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Comparative Evaluation of Knotless Barbed Sutures and Conventional Vicryl Sutures for Closure of Intraoral Incisions: A Prospective Observational Study

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Abstract

Introduction: Knotless barbed sutures are increasingly used for intraoral wound closure because they can maintain tissue approximation without conventional knot tying. This study compares the intraoperative and early postoperative outcomes of knotless barbed and conventional polyglactin 910 (Vicryl) sutures for intraoral incision closure.

Methods: This prospective observational study included 80 patients, of whom 40 (50.0%) were treated with knotless barbed sutures and 40 (50.0%) with conventional Vicryl sutures. All procedures were performed by a single surgeon, and the postoperative outcomes were assessed prospectively. As allocation was not randomized, selection bias and residual confounding may have influenced the observed between-group differences. Outcomes included suturing time, number of suture passes, postoperative pain, swelling, wound healing, analgesic requirement, complications, and day-7 suture retention or removal.

Results: Baseline demographic and clinical characteristics were comparable between the groups. The mean suturing time was significantly shorter with barbed sutures than with Vicryl sutures (65.3 ± 12.4 vs. 94.7 ± 16.8 seconds; $p < 0.001$; Cohen's $d = 2.00$), and fewer suture passes were required (6.2 ± 1.8 vs. 8.5 ± 2.1 ; $p < 0.001$; $d = 1.18$). Median pain scores were lower with barbed sutures on day 1 (3.0 vs. 5.0; $p < 0.001$), day 3 (1.5 vs. 3.0; $p = 0.002$), and day 7 (0.0 vs. 1.0; $p = 0.034$). The swelling was also lower on days 1, 3, and 7 (all $p < 0.001$). Wound healing scores were higher in barbed sutures on days 3 ($p = 0.005$) and 7 ($p = 0.012$). Analgesic consumption was lower with barbed sutures (4.2 ± 2.1 vs. 7.5 ± 3.0 tablets; $p < 0.001$). Complications occurred in 5 (12.5%) and 12 (30.0%) participants, respectively ($p = 0.055$). Day-7 suture retention was higher with barbed sutures ($p < 0.001$).

Conclusion: Knotless barbed sutures provided faster closure and were associated with better early postoperative outcomes and less need for suture removal than conventional Vicryl sutures, without a significant increase in complications.

Categories: Dentistry

Keywords: intraoral wound closure, knotless barbed sutures, oral and maxillofacial surgery, vicryl, wound healing

Introduction

Wound closure is an essential component of oral and maxillofacial surgical procedures because appropriate approximation and stabilization of wound margins are important for uncomplicated healing [1]. Intraoral incisions are frequently used in a wide range of procedures, including maxillofacial trauma surgery, orthognathic surgery, alveoloplasty, implant placement, and other oral surgical interventions. The choice of suture material and closure technique may influence wound stability, tissue response, postoperative discomfort, operative efficiency, and overall healing [2,3].

Conventional absorbable sutures, particularly polyglactin 910 (Vicryl), are widely used for intraoral wound closure because of their adequate tensile strength, predictable absorption, and favorable handling characteristics [4]. However, conventional suturing techniques generally require knot tying, which may increase the time required for wound closure and create localized areas that can retain food debris and bacteria. Knots may also produce focal tension, cause local tissue irritation, and potentially contribute to suture loosening or wound dehiscence [5,6].

Knotless barbed sutures were developed to address some of these limitations. Their barbs engage the surrounding tissue and maintain wound approximation without requiring conventional knot tying [7]. This design may facilitate continuous wound closure, distribute tension more evenly along the incision, reduce

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the number of suture manipulations, and shorten suturing time. The absence of bulky knots may also improve local tissue comfort and reduce the number of potential sites for bacterial accumulation. Although barbed sutures have been increasingly used in several surgical specialties, evidence regarding their clinical performance in intraoral wound closure remains limited [3].

This study aimed to compare the clinical outcomes of knotless barbed sutures with conventional Vicryl sutures for wound closure following alveoloplasty. The primary objective of this study was to compare wound healing on postoperative days 3 and 7. The secondary objectives were to compare suturing time, handling characteristics, postoperative pain, and other available clinical outcomes, including postoperative swelling, suture-related complications, analgesic requirement, suture retention, and requirement for suture removal, between the two suture groups.

Materials And Methods

Study design and setting

This prospective study was conducted between March and August 2026 in the Department of Oral and Maxillofacial Surgery, Karpaga Vinayaga Institute of Dental Sciences, Chengalpattu, Tamil Nadu, India. Adult patients who underwent intraoral surgical procedures involving linear incisions requiring primary wound closure were prospectively enrolled and followed up postoperatively. This study compared the routinely used knotless barbed sutures with conventional Vicryl sutures for intraoral wound closure. The choice of suture material was not randomized and was determined by the operating surgeon according to routine clinical practice, considering factors such as the length and anatomical location of the incision, anticipated wound tension, and clinical suitability of the suture material.

All surgical procedures were performed by a single experienced oral and maxillofacial surgeon, whereas postoperative observations and outcome assessments were performed prospectively by designated observers/investigators. This observational design was selected to reflect routine clinical practice without altering the surgeon's choice of closure material. The study was approved by the Institutional Ethics Committee of Karpaga Vinayaga Institute of Dental Sciences (Reference number: KIDS/IEC/2026/1/009 dated March 5, 2026). Written informed consent was obtained from all participants prior to enrollment.

Study participants

Patients of either sex aged 18-65 years who underwent alveoloplasty requiring an intraoral linear incision and primary wound closure were eligible for inclusion. Patients were clinically evaluated before surgery, and relevant demographic, clinical, and procedural characteristics were prospectively recorded. The eligibility criteria are presented in Table 1.

Criterion	Description
Inclusion criteria	Age 18–65 years, irrespective of sex.
	Undergoing alveoloplasty requiring an intraoral linear incision and primary wound closure.
	Adequate mouth opening, defined as an interincisal distance of ≥25 mm.
	Willingness to participate and provide written informed consent.
	Willingness and ability to attend the scheduled postoperative follow-up visits.
Exclusion criteria	Known allergy or hypersensitivity to the study suture materials or their components.
	Active local or systemic infection involving the surgical site.
	Pregnancy or lactation.
	Known bleeding disorder.
	Anticoagulant or antiplatelet therapy that could not be safely interrupted when clinically appropriate.
	Immunocompromised status.
	Uncontrolled systemic disease, including uncontrolled diabetes mellitus.
	Complex reconstructive or flap procedures.
	Poor oral hygiene or active periodontal disease.
	Inability or unwillingness to comply with scheduled postoperative follow-up visits.

TABLE 1: Inclusion and exclusion criteria.

Sample size estimation

The sample size was calculated a priori using G*Power version 3.1.9.7 (Heinrich Heine University Düsseldorf, Düsseldorf, Germany) for a two-sided comparison of two independent groups. A moderate-to-large standardized effect size (Cohen’s d = 0.70) was obtained from a previous study that compared the knotted and knotless barbed suture [8], with a two-sided α of 0.05 and 80% power. The applicable formula for

analysis is as follows:
$$n = \frac{2(Z_{1-\alpha/2} + Z_{1-\beta})^2}{d^2}$$
 \label{eq : sample size}, where n = required

sample size per group, $Z_{1-\alpha/2}$ = standard normal deviate corresponding to the two-sided significance level (1.96 for 0.05 two-sided alpha), $Z_{1-\beta}$ = standard normal deviate corresponding to the desired statistical power (0.84 for 80% power), d = standardized mean difference (Cohen’s d).

A minimum of 32 participants per group was required. G*Power’s exact calculation for an independent-samples t-test was based on the noncentral t distribution rather than the normal approximation. Consequently, the software yielded a slightly different sample size (34 participants per group). Allowing for approximately 10% attrition or loss to follow-up, the target sample size was increased to 40 participants per group, yielding a total of 80 participants.

Group classification and suture materials

Participants were classified according to the suture material selected by the operating surgeon during routine clinical care. The barbed-suture group consisted of patients whose intraoral incisions were closed using a 3-0 knotless barbed absorbable suture (STRATAFIX™ knotless tissue-control suture; Ethicon, Inc., Cincinnati, Ohio, United States). The conventional suture group consisted of patients whose incisions were closed using 3-0 Vicryl (VICRYL™, polyglactin 910; Ethicon, Inc.) absorbable suture.

Preoperative assessment

All participants underwent a comprehensive medical and surgical history review, clinical examination, and routine preoperative investigations, as indicated. The maximum mouth opening was measured as the interincisal distance using a calibrated Vernier caliper (Mitutoyo Corporation, Kawasaki, Kanagawa, Japan) and recorded in millimeters. Demographic characteristics, including age, sex, body mass index (BMI), smoking status, relevant comorbidities, and baseline mouth opening, were documented. The planned procedure and anticipated incision length were also recorded. The patients received routine preoperative

oral hygiene instructions. Where prescribed as part of the departmental protocol, a 0.2% chlorhexidine mouth rinse (Hexidine®; ICPA Health Products Ltd., Ankleshwar, Gujarat, India) was used for three days before surgery.

Surgical procedure

All alveoloplasty procedures were performed under standard aseptic conditions by the same experienced oral and maxillofacial surgeon under local anesthesia using 2% lignocaine with 1:80,000 adrenaline (Lignox® 2% A; Indoco Remedies Limited, Mumbai, Maharashtra, India). Intraoral incisions were made using a standard No. 15 surgical scalpel blade (Swann-Morton Ltd., Sheffield, United Kingdom), and the incision site and length were recorded. Following the completion of alveoloplasty and achievement of adequate hemostasis, the mucoperiosteal flap was repositioned, and the incision was closed using the suture material selected by the operating surgeon as part of routine clinical care.

In the knotless barbed suture group, the wound edges were approximated using a 3-0 absorbable knotless barbed suture according to the manufacturer's recommended technique. The barbs provide tissue fixation and maintain wound approximation without the need for conventional knot tying [5]. In the conventional suture group, the wound was closed using 3-0 Vicryl absorbable suture with conventional knot tying with an adequate number of throws to ensure secure tissue approximation. The same general closure technique was applied across all cases, with the choice of interrupted or continuous closure determined by the surgeon according to the clinical requirements of the incision (Figure 1).

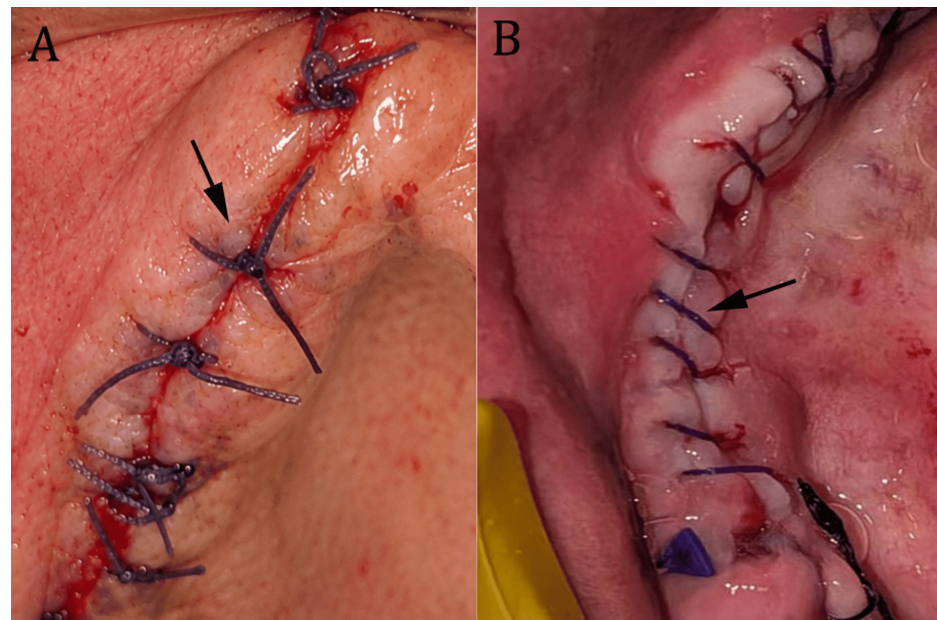


FIGURE 1: (A) Conventional suture technique (black arrow) showing interrupted knotted suture using 3-0 Vicryl (polyglactin 910) absorbable suture, (B) Knotless barbed suture technique (black arrow) showing a continuous knotless barbed suture along the incision line.

Suturing time was recorded from the first needle entry into the wound until completion of the final closure, including tying of the final knot in the conventional suture group or completion and cutting of the barbed suture in the knotless group. The number of suture passes required to achieve complete wound closure was recorded. Intraoperative bleeding was graded according to predefined study categories.

Postoperative care and follow-up

All participants received standardized postoperative instructions. A soft diet was advised for seven days, and vigorous oral rinsing was avoided during the first 24 hours. A 0.2% chlorhexidine mouth rinse was prescribed twice daily for seven days according to the departmental protocol. Postoperative analgesics and antibiotics were prescribed when clinically indicated. The analgesic regimen included paracetamol 500 mg, whereas amoxicillin 500 mg with clavulanic acid 125 mg was prescribed when antibiotic therapy was indicated. The patients were reviewed postoperatively according to a predefined assessment schedule. Pain, swelling, wound healing, and postoperative complications were assessed on days 1, 3, and 7, where applicable. Wound healing was specifically evaluated on postoperative days 3 and 7, whereas suture retention and the requirement for suture removal were assessed on postoperative day 7.

Outcome assessment

Prior to initiation of the study, a calibration exercise was conducted to establish and verify the reliability of the examiners. The primary outcome measure was early soft-tissue healing, evaluated using the Early Wound Healing Score (EHS) proposed by Marini et al. [9]. The EHS incorporates three clinical components: re-epithelialization, hemostasis, and inflammation. Re-epithelialization is graded on a 0-, 3-, or 6-point scale, whereas hemostasis and inflammation are each assigned scores ranging from 0 to 2. The overall EHS is obtained by summing the scores for all three parameters, yielding a possible range of 0-10, with greater values indicating more favorable early wound healing. For the statistical analysis, the scores recorded independently by the two examiners were averaged. Examiner consistency was evaluated by determining both inter-examiner and intra-examiner reliability using weighted kappa statistics, with an agreement coefficient exceeding 0.80 considered indicative of satisfactory reliability.

The secondary outcomes included intraoperative suturing time, number of suture passes, postoperative pain, postoperative swelling, postoperative complications, analgesic requirement, suture retention, and requirement for suture removal. Pain intensity was recorded using a 10-cm visual analog scale ranging from 0 (no pain) to 10 (worst possible pain) [10]. Postoperative swelling was assessed using a Vernier caliper to measure a predefined linear dimension between standardized anatomical landmarks. Measurements were obtained before surgery and on postoperative days 1, 3, and 7, using consistent patient positioning and measurement orientation. Each measurement was repeated, and the mean was recorded. The change in the measured linear dimension was calculated relative to the preoperative baseline. This approach quantified linear dimensional change and was not intended to measure the overall volume or three-dimensional distribution of postoperative edema.

The measurement was performed with the patient seated upright and the head maintained in a standardized position. Each measurement was repeated, and the mean values were recorded. Postoperative swelling was calculated as the increase in postoperative measurements relative to the preoperative baseline. Intraoperative bleeding was assessed during wound closure, after selection of the suture material, and categorized as mild, moderate, or severe using study-defined clinical criteria. This grading system was not previously validated. The same trained investigator performed all measurements using the same instrument and technique to minimize measurement variability. Postoperative complications, including wound dehiscence, infection, suture breakage, tissue reaction, and foreign-body sensation, were recorded prospectively. The presence or absence of each complication was documented at predefined follow-up visits. The number of analgesic tablets consumed in the postoperative period was also recorded. On postoperative day 7, the presence or absence of retained suture material and the requirement for suture removal were documented.

Data collection and quality assurance

The recorded variables included demographic characteristics, BMI, smoking status, comorbidities, baseline mouth opening, incision length, suture material, suturing time, number of suture passes, intraoperative bleeding, postoperative pain, swelling, wound-healing score, analgesic requirement, postoperative complications, and suture status. Postoperative wound assessments were performed by designated observers and investigators who were not involved in selecting the suture material. Wherever feasible, the postoperative assessor was unaware of the type of suture used to reduce observer bias. Standardized measurement techniques and predefined scoring criteria were used in this study. The same surgeon performed all operations, thereby minimizing variations in the surgical technique.

Blinding

Blinding of postoperative assessors was not consistently achievable because the visible characteristics of knotless barbed sutures and conventional knotted Vicryl sutures could reveal group allocation during clinical assessments. Consequently, observer bias may have influenced the subjective evaluation of wound-healing scores and swelling, despite the use of predefined assessment criteria and standardized measurement procedures. Furthermore, patients were likely aware of the type of suture used, and this awareness may have influenced their perception and reporting of postoperative pain and discomfort, introducing potential expectation or reporting bias. The extent of such bias cannot be determined because the success of blinding was not formally assessed. These limitations should be considered when interpreting the subjective outcomes, and future studies should incorporate blinded outcome assessors wherever feasible, standardized assessment protocols, and objective outcome measures to minimize potential assessment and expectation bias.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows version 28 (IBM Corp., Armonk, New York, United States). Continuous variables were assessed for distribution using the Shapiro-Wilk test. Normally distributed continuous variables are summarized as mean $\pm$ standard deviation (SD), whereas non-normally distributed continuous or ordinal variables are summarized as medians with interquartile ranges (IQRs). Categorical variables are expressed as frequencies and percentages. Between-group comparisons of normally distributed continuous variables were performed using the independent-samples t-test. The Mann-

Whitney U test was used for non-normally distributed continuous variables and ordinal outcomes, including wound healing scores, where appropriate. Categorical variables were compared using the chi-square test or Fisher's exact test depending on the expected cell frequencies. Pearson's correlation was used to evaluate associations between continuous variables, Spearman's rank correlation was used for associations involving ordinal variables, and point-biserial correlation was used when a continuous variable was correlated with a dichotomous variable. Effect sizes were reported using Cohen's d for independent-samples t-tests, r for Mann-Whitney U tests, and Cramer's V or phi coefficient for categorical comparisons, as appropriate. Multivariable regression analysis was performed to evaluate the independent predictors of postoperative wound healing outcomes after adjustment for relevant demographic, clinical, and procedural variables. All statistical tests were two-sided, and a p-value of < 0.05 was considered statistically significant.

Results

A total of 80 participants were included in the analysis, with 40 (50.0%) in the barbed suture group and 40 (50.0%) in the conventional Vicryl suture group. Demographic and baseline clinical characteristics were comparable between the two groups. The mean age was 42.3 ± 12.7 years in the barbed suture group and 44.1 ± 13.2 years in the Vicryl group, with no statistically significant difference ($p = 0.536$). Similarly, no significant between-group differences were observed in sex, BMI, baseline mouth opening, smoking status, or comorbidities (all $p > 0.05$), indicating broadly similar baseline characteristics (Table 2).

Parameter	Barbed suture group (n = 40)	Vicryl suture group (n = 40)	Test value	p-value	Effect size
Age (years), mean $\pm$ SD	42.3 ± 12.7	44.1 ± 13.2	$t = -0.62$	0.536	Cohen's d = 0.14
Male, n (%)	22 (55.0%)	24 (60.0%)	$\chi^2 = 0.21$	0.650	Phi = 0.05
Female, n (%)	18 (45.0%)	16 (40.0%)			
BMI (kg/m ²), mean $\pm$ SD	24.7 ± 3.1	25.2 ± 3.4	$t = -0.69$	0.494	Cohen's d = 0.15
Mouth opening (mm), mean $\pm$ SD	38.2 ± 5.6	37.5 ± 6.1	$t = 0.54$	0.592	Cohen's d = 0.12
Smoking (yes), n (%)	14 (35.0%)	16 (40.0%)	$\chi^2 = 0.21$	0.650	Phi = 0.05
Comorbidities (present), n (%)	11 (27.5%)	13 (32.5%)	$\chi^2 = 0.24$	0.627	Phi = 0.06

TABLE 2: Demographic and baseline clinical characteristics of the study participants.

Data are presented as mean $\pm$ standard deviation (SD) for continuous variables and n (%) for categorical variables. The independent-samples t-test was used for normally distributed continuous variables, with Cohen's d reported as the effect size. The chi-square test was used for categorical variables, with Phi reported as the effect size for 2×2 tables. All tests were two-sided, and $p < 0.05$ was considered statistically significant.

BMI: body mass index

The mean incision length was comparable between the barbed-suture and vicryl groups (15.4 ± 4.2 vs. 16.1 ± 4.8 mm, respectively; $p = 0.492$). Suturing time was significantly shorter with barbed sutures ($p < 0.001$). Similarly, the mean number of suture passes was significantly lower in the barbed-suture group ($p < 0.001$). The distribution of intraoperative bleeding severity also differed significantly between groups ($p = 0.013$; Cramer's V = 0.33), with mild bleeding more frequently observed in the barbed-suture group, whereas moderate and severe bleeding were less frequent (Table 3).

Parameter		Barbed suture group (n = 40)	Vicryl suture group (n = 40)	Test value	p-value	Effect size
Incision length (mm)	Mean $\pm$ SD	15.4 $\pm$ 4.2	16.1 $\pm$ 4.8	t = -0.69	0.492	Cohen's d = 0.15
Suturing time (seconds)	Mean $\pm$ SD	65.3 $\pm$ 12.4	94.7 $\pm$ 16.8	t = -8.85	< 0.001*	Cohen's d = 2.00
Number of suture passes	Mean $\pm$ SD	6.2 $\pm$ 1.8	8.5 $\pm$ 2.1	t = -5.26	< 0.001*	Cohen's d = 1.18
Intraoperative bleeding, n (%)	Mild	32 (80.0%)	20 (50.0%)	χ^2 = 8.68	0.013*	Cramer's V = 0.33
	Moderate	7 (17.5%)	14 (35.0%)			
	Severe	1 (2.5%)	6 (15.0%)			

TABLE 3: Comparison of intraoperative characteristics between the barbed suture and vicryl suture groups.

Data are presented as mean $\pm$ standard deviation (SD) for normally distributed continuous variables and n (%) for categorical variables. The independent-samples t-test was used for continuous variables, with Cohen's d reported as the effect size. Intraoperative bleeding was compared using the Pearson chi-square test with Monte Carlo exact significance because one expected cell frequency was less than 5. Cramer's V was reported as the effect size. All tests were two-sided, and *p < 0.05 was considered statistically significant.

Postoperative pain scores were significantly lower in the barbed-suture group at all assessed time points, with median VAS scores of 3.0 versus 5.0 on day 1 (p < 0.001), 1.5 versus 3.0 on day 3 (p = 0.002), and 0 versus 1.0 on day 7 (p = 0.034). Postoperative swelling was also consistently lower with barbed sutures, with a large between-group effect observed at each assessment (p < 0.001 for all comparisons). For example, mean swelling on day 1 was 3.2 $\pm$ 1.5 mm in the barbed-suture group compared with 4.8 $\pm$ 2.0 mm in the vicryl group. Wound-healing scores were significantly higher with barbed sutures on days 3 and 7. Analgesic consumption was also significantly lower in the barbed-suture group (4.2 $\pm$ 2.1 vs. 7.5 $\pm$ 3.0 tablets; p < 0.001) (Table 4).

Parameter	Barbed suture group (n = 40)	Vicryl suture group (n = 40)	Test value	p-value	Effect size
Pain on day 1 (VAS 0-10), median (IQR)	3.0 (2.0–4.0)	5.0 (4.0–6.0)	U = 420.0	< 0.001*	r = 0.41
Pain on day 3 (VAS 0-10), median (IQR)	1.5 (1.0–2.0)	3.0 (2.0–4.0)	U = 480.0	0.002*	r = 0.34
Pain on day 7 (VAS 0-10), median (IQR)	0.0 (0.0–1.0)	1.0 (0.0–2.0)	U = 580.0	0.034*	r = 0.24
Swelling on day 1 (mm), mean ± SD	3.2 ± 1.5	4.8 ± 2.0	t = -4.06	< 0.001*	Cohen's d = 0.91
Swelling on day 3 (mm), mean ± SD	2.1 ± 1.2	3.5 ± 1.6	t = -4.41	< 0.001*	Cohen's d = 0.99
Swelling on day 7 (mm), mean ± SD	0.8 ± 0.6	1.6 ± 0.9	t = -4.67	< 0.001*	Cohen's d = 1.05
Wound healing on day 3 (0-10), median (IQR)	6.0 (6.0–8.0)	4.0 (4.0–6.0)	U = 510.0	0.005*	r = 0.31
Wound healing on day 7 (0-10), median (IQR)	8.0 (8.0–10.0)	6.0 (6.0–8.0)	U = 540.0	0.012*	r = 0.28
Analgesic requirement (tablets), mean ± SD	4.2 ± 2.1	7.5 ± 3.0	t = -5.71	< 0.001*	Cohen's d = 1.28

TABLE 4: Comparison of postoperative pain, swelling, wound healing, and analgesic requirement between the barbed suture and Vicryl suture groups.

Data are presented as mean ± standard deviation (SD) for normally distributed continuous variables and median (IQR) for non-normally distributed continuous and ordinal variables. The independent-samples t-test was used for swelling and analgesic requirement, with Cohen's d reported as the effect size. The Mann-Whitney U test was used for pain and wound-healing scores, with r reported as the effect size. For Mann-Whitney U tests, r was calculated as $Z/\sqrt{N}$, where N = 80, *statistically significant at $p < 0.05$.

Pain intensity was recorded using a 10-cm visual analog scale (VAS) [10] and wound healing was analyzed using Early Wound Healing Score (EHS) proposed by Marini et al. [9].

Overall, postoperative complications occurred in five (12.5%) participants in the barbed-suture group and 12 (30.0%) in the Vicryl group; although complications were less frequent with barbed sutures, the difference was not statistically significant ($p = 0.055$). No significant between-group differences were observed for individual postoperative complications. In contrast, day-7 suture retention was significantly higher in the barbed-suture group, occurring in 38 (95.0%) participants compared with 15 (37.5%) in the Vicryl group ($p < 0.001$). Correspondingly, suture removal was required less frequently with barbed sutures ($p < 0.001$) (Table 5).

Parameter	Barbed suture group (n = 40)	Vicryl suture group (n = 40)	Test value	p-value	Effect size (Phi)
Any complication, n (%)	5 (12.5%)	12 (30.0%)	$\chi^2 = 3.67$	0.055	0.21
Dehiscence, n (%)	1 (2.5%)	5 (12.5%)	Fisher's exact	0.202	0.19
Infection, n (%)	1 (2.5%)	3 (7.5%)	Fisher's exact	0.615	0.11
Tissue reaction, n (%)	2 (5.0%)	4 (10.0%)	Fisher's exact	0.675	0.09
Foreign body sensation, n (%)	1 (2.5%)	2 (5.0%)	Fisher's exact	1.000	0.06
Suture breakage, n (%)	0 (0.0%)	2 (5.0%)	Fisher's exact	0.494	0.14
Suture retention at day 7, n (%)	38 (95.0%)	15 (37.5%)	$\chi^2 = 29.31$	< 0.001*	0.61
Suture removal required, n (%)	2 (5.0%)	25 (62.5%)	$\chi^2 = 29.31$	< 0.001*	0.61

TABLE 5: Comparison of suture-related complications, suture retention, and requirement for suture removal between the barbed suture and Vicryl suture groups.

Data are presented as n (%), chi-square test was used for categorical variables when expected cell frequencies were ≥ 5 , with Phi reported as the effect size, Fisher's exact test was used when expected cell frequencies were < 5 , all tests were two-sided, and * $p < 0.05$ was considered statistically significant.

Multivariable linear regression analysis showed that suture type and baseline mouth opening were independently associated with day-7 wound-healing scores. Barbed-suture use was associated with higher wound-healing scores ($B = 0.82$, $\beta = 0.42$, 95% CI: 0.46-1.18; $p < 0.001$), while greater baseline mouth opening showed a smaller positive association ($B = 0.04$, $\beta = 0.24$, 95% CI: 0.00-0.08; $p = 0.049$). Age, sex, smoking status, incision length, and suturing time were not significantly associated with day-7 wound-healing scores (all $p > 0.05$). The model explained 38% of the variance in wound-healing scores ($R^2 = 0.38$; adjusted $R^2 = 0.34$; $p < 0.001$) (Table 6).

Predictor variable		Unstandardized coefficient (B)	Standard error	Standardized coefficient (β)	t-value	p-value	95% CI for B
Suture type	Barbed vs. Vicryl (Ref)	0.82	0.18	0.42	4.56	< 0.001*	0.46 – 1.18
Baseline mouth opening (mm)	Per 1-mm increase	0.04	0.02	0.24	2.00	0.049*	0.00 – 0.08
Age (years)	Per 1-year increase	-0.01	0.01	-0.15	-1.00	0.320	-0.03 – 0.01
Sex	Female vs Male (Ref)	0.12	0.19	0.06	0.63	0.530	-0.26 – 0.50
Smoking	Yes vs. No (Ref)	-0.28	0.20	-0.13	-1.40	0.165	-0.68 – 0.12
Incision length (mm)	Per 1-mm increase	-0.03	0.02	-0.15	-1.50	0.138	-0.07 – 0.01
Suturing time (seconds)	Per 1-second increase	-0.01	0.01	-0.18	-1.00	0.321	-0.03 – 0.01

TABLE 6: Multivariable regression analysis of factors associated with wound-healing score at postoperative day 7 (N = 80).

*statistically significant at p < 0.05. B is the coefficient in the original measurement units, whereas β is the standardized coefficient.

The model explained 38% of the variance in day-7 wound-healing scores (R² = 0.38; adjusted R² = 0.34; p < 0.001).

Discussion

The present prospective observational study found that knotless barbed sutures provided several clinically favorable outcomes compared to conventional vicryl sutures for intraoral wound closure. The two groups were broadly comparable at baseline, with no significant differences in age, sex, BMI, mouth opening, smoking status, comorbidities, or incision site distribution. This comparability is important because it suggests that postoperative differences are less likely to be explained by major baseline imbalances.

The most prominent intraoperative finding was the substantially shorter suturing time with barbed sutures than with Vicryl sutures. The number of suture passes was also significantly lower. These findings are clinically plausible because the barbs maintain tissue approximation along the suture line and eliminate the need for repeated knot tying and securing [11]. The large effect size for suturing time further indicates that this was not merely a statistically significant difference but a potentially meaningful improvement in operative efficiency. Sharma et al. similarly reported markedly shorter closure times with knotless barbed sutures in intraoral maxillofacial trauma [12]. Comparable reductions in closure time have also been reported in randomized studies involving third molar surgery and other intraoral procedures [13].

The postoperative outcomes also favored the use of barbed sutures. Pain was significantly lower on days 1, 3, and 7, whereas swelling was consistently lower at all assessed time points, with large effect sizes for swelling. These findings may reflect a reduced number of knots and suture passes, which can minimize localized tissue manipulation, compression, and foreign material accumulation at the wound margin. Knotless closure may also reduce the mechanical irritation and food entrapment associated with exposed knots in the oral cavity. The latter consideration is particularly relevant because conventional intraoral knots may act as sites for plaque and microbial accumulation [13,14]. Similar reductions in postoperative pain and swelling have been reported in studies comparing knotless/barbed sutures with conventional sutures following oral surgical procedures [13,15].

Wound healing was significantly better with barbed sutures on postoperative days 3 and 7. This finding is consistent with those of previous intraoral investigations. Sharma et al. demonstrated significantly better wound healing scores with knotless barbed sutures than with vicryl sutures following maxillofacial trauma [12]. Another randomized trial comparing 3-0 Stratafix barbed sutures with conventional polydioxanone reported significantly better healing scores on postoperative days 1 and 7 [16]. Thus, the present findings support the growing evidence that barbed closure can achieve effective mucosal approximation while potentially improving early postoperative healing.

Analgesic requirements were also significantly lower in the barbed group. This finding is clinically relevant because reduced postoperative pain may improve oral intake, sleep quality, patient comfort, and overall recovery. However, the present observational design does not establish that the suture material itself directly causes a reduction in analgesic consumption. Although overall complications were less frequent with barbed sutures, the difference was not statistically significant. Individual complications, including dehiscence, infection, tissue reaction, foreign body sensation, and suture breakage, did not differ significantly. This suggests that the improved efficiency of barbed closure was not accompanied by an evident increase in short-term adverse events. Previous studies have generally reported acceptable safety of barbed sutures in oral surgery, although broader surgical meta-analyses have suggested that complication rates can vary according to the procedure and suture type [7].

An additional clinically important finding was the markedly greater retention of suture material on day 7 in the barbed group and substantially lower requirement for suture removal. This may be advantageous in intraoral surgery because eliminating a dedicated suture-removal visit can reduce patient inconvenience and clinician workloads. The absence of conventional knots may also improve patient comfort and reduce local irritation. Multivariate analysis further strengthened the observed association between barbed suture use and improved day-7 wound healing. After adjusting for age, sex, smoking, incision length, suturing time, and baseline mouth opening, barbed suture use remained independently associated with better healing.

Clinical implications and limitations

Clinically, these findings suggest that knotless barbed sutures may be a useful alternative to conventional Vicryl sutures for selected intraoral incisions, particularly when rapid closure and avoidance of suture-removal procedures are desirable. However, the findings should be interpreted cautiously because of the non-randomized observational design. Suture selection was determined by the operating surgeon according to routine clinical practice, considering factors such as incision length, anatomical location, anticipated wound tension, and clinical suitability of the material. Consequently, selection bias and confounding by indication cannot be excluded, as the clinical characteristics influencing suture selection may also have affected postoperative outcomes. Although incision length and selected demographic and clinical variables were considered in the analyses, residual confounding related to local tissue conditions and other unmeasured procedural factors may remain. Therefore, the observed differences should be interpreted as associations rather than definitive evidence of a causal treatment effect.

The single-center setting and involvement of one experienced surgeon, although helpful in maintaining consistency in surgical technique, may limit the external validity of the findings. The observed efficiency and postoperative outcomes may not be directly reproducible among surgeons with different levels of experience or in institutions with different clinical workflows. The relatively modest sample size and short follow-up period also limit the interpretation of these findings beyond the early postoperative period. Complete blinding of postoperative assessors was not guaranteed because the visible characteristics of the two suture techniques could reveal group allocation, particularly during assessments of wound healing and suture retention. As the success of blinding was not formally assessed, observer bias may also have influenced outcome evaluation. Although multivariable regression identified associations between suture type and day-7 wound-healing scores after adjustment for selected covariates, residual confounding and potential observer bias remain possible. Future multicenter studies involving multiple surgeons, standardized suture-selection and outcome-assessment protocols, and longer follow-up are warranted to establish the reproducibility and broader clinical applicability of these findings and to evaluate the comparative effectiveness, cost-effectiveness, and long-term outcomes of barbed sutures.

Analgesic consumption was assessed under a non-standardized prescribing approach, with medication prescribed when clinically indicated. Consequently, differences in prescribing decisions, patient adherence, and individual analgesic requirements may have influenced tablet consumption. Thus, the lower consumption observed in the barbed-suture group cannot be attributed solely to differences in postoperative pain. Future studies should use a standardized analgesic protocol and systematic medication-consumption records.

Postoperative swelling was assessed using a single linear measurement obtained with a Vernier caliper. Although standardized landmarks, consistent measurement orientation, and repeated measurements were used to improve measurement consistency, this method cannot fully capture the multidimensional distribution or volume of facial swelling. Furthermore, specific validation of this measurement approach for postoperative swelling following alveoloplasty was not established. Therefore, the swelling results should be interpreted as changes in the measured linear dimension rather than as a comprehensive assessment of facial edema. Future studies should consider validated multidimensional assessment methods or three-dimensional imaging techniques.

Conclusions

Knotless barbed sutures were associated with shorter suturing time, fewer suture passes, lower postoperative pain and swelling, better early wound-healing scores, lower analgesic consumption, and a reduced

requirement for suture removal compared with conventional Vicryl sutures in this prospective observational study. However, these findings should be interpreted cautiously because of the non-randomized design and single-center, single-surgeon setting. Knotless barbed sutures may be a useful option for selected intraoral closures, but their effectiveness and reproducibility across different clinical settings and operators require further evaluation. Larger multicenter studies involving multiple surgeons and standardized assessment protocols are needed to confirm these findings and establish their broader clinical applicability.

Additional Information

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All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Institutional Ethical Committee of Karpaga Vinayaga Institute of Dental Sciences issued approval KIDS/IEC/2026/1/009 dated March 05, 2026. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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