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Evaluation of Dentists' Awareness Level About Dental Implant Failures in Early Period

Erken Dönem Dental İmplant Kaybında Diş Hekimlerinin Farkındalık Düzeyinin Değerlendirilmesi

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ABSTRACT

Objective: To determine the awareness levels of dentists about possible risk factors in order to prevent early implant losses.
Methods: The questionnaire form was directed to the participants online. Statistical analyzes were made with frequency analysis and Chi-square test.
Results: Majority of the participants usually (68.4%) prescribe amoxicillin (postoperatively 1 g 2x1) to patients in implant surgeries. While the rate of those who thought that prophylactic antibiotic therapy was mostly and always effective in preventing early implant loss was 17.6%, this rate was 42.7% for postoperative antibiotherapy applications. The highest rate of thinking that prophylactic antibiotherapy is effective in preventing early implant loss was found in the periodontology specialist (20.5%) group. Periodontology specialists (23.3%) were the group who thought that the effectiveness of postoperative antibiotherapy was the least in this regard. History of periodontitis (76.3%) and postoperative complication development (73.1%), diabetes (92.4%), smoking (89.8%) and osteoporosis (78.7%) were evaluated as the factors that have the most impact on early implant loss.
Conclusion: It is thought that the general knowledge level of the dentists participating in the survey about early implant loss is sufficient. We believe that it would be beneficial to organize postgraduate vocational training programs in order to eliminate the differences between the knowledge levels of dentists.
Keywords: Awarenes Level, Early Implant Failure, Implant Complications

ÖZ

Amaç: Erken dönem implant kayıplarının önüne geçebilmek adına diş hekimlerinin olası risk faktörleri hakkındaki farkındalık düzeylerini saptamaktır.
Yöntem: Katılımcılara; online olarak anket formu yöneltildi. İstatistiksel analizler, frekans analizi ve Ki Kare testi ile yapıldı.
Bulgular: Katılımcıların çoğunluğu implant cerrahilerinde hastalara genellikle (%68,4) amoksisilin (işlem sonrası 1g 2x1) reçete etmektedirler. Profilaktik antibiyoterapi uygulanmasının erken dönem implant kaybını önlemede çoğunlukla ve her zaman etkili olduğunu düşünenlerin oranları %17,6 iken postoperatif antibiyoterapi uygulamaları için bu oran %42,7 idi. Profilaktik antibiyoterapinin erken dönem implant kaybını önlemede etkili olduğunu düşünme oranı en yüksek periodontoloji uzmanı hekim (%20,5) grubunda saptandı. Postoperatif antibiyoterapinin bu konudaki etkinliğinin en az olduğunu düşünen grup yine periodontoloji uzmanları (%23,3) idi. Periodontitis öyküsü (%76,3) ve postoperatif komplikasyon gelişimi (%73,1), diyabet (%92,4), sigara kullanımı (%89,8) ve osteoporoz (%78,7) erken dönem implant kaybında en fazla etkisi olan faktörler olarak değerlendirilmiştir.
Sonuç: Ankete katılan diş hekimlerinin erken dönem implant kaybı ile ilgili genel bilgi düzeylerinin yeterli olduğu düşünülmektedir. Diş hekimlerinin bilgi düzeyleri arasındaki farklılıkları giderebilmek için mezuniyet sonrası mesleki eğitim programlarının düzenlenmesinin faydalı olabileceği kanaatindeyiz.
Anahtar Kelimeler: Farkındalık Düzeyi, Erken Dönem İmplant Kaybı, İmplant Komplikasyonları

INTRODUCTION

Tooth loss can be corrected with prosthetic restorations in partially or completely edentulous patients. Although it is known that partially edentulous patients function well with fixed dental prostheses, the majority of patients have difficulty in adapting to removable dental prostheses.[1] Compared to natural teeth, patients using removable dental prostheses were found to have low performance in functional tests. Even with optimal dental prostheses, many oral functions may not be realised at the desired level.[1]

This study was presented orally at the 26th International Dentistry Congress of the Turkish Dental Association.

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Among the treatment options applied to edentulous patients, the most preferred approach is full-arch implant-supported fixed dental prostheses.[2] However, implant applications are complex processes involving surgical and prosthetic stages. Besides, many factors such as age, general health status, socio-cultural characteristics, financial possibilities, intraoral findings are highly influential on the success of implant applications.[3]

Although dental implant treatments have long-term clinical success, biological, biomechanical and aesthetic complications can be seen in some cases. Implant losses can be categorised as early or late failures, depending on the period of occurrence, either before prosthetic abutment placement (early) or after prosthetic loading (late).[4] Early implant losses occur as a result of the formation of a fibrous scar tissue between the bone and the implant surface instead of a normal wound healing with bone apposition on the implant surface.[5]

Dentists undoubtedly have a great role in preventing or reducing implant losses. This study aimed to determine the level of awareness of dentists about the possible causes of early implant losses in order to prevent early implant losses.

METHODS

Location of the Study and Permissions

Necessary permissions were obtained from the Hatay Mustafa Kemal University Non-invasive Research Ethics Committee for our prospective survey study. (Approval number 32 dated 16.06.2021). Informed consents were obtained from the participants before they started to fill in the survey form. The informed consent form is attached.

Data Collection Tools

The survey forms prepared to obtain data were made available online to the participants between July 2021 and May 2022.

The survey form was delivered online to 342 participants. The survey includes 23 questions, 5 for demographic and professional data and 18 for opinions on early implant loss.

Statistical Analysis

In the power analysis of our study, with 5% acceptable error and 95% confidence level, it was seen that at least 330 people should participate among 34045 people (the number of dentists in our country in 2021 according to Turkish Dental Association data).

SPSS software version 25.0 (IBM SPSS Corp.; Armonk, NY, USA) was used for statistical analysis of the data. Data for continuous measurements are given as mean ± standard deviation. Chi-square test was used for the comparison of categorical variables and the statistical significance level was determined as 0.05 for all tests

RESULTS

Demographic Data

It was determined that 36.3% (124) of the dentists participating in our study were female and 63.7% (218) were male. The mean age of the participants was 35.6 ± 8.8 years.

It was observed that 13.5% (46) of the participants worked in an oral dental health centre, 27.2% (93) in a university, 59.1% (202) in a private polyclinic/private practice and 0.3% (1) in other institutions. When the distribution of the speciality areas of the participants was examined, it was seen that 21.3% (73) of the physicians were periodontology specialists and 20.5% (70) were maxillofacial surgery specialists. All other demographic data are shown in Table 1.

Table 1. Professional data of the physicians participating in the study

Parameters	All Participants (n=342)
The organization we have studied, n (%)	
Oral dental health center	46 (13.5)
University	93 (27.2)
Private polyclinic/private practice	202 (59.1)
Other	1 (0.3)
Area of specialization, n (%)	
Periodontology	73 (21.3)
Maxillofacial Surgery	70 (20.5)
Other areas of specialization	30 (8.8)
No specialization	169 (49.4)
Implant application experience, n (%)	
0-5 years	155 (45.3)
5-10 years	80 (23.4)
10-15 years	71 (20.8)
15-20 years	29 (8.5)
Over 20 years	7 (2.0)

Analysing the Relationships between Variables

According to the answers given to the question "How often do you encounter early implant loss?", it was observed that dentists rarely (75.1%) encountered early implant loss. According to the answers given to the question "Do you think that patient gender is effective in early implant loss?", it was seen that the majority of the participants (70.2%) thought that patient gender was not effective in early implant loss. According to the answers given to the question "Do you think that patient age is effective in early implant loss?", approximately half of the dentists (46.2%) reported that patient age was not effective in early implant loss. When the distribution of the responses of the participating dentists to the question "Do you prescribe antibiotics to patients during implant surgery?" was analysed, it was observed that the majority of dentists (68.4%) applied Amoxicillin (1 g 2x1 postoperatively) treatment protocol to patients during implant surgery (Table 2).

Table 2. Participants' responses 1

Questions	All Participants (n=342) n (%)
How often do you encounter early implant loss?	
Never	17 (5)
Rarely	257 (75.1)
Sometimes	64 (18.7)
Mostly	4 (1.2)
Do you think patient gender has an impact on early implant loss (EIL)?	
Not effective	240 (70.2)
I see more early implant loss in male patients	49 (14.3)
I see more early implant loss in female patients	53 (15.5)
Do you think patient age has an impact on early implant loss (EIL)?	
Not effective	158 (46.2)
I see early implant loss more in the 20-40 age range	9 (2.6)
I see early implant loss more in the 40-60 age range	56 (16.4)
Over the age of 60, I see early implant loss more often	119 (34.8)
Do you prescribe antibiotics to patients in implant surgeries?	
I do not prescribe	18 (5.3)
Amoxicillin (3 g loading before the procedure)	3 (0.9)
Amoxicillin (2 g loading before the procedure)	12 (3.5)
Amoxicillin (1 g loading before the procedure)	11 (3.2)
Amoxicillin (2 g loading before the procedure and 1 g 2x1 after the procedure)	43 (12.6)
Amoxicillin (2 g loading before the procedure and 500 mg 2x1 after the procedure)	8 (2.3)
Amoxicillin (1 g 2x1 after the procedure)	234 (68.4)
Other	13 (3.8)

The answers of the physicians participating in the study to the questions asked about the possible risk factors of early implant loss are shown in Table 3. It was observed that the majority of physicians thought that postoperative antibiotherapy was more effective than prophylactic antibiotherapy in early implant loss (Table 3).

The most common factors causing early implant loss were thought to be a history of periodontitis and the development of postoperative complications by the majority of participants (Table 3).

Table 3. Participants' responses 2

	Never n (%)	Rarely n (%)	Sometimes n (%)	Mostly n (%)	Always n (%)
Prophylactic antibiotic administration	91 (26.6)	113 (33)	78 (22.8)	56 (16.4)	4 (1.2)
Postoperative antibiotic administration	42 (12.3)	81 (23.7)	73 (21.3)	116 (33.9)	30 (8.8)
One-stage surgery	35 (10.2)	120 (35.1)	126 (36.8)	57 (16.7)	4 (1.2)
Use of short implants	102 (29.8)	115 (33.6)	70 (20.5)	50 (14.6)	5 (1.5)
Use of narrow diameter implants	105 (30.7)	121 (35.4)	65 (19)	49 (14.3)	2 (0.6)
Periodontitis history	5 (1.5)	25 (7.3)	51 (14.9)	206 (60.2)	55 (16.1)
Presence of adjacent teeth	92 (26.9)	147 (43)	78 (22.8)	25 (7.3)	0 (0)
Development of postoperative complications	3 (0.9)	26 (7.6)	63 (18.4)	231 (67.5)	19 (5.6)
Segmentation applied to the surgical site	27 (7.9)	153 (44.7)	108 (31.6)	53 (15.5)	1 (0.3)
Immediate implant application	35 (10.2)	147 (43)	105 (30.7)	53 (15.5)	2 (0.6)

The responses to the survey questions were also evaluated by classifying them according to their areas of expertise. It was found that antibiotic applications in the postoperative period were preferred more frequently by dentists belonging to other specialities and dentists with no speciality (Table 4).

Table 4. Distribution of participants' opinions on the role of antibiotherapy in preventing early implant loss according to their specialty

	Periodontology (n=73) n(%)	Maxillofacial Surgery (n=70) n(%)	Other areas of specialization (n=30) n(%)	Dentists without specialization (n=169) n(%)	*P*
Prophylactic antibiotic administration					.703
Never - Rarely - Sometimes	58 (79.5)	60 (85.7)	26 (86.7)	138 (81.7)	
Mostly - Always	15 (20.5)	10 (14.3)	4 (13.3)	31 (18.3)	
Postoperative antibiotic administration					**.001**
Never - Rarely - Sometimes	56 (76,7)[a]	49 (70)[a]	18 (60)[a, b]	73 (43,2)[b]	
Mostly - Always	17 (23,3)[a]	21 (30)[a]	12 (40)[a, b]	96 (56,8)[b]	

* Letters indicate which groups the statistical significance is between

In addition, other factors that were statistically different between specialities were the use of narrow diameter implants and periodontitis history. Dentists from other specialities believe that the use of narrow-diameter implants causes early implant loss more frequently. The rates of thinking that periodontitis usually and always caused early implant loss were found to be 89% in periodontology specialists, 77.5% in dentists with no speciality, 76.7% in dentists with other specialities and 60% in maxillofacial surgery specialists, respectively (Table 5). When the effect of systemic conditions on early implant loss was questioned, similar results were obtained for all specialities. The most common systemic conditions thought to cause implant loss were diabetes mellitus (92.4%), smoking (89.8%) and osteoporosis (78.7%), respectively (Table 6).

When the effect of surgical site and bone quality-quantity on early implant loss was questioned, 55.3% of the participants stated that they encountered early implant loss more frequently in the maxilla posterior and 73.7% of the participants stated that they encountered early implant loss more frequently in D4 bone structure (Table 6).

Table 5. Distribution of participants' responses according to their areas of specialization 1

	Periodontology (n=73) n(%)	Maxillofacial Surgery (n=70) n (%)	Other areas of specialization (n=30) n (%)	Dentists without specialization (n=169) n (%)	*P*
One-stage surgery					
Never - Rarely - Sometimes - Mostly - Always	59 (80.8) / 14 (19.2)	62 (88.6) / 8 (11.4)	24 (80) / 6 (20)	136 (80.5) / 33 (19.5)	.480
Use of short implants					
Never - Rarely - Sometimes - Mostly - Always	61 (83.6) / 12 (16.4)	61 (87.1) / 9 (12.9)	23 (76.7) / 7 (23.3)	142 (84) / 27 (16)	.633
Use of narrow diameter implants					
Never - Rarely - Sometimes - Mostly - Always	59 (80,8)[a] / 14 (19,2)[a]	64 (91,4)[a] / 6 (8,6)[a]	18 (60)[b] / 12 (40)[b]	150 (88,8)[a] / 19 (11,2)[a]	**.001**
Periodontitis history					
Never - Rarely - Sometimes - Mostly - Always	8 (11)[a] / 65 (89)[a]	28 (40)[b] / 42 (60)[b]	7 (23,3)[a, b, c] / 23 (76,7)[a, b, c]	38 (22,5)[c] / 131 (77,5)[c]	**.001**
Presence of adjacent teeth					
Never - Rarely - Sometimes - Mostly - Always	68 (93.2) / 5 (6.8)	61 (87.1) / 9 (12.9)	26 (86.7) / 4 (13.3)	162 (95.9) / 7 (4.1)	.063
Postoperative complications					
Never - Rarely - Sometimes - Mostly - Always	18 (24.7) / 55 (75.3)	21 (30) / 49 (70)	8 (26.7) / 22 (73.3)	45 (26.6) / 124 (73.4)	.911
Segmentation applied to the surgical site					
Never - Rarely - Sometimes - Mostly - Always	63 (86.3) / 10 (13.7)	61 (87.1) / 9 (12.9)	24 (80) / 6 (20)	140 (82.8) / 29 (17.2)	.722
Immediate implant application					
Never - Rarely - Sometimes - Mostly - Always	59 (80.8) / 14 (19.2)	64 (91.4) / 6 (8.6)	22 (73.3) / 8 (26.7)	142 (84) / 27 (16)	.115

* Letters indicate which groups the statistical significance is between

Table 6. Distribution of participants' responses according to their areas of specialization 2

	Periodontology (n=73) n (%)	Maxillofacial Surgery (n=70) n (%)	Other areas of specialization (n=30) n (%)	Dentists without specialization (n=169) n (%)	All participants (n=342) n (%)
Surgical site					
Surgical site has no effect	22 (30.1)	15 (21.4)	2 (6.7)	33 (19.5)	72 (21.1)
Maxilla anterior	6 (8,2)	9 (12.9)	6 (20)	40 (23.7)	61 (17.8)
Maxilla posterior	36 (49.3)	40 (57.1)	20 (66.7)	93 (55)	189(55.3)
Mandibula anterio	9 (12.3)	13 (18.6)	7 (23.3)	29 (17.2)	58 (17)
Mandibula posterior	13 (17.8)	7 (10)	2 (6.7)	23 (13.6)	45 (13.2)
Bone quality and quantity					
Not effective	5 (6.8)	6 (8.6)	1 (3.3)	16 (9.5)	28 (8,2)
D1 bone	30 (41.1)	28 (40)	7 (23.3)	57 (33.7)	122(35.7)
D2 bone	3 (4.1)	0 (0)	2 (6.7)	7 (4.1)	12 (3.5)
D3 bone	11 (15.1)	7 (10)	5 (16.7)	24 (14.2)	47 (13.7)
D4 bone	52 (71.2)	57 (81.4)	18 (60)	125 (74)	252(73.7)
Systemic conditions					
Smoking	68 (93.2)	66 (94.3)	26 (86.7)	147 (87)	307(89.8)
Alcohol	23 (31.5)	27 (38.6)	17 (56.7)	89 (52.7)	156(45.6)
Hypertension	6 (8,2)	4 (5.7)	9 (30)	20 (11.8)	39 (11.4)
Diabetes	67 (91.8)	67 (95.7)	28 (93.3)	154 (91.1)	316(92.4)
Obesity	13 (17.8)	12 (17.1)	8 (26.7)	22 (13)	55 (16.1)
Cholesterol	10 (13.7)	8 (11.4)	7 (23.3)	14 (8.3)	39 (11.4)
Serum Vitamin D level	24 (32.9)	40 (57.1)	10 (33.3)	40 (23.7)	114(33.3)
Osteoporosis	57 (78.1)	61 (87.1)	25 (83.3)	126 (74.6)	269(78.7)
Menopause	19 (26)	21 (30)	15 (50)	48 (28.4)	103(30.1)

DISCUSSION

The aim of the study was to determine the awareness levels of dentists working in Turkey about the factors that may cause early implant loss and to reveal how these awareness levels vary according to their specialties.

Implant loss can occur at different time frames during treatment or follow-up. Traditionally, implants lost before prosthetic loading are classified as early losses.[6,7] In the study by Alsaadi et al.[8] a total of 2004 patients and 6946 implant applications were evaluated for implant loss. In this study, 8.9% of patients experienced early implant loss. Early implant loss was observed in 3.6% of the implants. A recent meta-analysis that reviewed the entire literature on this topic presented data from 50 different studies examining early implant loss.[9] In this meta-analysis by Tomasi et al.,[9] the proportion of patients who experienced early implant loss varied between 0% and 15%. Similarly, the rate of early implant loss varies between 0 and 5.8% per implant. The fact that these rates are so variable shows that many factors can be effective on early implant loss. In our study, when the frequency of early implant loss was questioned, 75.1% of the participants stated that they rarely encountered it. The rate of those who stated that they mostly encounter this problem was 1.2%.

There are some reports that gender is associated with early implant loss. Olmedo-Gaya et al.[10] showed that early implant loss was more common in male patients. The higher prevalence of this condition in men has been attributed to the higher prevalence of smoking.[10] However, in another study, gender was not found to be a risk factor.[9] In our study, when the opinions about the effect of gender on early implant loss were questioned, the rate of those who thought that the gender factor was ineffective was 70.2%. While the rate of those who had more frequent early implant loss in men was 14.3%, this rate was 15.5% in women. The opinions of the dentists included in our study regarding the effect of gender on early implant loss were found to be adequate and generally consistent with the literature.

Many studies showing a relationship between age and early implant loss, show that early implant loss is more common over the age of 60. However, there are conflicting publications on this issue. Noguerol et al.[11] showed that old age was protective for early implant loss in their study. Lin et al.[12] compiled the results of more than 30,000 implant applications and showed that being over 60 years of age is a risk factor for early implant loss. In our study, when the relationship between age factor and early implant loss was questioned, the rate of those who thought that age was not effective was 46.2%. The proportion of dentists who generally observed early implant loss in individuals over the age of 60 was found to be 34.8%. Considering the conflicting data on age in the literature, it is not possible to state a definite consensus on this issue.

In a study questioning antibiotic prescribing habits in implant applications, 217 dentists working in the United States were surveyed.[13] Overall, 51.6% of the participants prescribed antibiotics before surgery. Again, 71.4% of the surveyed dentists prescribed antibiotics after routine dental implant surgery. The most commonly used preoperative regimen was 2 g amoxicillin given 1 hour before the procedure (32%). The most commonly preferred postoperative regimen was 500 mg amoxicillin given 3 times daily for 5 days (53%).[13] Canullo et al.[14] found that prophylactic antibiotic administration helped prevent early implant loss in healthy patients. Romandini et al.[15] concluded in their study with 1,693 patients that although the most commonly used prescription was a single dose of 2 g amoxicillin preoperatively, the most successful results were obtained with a single dose of 3 g amoxicillin preoperatively. When the antibiotic use habits of the participants were evaluated in our study, it was observed that 5.3% of the dentists did not prescribe antibiotics. The rate of physicians who applied various antibiotherapy protocols for prophylaxis in the preoperative period was 22.5%. It was observed that the majority of the participants (68.4%) applied the amoxicillin 2x1 g protocol postoperatively. When the role of antibiotic administration in preventing early implant loss was questioned, the rate of those who thought that prophylactic antibiotic administration was mostly and always effective in preventing early implant loss was 17.6%, while this rate was 42.7% for postoperative antibiotic administration. According to their specialty, 20.5% of periodontology specialists thought that prophylactic antibiotherapy could prevent early implant loss. Among all specialties, that consider prophylactic antibiotic therapy to be the most effective has been identified as periodontology. Among all specialties, that consider postoperative antibiotic therapy to be the least effective has been identified as periodontology. (23.3%). It was observed that the group who thought that postoperative antibiotic administration was effective in this regard the most was dentists without specialization (56.8%) and this difference was statistically significant. There was no statistically significant difference in the level of awareness regarding the effect of prophylactic antibiotic use on early implant loss. As seen in international studies, prophylactic applications are performed less frequently than postoperative applications worldwide.[14,15] In our study, there were different practices regarding antibiotherapy and different approaches even among specialties.

The relationship between single-stage surgery and early implant loss is not yet fully understood. Studies on this subject are limited. In a meta-analysis, Troiano et al.[16] compiled data from 13 different studies. The study reported that single-stage surgery may cause a higher rate of early implant loss. However, this was found to be relatively significant. It is stated that the level of evidence of the results obtained is quite low. In our study, when the participants were questioned about the effect of single-stage surgery on early implant loss, the rate of those who mostly and always thought that this factor could cause early implant loss was 17.9%. According to specialties, maxillofacial surgeons (11.4%) were the group who thought that single-stage surgery had the least effect on this issue. Approximately 20% of all other groups thought that single-stage surgery could often and always cause early implant loss. As a result of the analysis, it was observed that there was no statistically significant difference between the awareness levels of physicians regarding single-stage surgery.

There are many studies showing that short and narrow diameter implants can cause early implant loss. Alsaadi et al.[8] found that narrow diameter implants are a significant risk factor for early implant loss. Da Rocha Costa Coelho et al.[17] evaluated 594 patients and 2,537 dental implant applications in their study. In this study, early loss rate was found to be significantly higher in implants with diameters shorter than 8.5 mm and narrower than 3.75 mm. However, there are many other studies not confirming these results.[11,12,18,19] In the study by Derks et al.[19] in the Swedish population, it was shown that narrow implants are not a risk factor, instead short implants may be a more important risk factor. Lin et al.[12] showed that short implants rather than narrow implants are an important risk factor. However, there are many studies not confirming these results either.[18,20] When the effect of short and narrow implant use among the factors that may be effective in early implant loss was questioned among the participants, the rate of those who thought that short implant use was mostly and always effective was 16.1% and the rate of those who thought that narrow implant use was mostly and always effective was 14.9%. When the participants were evaluated according to their specialties, the rates of thinking that the use of short implants was effective were found to be similar between specialties. The rate of dentists who thought that narrow-diameter

implants were effective on early implant loss was 40% among dentists from other specialties. This rate was statistically significantly higher than the other groups. Such short and narrow diameter implants are used in some special patient groups. Especially this group of patients with insufficient bone tissue is already at risk for early implant loss. Therefore, it is not yet clear whether early implant loss is caused by short and narrow diameter implants or by other risk factors. Dentists with no specialization and other specialties may prefer short and narrow diameter implant applications rather than potentially complex augmentation procedures in these patient groups with insufficient bone tissue. The dentists participating in our study also generally think that short and narrow diameter implants are not a significant risk factor for early implant loss. Only a statistically significantly higher proportion of dentists from other specialties (40%) consider this factor to be influential in early implant loss.

A meta-analysis by Sgolastra et al.[21] compiled data from 16 different studies and as a result, it was found that having periodontitis had significant effects on early implant loss. The rate of those who thought that periodontitis could often and always cause early implant loss was 76.3%. Among specialties, the rates of thinking that periodontitis often and always causes early implant loss are 89% in periodontology specialists, 77.5% in dentists without specialization, 76.7% in dentists with other specialties and 60% in maxillofacial surgery specialists, respectively. It was observed that maxillofacial surgery specialists thought that this factor was less effective in early implant loss compared to other specialties and this difference was statistically significant.

Theoretically, it has been suggested that the presence of adjacent teeth may cause implant loss,[22] however, there is no clear study on this subject. It is thought that the implant may damage the neighboring tooth, making it devital and may cause implant loss with the infection that may develop. In our study, the presence of adjacent teeth was the factor least likely to cause early implant loss (7.3%). It was found that there was no statistically significant difference in the opinions about the effect of the presence of adjacent teeth on early implant loss between the specialties. However, periodontologists and non-specialized dentists considered the presence of adjacent teeth to be less influential (6.8% and 4.1%, respectively). Rare complications such as loss of vitality of the adjacent tooth and early implant loss are not considered as clear risk factors. The dentists included in our study generally think similarly.

Some postoperative complications may cause early implant loss. Da Rocha Costa Coelho et al.[17] showed that early implant loss may be observed more frequently after implant surgery if postoperative complications such as wound dehiscence, pus flow, infection and pain develop. In our study, the second factor thought to be most effective on early implant loss was the development of postoperative complications. The rate of those who thought that the development of postoperative complications was mostly and always caused by early implant loss was 73.1%. In each of the specialties, it was thought that the development of postoperative complications could cause early implant loss in approximately 70-75% of cases. The development of complications such as infection and wound dehiscence in the postoperative period is an important risk factor for early implant loss.[17] The dentists participating in our study were also found to have a high and sufficient level of awareness on this issue.

Olmedo-Gaya et al.[10] found that the application of augmentation procedure for the surgical site was a risk factor for early implant loss. However, these patients with insufficient bone tissue already have other risk factors for early implant loss, making it difficult to determine which factor is more effective. In our study, the rate of those who thought that augmentation of the implant site was mostly and always effective in early implant loss was 15.8%. This opinion was found to be similar between specialties and no statistically significant difference was observed. In general, the participants did not consider the fact that augmentation had been performed as a risk factor. There is not much literature data on this subject and there is no consensus.

Jemt et al.[23] found that immediate implant placement after tooth extraction is a risk factor for early implant loss. However, there are not many studies on this factor. Randomized controlled trials and meta-analyses are needed on this subject. In our study, the rate of those who thought that immediate implant application was mostly and always effective in early implant loss was 16.1%. When evaluated according to specialties, the rate of thinking that immediate application is mostly and always effective in early implant loss was 8.6% among maxillofacial surgeons. This rate was the lowest among other specialization groups. However, no statistically significant difference was found between specialties. According to the data we obtained in our study, participants do not think that this practice is an important risk factor. Personal experience comes to the fore in these issues where there is not much literature data.

The surgical site has always been considered an important risk factor for early implant loss. Many studies have shown that implant placement in the maxilla is an important risk factor for early implant loss.[24] Rosenberg et al.[24] reported that the risk was higher in the posterior region of the maxilla. Similarly, Alsaadi et al.[8] found a high risk in the posterior maxilla. However, a large cohort study by Lin et al.[12] revealed that the anterior region of the mandible is a more important risk factor. In our study, when the opinions of the participants about the surgical site factor, which was evaluated among the effective factors in implant loss, were questioned, in general, all specialties reported that early implant loss is most common in the posterior region of the maxilla. However, approximately 1 in 3 (30.1%) periodontologists think that the surgical site has no effect. Many studies have emphasized the importance of the surgical site for early implant loss.[8,12] According to literature data, caution and awareness should be kept high in terms of early implant loss, especially in posterior maxilla applications.

In a study by Nicolielo et al.[25] evaluating bone quality and quantity, a higher rate of early implant loss was observed in D4 bone structure. When the answers of the participants to the question about the effect of bone quality and quantity on implant loss were analyzed in our study, all dentists reported that a high proportion (73.7%) of them thought that the D4 bone structure caused implant loss. Among periodontologists, this rate was 71.2%. It is known that the D4 bone structure is mostly located in the posterior part of the maxilla.[25] It was found that it is well known that early implant loss is more common in D4 bone structure and awareness on this issue is high.

A Japanese study on implant loss in smokers showed that smoking increases the risk of early implant loss.[26] In addition, this study showed that smoking after the surgical procedure was effective in early implant loss, independent of smoking duration. The effect of smoking and alcohol use on implant survival was examined in the study by Galindo-Moreno et al.[27] In this study, smoking and alcohol consumption of more than 10 grams per day were shown to have significant effects on periimplant marginal bone loss. However, no data on early implant loss has been presented.[27] Many other studies have also shown that smoking is a significant risk factor for early implant loss.[9] In our study, the rate of thinking that smoking caused implant loss was 89.8%, while the same rate for alcohol was 45.6%. These rates were similar among all specialty groups. While the awareness of the dentists participating in our study about smoking is at an adequate level, no clear conclusion could be reached at the level of awareness about alcohol consumption. More

studies on the relationship between alcohol consumption and early implant loss are needed.

Diabetes is thought to be closely associated with early implant loss.[28,29] Many experimental studies have shown the negative effects of diabetes on implant healing. Diabetes mellitus impairs wound healing and increases susceptibility to infection.[28,29] Moy et al.[29] found that diabetic patients had more than twice the risk of implant failure. Morris et al.[28] found a very small increase in risk in patients with diabetes (6.8% vs. 7.8%). However, in some human studies, the relationship between the presence of diabetes and early implant loss has not been clearly demonstrated.[8,30] Hypertension is also suspicious for the risk of early implant loss. However, this relationship has not been demonstrated in any study.[31] In our study, participants in all specialty groups reported that diabetes was the most common systemic factor causing implant loss (92.4%). The presence of hypertension (11.4%) was one of the factors least likely to cause implant loss in all specialty groups. Systemic factors may be overlooked by many dentists or not questioned sufficiently before the procedure. However, in our study, it was shown that the awareness level of all dentists was very good in terms of the relationship of diabetes with early implant loss. Although the results cannot be shown conclusively, it is an important requirement for dentists to have a high awareness of systemic disease.

A recent meta-analysis by Monteiro et al.[32] compiled the results of 6 different studies and concluded that there was no significant relationship between obesity and implant complications. A cohort study in Italy, which evaluated 277 patients, showed no association between high cholesterol levels and implant losses.[33] Obesity (16.1%) and high cholesterol (11.4%) were the systemic factors least likely to cause early implant loss in our study. Studies have not shown a relationship between these factors and early implant loss. The majority of dentists working in our country think that these factors are ineffective, in line with the data in the literature.

The relationship between vitamin D levels and early implant loss has long been a focus of interest for researchers. This is mainly due to the effects of Vitamin D levels on bone metabolism. Guido Mangano et al.[34] found no relationship between serum vitamin D levels and early implant loss. There are also many studies questioning the relationship between early implant loss and osteoporosis. Alsaadi et al.[8] showed that osteoporosis is one of the most influential factors on early implant loss. A meta-analysis by Medeiros et al.[35] concluded that there was no significant relationship between osteoporosis and implant survival. Much more randomized controlled clinical trials are needed to clarify this issue. In our study, 78.7% of the participants thought that there was a relationship between osteoporosis and early implant loss and this rate was similar among all specialty groups. The rate of those who thought that serum vitamin D levels were important for early implant loss was 33.3%. More than half of maxillofacial surgeons (57.1%) consider vitamin D to be an important risk factor for early implant loss. Rates are similar in other specialties. Although there are no definitive results in terms of both vitamin D levels and osteoporosis, osteoporosis is considered to be an important risk factor for early implant loss by the dentists participating in our study. Although it has not been conclusively proven, it is important to be aware of the patient's systemic conditions and to be careful in these patients in terms of early implant loss.

Oral hygiene, surgical experience of the operator, implant surface, and bisphosphonate use are among the factors that draw attention when we look at the answers given to the open-ended question. Since patients with poor oral hygiene are likely to develop postoperative complications, this factor was already indirectly assessed in the questionnaire. The surgical experience of the operator is important in terms of factors to be considered during the procedure. Implant surgery is an important treatment protocol that requires knowledge, experience and attention. Today, it is difficult to say that there is a definite relationship between implant surface and early implant loss.[25]

CONCLUSION

According to the results we obtained in our study, it was determined that the level of knowledge of dentists about early implant loss is sufficient in general. It is noteworthy that postoperative antibiotic use is much more intensive than prophylactic antibiotic use. The fact that there are many studies showing the effectiveness of prophylactic antibiotherapy in preventing early implant loss reveals the need to increase the level of awareness of the situation. Regarding some factors, differences were found in the awareness levels of specialist physicians in terms of level of knowledge. Therefore, we believe that it would be important to review and standardize dental implant curricula across institutions to eliminate the differences between specialties.

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REFERENCES

1. Acar A, İnan Ö. İmplant destekli protezlerde okluzyon. *Cumhuriyet Üniv Diş Hek Fak Derg*. 2001;4(1):52-56.
2. Karakoca S, Boynuegri D, Yalim M. Dissiz Alt Çenede Implant Destekli Hareketli Protez Uygulamalari/Implant-Retained Mandibular Overdentures: Case Report. *Türkiye Klinikleri J Health Sci*. 2010; 16(3): 274.
3. Eltaş A, Dündar S, Uzun İH, Malkoç MA. Dental implant başarısının ve hasta profilinin değerlendirilmesi: retrospektif bir çalışma. *Atatürk Üniv Diş Hek Fak Derg*. 2013;23(1):1-8.

4. Manzano G, Montero J, Martín-Vallejo J, Del Fabbro M, Bravo M, Testori T. Risk factors in early implant failure: a meta-analysis. *Implant Dent*. 2016;25(2):272-280.
5. Alsaadi G, Quirynen M, Komárek A, Van Steenberghe D. Impact of local and systemic factors on the incidence of late oral implant loss. *Clin Oral Implants Res*. 2008;19(7):670-676.
6. Cecchinato D, Olsson C, Lindhe J. Submerged or non-submerged healing of endosseous implants to be used in the rehabilitation of partially dentate patients. *J Clin Periodontol*. 2004;31(4):299-308.
7. Koldsland OC, Scheie AA, Aass AM. Prevalence of implant loss and the influence of associated factors. *J Periodontol*. 2009;80(7):1069-1075.
8. Alsaadi G, Quirynen M, Komárek A, van Steenberghe D. Impact of local and systemic factors on the incidence of oral implant failures, up to abutment connection. *J Clin Periodontol*. 2007;34(7):610-617.
9. Tomasi C, Derks J. Etiology, occurrence, and consequences of implant loss. *Periodontol 2000*. 2022;88(1):13-35.
10. Olmedo-Gaya MV, Manzano-Moreno FJ, Cañaveral-Cavero E, de Dios Luna-del Castillo J, Vallecillo-Capilla M. Risk factors associated with early implant failure: A 5-year retrospective clinical study. *J Prosthet Dent*. 2016;115(2):150-155.
11. Noguerol B, Muñoz R, Mesa F, de Dios Luna J, O'Valle F. Early implant failure. Prognostic capacity of Periotest: retrospective study of a large sample. *Clin Oral Implants Res*. 2006;17(4):459-464.
12. Lin G, Ye S, Liu F, He F. A retrospective study of 30,959 implants: Risk factors associated with early and late implant loss. *J Clin Periodontol*. 2018;45(6):733-743.
13. Deeb GR, Soung GY, Best AM, Laskin DM. Antibiotic Prescribing Habits of Oral and Maxillofacial Surgeons in Conjunction With Routine Dental Implant Placement. *J Oral Maxillofac Surg Offic J Am Assoc Oral Maxillofac Surg*. 2015;73(10):1926-1931.
14. Canullo L, Troiano G, Sbricoli L, et al. The Use of Antibiotics in Implant Therapy: A Systematic Review and Meta-Analysis with Trial Sequential Analysis on Early Implant Failure. *Int J Oral Maxillofac Implants*. 2020;35(3):485-494.
15. Romandini M, De Tullio I, Congedi F, et al. Antibiotic prophylaxis at dental implant placement: Which is the best protocol? A systematic review and network meta-analysis. *J Clin Periodontol*. 2019;46(3):382-395.
16. Troiano G, Lo Russo L, Canullo L, Ciavarella D, Lo Muzio L, Laino L. Early and late implant failure of submerged versus non-submerged implant healing: A systematic review, meta-analysis and trial sequential analysis. *J Clin Periodontol*. 2018;45(5):613-623.
17. da Rocha Costa Coelho T, Almeida de Azevedo R, Borges Maia WW, Nunes Dos Santos J, Ramos Cury P. Evaluation of the Association of Early Implant Failure With Local, Environmental, and Systemic Factors: A Retrospective Study. *J Oral Maxillofac Surg Offic J Am Assoc Oral Maxillofac Surg*. 2021;79(6):1237-1245.
18. Bornstein MM, Halbritter S, Harnisch H, Weber HP, Buser D. A retrospective analysis of patients referred for implant placement to a specialty clinic: indications, surgical procedures, and early failures. *Int J Oral Maxillofac Implants*. 2008;23(6):1109-1116.
19. Derks J, Håkansson J, Wennström JL, Tomasi C, Larsson M, Berglundh T. Effectiveness of implant therapy analyzed in a Swedish population: early and late implant loss. *J Dent Res*. 2015;94(3 Suppl):44s-51s.
20. Noda K, Arakawa H, Kimura-Ono A, et al. A longitudinal retrospective study of the analysis of the risk factors of implant failure by the application of generalized estimating equations. *J Prosthodont Res*. 2015;59(3):178-184.
21. Sgolastra F, Petrucci A, Severino M, Gatto R, Monaco A. Periodontitis, implant loss and peri-implantitis. A meta-analysis. *Clin Oral Implants Res*. 2015;26(4):e8-e16.
22. Sussman HI. Tooth devitalization via implant placement: a case report. *Periodontal Clin Investig*. 1998;20(1):22-24.
23. Jemt T, Karouni M, Abitbol J, Zouiten O, Antoun H. A retrospective study on 1592 consecutively performed operations in one private referral clinic. Part II: Peri-implantitis and implant failures. *Clin Implant Dent Relat Res*. 2017;19(3):413-422.
24. Rosenberg ES, Cho SC, Elian N, Jalbout ZN, Froum S, Evian CI. A comparison of characteristics of implant failure and survival in periodontally compromised and periodontally healthy patients: a clinical report. *Int J Oral Maxillofac Implants*. 2004;19(6):873-879.
25. Nicolielo LFP, Van Dessel J, Jacobs R, Quirino Silveira Soares M, Collaert B. Relationship between trabecular bone architecture and early dental implant failure in the posterior region of the mandible. *Clin Oral Implants Res*. 2020;31(2):153-161.
26. Nagao T, Fukuta J, Sugai T, et al. Prevalence of early and late oral implant loss among smokers: a nationwide survey in Japan. *Int J Oral Maxillofac Surg*. 2021;50(8):1113-1119.
27. Galindo-Moreno P, Fauri M, Avila-Ortiz G, Fernández-Barbero JE, Cabrera-León A, Sánchez-Fernández E. Influence of alcohol and tobacco habits on peri-implant marginal bone loss: a prospective study. *Clin Oral Implants Res*. 2005;16(5):579-586.
28. Morris HF, Manz MC, Tarolli JH. Success of multiple endosseous dental implant designs to second-stage surgery across study sites. *J oral Maxillofac Surg: J Am Assoc Oral Maxillofac Surg*. 1997;55(12):76-82.
29. Moy PK, Medina D, Shetty V, Aghaloo TL. Dental implant failure rates and associated risk factors. *Int J Oral Maxillofac Implants*. 2005;20(4):569-577.
30. Staedt H, Rossa M, Lehmann KM, Al-Nawas B, Kämmerer PW, Heimes D. Potential risk factors for early and late dental implant failure: a retrospective clinical study on 9080 implants. *Int J Implant Dent*. 2020;6(1):1-10.
31. Cappuccio FP, Meilahn E, Zmuda JM, Cauley JA. High blood pressure and bone-mineral loss in elderly white women: a prospective study. Study of Osteoporotic Fractures Research Group. *Lancet*. 1999;354(9183):971-975.
32. Monteiro J, Pellizzer EP, Araújo Lemos CA, de Moraes SLD, do Egito Vasconcelos BC. Is there an association between overweight/obesity and dental implant complications? A systematic review and meta-analysis. *Int J Oral Maxillofac Surg*. 2019;48(9):1241-1249.
33. Tirone F, Salzano S, D'Orsi L, Paola P, Rodi D. Is a high level of total cholesterol a risk factor for dental implants or bone grafting failure? A retrospective cohort study on 227 patients. *Eur J Oral Implantol*. 2016;9(1):77-84.
34. Guido Mangano F, Ghertasi Oskouei S, Paz A, Mangano N, Mangano C. Low serum vitamin D and early dental implant failure: Is there a connection? A retrospective clinical study on 1740 implants placed in 885 patients. *J Dent Res Dent Clin Dent Prospects*. 2018;12(3):174-182.
35. de Medeiros F, Kudo GAH, Leme BG, et al. Dental implants in patients with osteoporosis: a systematic review with meta-analysis. *Int J Oral Maxillofac Surg*. 2018;47(4):480-491.