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ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2026;15(1):384-9

Preference and use of different suture materials among surgeons: An original study

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Received 13 June 2025; Accepted 04 August 2025
Available online 20 February 2026 with doi: 10.5455/medscience.2025.06.157

Abstract

The choice of suture critically impacts surgical results, considering both clinical and logistical aspects. Despite the range of suture materials available, studies on surgeon preferences and related complications are insufficient. This study aimed to investigate the preferences of surgeons regarding suture materials and identify the correlation between material choice and postoperative complications. A cross-sectional survey was performed with 200 surgeons representing various surgical specialties. Demographic data, suture preferences (skin and deep tissue), selection criteria (tissue type, biocompatibility, supply/cost), and complication experience (inflammation, wound dehiscence) were all collected via structured questionnaires. Surgeons most often chose rapid vicryl for skin closure (55.0%, n=110), and vicryl for deep tissue (77.5%, n=155). A majority (n=147, 73.5%) prioritized the supply chain and price in their selection. The choice of 18.5% (n=37) of the surgeons was influenced by monofilament or multifilament properties. There was a strong link between selection criteria and the choice of suture for both skin and deep tissue ($p<0.001$). Among participants, 42.0% (n=84) experienced postoperative complications; inflammation (n=63, 31.5%) and wound dehiscence (n=21, 10.5%) were the most frequent. Rapid vicryl use significantly correlated with inflammation (93.6%, n=59, $p<0.001$), and polydioxanone use significantly correlated with wound dehiscence (85.7%, n=18, $p<0.001$). The accessibility of suture materials, not their biological properties, is the main factor influencing selection, with notable links between specific sutures and complications. To optimize patient outcomes, these results emphasize the necessity for standardized, evidence-based suture selection guidelines and increased availability of various suture materials.

Keywords: Polydioxanone, suture materials, surgeon preferences, vicryl

Introduction

Suturing is a vital surgical process that brings wound edges together and safeguards the surgical site [1]. Until sufficient natural tissue strength develops during healing, it offers mechanical support to the wound [2,3]. Furthermore, surgical sutures provide hemostasis, tissue stabilization, and wound isolation to support healing. Consequently, contamination in the surgical area is lessened, promoting faster healing [4].

Numerous suture materials are options for surgical procedures. The material is chosen based on tissue thickness and the clinical requirements for connective tissue, skin, and cartilage [5,6]. However, a broad range of materials exists for these tissues, with surgeon choice driven by factors like handling, knot security, and infection risk [7].

Absorbable and non-absorbable are the two main categories of sutures [6,8,9]. Absorbable suture absorption time differs based on the suture type. Following complete wound healing, non-absorbable sutures are to be removed. Absorbable sutures, such as those made of glycolic acid, polydioxanone, or polyglycolic acid, differ from non-absorbable sutures, which include silk, polyester, or nylon [6,10,11].

A further classification uses filament structure as a basis, such as monofilament (a single strand) and multifilament (several strands braided). Although multifilament sutures create stronger knots that are resistant to unraveling, they are associated with a higher risk of tissue reaction and microbial colonization [11]. Besides traditional sutures, wound closure can also be achieved with staples, adhesive strips, or tissue adhesives [1,8,9]. These materials provide stable and practical closure choices; however, consensus is lacking regarding the aesthetic outcomes of tissue adhesives [5,6,11].

There is a scarcity of data regarding the frequency of complications

CITATION
Geckil OF, Geckil N. Preference and use of different suture materials among surgeons: An original study. Med Science. 2026;15(1):384-9.

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DOI: 10.5455/medscience.2025.06.157

like wound dehiscence, inflammation, or hematoma following suture use, notwithstanding variations in the materials' chemical and physical properties [7,10,12,13]. Prior research has largely concentrated on individual complications within particular surgical fields [7,10,14,15].

This study investigated the selection rationale behind common suture materials and related complications. Experienced surgeons formed the study sample to guarantee higher data reliability based on their extensive experience.

Material and Methods

This study received ethical approval from Niğde Ömer Halisdemir University's Non-Interventional Research Ethics Committee (Approval date: 18/11/2024, The protocol number: 2024/95 and 204/103).

Surgeons currently practicing at five hospitals Niğde Training and Research Hospital, Kayseri City Hospital, Adana City Hospital, Adana Yüreğir State Hospital, and Adana Başkent Hospital—provided the data. The study included 200 physicians representing various surgical specialties. Data was collected and evaluated at the Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Niğde Ömer Halisdemir University. All participants provided informed consent. The study excluded surgeons lacking five years of surgical practice or providing incomplete survey responses.

Email and social media were used to distribute structured surveys and informed consent forms (created with Google Forms) to surgeons in Niğde and neighboring provinces. The survey targeted specialists in a range of surgical fields, including orthopedics, obstetrics and gynecology, plastic and reconstructive surgery, general surgery, urology, cardiovascular surgery, thoracic surgery, and otorhinolaryngology.

Only complete surveys from eligible participants following a screening process were used in the analysis. Data collected by the questionnaire included age, surgical specialty, primary suture selection criteria, commonly used suture materials for skin and deep tissue closure (silk, nylon, polyglycolic acid, polydioxanone, glycolic acid polymer, polypropylene, polyester, polylactic acid, stapler, strip), the role of monofilament or multifilament structure in suture preference, and the effect of complications (hematoma, inflammation, infection, or wound dehiscence) on suture selection.

The power analysis was conducted with R Studio version 2024.12.0. Based on a planned one-way ANOVA for suture selection criteria and first choice for skin closure, the effect size was calculated as Cramer's V=0.529. A sample size of 200 and a significance level of 0.05 yielded a statistical power of 1.00 in the study.

Statistical Analysis

The Shapiro-Wilk test assessed whether the data was normally distributed. Comparisons among suture materials and filament characteristics were planned using the Kruskal-Wallis H test. Continuous data is shown as mean±SD: standard deviation or median (minimum-maximum), while categorical data is presented as frequencies and percentages. Categorical variable comparisons used Pearson Chi-Square or Fisher-Freeman-Halton tests, depending on data distribution. When comparing at least three categories, researchers preferred the Fisher-Freeman-Halton test.

All statistical analyses were performed using SPSS (IBM Corp. Released 2017. Version 25.0), and the p-value below 0.05 indicated statistical significance.

Result

The demographic data for the 200 study participants are summarized in Table 1. Most participants (53.0%, n=106) were aged 30–40 and had 5–10 years of surgical experience (52.0%, n=104). The top three specialties were Cardiovascular Surgery (n=32, 16.0%), Ear, Nose, and Throat Surgery (n=31, 15.5%), and General Surgery (n=24, 12.0%). The preferred suture material for deep tissue closure was Vicryl (n=155, 77.5%). Surgeons' suture selection was primarily influenced by tissue characteristics (20.0%, n=40), material biocompatibility (6.5%, n=13), and supply chain/price (73.5%, n=147). Monofilament or multifilament suture type impacted the preferences of 18.5% (n=37) of participating physicians. Suture material issues during surgery led to inflammation in 31.5% (n=63) and wound dehiscence in 10.5% (n=21) of physicians, based on field checks.

The choice of suture material for skin and deep tissue closure was significantly related to suture selection criteria ($p<0.001$ for both). In prioritizing biocompatible materials, surgeons selected nylon (53.8%, n=7) most frequently for skin and polydioxanone (92.3%, n=12) for deep tissue. Conversely, prioritizing supply chain/price, 66.7% (n=98) favored rapid vicryl for skin closure and 90.5% (n=133) preferred vicryl for deep tissue closure (Table 2).

Table 3 presents the connection between monofilament/multifilament suture preferences and choices in skin and tissue sutures. The suture material's monofilament or multifilament nature affected 37 (18.5%) of the surgeons. This consideration and suture selection for both skin and deep tissue showed a strong correlation ($p<0.001$ for both). Surgeon suture choices were predominantly polypropylene (n=20, 54.1%) for skin and polydioxanone (n=31, 83.8%) for deep tissues, influenced by the filament properties.

Of participants, 42.0% (n=84) reported postoperative complications, most commonly inflammation (n=63, 31.5%) and wound dehiscence (n=21, 10.5%). The type of suture material used was significantly associated with the type of complication observed ($p<0.001$ for both). A strong association existed between rapid vicryl and inflammation (n=59, 93.6%), contrasting with the usage of nylon (n=10, 47.6%) and polypropylene (n=11, 52.4%) in patients experiencing wound dehiscence. In deep tissue closure, polydioxanone was used significantly more often in cases of wound dehiscence (n=18, 85.7%) compared to vicryl, which was mostly used in uncomplicated cases (n=89, 76.7%) (Table 4).

DOI: 10.5455/medscience.2025.06.157

Table 1. Demographic variables

Variables		Total n=200, n (%)
Age of the Surgeon	*30-40 years old*	106 (53.0)
	40-50 years old	84 (42.0)
	50-60 years old	10 (5.0)
Years of Experience	*5-10 years*	104 (52.0)
	11-15 years	84 (42.0)
	>15 years	12 (6.0)
Profession	*General Surgery*	24 (12.0)
	Thoracic Surgery	21 (10.5)
	Obstetrics and Gynaecology	21 (10.5)
	Cardiovascular Surgery	32 (16.0)
	Ear, Nose and Throat	31 (15.5)
	Orthopedics and Traumatology	21 (10.5)
	Plastic and Reconstruction Surgery	29 (14.5)
	Urology	21 (10.5)
Suture Selection Criteria	*Characteristic of Tissue*	40 (20.0)
	Material Biocompatibility	13 (6.5)
	Supply chain/price	147 (73.5)
First choice for skin	*Nylon*	13 (6.5)
	Polyprolene	47 (23.5)
	Rapid vicryl	110 (55.0)
	Stapler	23 (11.5)
	Vicryl	7 (3.5)
First choice for Deep Tissue	Polydioxanone	45 (22.5)
	Vicryl	155 (77.5)
Monofilament/Multifilament	Effects	37 (18.5)
	No	163 (81.5)
Problem Encountered	Inflammation	63 (31.5)
	Wound dehiscence	21 (10.5)
	No	116 (58.0)

Table 2. Examining the relationship between suture selection criteria and sutures selected for skin and tissue

Variables	Characteristic of tissue n=40, n (%)	Material Biocompatibility n=13, n (%)	Supply chain/price n=147, n (%)	p value
First choice for skin				
Nylon	6 (15)	7 (53.8)	0	**<0.001[a]**
Polyprolene	23 (57.5)	5 (38.5)	19 (12.9)	
Rapid vicryl	11 (27.5)	1 (7.7)	98 (66.7)	
Stapler	0	0	23 (15.6)	
Vicryl	0	0	7 (4.8)	
First choice for Deep Tissue				
Polydioxanone	19 (47.5)	12 (92.3)	14 (9.5)	**<0.001[b]**
Vicryl	21 (52.5)	1 (7.7)	133 (90.5)	

Variables are given as n (%) a: Fisher-Freeman Halton test, b: Chi-Square test

DOI: 10.5455/medscience.2025.06.157

Table 3. The relationship between monofilament/multifilament preference influencing and selected sutures for skin and tissue

Variables	Effects n=37, n (%)	No n=163, n (%)	p value
First choice for skin			
Nylon	6 (15)	7 (53.8)	**<0.001[a]**
Polyprolene	23 (57.5)	5 (38.5)	
Rapid vicryl	11 (27.5)	1 (7.7)	
Stapler	0	0	
Vicryl	0	0	
First choice for Deep Tissue			
Polydioxanone	19 (47.5)	12 (92.3)	**<0.001[b]**
Vicryl	21 (52.5)	1 (7.7)	

Variables are given as n (%) a: Fisher-Freeman Halton test, b: Chi-Square test

Table 4. The relationship between the problem encountered and the sutures selected for skin and tissue

Variables	Inflammation n=63, n (%)	Wound dehiscence n=21, n (%)	No n=116, n (%)	p value
First choice for skin				
Nylon	0	10 (47.6)	3 (2.5)	**<0.001[a]**
Polyprolene	1 (1.6)	11 (52.4)	35 (30.2)	
Rapid vicryl	59 (93.6)	0	51 (44)	
Stapler	1 (1.6)	0	22 (19)	
Vicryl	2 (3.2)	0	5 (4.3)	
First choice for Deep Tissue				
Polydioxanone	0	18 (85.7)	27 (23.3)	**<0.001[b]**
Vicryl	63 (100)	3 (14.3)	89 (76.7)	

Variables are given as n (%) a: Fisher-Freeman Halton test, b: Chi-Square test

Discussion

The study of 200 surgeons showed a preference for rapid vicryl in skin closure and vicryl in deep tissue closure. The choice was based mainly on supply chain and price. A strong correlation existed between suture selection and material used for both skin and deep tissue. The choice between monofilament and multifilament lines significantly impacted material selection, influencing 18.5% of surgeons. Inflammation and wound dehiscence after surgery were significantly more common with rapid vicryl and polydioxanone sutures. This study gives crucial insights into surgeons' preferences for suture materials and their link to post-operative complications, contributing valuable data to a field with limited comprehensive, multi-specialty assessments.

The high usage of rapid vicryl in skin and deep tissue closure highlights the shift towards absorbable synthetics; this agrees with studies showing benefits like simpler use and less follow-up [15-17]. A key difference between our study and recent global trends is the unexpectedly high use of rapid vicryl in skin closure. A 2023 global survey of plastic surgeons revealed polypropylene as the favored skin closure material in 48% of instances, compared to just 25% for absorbable sutures, mainly due to strength and scar appearance worries [5]. Our cohort's choice of absorbable sutures could be explained by institutional supply issues, given that 73.5% of participants prioritized supply chain/price. Unlike studies focusing on biocompatibility and tensile strength as key suture selection criteria, especially in private sectors [4], this one presents a different perspective.

Significant correlations ($p<0.001$) emerged between suture selection criteria and material choice in our study, with biocompatibility-prioritizing surgeons predominantly using nylon (53.8%) and polydioxanone (92.3%). Studies [12,15,18] show similar preferences: 61% of surgeons in contaminated settings selected nylon based on biocompatibility. This indicates a consistent approach to material selection in settings prioritizing biological safety.

Suture selection by 18.5% of surgeons was also affected by monofilament/multifilament properties, a preference significantly linked to specific skin and deep tissue materials. In line with best infection control practices [6,8,19], surgeons emphasizing filament structure selected polypropylene sutures

DOI: 10.5455/medscience.2025.06.157

for skin and polydioxanone for deeper tissues. This indicates an awareness among a subset of clinicians of the importance of filament structure in reducing complications [9,19]. However, in the current study, only 18.5% of surgeons prioritized filament characteristics, suggesting a knowledge translation or training gap compared to Western Europe, where 60% consider filament type critical [7].

Inflammation (31.5%) and wound dehiscence (10.5%) were the most common postoperative complications, reported by 42% of participants. Inflammation was strongly associated with rapid vicryl, whereas wound dehiscence was linked to nylon and polypropylene. In deep tissue wounds, polydioxanone was the most common suture material for dehiscence, whereas vicryl was mainly used when healing proceeded without complications. This research shows that complication profiles vary by material. Polydioxanone's effectiveness in preserving wound integrity surpasses that of other absorbable sutures, as demonstrated by Katz et al. [20]. In contrast to Zucker et al.'s [18] meta-analysis; while they found no difference in inflammation, we found higher wound dehiscence with polypropylene compared to vicryl. However, by Edmiston et al. [10] demonstrated that multifilament sutures substantially raise the risk of bacterial adherence and inflammation, corroborating our results. Given the significant inflammatory complications associated with rapid vicryl, its routine use for skin closure may require reevaluation, primarily in sensitive patients or high-risk situations.

The complications seen with polydioxanone use in deep tissue closure need to be discussed. Despite polydioxanone's reputation for strong tensile strength and minimal tissue reaction, our cohort's high wound dehiscence rate (85.7%) indicates potential misapplication in situations demanding more adaptable or rapidly resorbable materials. Another study reported a 3.6% dehiscence rate with polydioxanone, significantly lower than ours, possibly due to differing patient groups or improper use [21]. Alternatively, the findings suggest that suture properties alone may not guarantee dehiscence prevention in all tissue types and surgical procedures, underscoring the importance of context-specific guidelines.

Systemic problems in surgical practice are mirrored by the high number of surgeons, citing supply chain issues and pricing as their main concern. A new global health report shows that in 40% of surveyed hospitals in low-to-middle-income countries [22], adherence to best surgical practices is chiefly hampered by supply constraints. Additionally, a global abdominoplasty suture study by Wen et al. revealed that cost was a primary factor for only 22% of participants and most decisions were based on handling characteristics and patient outcomes [5]. These restrictions compel clinicians to make practical choices, potentially deviating from evidenced guidelines. The variation reveals problems with consistency and possibly insufficient funding in public health systems. To reduce complications and standardize care, healthcare policy should prioritize improving access to and affordability of various suture materials.

This research stresses the importance of evidence-based suture choice protocols, especially in facilities where cost is a major factor. The cost savings from using cheaper sutures may be offset by increased long-term costs associated with complications, such as re-operations and extended healing times, as our research shows.

Limitations of the study

Our study has limitations, including the use of self-reported data, potential recall bias, and a lack of control over patient factors (like comorbidities and wound contamination) affecting healing. Despite this, the wide range of specialties and statistically significant correlations provide strong evidence for real-world applications. Further research needs to compare suture materials through prospective trials on matched surgical cases with controlled patient and wound variables. Furthermore, the novel application of electrically stimulating sutures, producing therapeutic electric fields under mechanical stress, shows potential for minimizing infections and strengthening wound integrity [14,23]. Future surgeon preferences could shift based on research into electrically stimulating sutures and their access.

Conclusion

This study shows the complex interaction of clinical choices, resource availability, and post-surgery results when selecting sutures. Contrary to international norms, supply chain and prize are more influential than clinical material properties on surgeon choices. Strong links between certain sutures and issues like inflammation or wound separation necessitate evidence-based guidelines tailored to each situation. Better surgeon training on materials, particularly filament structure, combined with addressing supply chain issues, could lead to fewer surgical complications and better outcomes.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
The study received ethical approval from the Niğde Ömer Halisdemir University's Non-Interventional Research Ethics Committee (Approval date: 18/11/2024, The protocol number: 2024/95 and 204/103).

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