reason for such a result might be the reduced thickness of the buccal and lingual plates of mandibular central and lateral incisor teeth.[17] It was indicated[18] that lower incisors were extracted mainly for periodontal reasons. The alveolar bone with reduced stability correlates with a reduced primary stability and a significantly higher implant failure rate.[19,20] The narrow diameter of the mandibular incisor roots may also interfere with appropriate implant diameter and distance between implants.[9] In addition, marginal loss of osseointegration at the buccal side may cause poor esthetics.[17] To overcome these problems, clinicians may prefer placing the implants into the canine region and using pontics for the incisors during FPD construction.

Mandibular implant retained overdenture is an attractive treatment option and has gained considerable acceptance because of its relative simplicity and minimal invasiveness.[21-23] The removable overdenture supported by 2 anterior implants offer a less complex and less expensive option for an edentulous patient.[23] However, conventional complete dentures have long been the only prosthodontic treatment option for edentulous maxilla and a large number of edentulous patients report satisfaction with complete denture usage.[24] In this study, it was indicated that implants for overdenture were inserted in mandible with statistically significant difference compared to maxilla (96.9%).

All implants for overdenture were placed in anterior region and 40% of patients who had overdentures were in age group of 70 and over. This may depend on a variety of reasons. First of all, 2 anterior implants are usually considered the minimum number to provide support, retention and stability for mandibular overdenture treatment.[22,25] The minimal number of implants has also economic benefit to the patient.[26] Misch9 had predicted 100% success rate for implants placed in the type of bone which is present in the anterior mandible. There are controversial considerations and limited evidence which suggest that additional implants for overdenture results in a better treatment outcome.[27] Secondly, posterior alveolar ridge resorbtion in elderly patients may cause inadequate height of residual ridge for implant placement that prevents using additional posterior implants. It was revealed[28] that mandibular alveolar ridge reduction is continuing in conventional complete denture wearers. Therefore, elderly patients with complete dentures often complain about lack of retention and stability with decreased chewing ability.[29]

In this study, posterior region was the most frequently site for implant placement (66.6%) compared to anterior region (15.8%). This observation can be explained by lower extraction rate in anterior teeth probably because they are relatively resistant to caries, more accessible for complicated endodontic and restorative treatments, and their extraction may be delayed due to esthetic reasons.[18]

CONCLUSIONS

Within the limitations of this study, it can be concluded that most of the patients with implant treatment had single-unit FPDs instead of multi-unit FPDs or overdentures. Implantology has allowed more options for rehabilitation of complete and partially edentulous patients. The clicians should describe all possible alternatives to the patient, addressing all the positive and negative aspects of each possibility, such as treatment time, complexity of surgical procedures and the final cost. The patient should select the best cost-benefit relationship. It would also be interesting to asses the restoration types of dental implants in other cities of Turkey to determine the overall country situation and to make comparison between them.

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