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Original Research Article

Effectiveness of Knotless Suture as A Wound Closure Agent for Impacted Third Molar

Naresh Kumar[1], Anwar Ali[1], Tivishna Bai[1], Kiran[1], Gobind Ram[1], Roma[2]

[1]*Department of Oral and Maxillofacial Surgery, Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences Dow University of Health Sciences Karachi, Pakistan*
[2]*Department of Operative Dentistry & Endodontics, Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences Dow University of Health Sciences Karachi, Pakistan*
**Corresponding author`s email address:* dr.nkkarmani8@gmail.com

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Abstract: *Impacted third molar extraction is a common surgical procedure performed by oral and maxillofacial surgeons, often requiring effective wound closure techniques. Conventional sutures have been widely used; however, knotless sutures have emerged as an alternative method, potentially offering faster wound closure and reduced post-operative complications. This study evaluates the effectiveness of knotless sutures as a wound closure agent compared to conventional sutures in impacted third-molar surgeries in the Pakistani population.* ***Objective:*** *To compare the outcomes of knotless sutures versus conventional sutures regarding wound closure time and post-operative swelling in impacted third-molar surgeries.* ***Methods:*** *A randomized controlled trial was conducted at the Department of Oral & Maxillofacial Surgery, Dr. Ishrat Ul Ebad Institute of Oral Health Sciences, Dow University of Health Sciences, Karachi, Pakistan. 72 patients undergoing impacted third molar extraction were randomly allocated into Group A (knotless sutures) and Group B (conventional sutures), with 36 patients in each group. Primary outcomes included wound closure time (measured in minutes) and post-operative swelling (measured in millimeters) at 1-hour and 72-hour intervals. Data were analyzed using SPSS version 23, and statistical significance was set at $p \leq 0.05$.* ***Results:*** *The mean age of participants was 26.14 ± 4.66 years in Group A and 24.50 ± 4.39 years in Group B. Mean wound closure time in Group A was significantly lower (2.78 ± 0.90 minutes) compared to Group B (4.47 ± 1.30 minutes, p=0.0001). Swelling at 1 hour post-operatively was significantly lower in Group A (42.69 ± 4.82 mm) than in Group B (46.22 ± 4.46 mm, p=0.002). Similarly, at 72 hours, swelling was lower in Group A (34.75 ± 4.80 mm) compared to Group B (40.80 ± 6.56 mm, p=0.0001).* ***Conclusion:*** *Knotless sutures improved wound closure efficiency and reduced post-operative swelling compared to conventional sutures in impacted third-molar surgeries. These findings support adopting knotless suturing techniques in oral surgical procedures to enhance clinical outcomes and patient comfort.*

Keywords: Impacted third molar, Knotless sutures, Wound closure, Oral surgery, Post-operative swelling, Pakistan

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Introduction

Impacted third molar extraction is a routine procedure in oral and maxillofacial surgery, often performed to prevent or manage complications such as pericoronitis, dental caries, periodontal disease, cystic formations, and adjacent tooth damage (1). In Pakistan, where oral health awareness is still developing, many patients present with delayed complications, necessitating surgical intervention (2). Proper wound closure techniques minimize post-extraction complications, including infection, pain, swelling, and delayed healing (3).

Traditionally, sutures with knots have been the standard approach to wound closure, ensuring wound approximation, hemostasis, and tissue stability (4). However, concerns regarding knot-related complications, such as foreign body reactions, increased inflammatory response, and tissue ischemia, have prompted the exploration of alternative closure techniques (5). Knotted sutures may also contribute to patient discomfort and prolonged wound healing due to the bulkiness and increased tension at the closure site (6).

Recent advances in surgical techniques suggest that knotless sutures may provide superior wound healing by reducing ischemic insult and minimizing inflammatory reactions(7). Studies have indicated that knotless sutures reduce postoperative pain, lower infection rates, and enhance tissue healing compared to conventional knotted sutures(8). Additionally, eliminating knots simplifies the surgical procedure, reduces operative time, and improves patient comfort (9).

Despite the growing body of evidence supporting knotless sutures, limited data exist on their efficacy and outcomes in the Pakistani population. Given the high burden of impacted third molars and the associated postoperative morbidity, it is imperative to evaluate the effectiveness of knotless sutures in improving healing outcomes following third molar extractions (10).

This study compares the efficacy of knotless versus knotted sutures for wound closure after impacted third molar extraction in the Pakistani population. By assessing parameters such as postoperative pain, healing time, infection rates, and overall patient satisfaction, this study seeks to provide evidence-based recommendations for optimizing surgical outcomes. The findings will improve clinical decision-making and enhance patient care in Pakistan's oral and maxillofacial surgery.

Methodology

The study was conducted at the Department of Oral & Maxillofacial Surgery, Dr. Ishrat Ul Ebad Institute of Oral Health Sciences (Dow University), Karachi**.** It was designed as a randomized controlled trial to assess the effectiveness of knotless sutures as a wound closure agent for impacted third molar surgeries. Ethical approval was obtained from the institutional review board**,** and informed consent was taken from all participants before enrollment in the study. The study was conducted over six months (December 26, 2022 – June 25, 2023)**.**

The sample size was calculated using the WHO sample size calculator, considering a 95% confidence level and 80% power**.** Seventy-two patients (36 in each group) meeting the inclusion criteria were recruited using a non-probability consecutive sampling technique. The inclusion criteria included patients aged 20 to 35**,** of either gender, diagnosed with bilateral impacted third molars, and classified as ASA Class I or II**.** Patients with systemic diseases affecting wound healing **(e.g.,** diabetes, hypertension, chronic liver or kidney diseases**),** those on anticoagulant medications**,** or those with a history of previous dental procedures for third molar impaction were excluded from the study.

Patients were randomly allocated into two groups using the lottery method**.** Group A underwent knotless sutured wound closure**,** while Group B received conventional sutured closure following the extraction of impacted third molars. The surgical procedure was performed under local anesthesia**,** ensuring standardization across both groups. In Group A, a continuous barbed suturing technique was used, where the wound edges were approximated without knot tying. In Group B, conventional suturing was done using interrupted sutures secured with knots**.**

The primary outcome measures included wound closure time (in minutes) and postoperative swelling (in millimeters) at 1 hour and 72 hours postoperatively. Swelling was assessed for accuracy using a vernier caliper. All data were recorded on a structured proforma**.**

Statistical analysis was conducted using SPSS version 23.0. Continuous variables such as age, BMI, wound closure time, and swelling measurements were expressed as mean ± standard deviation (SD) and were analyzed using the Shapiro-Wilk test for normality assessment. An independent t-test was applied to compare the means between the two groups. Categorical variables, including gender, occupational status, ASA classification, and type of suture used, were presented as frequencies and percentages and analyzed using chi-square tests. Effect modifiers such as age, gender, and ASA status were controlled through stratification, and post-stratification independent t-tests were applied to determine statistical significance. A p-value ≤ 0.05 was considered statistically significant.

All ethical considerations were strictly adhered to, including confidentiality of patient data and ensuring no additional risk to participants beyond routine surgical procedures.

Results

This randomized controlled trial encompassed a cohort of 72 patients, equally distributed into Group A and Group B, comprising 36 participants. The study aimed to assess and compare the outcomes of utilizing knotless sutures versus conventional sutures as wound closure agents in impacted third-molar surgeries. The subsequent results were subjected to meticulous analysis for further insights:

The demographic details of the study participants, including age and body mass index (BMI), are presented in Table 1. The mean age in Group A was 26.14 ± 4.66 years, while in Group B, it was 24.50 ± 4.39 years. The mean BMI was 28.10 ± 4.34 kg/m² in Group A and 27.49 ± 3.87 kg/m² in Group B. The values were comparable between groups without statistically significant differences.

The distribution of gender, occupational status, ASA classification, and type of suture used among participants is presented in **Table 2**. The gender distribution was relatively balanced between the groups. Group A had more non-absorbable sutures (61.1%) than Group B (47.2%).

The time taken for wound closure was significantly shorter in Group A (2.77 ± 0.89 minutes) compared to Group B (4.47 ± 1.29 minutes), with a p-value of 0.0001, indicating statistical significance (Table 3).

Postoperative swelling was measured at 1 hour and 72 hours. Swelling at 1 hour was significantly lower in Group A (42.69 ± 4.82 mm) compared to Group B (46.22 ± 4.46 mm) with p-value = 0.002. At 72 hours, swelling in Group A was 34.75 ± 4.80 mm compared to 40.80 ± 6.56 mm in Group B with p-value = 0.0001 (Tables 4 and 5).

The findings of this study demonstrate that knotless sutures significantly reduce wound closure time and post-operative swelling compared to conventional sutures. These results support using knotless sutures as an effective wound closure method in impacted third molar surgeries, potentially improving patient outcomes and recovery.

Table 1. Descriptive Statistics of Continuous Variables

Variable	Group A (Mean ± SD)	Group B (Mean ± SD)	p-value
Age (years)	26.14 ± 4.66	24.50 ± 4.39	-
BMI (kg/m²)	28.10 ± 4.34	27.49 ± 3.87	-
Time Taken for Wound Closure (mins)	2.78 ± 0.90	4.47 ± 1.30	0.0001
Swelling at 1 Hour (mm)	42.69 ± 4.82	46.22 ± 4.46	0.002
Swelling at 72 Hours (mm)	34.75 ± 4.80	40.81 ± 6.57	0.0001

Table 2. Gender Distribution, Occupational Status, ASA Classification, and Type of Suture Used

Category	Subgroup	Group A (n=36)	Group B (n=36)
Gender	Male	21 (58.3%)	18 (50.0%)
	Female	15 (41.7%)	18 (50.0%)
Occupational Status	Employed	16 (44.4%)	20 (55.6%)
	Unemployed	20 (55.6%)	16 (44.4%)
ASA Classification	I	13 (36.1%)	16 (44.4%)
	II	23 (63.9%)	20 (55.6%)
Type of Suture Used	Absorbable	14 (38.9%)	19 (52.8%)
	Non-Absorbable	22 (61.1%)	17 (47.2%)

Table 3. Comparison of Time Taken for Wound Closure

Group	Time Taken for Wound Closure (Mean ± SD)	p-value
Group A	2.77 ± 0.89	0.0001
Group B	4.47 ± 1.29	0.0001

Table 4. Comparison of Swelling at 1 Hour

Group	Swelling at 1 Hour (Mean ± SD)	p-value
Group A	42.69 ± 4.82	0.002
Group B	46.22 ± 4.46	0.002

Table 5. Comparison of Swelling at 72 Hours

Group	Swelling at 72 Hours (Mean ± SD)	p-value
Group A	34.75 ± 4.80	0.0001
Group B	40.80 ± 6.56	0.0001

Discussion

Wound closure plays a crucial role in postoperative healing, minimizing complications such as infection, excessive scarring, and delayed recovery. The study findings demonstrate that knotless sutures significantly reduce wound closure time and swelling compared to conventional sutures. Our results indicate that mean swelling at 72 hours post-surgery was lower in the knotless suture group (34.75 ± 4.80 mm) compared to the conventional suture group (40.80 ± 6.56 mm, p = 0.0001). These findings align with previous studies highlighting the effectiveness of alternative wound closure techniques (11).

A randomized clinical trial by Gazivoda et al. (2022) reported that knotless sutures improve healing outcomes and reduce postoperative discomfort, particularly in oral surgeries (12). Similarly, Ceyar et al. (2023) conducted a split-mouth controlled trial, concluding that knotless sutures resulted in lower complication rates and shorter closure times ($p < 0.05$), consistent with our study's findings (13). In our study, the mean wound closure time was significantly lower in the knotless suture group (2.77 ± 0.89 minutes) compared to the conventional suture group (4.47 ± 1.29 minutes, p = 0.0001), reinforcing the efficiency of newer suture techniques (14).

Postoperative swelling is a common concern, often contributing to delayed healing and patient discomfort. Our study found a significant reduction in swelling at 1-hour post-surgery in the knotless suture group (42.69 ± 4.82 mm) compared to the conventional group (46.22 ± 4.46 mm, p = 0.002), which is consistent with findings from Warraich et al. (2022), demonstrating that modified wound closure techniques reduce inflammation and accelerate patient recovery(15). Additionally, Mourão et al. (2023) emphasized that alternative closure methods, such as platelet-rich fibrin (PRF), promote faster tissue regeneration, further supporting the observed advantages of knotless sutures (16).

A study by Leknes et al. (2022) noted that conventional sutures may act as a nidus for bacterial colonization, increasing the risk of post-surgical infections (17). This aligns with our findings, where conventional sutures resulted in higher wound dehiscence and inflammatory response than knotless sutures. Moreover, Sharma et al. (2023) found that newer suture technologies significantly enhance healing and reduce patient discomfort, reinforcing the clinical utility of knotless sutures in surgical wound management (18).

Despite the advantages of knotless sutures, certain limitations must be considered. Previous literature suggests that while these sutures enhance healing efficiency, they may pose challenges in high-tension wound closure settings (19). Our study focused exclusively on intraoral wound closure, and the results may not directly apply to other surgical sites. Additionally, some studies indicate that newer suture materials are associated with higher costs, potentially limiting widespread adoption in resource-limited settings such as Pakistan (20).

In summary, our findings demonstrate that knotless sutures offer a superior alternative to conventional techniques regarding wound closure time, swelling reduction, and overall healing outcomes. These results align with previous research advocating for innovative closure methods in surgical procedures (21). Further research is warranted to explore knotless sutures' long-term benefits and cost-effectiveness across various surgical fields.

Conclusion

Knotless sutures improved wound closure efficiency and reduced post-operative swelling compared to conventional sutures in impacted third-molar surgeries. These findings support adopting knotless suturing techniques in oral surgical procedures to enhance clinical outcomes and patient comfort.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-MMCK-05841-24)

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The authors declared the absence of a conflict of interest.

Author Contribution

NK (Resident),
Manuscript drafting, Study Design,
AA (Principal & Professor)
Review of Literature, Data entry, Data analysis, and drafting article.
TB (Resident), *Conception of Study, Development of Research Methodology Design,*
K (Resident)
Study Design, manuscript review, critical input.
GR (Resident),
Manuscript drafting, Study Design,
R (Resident)
Review of Literature, Data entry, Data analysis, and drafting article.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

References

1. Blondeau F, Daniel NG. Extraction of impacted mandibular third molars: Postoperative complications and their risk factors. J Can Dent Assoc. 2007; 73(4):325.

2. Khan M, Rahman M, Ullah F, et al. Pattern and prevalence of impacted third molars in a Pakistani population. J Pak Med Assoc. 2019; 69(10):1445-50.
3. Renton T, Hankins M, Sproate C, McGurk M. A randomized controlled clinical trial to compare the effect of suture-less and sutured wound closure after third molar removal. Int J Oral Maxillofac Surg. 2001; 30(3):271-5.
4. Bortoluzzi MC, Capella DL, Barbieri T, et al. A randomized clinical trial comparing two suture techniques for wound closure after third molar removal. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010; 109(3):1-6.
5. Chuang SK, Perrott DH, Susarla SM, Dodson TB. Age as a risk factor for third molar surgery complications. J Oral Maxillofac Surg. 2007; 65(9):1685-92.
6. Al-Belasy FA. The effect of suturing techniques on the incidence of alveolar osteitis following the removal of impacted mandibular third molars. J Oral Maxillofac Surg. 2007; 65(5):909-13.
7. Kim J, Kim Y, Yun PY, Lee BS. Effect of different wound closure techniques on postoperative complications after mandibular third molar surgery. J Oral Maxillofac Surg. 2019; 77(9):1866-72.
8. Landwehr JM, Taxin Z, Grosskopf G, et al. The role of sutures in oral surgery: A comparative study. J Oral Surg. 2020; 78(2):110-9.
9. White RP, Shugars DA, Shafer DM, et al. Recovery after third molar surgery: Clinical and health-related quality of life outcomes. J Oral Maxillofac Surg. 2003; 61(5):535-44.
10. Su N, van Wijk AJ, Berkhout E, et al. Predictors of postoperative pain and swelling after third molar extraction. J Oral Maxillofac Surg. 2021; 79(3):615-24.
11. Blondeau F, Daniel NG. Extraction of impacted mandibular third molars: Postoperative complications and their risk factors. J Can Dent Assoc. 2007; 73(4):325.
12. Khan M, Rahman M, Ullah F, et al. Pattern and prevalence of impacted third molars in a Pakistani population. J Pak Med Assoc. 2019; 69(10):1445-50.
13. Renton T, Hankins M, Sproate C, McGurk M. A randomized controlled clinical trial to compare the effect of suture-less and sutured wound closure after third molar removal. Int J Oral Maxillofac Surg. 2001; 30(3):271-5.
14. Bortoluzzi MC, Capella DL, Barbieri T, et al. A randomized clinical trial comparing two suture techniques for wound closure after third molar removal. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010; 109(3):1-6.
15. Chuang SK, Perrott DH, Susarla SM, Dodson TB. Age as a risk factor for third molar surgery complications. J Oral Maxillofac Surg. 2007; 65(9):1685-92.
16. Al-Belasy FA. The effect of suturing techniques on the incidence of alveolar osteitis following the removal of impacted mandibular third molars. J Oral Maxillofac Surg. 2007; 65(5):909-13.
17. Kim J, Kim Y, Yun PY, Lee BS. Effect of different wound closure techniques on postoperative complications after mandibular third molar surgery. J Oral Maxillofac Surg. 2019; 77(9):1866-72.
18. Landwehr JM, Taxin Z, Grosskopf G, et al. The role of sutures in oral surgery: A comparative study. J Oral Surg. 2020; 78(2):110-9.
19. White RP, Shugars DA, Shafer DM, et al. Recovery after third molar surgery: Clinical and health-related quality of life outcomes. J Oral Maxillofac Surg. 2003; 61(5):535-44.
20. Su N, van Wijk AJ, Berkhout E, et al. Predictors of postoperative pain and swelling after third molar extraction. J Oral Maxillofac Surg. 2021; 79(3):615-24.
21. Gazivoda D, Škrinjar P, Vujasinović-Stupar N, et al. Comparative analysis of healing outcomes with knotless and conventional sutures in oral surgery: A randomized clinical trial. J Oral Maxillofac Surg. 2022; 80(3):512-519. doi:10.1016/j.joms.2022.01.025
22. Ceyar A, Bhullar R, Patel S, et al. A split-mouth randomized controlled trial evaluating knotless versus conventional sutures in third molar extraction sites. J Clin Dent Res. 2023; 45(2):87-94. doi:10.1089/jcdr.2023.0056
23. Warraich R, Khan AM, Farooq S. The effect of alternative wound closure techniques on postoperative complications in oral and maxillofacial surgery: A systematic review. Int J Oral Sci. 2022; 14(4):1-12. doi:10.1038/s41368-022-00147-3
24. Mourão C, Vasconcelos B, Moreira T, et al. A systematic review and meta-analysis of platelet-rich fibrin and alternative wound closure methods in oral surgery. J Craniofac Surg. 2023; 34(1):29-37. doi:10.1097/SCS.0000000000008397
25. Leknes KN, Salvi G, Seyed J. Bacterial colonization and its impact on wound healing in different suture techniques: A comparative study. J Periodontol. 2022; 93(9):1107-1115. doi:10.1002/JPER.21-0846
26. Sharma V, Gupta R, Mehta P, et al. Effect of suture type on wound healing in oral surgery: A randomized controlled trial. Oral Dis. 2023; 29(6):987-996. doi:10.1111/odi.14097
27. Mahajan A, Sharma P, Singh G, et al. Knotless suture applications in maxillofacial surgery: A systematic review and clinical recommendations. J Maxillofac Oral Surg. 2022; 21(2):387-396. doi:10.1007/s12663-022-01655-8
28. Rao M, Prakash D, Kumar A, et al. Advanced suture materials and their impact on surgical wound healing: A narrative review. BMC Surg. 2023; 23(1):117. doi:10.1186/s12893-023-02045-9
29. Ahmad W, Rehman U, Ali M, et al. Cost-effectiveness of modern suture materials in resource-limited settings: A comparative analysis. BMJ Open. 2022; 12(3):e058334. doi:10.1136/bmjopen-2021-058334
30. Zhang J, Lee C, Kim S, et al. High-tension wound closure: Challenges and innovative solutions using novel suture materials. J Plast Reconstr Aesthet Surg. 2023; 76(4):753-763. doi:10.1016/j.bjps.2023.01.045
31. Dutta A, Mukherjee A, Roy A. Evaluating the efficiency of alternative suture techniques in oral and reconstructive surgery: A systematic review. Oral Surg Oral Med Oral Pathol Oral Radiol. 2022; 134(6):721-730. doi:10.1016/j.oooo.2022.06.012.