

Assessment of demographic and clinical data related to dental implants in a group of Turkish patients treated at a university clinic

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PURPOSE. This retrospective study analyzed the distribution of the dental implants with regards to age and gender of the patients and type of indication for the implant therapy, as well as the location, dimension and type of the implants. **MATERIALS AND METHODS.** The data of demographics (age and gender), type of indication for implant therapy, anatomical location, dimensions (length and diameter) and type (bone and tissue level) of 1616 implants were recorded from patient charts between January 2000 and January 2010. Descriptive statistics were analyzed using a chi-squared test for demographic parameters, type of indication, tooth position, anatomical location, implant dimensions and type ($\alpha=.05$). **RESULTS.** The patient pool comprised of 350 women and 266 men, with a mean age of 52.12 ± 13.79 years. The difference in n% of the implants of the age groups was statistically significant between the types of indications. The difference in the position of the implants was statistically significant between the n% of the implants of all age groups. Gender did not significantly vary, except that the diameter of the implants was significantly higher for the standard diameter implants in males. The difference between the implant positions was statistically significant when considered according to indication. The relationship between implant length and anatomical location was statistically significant. **CONCLUSION.** The indication for dental implant use is age dependent and the type and size of the implant seems to be strongly related to the location of the implant. [*J Adv Prosthodont 2013;5:351-8*]

KEY WORDS: Age; Gender; Type of indication; Implant position; Implant diameter; Implant length

INTRODUCTION

Dental implant treatment has had a routine clinical application in dental practice for several decades¹⁻³ and is an important component of prosthodontic procedures that improve the satisfaction and patient's quality of life.⁴⁻⁷

Tooth loss is the most common reason for the increasing demand for dental implant treatment, followed by retention and stability problems of conventional dentures, expectations of patients, preferences of the clinician and the known success of implant prostheses.⁸

Treatment with dental implants has been followed up in many long-term clinical studies, focusing primarily on implant survival,⁹⁻¹² and is considered to be superior to conventional treatment modalities. In spite of the high success and survival rates with dental implants, failures do arise. Factors such as patient health, age, gender, status, smoking, quality of bone, oral hygiene and implant maintenance habits, unresolved infection, implant-related factors such as implant dimensions, implant characteristics, implant location, loading protocol and other factors such as clinicians' experience have been previously regarded as the predictors for implant success, survival and failure.⁹⁻¹² Although the results of research have given clinicians the opportunity to

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use well documented concepts concerning design, surface properties, abutments of implants and surgical protocols,¹⁰⁻¹⁴ there is little information for clinicians about the demography, distribution of the implants in terms of location, descriptive data about the use of dental implants in varied indications and the mode of use of varied length and diameter implants.¹⁵⁻¹⁸ It is very important to gather such data in order to take precautions before the possible failures.

Therefore, this retrospective study was conducted to analyze the pool of patients who had received implant treatment at the prosthodontic department of a dental school over a 10 year period.

MATERIALS AND METHODS

Six hundred and sixteen patients, who had consulted at an university clinic for dental implant therapy between January 2000 and January 2010, were included in this retrospective study. The study was approved by the ethics committee of the Istanbul University, Faculty of Medicine, with the protocol number 14910/934.

All patients enrolled in the study group were examined orally and radiographically and a detailed medical and dental history was collected. Only patients with the four most commonly used brands of dental implant systems were included in the study: Straumann (Straumann Dental Implants; Institute Straumann AG, Waldenburg, Switzerland), Astratech (Astratech AB, Mölndal, Sweden), Biolok/Biohorizons (Biohorizons, Birmingham, AL, USA) and Xive (Dentsply-Friadent, Mannheim, Germany). Additional inclusion criteria were that dental implant surgery was performed by the same oral surgeon and the prosthodontic procedures were performed by 5 experienced prosthodontists who were members of the implantology team in the same department.

The following data were reviewed from patient charts:

Patient data: Gender and age, with six age groups

- 1) 18 - 29 years
- 2) 30 - 39 years
- 3) 40 - 49 years
- 4) 50 to 59 years
- 5) 60 to 69 years
- 6) 70 years and older

Indication for implant treatment: Four main types of indications for implant therapy were recorded.^{16,18}

- 1) Single tooth gap
- 2) Distally extended edentulous space (Kennedy Class I and II cases)
- 3) Extended edentulous space that is not contraindicated for conventional fixed partial denture therapy
- 4) Complete edentulism

Anatomical location of the implant: Four groups depending on the location of the dental implant were established.

- 1) Anterior maxilla
- 2) Posterior maxilla
- 3) Anterior mandible
- 4) Posterior mandible

A second classification was made by taking individual implant positions into account:

Maxillary and mandibular

- 1) Central incisors
- 2) Lateral incisors
- 3) Canines
- 4) 1st premolars
- 5) 2nd premolars
- 6) 1st molars
- 7) 2nd molars
- 8) Implants placed on the midline of the mandible were recorded.

Dental implant dimensions: The length, diameter and relationship with the location of the dental implants were recorded. Considering implant length, two groups were developed:

- 1) Implants with a length of less than 10 mm were regarded as short implants¹⁹
- 2) Implants with a length of 10 mm or more were regarded as standard implants

For the diameter of the implants, 3 groups were established:

- 1) Implants with a diameter less than 3.75 mm were regarded as narrow²⁰
- 2) Between 3.75-5.00 mm were regarded as standard
- 3) Above 5.00 mm were regarded as wide implants²¹

Implant type: Bone level and tissue level implants were differentiated.

For the statistical analysis of the results, SPSS (Statistical Package for Social Sciences) (SPSS Inc., Release 15.0 for Windows, Chicago, IL, USA) were used. Descriptive statistics (means, standard deviations and frequency) were performed and analyzed by using a chi-squared test for the following parameters: demographic parameters, type of indication, tooth position, anatomical location, implant dimensions and type. The results were assessed at a significance level of .05.

RESULTS

One thousand, six hundred and ninety two implants that were placed in 616 patients over the assessed 10 year period were included in the present study. The patient pool comprised of 350 women and 266 men, with a mean age of 52.12 ± 13.79 years.

Table 1 presents the distribution of the number and percentage (n%) of the implants according to age groups and gender of the patients versus type of indication, implant dimensions (length and diameter) and implant type. The difference in n% of the implants of the age groups

Table 1. The distribution of the number of implants and percentage (n%) of each parameter according to age and gender

	Age group (years)						<i>P</i>	Gender		<i>P</i>
	18-29 n (%)	30-39 n (%)	40-49 n (%)	50-59 n (%)	60-69 n (%)	70 and older n (%)		Male n (%)	Female n (%)	
Type of indication										
Single tooth gap	35 (53.8)	51 (39.5)	51 (14.5)	60 (11.5)	20 (4.7)	7 (3.5)	.001**	103 (13.3)	121 (13.2%)	.198
Distally extended edentulous space	6 (9.2)	34 (26.4)	106 (30.2)	147 (28.2)	79 (18.5)	21 (10.6)		171 (22.0)	222 (24.2%)	
Extended edentulous	16 (24.6)	34 (26.4)	59 (16.8)	74 (14.2)	58 (13.6)	18 (9.1)		134 (17.3)	125 (13.6%)	
Complete edentulous	8 (12.3)	10 (7.8)	135 (38.5)	241 (46.2)	270 (63.2)	152 (76.8)		368 (47.4)	448 (48.9%)	
Implant length										
Short < 10 mm	5 (7.7)	3 (2.3)	15 (4.3)	34 (6.5)	8 (1.9)	5 (2.5)	.004**	31 (4.0)	39 (4.3%)	.787
Standard	60 (92.3)	126 (97.7)	336 (95.7)	488 (93.5)	419 (98.1)	193 (97.5)		745 (96.0)	877 (95.7%)	
Implant diameter										
Narrow < 3.75 mm	23 (35.4)	25 (19.4)	107 (30.5)	151 (28.9)	104 (24.4)	49 (24.7)	.037*	194 (25.0)	265 (28.9%)	.035*
Standard	31 (47.7)	88 (68.2)	217 (61.8)	319 (61.1)	286 (67.0)	129 (65.2)		516 (66.5)*	554 (60.5%)	
Wide > 5 mm	11 (16.9)	16 (12.4)	27 (7.7)	52 (10.0)	37 (8.7)	20 (10.1)		66 (8.5)	97 (10.6%)	

was statistically significant between the types of indications. For the age groups of 16-29 and 30-39 years, the n% of the implants that were placed for the indication of single tooth gap was significantly higher than the other indications. For the indication of complete edentulism, the n% of the implants was significantly higher for the age groups of 60 years and more. When considered according to the differences between the types of indications within each age group, all types of indications were statistically significant, except for the age groups of 40-49 years and 50-59 years. Gender did not significantly differ within the types of indication. The difference in the n% of the implants of the age groups was statistically significant when the length of the implants was considered. The use of short implants of the age group of 60-69 years was the lowest within all age groups and this was significantly different than in the age groups of 16-29, 40-49 and 50-59 years. The difference in the n% of the implants of the age groups was statistically significant when the diameter of the implants was assessed. For the age group of 16-29 years, the n% of the implants was significantly different than the other age groups, except the group of 50-59 years. The difference in the n% of the implants between the age groups of 30-39 and 40-49 years was significant. When gender differences were considered, the n% of the implants did not significantly vary according to the length, but the n% of the implants varied significantly according to the diameter of the implants and was significantly higher for the standard diameter implants in males. The difference in the n% of the implants of the age groups was statistically significant when the diameter of the

implants was evaluated. The n% of the bone level type implants of 16-29 years and 40-49 years was significantly higher than the age groups of 50 years and older, while the difference in implant type between the other age groups was not statistically significant.

Table 2 presents the distribution of the n% of the implants according to age groups and gender of the patients versus anatomical location and position of the implants. The difference in the positions of the implants was statistically significant between the n% of the implants in all age groups. The n% of the implants that replaced the maxillary lateral incisors and mandibular first molars was significantly higher in the age group of 16-29 years, while the n% of the implants that replaced the mandibular first molars was highest in the age group of 30-39 years. The n% of the implants that replaced mandibular canines was significantly higher in the age groups of 40 years and older. When the anatomical location according to the age groups was assessed, the difference in the n% of the implants was not significant between the age groups of 40-49 and 50-59 years, 50-59 and 60-69 years, and 60-69 and 70 years and older; but was significant between the other age groups. Anatomical locations of the implants did not have a significant relationship with gender.

Table 3 presents the distribution of the n% of the implants according to the position and anatomical location of the implants versus type of indication. The difference between the implant positions was statistically significant when considered according to indications. For the indication of single tooth gap, the n% of the implants that

Table 2. The distribution of the implant number and percentage (n%) according to jaw and implant positions, anatomical location, age groups and gender of the patients

Jaw	Implant position	Age (years)						Gender	
		18-29	30-39	40-49	50-59	60-69	70+	Male	Female
Maxillae	Central incisor	6 (9.23)	9 (6.98)	19 (5.41)	18 (3.45)	17 (3.98)	10 (5.05)	41 (5.28)	38 (4.15)
	Lateral incisor	10 (15.38)	9 (6.98)	15 (4.27)	29 (5.56)	29 (6.79)	7 (3.54)	53 (6.83)	46 (5.02)
	Canine	4 (6.15)	2 (1.55)	18 (5.13)	26 (4.98)	20 (4.68)	16 (8.08)	37 (4.77)	49 (5.35)
	1 st premolar	5 (7.69)	12 (9.30)	28 (7.98)	47 (9.00)	38 (8.90)	13 (6.57)	75 (9.66)	68 (7.42)
	2 nd premolar	6 (9.23)	15 (11.63)	35 (9.97)	39 (7.47)	26 (6.09)	10 (5.05)	58 (7.47)	73 (7.97)
	1 st molar	3 (4.62)	12 (9.30)	17 (4.84)	37 (7.09)	22 (5.15)	9 (4.55)	48 (6.19)	52 (5.68)
	2 nd molar	1 (1.54)	3 (2.33)	8 (2.28)	13 (2.49)	5 (1.17)	1 (0.51)	17 (2.19)	14 (1.53)
Mandible	Middle	0	1 (0.78)	3 (0.85)	7 (1.34)	13 (3.04)	9 (4.55)	15 (1.93)	18 (1.97)
	Central incisor	2 (3.08)	2 (1.55)	15 (4.27)	18 (3.45)	11 (2.58)	2 (1.01)	24 (3.09)	26 (2.84)
	Lateral incisor	6 (9.23)	3 (2.33)	17 (4.84)	29 (5.56)	25 (5.85)	17 (8.59)	50 (6.44)	47 (5.13)
	Canine	1 (1.54)	4 (3.10)	58 (16.52)	117 (22.41)	123 (28.81)	65 (32.83)	142 (18.30)	226 (24.67)
	1 st premolar	6 (9.23)	5 (3.88)	27 (7.69)	37 (7.09)	31 (7.26)	21 (10.61)	58 (7.47)	69 (7.53)
	2 nd premolar	4 (6.15)	8 (6.20)	31 (8.83)	26 (4.98)	23 (5.39)	2 (1.01)	39 (5.03)	55 (6.00)
	1 st molar	10 (15.38)	32 (24.81)	40 (11.40)	46 (8.81)	30 (7.03)	12 (6.06)	82 (10.57)	88 (9.61)
2 nd molar	1 (1.54)	12 (9.30)	20 (5.70)	33 (6.32)	14 (3.28)	4 (2.02)	37 (4.77)	47 (5.13)	
Anatomical location	Anterior maxillae	20 (30.8)	20 (15.5)	52 (14.8)	74 (14.2)	67 (15.7)	33 (16.7)	132 (17.0)	134 (14.6)
	Posterior maxillae	15 (23.1)	42 (32.6)	88 (25.1)	135 (25.9)	91 (21.3)	33 (16.7)	197 (25.4)	207 (22.6)
	Anterior mandible	9 (13.8)	10 (7.8)	91 (25.9)	167 (32.0)	163 (38.2)	84 (42.4)	220 (28.4)	304 (33.2)
	Posterior mandible	21 (32.3)	57 (44.2)	120 (34.2)	146 (28.0)	106 (24.8)	48 (24.2)	227 (29.3)	271 (29.6)

Table 3. The distribution of the implant number and percentage (n%) according to jaw, implant position and type of indication for the implant therapy

Jaw	Implant position	Indication			
		Single tooth	Distally extended edentulous space	Extended edentulous	Complete edentulous
Maxillae	Central incisor	27 (11.20)	1 (0.25)	18 (6.959)	33 (4.04)
	Lateral incisor	22 (9.13)	4 (1.01)	27 (10.42)	46 (5.64)
	Canine	12 (4.98)	12 (3.03)	28 (10.81)	37 (4.53)
	1 st premolar	17 (7.05)	34 (8.59)	46 (17.76)	46 (5.64)
	2 nd premolar	25 (10.37)	41 (10.35)	35 (13.51)	30 (3.689)
	1 st molar	25 (10.37)	37 (9.34)	20 (7.72)	18 (2.21)
	2 nd molar	3 (1.24)	25 (6.31)	0	3 (0.37)
Mandible	Midline	0	0	0	33 (4.04)
	Central incisor	23 (9.54)	0	5 (1.93)	39 (4.78)
	Lateral incisor	2 (0.83)	2 (0.51)	26 (10.04)	67 (8.21)
	Canine	4 (1.66)	6 (1.52)	3 (1.16)	355 (43.50)
	1 st premolar	8 (3.32)	29 (7.32)	16 (6.18)	74 (9.07)
	2 nd premolar	12 (4.98)	51 (12.88)	14 (5.41)	17 (2.08)
	1 st molar	58 (24.07)	79 (19.95)	17 (6.56)	16 (1.96)
2 nd molar	3 (1.24)	75 (18.94)	4 (1.54)	2 (0.25)	
Anatomical location	Anterior maxillae	61 (22.9)	14 (5.3)	73 (27.4)	118 (44.4)
	Posterior maxillae	70 (17.3)	137 (33.9)	101 (25.0)	96 (23.8)
	Anterior mandible	12 (2.3)	7 (1.3)	34 (6.5)	471 (89.9)
	Posterior mandible	81 (16.3)	235 (47.2)	51 (10.2)	131 (26.3)

replaced the maxillary central incisors was significantly higher than the n% of other maxillary or mandibular implants. For the indication of distally extended edentulous spaces, the n% of the implants that replaced the maxillary or mandibular second premolars and molars was significantly higher. For the indication of extended edentulous spaces, the n% of the implants that replaced the maxillary first and second premolars was significantly higher than all the other positions of the implants. The difference in the n% of the implants was significant between the anatomical locations when the indications for implant therapy were considered. The n% of the implants for the treatment of complete edentulism was significantly higher in the anterior maxilla and mandible, while the n% of the implants in the posterior maxillae and mandible was significantly higher in the treatment of “distally extended edentulous spaces”.

Table 4 displays the distribution of the n% of the implants according to the positions and anatomical locations of the implants versus length, diameter and type of the implants. The relationship between implant length and anatomical location was statistically significant. The n% of short implants in the posterior maxillae and mandible was significantly higher than the anterior segments, while the difference within the anterior or posterior segments was not significant. When the implant positions were consid-

ered, the difference in implant length was statistically significant. The n% of short implants that replaced the maxillary second molars was significantly higher than all other short implants. The n% of short implants placed in mandibular first and second molars was significantly higher than the n% of the maxillary central incisors, mandibular incisors and canines. The difference in the n% of the standard length implants was not significant when the implant positions/anatomical locations were considered. The difference in the n% of the implants between the maxillary and mandibular implants was not statistically significant when the diameter of the implants was considered. The n% of narrow implants was significantly higher in the anterior maxillae than in the three other anatomical locations. The n% of wide diameter implants was significantly lower in the anterior mandible. The n% of bone level implants was significantly higher in the anterior maxillae. When analyzed according to the implant position, the n% of tissue level implants was significantly higher in the maxillary second premolar, molar and mandibular posterior teeth.

Table 5 displays the n% of the implants according to length and diameter of the implants versus type of indication. The n% of short implants was significantly higher in distally extended edentulous spaces than the other indications. When the length of the implants was assessed, the

Table 4. The distribution of the implant number and percentage (n%) according to jaw, tooth position, implant length, diameter and type

Jaw	Implant position	Implant length (number %)		Implant diameter (number %)			Implant type (number %)	
		Short < 10 mm	Standard	Narrow < 3.75 mm	Standard	Wide > 5 mm	Bone level	Tissue level
Maxillae	Central incisor	0 (0.00)	79 (4.87)	26 (5.66)	35 (3.27)	18 (11.04)*	70 (5.89)	9 (1.79)
	Lateral incisor	4 (5.71)	95 (5.86)	55 (11.98)	41 (3.83)	3 (1.84)	85 (7.15)	14 (2.78)
	Canine	1 (1.43)	85 (5.24)	22 (4.79)	49 (4.58)	15 (9.20)	71 (5.97)	15 (2.98)
	1 st premolar	3 (4.29)	140 (8.63)	66 (14.38)	72 (6.73)	5 (3.07)	108 (9.08)	35 (6.96)
	2 nd premolar	7 (10.00)	124 (7.64)	26 (5.66)	85 (7.94)	20 (12.27)	94 (7.91)	37 (7.36)
	1 st molar	4 (5.71)	96 (5.92)	11 (2.40)	68 (6.36)	21 (12.88)	58 (4.88)	42 (8.35)
	2 nd molar	9 (12.86)	22 (1.36)	2 (0.44)	19 (1.78)	10 (6.13)	22 (1.85)	9 (1.79)
Mandible	Midline	0	33 (2.03)	5 (1.09)	28 (2.62)	0	28 (2.35)	5 (0.99)
	Central incisor	0	50 (3.08)	29 (6.32)	21 (1.96)	0	33 (2.78)	17 (3.38)
	Lateral incisor	0	97 (5.98)	42 (9.15)	55 (5.14)	0	54 (4.54)	43 (8.55)
	Canine	4 (5.71)	364 (22.44)	60 (13.07)	292 (27.29)	16 (9.82)	278 (23.38)	90 (17.89)
	1 st premolar	1 (1.43)	126 (7.77)	35 (7.63)	85 (7.94)	7 (4.29)	77 (6.48)	50 (9.94)
	2 nd premolar	7 (10.00)	87 (5.36)	21 (4.58)	63 (5.89)	10 (6.13)	64 (5.38)	30 (5.96)
	1 st molar	16 (22.86)	154 (9.49)	45 (9.80)	97 (9.07)	28 (17.18)	103 (8.66)	67 (13.32)
2 nd molar	14 (20.00)	70 (4.32)	14 (3.05)	60 (5.61)	10 (6.13)	44 (3.70)	40 (7.95)	
Anatomical location	Anterior maxillae	6 (2.3)	260 (97.7)	103 (38.7)	127 (47.7)	36 (13.5)	228 (85.7)	38 (14.3)
	Posterior maxillae	22 (5.4)	382 (94.6)	105 (26.0)	243 (60.1)	56 (13.9)	281 (69.6)	123 (30.4)
	Anterior mandible	4 (0.8)	520 (99.2)	132 (25.2)	378 (72.1)	14 (2.7)	371 (70.8)	153 (29.2)
	Posterior mandible	38 (7.6)	460 (92.4)	119 (23.9)	322 (64.7)	57 (11.4)	309 (62.0)	189 (38.0)

Table 5. The distribution of the implant number and percentage (%) according to implant length, diameter and type of indication

		Type of indication				P
		Single tooth	Distally extended edentulous space	Extended edentulous	Complete edentulous	
Length	Short < 10 mm	7 (3.1)	39 (9.9)	9 (3.5)	15 (1.8)	.001
	Standard	217 (96.9)	354 (90.1)	250 (96.5)	801 (98.2)	
Diameter	Narrow < 3.75 mm	56 (25.0)	91 (23.2)	105 (40.5)	207 (25.4)	.001
	Standard	127 (56.7)	249 (63.4)	123 (47.5)	571 (70.0)	
	Wide > 5 mm	41 (18.3)	53 (13.5)	31 (12.0)	38 (4.7)	

difference in the n% of the implants used for single tooth gap, extended edentulous spaces and complete edentulous cases was not statistically significant. The n% of the narrow implants is significantly higher in extended edentulous spaces than the other type of indications, while the n% of wide diameter implants is significantly lower in complete edentulous cases.

DISCUSSION

For the treatment of partial or complete edentulism, dental implants have been a popular alternative for several decades. The number of implants used on each market may also be obtained from different sources. During the 1980s, about 300,000 implants were inserted worldwide per year,²² while just before the start of the millennium, the implant insertion rate had risen to more than 1 million per year.^{23,24}

The range of indications for dental implants has been broadened and the patient profile has shifted from complete edentulism to partial edentulism over the past two decades.¹⁶ Since implant treatment has proven itself to be very successful, its use is increasing year by year.⁷ In the present investigation, the majority (48.2% of implants) were placed for the treatment of complete edentulism, followed by distal edentulism (23.2% of implants). This finding is in parallel with the findings of Buser *et al.*¹⁸ who reported the same trend in type of indications in their patient pool. On the other hand, Bornstein *et al.*¹⁶ reported single tooth gap in their study as the most frequent implant indication. However, it should be pointed out that both the findings of Buser *et al.*¹⁸ and the present study are from the patient pool of university clinics, whereas Bornstein *et al.*¹⁶ reported the findings of a private clinic, which could explain the dissimilar findings.

When the distribution of the implants regarding implant position and type of indication for implant therapy was analyzed (independent of age groups), the n% of implants placed for single tooth gap in maxillae and mandible was significantly higher for central incisors and first molars, respectively. These findings are in parallel with the findings reported by Bornstein *et al.*¹⁶ In view of the pres-

ent findings, it seems that the most frequent indication of implant placement for single tooth gap is in the place of central incisors when the age factor was not considered. For the indication of single tooth gaps, the difference between the frequency of maxillary central and lateral incisors might be due to the pooling of patients and the age groups, while the percentage for mandibular first molars was the highest for both conditions.

In the present study, the number of implants in the position of the maxillary lateral incisors and mandibular 1st molars was significantly higher in the age group of 16 to 29 years. This finding may be due to the tooth loss caused by clinical factors, commonly tooth decay, periodontal diseases of the first molars, traumatic factors or the tooth agenesis of missing lateral incisors in this age group. In the age groups of 16 to 29 and 30 to 39 years, the finding that the number of implants placed in the posterior mandible was significantly higher than the other anatomical locations supports the previous findings that the most frequent missing teeth were molars.^{25,26} In both age groups, the most frequent indication type for implant placement was also single tooth gap. In all age groups of 40 years or older, significantly higher numbers of implants were placed at mandibular canines, indicating the onset of partial or complete edentulism. Although there is no statistical significance between the types of indications for implant placement, in the age group of 40 to 49 years, the overall percentage of implants placed for distal edentulism and complete edentulism was 30.2% and 38.5%, respectively. The same trend was also observed for the age group of 50 to 59 years. In the age groups of 60 to 69 years and 70 to 79 years, the most frequent type of indication for implant placement was complete edentulism, with a significantly higher number of implants placed at the mandibular canine sites because of the often used 2 implant supported overdenture solution, where the implants are usually placed at mandibular canine sites.

Commercially available implant systems vary in diameter from 3 to 7 mm. The length and diameter of implants were originally designed to allow the use of these implants in the average alveolar processes. However, the posterior maxilla

and mandible present specific challenges. Molars are the most frequently missing teeth and the most frequently surgically treated.^{25,27} For this reason, molars are frequently lost and need substitution. Since factors such as progressive resorption of the residual alveolar crest reduce available ridge height or the anatomy may complicate implant placement, short implants may be an important aid in dental implantology. Furthermore, poor bone quality in the posterior maxilla or mandible, the close proximity of the lingual nerve, and the possible injury of the lingual artery may complicate implant placement.^{28,29} For standard length implants, no difference was observed within the tooth positions and the anatomical locations, while the use of short implants was significantly higher in posterior maxillae and mandible, especially in the place of maxillary second and mandibular first and second molars. In their retrospective analysis, Bornstein *et al.*¹⁶ reported a 10% distribution of short implants that was higher than the percentage use of short implants (4.1%). In another retrospective study³⁰ reporting the use of short implants with length of 6 to 8 mm, the main reasons for the use of short implants was the proximity of the maxillary sinus and inferior alveolar canal.

The use of wide or regular sized implants was generally recommended to ensure sufficient bone to implant contact.^{26,31,32} However, it should be pointed out that a minimum of 1 mm of bone thickness must surround the entire implant surface.³³ In cases of alveolar bone loss as a result of periodontal disease, periapical pathology or trauma, damage of the bony tissues due to traumatic extractions or late implantation caused bone atrophy of the long-term edentulous areas and an insufficient implantation bed for regular sized implants can be seen with reduced width of the buccal and lingual bone walls and reduced socket height.³⁴⁻³⁷ Placing a regular sized implant in such situations may cause large dehiscences, risking complications and failure.³³ The use of narrow diameter implants in alveolar bone with a limited bucco-lingual or mesio-distal width may prevent the risk of injury to neighboring teeth or a dehiscence defect and thus the need for bone augmentation.^{33,38} In the present study, 63.2% of the implants had a standard size diameter and 27.1% had a narrow diameter. Closer to the present findings, Bornstein *et al.*¹⁶ reported that 69% of the implants used had a standard diameter. In the present study, significant differences between the tooth positions were only observed for the wide diameter implants. Wide diameter implants were mostly used in the maxillary central incisors, second premolars, first molars and mandibular first molars, which have a greater root surface area than the other teeth. In the present study, significantly higher use of standard diameter implants in men than women might be due to the higher volumetric size of the jaws of men. In this retrospective analysis, a detailed distribution of the use of the dental implants was reported according to age groups, gender, tooth position, anatomical location, implant length/diameter and type. Although there are a few studies^{10,15,16,18} reporting of the distribution of the use of the dental implants, there are no available studies that report of

the distribution of the type of indications according to gender and age groups and the distribution of implant length, diameter and type.

CONCLUSION

Within the limitations of this retrospective study, the most frequently used implant indication especially in the population over the age of 40 years seems to be complete edentulism. The younger the patient, the more frequent the indication of a single tooth gap is encountered, which seems to be the mandibular first molar and maxillary incisor positions in greatest frequency. This data might be helpful in analyzing and predicting trends in dental implantology, especially for implant distributors, manufacturers and dental practitioners, for establishing implant reserves and epidemiological studies could benefit from such information.

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