

Clinical handling and early tissue response of four oral surgery suture materials: a pilot comparative study

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Abstract

Background

Suture materials employed in oral surgery vary with respect to their structure, absorbability, coating, handling characteristics, and propensity for plaque retention and tissue reaction. These attributes may impact early wound stability and signs of postoperative inflammation.

Objective

To compare four widely utilized oral surgery suture materials with respect to clinician-rated intraoperative performance and early postoperative clinical response.

Methods

A total of forty patients requiring oral surgical procedures involving suturing were incorporated into a four-arm pilot comparative study. Four types of suture materials were assessed: absorbable monofilament Monocryl 4-0, non-absorbable braided polyester Ethibond Excel 4-0, absorbable antibacterial-coated braided polyglactin 910 Vicryl Plus 4-0, and braided silk 4-0. Follow-up evaluations were conducted at days 3, 7, and 14. Sutures were removed on day 7, including those that are absorbable. The operator rated smoothness, handling, and resistance during placement on a 0-10 scale. Clinical scores for edema, gingival inflammation, perilesional plaque, and suppuration were documented at follow-up.

Results

Monocryl demonstrated the highest mean smoothness score (8.47 ± 0.85) and clinician-rated resistance score (8.92 ± 0.74). Silk exhibited the lowest scores in smoothness (5.60 ± 1.10) and resistance (5.21 ± 0.97), while attaining the highest handling score (7.82 ± 0.95). Early clinical assessments indicated increased edema and inflammation associated with silk at 3 days; conversely, Vicryl Plus showed comparatively low inflammatory scores and low perilesional plaque scores at day 3 and lower scores than silk during follow-up.

Suppuration was infrequent across all groups.

Conclusions

Within the limitations of this pilot dataset, synthetic sutures appeared to provide more favorable intraoperative performance than braided silk, while antibacterial-coated Vicryl Plus showed favorable early clinical scores. The findings should be interpreted cautiously because of the small sample size, incomplete reporting of allocation and ethics procedures, unclear scoring definitions, and absence of microbiological analysis. Larger randomized clinical studies with standardized clinical and microbiological outcomes are required before definitive recommendations can be made.

Keywords: oral surgery; sutures; Vicryl Plus; Monocryl; silk; wound healing; dental surgery.

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Introduction

Suturing constitutes a final yet clinically pivotal step in numerous oral surgical interventions. Beyond the mechanical approximation of wound margins, the suture material remains susceptible to exposure to saliva, masticatory forces, biofilm accumulation, and tissue movement. These factors are particularly significant within the oral cavity, where the surgical site is perpetually subjected to a complex microbiological milieu and where local inflammation may compromise early wound stabilization.

An ideal suture for oral surgery should encompass sufficient tensile strength, dimensional stability, knot security, ease of manipulation, minimal trauma to tissues, biocompatibility, and low susceptibility to microbial colonization. Systematic evidence demonstrates that various suture materials differ in their physical characteristics, inflammatory responses, and bacterial adhesion profiles when employed for oral wound closure [1].

The structure of sutures is a significant factor influencing clinical outcomes. Monofilament sutures typically facilitate smoother passage through tissues and possess fewer interstices capable of harboring fluids and microorganisms. Conversely, multifilament sutures, including natural silk and synthetic braided materials, may offer enhanced handling and knot security; however, they are also associated with increased capillarity and plaque retention. Studies on oral tissues have indicated that intraoral sutures can elicit prolonged tissue responses, and multifilament sutures may provoke a more substantial inflammatory reaction than monofilament sutures within certain mucosal environments [3,6].

Silk has historically been extensively utilized in the field of dentistry owing to its cost-effectiveness, ease of handling, and satisfactory knot security. Nevertheless, silk is not biologically inert, and its braided organic structure may promote fluid absorption and microbial colonization. Clinical and microbiological investigations have demonstrated that bacteria exhibit differential adherence to various intraoral suture materials, thereby underscoring the importance of selecting appropriate materials based on the surgical site and anticipated healing processes [4,5].

Synthetic sutures have been developed to enhance biological stability and predictability. Monofilament absorbable materials, such as poliglecaprone 25, potentially decrease tissue drag and microbial retention; however, their memory effect may complicate knot management. Braided synthetic sutures could improve handling but exhibit some surface characteristics akin to multifilament materials. Antibacterial-coated sutures, including triclosan-coated polyglactin 910, have been examined as a means to diminish microbial colonization. Nonetheless, the evidence within oral surgery remains heterogeneous and does not consistently support a clinically significant reduction in infection [2,7-9].

The objective of this preliminary comparative study was to assess four suturing materials employed in oral surgery—Monocryl, Ethibond Excel, Vicryl Plus, and silk—in relation to clinician-rated handling properties and initial postoperative clinical response.

Because no direct microbiological analysis was conducted, the study evaluates clinical outcomes only and does not assess bacterial load.

Materials and Methods

Study design and reporting status

This study was a pilot, four-arm comparative clinical study involving 40 patients, each assigned to one of four groups, each receiving a specific suture material.

Participants

Forty patients requiring oral surgical procedures involving suturing were enrolled in the study. The inclusion criteria included an age range of 18 to 65 years, absence of systemic diseases, no use of antibiotics or anti-inflammatory medications within two months prior to surgery, an indication for a surgical procedure necessitating sutures, and no signs of inflammation or suppuration at the surgical site.

Suture materials

Participants were allocated to one of four groups according to the suture material utilized. All sutures were of 4-0 size and were equipped with a 16-mm, 3/8 triangular needle.

Group	Material	Structure and absorbability	Size
A	Monocryl	Absorbable synthetic monofilament	4-0
B	Ethibond Excel	Non-absorbable braided synthetic polyester	4-0
C	Vicryl Plus	Absorbable braided polyglactin 910 with antibacterial coating	4-0
D	Silk	Braided natural non-absorbable silk	4-0

Table 1. Suture materials evaluated in the study.

Preoperative hygiene protocol

Seven days prior to the surgical procedure, all patients received professional oral hygiene care. During this appointment, standardized home-care instructions were also provided. The protocol comprised manual toothbrushing of all dental surfaces three times daily for a minimum of two minutes, employing the modified Bass technique. The protocol did not include the use of mouthwash.

Follow-up and outcomes

Clinical follow-up visits were conducted at 3, 7, and 14 days. All sutures, including absorbable sutures, were removed at the 7-day follow-up. The intraoperative performance of each material was rated on a 0-10 scale for smoothness, handling, and resistance during placement. Resistance was defined as a clinician-rated intraoperative property and is not treated as laboratory-measured tensile strength.

The postoperative clinical outcomes encompassed edema, gingival inflammation, perilesional plaque, and suppuration. These parameters were originally characterized as binary variables; however, the reported aggregate data demonstrated values exceeding 1. As a result, they were analyzed as aggregate clinical scores rather than binary 0/1 outcomes.

Results

Study sample

A total of forty patients were enrolled and allocated to four distinct groups corresponding to the respective suture materials.

Intraoperative performance

The descriptive intraoperative ratings are summarized in Table 2 and Figure 1. Monocryl demonstrated the highest mean scores for smoothness and clinician-rated resistance during placement. Silk exhibited the lowest scores for smoothness and resistance but received the highest handling score. Ethibond Excel and Vicryl Plus exhibited intermediate values across most domains.

Variable	Monocryl	Ethibond Excel	Silk	Vicryl Plus
Smoothness	8.47 ± 0.85	7.47 ± 0.91	5.60 ± 1.10	7.46 ± 0.87
Handling	6.68 ± 0.92	6.47 ± 1.01	7.82 ± 0.95	7.46 ± 0.89
Clinician-rated resistance	8.92 ± 0.74	7.43 ± 0.88	5.21 ± 0.97	7.77 ± 0.85

Table 2. Clinician-rated intraoperative performance scores. Values are presented as mean ± SD. Only descriptive statistics are reported because patient-level data were not available for inferential analysis.

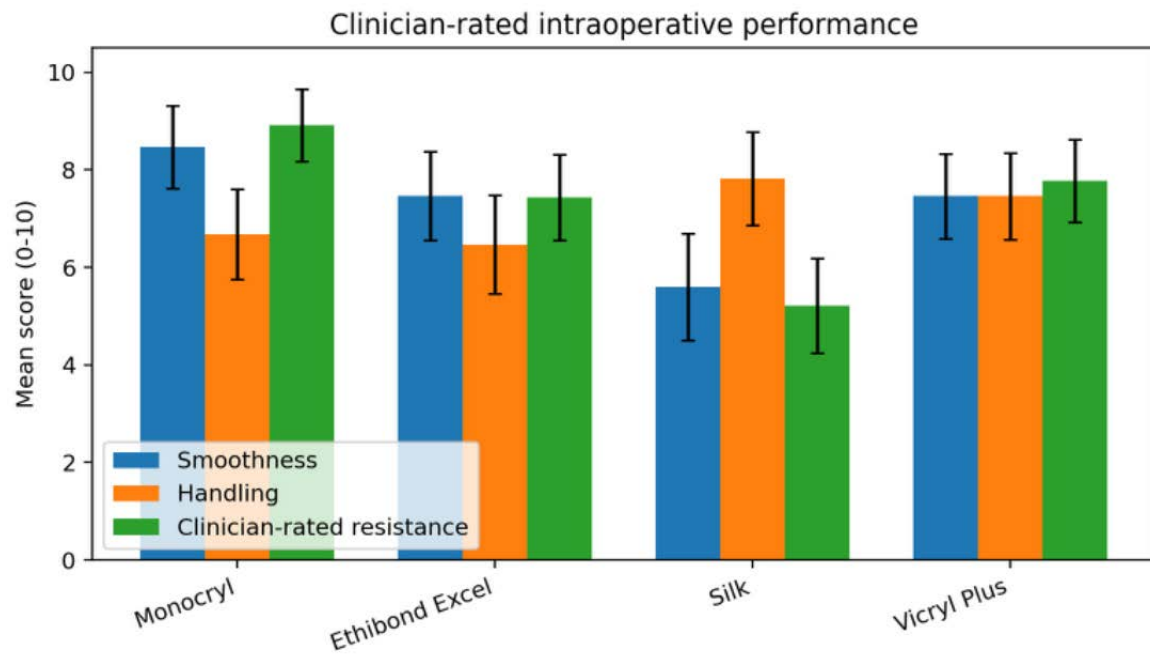


Figure 1. Mean clinician-rated smoothness, handling, and resistance during suture placement. Error bars indicate SD.

Postoperative clinical scores

Postoperative clinical scores are summarized in Table 3 and Figures 2-5. On day 3, silk exhibited the highest mean values for edema, inflammation, and perilesional plaque. Vicryl Plus demonstrated comparatively low inflammation scores on days 7 and 14, while perilesional plaque scores remained lower than those observed for silk. Suppuration was infrequent and was not observed for Ethibond Excel or Vicryl Plus in the aggregate data.

Material	Follow-up	Edema	Inflammation	Perilesional plaque	Suppuration
Monocryl	3 days	0.75 ± 0.12	0.75 ± 0.14	0.25 ± 0.10	0.08 ± 0.05
Monocryl	7 days	0.50 ± 0.11	0.50 ± 0.13	0.08 ± 0.07	0.08 ± 0.03
Monocryl	14 days	0.17 ± 0.06	0.17 ± 0.05	0.03 ± 0.02	0.00
Ethibond Excel	3 days	0.50 ± 0.15	0.33 ± 0.12	0.25 ± 0.10	0.00
Ethibond Excel	7 days	0.33 ± 0.14	0.17 ± 0.09	0.25 ± 0.11	0.00
Ethibond Excel	14 days	0.08 ± 0.05	0.08 ± 0.04	0.33 ± 0.13	0.00
Silk	3 days	1.05 ± 0.20	1.05 ± 0.19	0.80 ± 0.18	0.10 ± 0.04
Silk	7 days	0.50 ± 0.15	0.60 ± 0.16	0.70 ± 0.14	0.00
Silk	14 days	0.16 ± 0.09	0.20 ± 0.08	0.35 ± 0.11	0.00
Vicryl Plus	3 days	0.62 ± 0.14	0.43 ± 0.12	0.20 ± 0.09	0.00
Vicryl Plus	7 days	0.40 ± 0.12	0.12 ± 0.08	0.31 ± 0.11	0.00
Vicryl Plus	14 days	0.60 ± 0.13	0.10 ± 0.05	0.32 ± 0.12	0.00

Table 3. Postoperative clinical scores by suture material and follow-up time. Values are presented as mean ± SD. The outcomes are reported as aggregate clinical scores and should not be interpreted as binary 0/1 variables because values greater than 1 were present in the reported aggregate data.

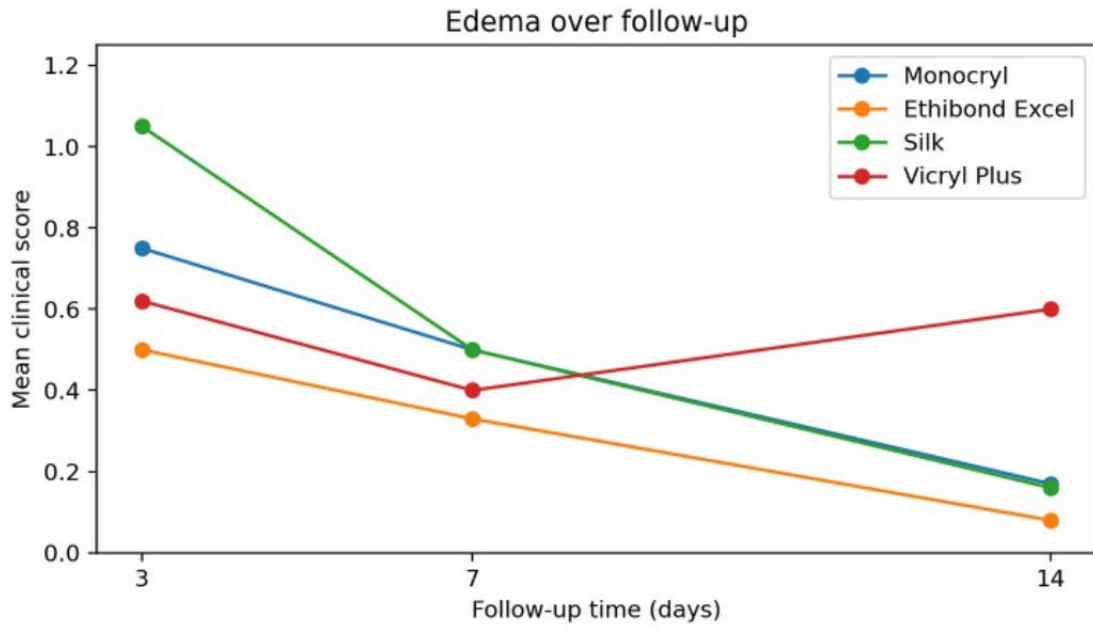


Figure 2. Edema mean score over follow-up by suture material.

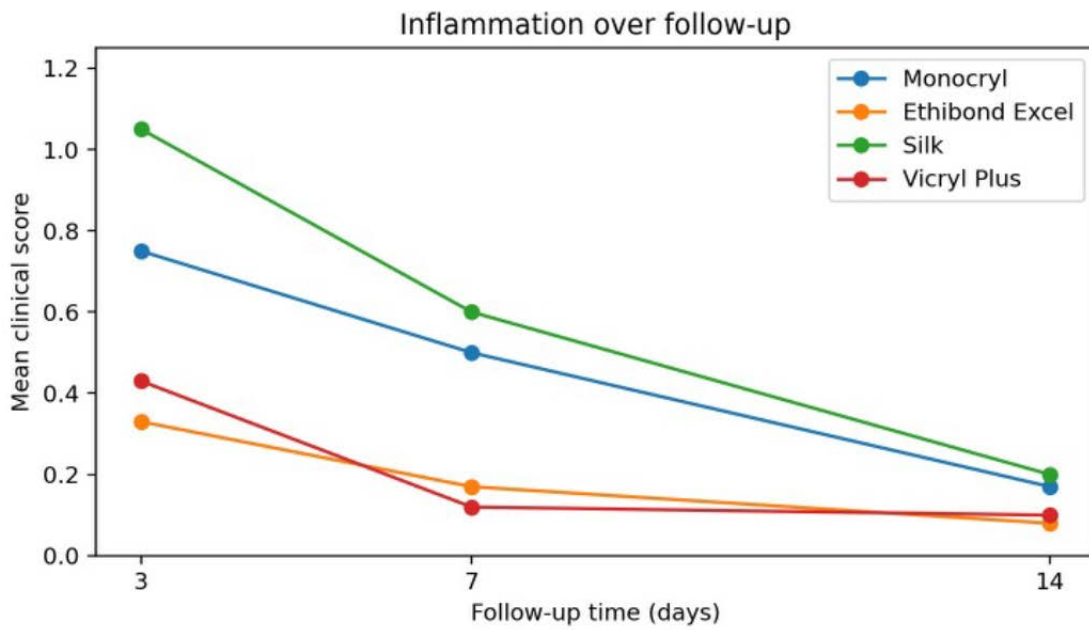


Figure 3. Mean inflammation score over follow-up by suture material.

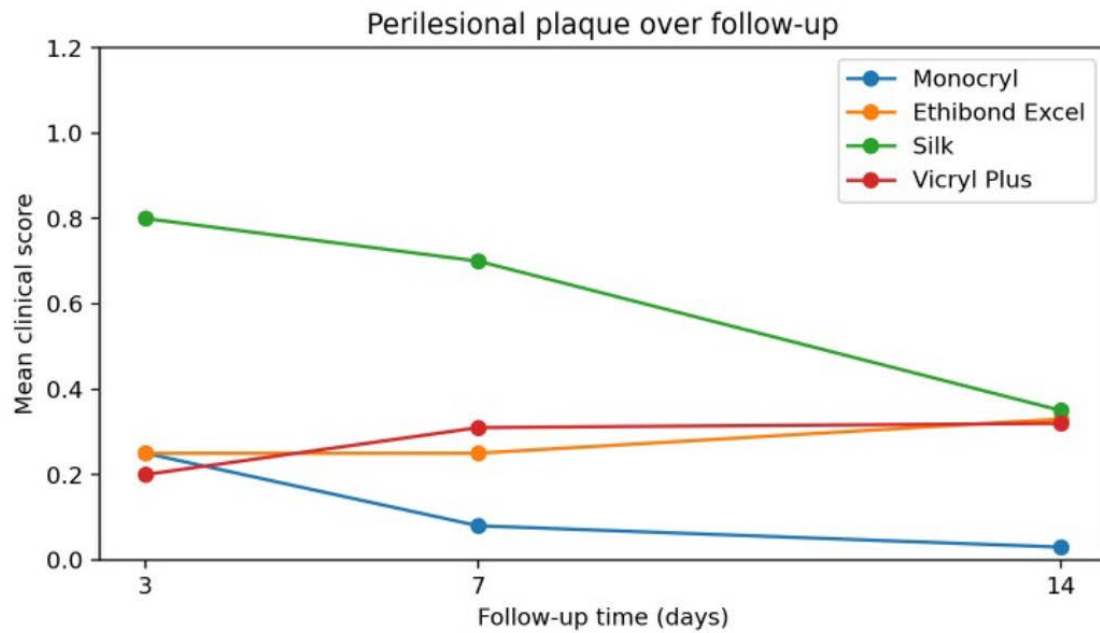


Figure 4. Mean perilesional plaque score over follow-up by suture material.

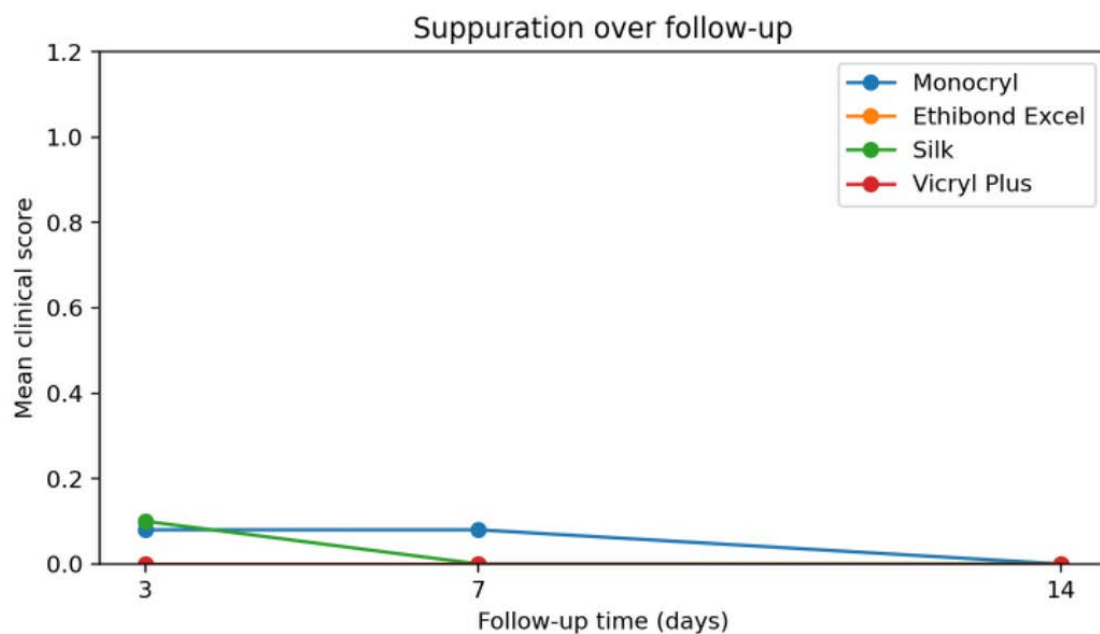


Figure 5. Mean suppuration score over follow-up by suture material.

Discussion

This pilot comparative study suggests that the tested suture materials differ in clinician-rated intraoperative performance and early postoperative clinical scores. The most consistent descriptive pattern was the favorable smoothness and resistance profile of Monocryl and the lower smoothness and resistance profile of silk. This is biologically plausible because monofilament synthetic sutures usually produce less tissue drag during passage, while braided natural silk may show greater surface friction and lower mechanical predictability in clinical handling. However, because resistance was assessed subjectively during placement, these findings should not be interpreted as laboratory-measured tensile strength.

Silk achieved the highest handling score. This observation aligns with its longstanding clinical appeal: silk is recognized for its flexibility, ease of knotting, and familiarity among many practitioners. However, superior handling characteristics do not necessarily correlate with enhanced biological performance. In the current dataset, silk demonstrated higher scores in early edema, inflammation, and plaque accumulation, particularly on day 3. This trend aligns with existing literature indicating that

braided materials have the propensity to retain fluids and microorganisms within their interstices, although the extent of tissue response is influenced by factors such as oral hygiene, surgical site, suture location, and individual patient variables [3-6].

Vicryl Plus demonstrated favorable early clinical scores within this dataset, particularly in relation to inflammation and perilesional plaque. These findings may align with the intended purpose of antibacterial-coated sutures. However, the current study did not incorporate microbiological sampling, culturing, molecular analysis, or direct quantification of bacterial load. Consequently, it cannot establish that Vicryl Plus reduced bacterial colonization. Therefore, the observed pattern should be interpreted only as an association between Vicryl Plus and lower clinical scores in this pilot sample.

The broader evidence concerning antibacterial-coated sutures in oral surgery remains inconclusive. Scoping and systematic reviews suggest potential antimicrobial benefits associated with coated sutures; however, individual clinical studies have not consistently demonstrated clinically significant reductions in infection or bacterial colonization [2,7-9]. For instance, in dental implant surgery, a randomized clinical study comparing Vicryl and triclosan-coated Vicryl Plus did not observe a significant decrease in surgical site infections with the coated material [9]. This context warrants a cautious interpretation of the current findings.

No discernible pattern of suppuration emerged from the aggregated data. This is clinically significant, as inflammation and plaque buildup are not synonymous with infection. Sutures may induce local tissue reactivity without necessarily causing overt suppurative complications. Future research should meticulously differentiate between signs of inflammation, plaque retention, microbiological colonization, wound dehiscence, and confirmed surgical site infection.

A significant limitation of the current study is the incomplete reporting of the methodology. The allocation procedure has not been described, and no baseline table was provided. The specific types and locations of oral surgical procedures were not documented, hindering the evaluation of whether the four groups are genuinely comparable. Additionally, the calibration and blinding status of the examiner were not disclosed.

The statistical methodology also necessitates revision. Follow-up outcomes were systematically collected from the same patients; consequently, methods presuming independent observations are not appropriate. A conclusive analysis should employ patient-level data and utilize a model suitable for repeated measures and the specific measurement scale.

Conclusions

Within the constraints of this pilot comparative dataset, synthetic suture materials appeared to exhibit more favorable clinician-rated smoothness and resistance during placement than braided silk. Silk maintained a favorable profile in terms of handling; however, it exhibited higher early clinical scores for edema, inflammation, and plaque. Vicryl Plus showed favorable descriptive clinical scores; nonetheless, the study did not directly measure bacterial load and therefore cannot confirm an antibacterial clinical effect.

The findings presented herein should be regarded as preliminary. Future randomized studies with sufficient power, standardized clinical scoring protocols, microbiological outcome assessments, and repeated-measures statistical models are necessary to determine whether a single suture material should be preferred for specific oral surgical indications.

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