

Preference of Suture Specifications in a Selected Periodontal and Implant Surgeries in Turkey

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Eur J Dent 2019;13:108–113

Abstract

Objective Various suture materials and needles are now available for use in the dental surgery. The aim of this study was to determine the preference of suture materials among Turkish dentists by a dental survey.

Materials and Methods The survey was prepared and sent electronically to Turkish dentists through e-mail and/or Facebook. Dentists were asked to report their graduation year from dental school and their specialty if they have one. In addition, the type periodontal/implant operations and the frequency of those operations applied by them were questioned. The participants were to indicate their suture preferences for these procedures in a multiple-choice questionnaire.

Results Fifty-seven regular dentists, 49 periodontists, 22 oral surgeons, and 8 other specialists completed a self-administered survey. The majority of clinicians worked in private practice (77.9%). Nonabsorbable sutures were the most preferred for all procedures except periodontal plastic surgery. In regenerative surgeries, monofilament, 5–0 diameter suture material on a reverse cutting, 3/8 circle needle was preferred. In addition, for mucogingival surgery, 5–0 diameter suture material on a reverse cutting and 3/8 circle needle was favored. For dental implants, 4–0 diameter suture material on a reverse cutting and 3/8 circle needle was preferred. Monofilament and braided sutures were selected almost equally for implant operations.

Conclusions In periodontal and implant surgeries, dentists highly preferred the use of nonabsorbable sutures. In addition, the shape and diameter of needle had an important role in the selection of suture material. The present study's results may serve as a guide for the future studies.

Keywords

- ▶ implant surgeries
- ▶ periodontal operations
- ▶ suture types

Introduction

Wound closure is a key element for healing following surgical operations and important to promote favorable and successful healing while reducing complications such as infection.^{1,2} Sutures, surgical clamps, and adhesive agents are used for securing and stabilizing detached tissues for the subsequent satisfactory healing.³ Surgical clamps may not be suitable for routine oral surgery interventions due to the high cost and the failure to affect the closing forces.⁴ Cyanoacrylate tissue adhesives may be applied occasionally as an alternative to suturing.^{5–7} In addition, tissue adhesives have bacteriostatic and hemostatic properties and reduce

the treatment time.⁸ However, some disadvantages of adhesives include insufficient adherence to wound margins, application problems, and prolonged healing times. These variables limit the use of adhesives.³ Although suturing is usually a time-consuming and technique-sensitive part of surgical procedures, it is the best available technique for ideal wound closure without destroying the physiological aspects of wound healing.⁹

Ideally, suture materials should be biocompatible and induce minimal tissue reactions while providing sufficient strength during the critical period of healing. These materials are classified as braided multifilament and

monofilament or bioabsorbable and nonabsorbable.¹⁰ The needle and thread characteristics affect wound healing and surgical outcome.⁹ For instance, the silk sutures were tested against Teflon (polytetrafluoroethylene) in implant operations. Silk sutures showed less intraoperative handling and less patient discomfort. In addition, the latter was shown to have less plaque accumulation, but without a statistical difference.¹¹ Leknes et al stated that braided silk sutures cause a more extensive inflammatory tissue reaction than monofilament sutures due to their ability to conduct bacterial migration into the flap.¹² In periodontal surgery, 3/8 circular, reverse cutting, sharp needle sutures with 4-0, 5-0, or 6-0 tread diameter are generally preferred to ensure optimum results through minimizing tissue trauma.^{3,13-15} Furthermore, not only the needle and thread characteristics but also the suturing technique and the surgical approach have an influence on the wound healing. Tavelli et al showed that the suturing technique has a significant role in the flap adaptation that might enhance the surgical outcome.¹⁶

There are many suturing materials now available in the dental market. However, the selection of suture material for periodontal or implant surgery is often based on personal choices rather than scientific data and has not been extensively investigated. The aim of this study was to

determine the preference of suture materials among a group of dentists in Turkey by a dental survey.

Materials and Methods

Study Design

This study was conducted between March 2013 and July 2013. The study protocol was approved by the Istanbul Aydin University Ethics Committee (number: 238). Surveys (– Fig. 1) were prepared in Google Forms and were sent through Facebook (professional dentistry groups) and e-mail accounts to the dentists to increase participation.

Demographics of the participants were specified by professional experience (years of practice and practice setting) and the presence of a specialty.

The type and frequency of periodontal and implant operations reported by the dentists were recorded. The participants were asked to specify the choice of their suture type (absorbable or nonabsorbable, monofilament or braided multifilament, and thread diameter [3-0, 4-0, 5-0, 6-0, and 7-0]), needle shape (circular shaped, reverse cutting, or cutting), and needle cutting edge preference in different operations such as periodontal surgeries (flap, guided tissue regeneration [GTR] operations), mucogingival surgeries (frenectomy, vestibuloplasty, free gingival graft [FGG], and

The image shows a screenshot of a survey form with the following questions and options:

- 1. How long has it been since you have finished your license education?**
 0-5 years 5-10 years 11-15 years 16-20 years 1-25 years more than 25 years
- 2. Which of the following statements is describing you better?**
 No PhD or specialization PhD or specialization in Periodontology
 Ph.D. or specialization in Oral and Maxillofacial Surgery
 Ph.D. or specialization in Prosthetic Dentistry Ph.D. or specialization in Restorative Dentistry
 PhD or specialization in Endodontics PhD or specialization in Pedodontics
 Ph.D. or specialization in Orthodontics Ph.D. or specialization in Oral and Maxillofacial Radiology
- 3. Which university did you graduate from?**
- 4. If you did, how long has it been since you have finished your Ph.D. or specialization?**
 0-5 years 6-10 years 11-15 years 16-20 years 21-25 years more than 25 years
- 5. What is your working status?**
 Private Dentist Office Private Dentist Clinic University Dental Center- Public Dental Center - Private
- 6. Which surgical operation do you perform mostly?**
 Flap Operations Mucogingival Operations Guided Tissue Regeneration Operations Implant Operations
 Guided Bone Regeneration Operations
- 7. How often do you perform these operations?**
 Everyday Once in 2-4 days Once in a week Once in a month
- 8. Mark your preferences for flap operations;**
 - 8a. suture material.**
 Absorbable Non-absorbable
 - 8b. suture material.**
 Braided-Multifilament Monofilament
 - 8c. needle.**
 Circular shaped Reverse cutting Cutting
 - 8d. needle.**
 1/2 circle 3/8 circle Straight
 - 8e. suture diameter.**
 3-0 4-0 5-0 6-0 7-0

Fig. 1 The survey consists of 15 questions, and the first eight questions are shown.

connective-tissue graft), and implant operations with or without guided bone regeneration (GBR).

Statistical Analysis

The statistical analysis was performed using the Statistical Package for the Social Sciences software (IBM Corp, released 2013, Version 22.0, Armonk, New York). The collected results were averaged (mean \pm standard deviation) for all parameters.

Results

In total, 136 participants completed the survey and 66.2% of the participants defined themselves as experienced clinicians in practice over 10 years. About 41.9% of the participants were general practitioners. Among the specialists, 62.6% were periodontists and 27.9% were oral surgeons. Approximately, 41.2% of the specialists reported having 5 or more years of experience. Only 22.1% of the clinicians worked at a university clinic or public hospital. About 42.6% of the participants reported that they perform only implant surgeries, whereas the percentage of doctors performing all five listed surgeries was 14%. In total, 58.9% of the participants reported performing surgical interventions more than three times in a week. In the survey, no clinician selected the 7–0 suture diameter.

About 75.7% of the participants reported using non-resorbable suture material in flap surgery. Nearly 42.6% of the clinicians reported using only braided suture material and 41.2% used only monofilament. Only 8.1% reported to use both and the remaining dentists did not respond to this question. About 45.6% and 72.8% of them reported using reverse cutting needles and 3/8 circle needles for flap surgeries, respectively. 4–0 and 5–0 diameter suture materials were preferred 52.2% for flap operations by the clinicians.

Nonresorbable and monofilament suture materials were highly preferred in GTR operations (60.3% and 63.2%, respectively). In these surgeries, the most selected diameter was 5–0. Reverse cutting and 3/8 circle needles were most preferred in GTR operations. Similarly, nonabsorbable, monofilament, 5–0 diameter material on a reverse cutting, and 3/8 circle sutures were preferred in hard-tissue ridge augmentations.

Monofilament, 5–0 suture material on a reverse cutting, and 3/8 circle needle was favored for FGG, subepithelial connective-tissue grafts (SCTG), and frenectomy operations. Nonabsorbable and absorbable sutures were preferred almost equally for frenectomy and SCTG operations. However, non-resorbable sutures were more preferred in FGG operations.

For dental implant surgeries, 3–0, 4–0, and 5–0 diameter threads on reverse cutting, 3/8 circle needles were preferred.

Table 1 Periodontal and dental implant operations versus suture preferences (absorbable or nonabsorbable, monofilament or braided multifilament, and diameter of the thread)

Suture material	Periodontal flap, n (%)	Guided tissue regeneration, n (%)	Frenectomy, n (%)	Free gingival graft, n (%)	Connective tissue graft, n (%)	Dental implant, n (%)	Guided bone regeneration, n (%)
Absorbable	22 (16.2)	30 (22.1)	59 (43.4)	42 (30.9)	46 (33.8)	14 (10.3)	22 (16.2)
Nonabsorbable	103 (75.7)	82 (60.3)	57 (41.8)	62 (45.6)	49 (36.0)	110 (80.9)	79 (58.1)
Both	1 (0.7)	2 (1.5)	4 (3.0)	6 (4.4)	10 (7.4)	6 (4.4)	5 (3.7)
No response	10 (7.4)	22 (16.2)	16 (11.8)	26 (19.1)	31 (22.8)	6 (4.4)	30 (22.1)
Braided	58 (42.6)	23 (16.9)	52 (38.2)	36 (26.5)	27 (19.9)	56 (41.2)	29 (21.3)
Monofilament	56 (41.2)	86 (63.2)	61 (44.9)	72 (52.9)	68 (50.0)	62 (45.6)	69 (50.7)
Both	11 (8.1)	5 (3.7)	5 (3.7)	1 (0.7)	9 (6.6)	9 (6.6)	10 (7.4)
No response	11 (8.1)	22 (16.2)	18 (13.2)	27 (19.9)	32 (23.5)	9 (6.6)	28 (20.6)
3–0	17 (12.5)	16 (11.8)	16 (11.8)	6 (4.4)	6 (4.4)	29 (21.3)	13 (9.6)
4–0	31 (22.8)	25 (18.4)	44 (32.4)	15 (11.0)	10 (7.4)	34 (25.0)	26 (19.1)
5–0	28 (20.6)	53 (39.0)	47 (34.6)	42 (30.9)	40 (29.4)	30 (22.1)	33 (24.3)
6–0	6 (4.4)	19 (14.0)	11 (8.0)	23 (16.9)	26 (19.1)	1 (0.7)	5 (3.7)
3–0 + 4–0	12 (8.8)	0	0	3 (2.2)	2 (1.5)	14 (10.3)	8 (5.9)
3–0 + 5–0	4 (3.0)	0	0	1 (0.7)	0	2 (1.5)	1 (0.7)
4–0 + 5–0	12 (8.8)	1 (0.7)	1 (0.7)	9 (6.6)	4 (2.9)	11 (8.1)	10 (7.4)
5–0 + 6–0	3 (2.2)	1 (0.7)	1 (0.7)	8 (5.9)	10 (7.4)	3 (2.2)	9 (6.6)
3–0 + 4–0 + 5–0	6 (4.4)	0	0	0	2 (1.5)	3 (2.2)	3 (2.2)
4–0 + 5–0 + 6–0	5 (3.7)	0	0	1 (0.7)	3 (2.2)	1 (0.7)	2 (1.5)
Other combinations	3 (2.2)	0	0	0	0	1 (0.7)	0
No response	9 (6.6)	21 (15.4)	16 (11.8)	28 (20.6)	33 (24.2)	7 (5.2)	26 (19.0)

Table 2 Periodontal and dental implant operations versus needle characteristics (needle cutting edge and shape)

Needle	Periodontal flap, n (%)	Guided tissue regeneration, n (%)	Frenectomy, n (%)	Free gingival graft, n (%)	Connective tissue graft, n (%)	Dental implant, n (%)	Guided bone regeneration, n (%)
Circular shaped	20 (14.7)	25 (18.4)	30 (22.1)	27 (19.9)	25 (18.4)	19 (14.0)	10 (7.4)
Reverse cutting	62 (45.6)	56 (41.2)	50 (36.8)	53 (39.0)	50 (36.8)	61 (44.9)	59 (43.3)
Cutting	33 (24.3)	34 (25.0)	30 (22.1)	21 (15.4)	24 (17.6)	40 (29.4)	30 (22.1)
Combinations	11 (8.1)	0	9 (6.5)	7 (5.1)	5 (3.7)	9 (6.6)	11 (8.1)
No response	10 (7.4)	21 (15.4)	17 (12.5)	28 (20.6)	32 (23.5)	7 (5.2)	26 (19.1)
1/2 circle	19 (14.0)	12 (8.8)	14 (10.3)	25 (18.4)	16 (11.8)	21 (15.4)	12 (8.8)
3/8 circle	99 (72.8)	90 (66.2)	90 (66.2)	88 (64.7)	80 (58.8)	97 (71.3)	88 (64.7)
Straight	2 (1.5)	3 (2.2)	2 (1.5)	3 (2.2)	3 (2.2)	3 (2.2)	2 (1.5)
Combinations	5 (3.7)	6 (4.4)	2 (1.5)	0	4 (2.9)	5 (3.7)	6 (4.4)
No response	11 (8.1)	25 (18.4)	28 (20.0)	20 (14.7)	33 (24.3)	10 (7.4)	28 (20.6)

Monofilament and braided sutures selected almost equally for implant surgeries. In addition, the nonabsorbable suture was favored. The use of absorbable sutures was more preferred for frenectomy (43.4%) when compared to other listed surgical procedures, whereas for the implant surgery, nonabsorbable sutures were preferred (80.9%).

Overall, clinicians showed a high preference for non-absorbable sutures in all the procedures except periodontal plastic surgeries. In addition, reverse cutting 3/8 circle needles were reported to be the most popular needle body type among all procedures listed. ►Tables 1 and 2 illustrate the preference of sutures and needles, respectively.

Discussion

The present study was the first study about the preference of suture materials among dentists in Turkey. The results revealed that nonabsorbable sutures were more preferred, especially for dental implant, periodontal flap, and GTR operations. It has also been observed that reverse cutting and 3/8 circle needles were the most frequently selected type.

The criteria of the suture material selection differ in dentistry from general medicine due to the effects of saliva, the existence of oral bacteria and their byproducts of metabolism, high tissue vascularization, and movement of the wound edges during mastication and speech.^{12,17,18} The penetration trauma results in the maximum tissue reaction at the third postsurgery day.¹⁹ Absorbable or nonabsorbable sutures induce similar penetration trauma.²⁰ However, it was reported that absorbable threads produce more tissue reaction.^{21,22} Natural absorbable suture (Catgut-collagen) is digested by proteolytic enzymes, whereas synthetic absorbable sutures (Polyglycolide, Polyglactin 910) are degraded by hydrolysis reaction.²³ In an animal study, it was demonstrated that natural absorbable suture caused more severe soft-tissue reaction compared with synthetic ones. On the other hand, synthetic absorbable threads cause less severe reaction related to their inorganic structure, but their absorptions are rather inconvenient.⁷ In a recent study, the popularity of suture materials among clinicians

at a postdoctoral periodontology program was evaluated. Absorbable sutures were preferred in the majority of periodontal surgeries such as osseous repositioned flap, free gingival or SCTG, and dental implant operations.¹⁸ On the contrary, dentists' choices in the present study demonstrated a high preference for nonabsorbable sutures in all the procedures except periodontal plastic surgeries (►Table 1).

The oral cavity is naturally colonized by several bacteria series and the tissues are more exposed to the bacterial infections. The suture material is evaluated as a foreign body that increases microbial penetration into the wound edges, and this risk is affected by the capillarity of the suture thread.² Oral fluids and microorganisms could diffuse through multifilament threads along suture fibers by capillary action.²⁴ However, it has been reported that synthetic threads constitute a mild inflammatory tissue reaction than sutures of organic origin.¹⁹ In addition, Setzen and Williams demonstrated that absorbable and nonabsorbable multifilament sutures elicit a more severe tissue response than nonabsorbable monofilament sutures.²⁵ It has been recently reported that the first choice between the suture materials should be the nylon ones and their removal should be carried out as early as possible.²⁶ In this study, clinicians favored monofilament threads for GTR with materials such as graft or/and membrane, GBR procedures, and FGG and SCTG operations. In addition, in this survey, monofilament and braided sutures selected almost equally for implant surgeries and periodontal flap operations.

The commonly used sutures and surgical needles in oral surgery have different features such as design, the materials they are made from, stability, and capillarity of the used thread.² Using a smaller diameter needle such as 6–0 or 7–0 for the wound closure may reduce the risk of tearing or traumatizing the soft tissue and improve the passive flap adaptation.^{27,28} The present study revealed that 5–0 threads were selected mostly in GTR, free gingival, or connective-tissue graft operations. In addition, 6–0 threads were chosen in these procedures. Recently, it has been pointed out in a meta-analysis study that preferring microsurgical techniques and using sutures with a smaller diameter than 5–0 were

associated with the success of root coverage.²⁹ Surprisingly, 3–0, 4–0, and 5–0 diameter threads were preferred almost equally in implant surgeries. A study conducted in the United States reported that 4–0 diameter thread was most preferred in the surgical procedures such as periodontal flap surgery, oral GBR procedures, and hard-tissue augmentations, whereas 5–0 diameter thread was favorably used in free gingival/connective-tissue graft procedures. Both 4–0 and 5–0 diameter threads were selected almost equally in implant operations and soft-tissue ridge augmentations.¹⁸

The reverse cutting needle is the most suitable for oral surgery as its advantage of preventing soft-tissue tear, especially in the thin oral mucosa.¹⁸ This type of needle has considerable advantages over the classical cutting needles. It is much stronger and more protective to tissue trauma/laceration and minimization of the risk of overtightening causing ischemia.² In the present study, reverse cutting needles were the most favored for the periodontal and implant operations. In addition, dentists preferred to use circular and cutting-shaped needles except for GBR operations. However, Maksoud et al stated that no circular shaped and almost no cutting needle types were selected among clinicians at a teaching institution in the United States.¹⁸

Straight needles are used in intradermal sutures and skin wounds in the maxillofacial region³⁰ whereas, curved needles such as 1/2 and 3/8 curved are mostly used in oral surgical operations.² In addition, the 3/8 circle needle generally ensures optimal results for periodontal surgeries.³ The data of the present study confirmed that the most selected needle type was 3/8 circle. On the other hand, straight needles were preferred in all procedures with small numbers.

The possibility of multiple replies to the survey and a limited number of the participants were the limitations of this study.

Conclusions

Several parameters guide dentists' suture selection in each clinical scenario such as the quality and thickness of the soft tissues, the design of the flaps, and the personal choice. Within the limitations of the present study, it can be concluded that nonabsorbable and monofilament sutures were highly preferred in all the periodontal and implant operations. In addition, reverse cutting and 3/8 curvature needles were reported to be the most popular needle body type among all procedures. Finally, while this study retrospectively surveyed dental practitioners, these practitioners based their responses on their recent practice patterns; a future study that asked dentists and/or dental specialists to record prospectively information pertaining to their suture material and technique selection based on would presumably provide more accurate data. For this purpose, a questionnaire, in which certain case definitions such as anatomical considerations of the operation site, systemic and oral hygiene status, and expectations of the patient are included, might help to clarify the choice reasons of suture materials and techniques by the dental practitioners.

Financial Support and Sponsorship

None.

Conflicts of Interest

None.

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