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# What's new for the clinician?
## - Excerpts from and summaries of recently published papers

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**Compiled and edited by V Yengopal**

## 1. Alvogel versus absorbable gelatin sponge as palatal wound dressings following epithelialized free gingival graft harvest

K Ehab, O Abouldahab, A Hassan, KM El-Sayed. Alvogel and absorbable gelatin sponge as palatal wound dressings following epithelialized free gingival graft harvest: a randomized clinical trial. Clinical Oral Investigations. 2020; Mar 6:1-9.

The gingiva covering the hard palate is composed of three histologic layers: the orthokeratinized epithelium, the coarse subepithelial connective tissue (the lamina propria), with its high proportion of inter-cellular substance, and the submucosa, attaching the lamina propria to the periosteum of the underlying bone.[1]

Clinically, the hard palate gingiva is harvested (donor tissue) for tissue grafting in a variety of sites in the body, e.g., the hip and ocular regions. Postoperative pain and bleeding at these donor sites on the hard palate are most common complication following free gingival palatal graft harvesting until complete re-epithelization.

Although various agents have been suggested to protect the denuded donor areas of the palate, including stents, collagen-gel tin scaffolds, resorbable gelatin sponge, oxidized cellulose and sterile gauze combined with external pressure, platelet-rich fibrin (PRF), medicinal plant extract dry socket (MPE), platelet concentrates and equine-derived collagen, currently, no gold standard exists.[1]

Ehab and colleagues from Egypt (2020)[1] reported on a trial that sought to clinically compare for the first time the effects of Alvogel (used commonly for the management of dry socket [alveolar osteitis]) versus absorbable gelatin sponge as a palatal wound dressing on the incidence and severity of postoperative pain, amount of analgesic consumption, post-surgical bleeding, and palatal wound re-epithelization, following epithelialized free gingival graft harvesting in a randomized controlled clinical trial.

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### MATERIALS AND METHODS

This was a prospective, randomized clinical trial with a parallel design that sought to investigate the effects of Alvogel (intervention group) versus absorbable gelatin sponge (control group) as palatal wound dressing agents, on the incidence and severity of postoperative pain, amount of analgesic consumption, post-surgical bleeding, and palatal wound re-epithelization, following epithelialized free gingival graft harvesting.

Thirty six healthy patients scheduled for different periodontal and peri-implant plastic surgeries, requiring palatal mucosal graft harvesting, either epithelialized or de-epithelialized, were recruited for this trial. Patients with severe gagging reflex, smoking patients, pregnant or lactating females, patients with psychiatric disorder, patients with coagulation disorders, patients with known allergies to any of the used agents, and diabetic patients were excluded.

Before the procedure, all patients received full mouth supra- and subgingival scaling and detailed oral hygiene instructions. Patients were then randomized into intervention (receiving Alvogel as a dressing for their palatal wounds) and control (receiving the absorbable gelatin sponge as a dressing for their palatal wounds) groups, with an allocation ratio 1:1.

Blinding of the participants and outcome assessor was possible but the operators placing the test materials could not be blinded. The primary surgical site requiring soft tissue grafting was prepared using a standardized protocol on both groups. The graft was used as it is or de-epithelialized extraorally, according to the purpose it was harvested for.

The graft dimensions (width and length) and the thickness of the residual palatal mucosa in a midpoint of the wound area were recorded, using William's graduated

periodontal probe. In the intervention group, the denuded palatal area was superficially covered with a continuous thin layer of Alvogel (Septodont), while in the control group, absorbable gelatin sponge (Cutanplast Standard) was cut to the palatal wound size and applied. Following manual compression of the wound area, both agents were secured in place using compressive palatal sling sutures.

After the procedure and placement of Alvogel or gelatin sponge, every patient was given 1 g amoxicillin plus clavulanic acid twice per day for 6 days and 150 mg biprofenid for 7 days when needed. Patients were advised to rinse twice a day with 0.12% chlorhexidine HCL solution for 3 weeks following the surgery. Sutures were removed 14 days following the surgery. The Alvogel and the gelatin sponge were not removed postoperatively and disintegrated, and were incorporated into the healing tissues over the healing period.

Patient-reported daily VAS pain scores (scores vary between 0 and 10. 0, no pain; 1, minimal pain; 5, moderate pain; 10, severe pain) for 2 weeks post-surgically were defined as the study's primary outcome.

Post-surgical bleeding and complete re-epithelialization of the palatal wound over the follow-up period of 5 weeks until complete healing were achieved in addition to the number of analgesic tablets consumed over 7 days (1st week) were defined as secondary outcomes.

Re-epithelization of the palatal wound was evaluated using the H2O2 test. Briefly, the healing area to be evaluated was dried, and 3% H2O2 was sprinkled on the wound. If the epithelium was still discontinuous, H2O2 diffuses into the palatal connective tissue, where the enzyme catalase acts on H2O2, releasing water and oxygen and clinically producing bubbles on the wound surface. Complete healing scores were recorded as a dichotomous variable (yes/no). Re-epithelization of the palatal wounds was evaluated weekly for 5 weeks postoperatively.

## RESULTS

Thirty-six patients were recruited for the present randomized controlled clinical trial: 18 patients in the intervention (13 females and 5 males, mean age 31.3 years) and 18 patients in the control group (11 females and 7 males, mean age 34.1 years). The intervention and control groups were balanced for age and gender ($p > 0.05$).

There were no dropouts and all patients in both groups completed the follow-up period until complete healing postoperatively. No adverse effects were reported in any of the groups.

Although the harvested grafts varied in their width (5 to 15 mm) and length (8 to 22 mm), according to the mucogingival procedure they were harvested for, no significant differences were noted in the harvested graft dimensions between the intervention and the control groups. The remaining palatal tissue thickness varied between 0 and 2 mm, with significantly lower palatal tissue thickness noted in the control group.

At 1, 2, 3, 4, and 5 days, significantly higher patient-reported VAS pain scores were noted in the control as compared with the intervention group. At days 6 and 7, no significant differences were notable between the groups. The control group continued to demonstrate significantly higher pain scores from days 8 to 12.

Again, on the 13th and 14th days, no significant differences were notable in the pain scores between the two groups. Over time, a significant decrease in pain scores was notable independently in the intervention group and the control group (within group comparison).

A significantly higher number of analgesic tablets were consumed by patients in the control group in contrast to the intervention group over the first 7 days of the healing period (Table 5, Mann-Whitney U test).

Up to 3 weeks following the palatal graft harvesting, no complete re-epithelization was noted in any of the cases of the intervention or control groups. At 4 weeks, no significant differences were notable between groups, with 22.2% of subjects in the intervention and 11.1% subjects in the control group demonstrating complete re-epithelization of their palatal engraftment sites. At 5 weeks postoperatively, all subjects in both groups demonstrated complete re-epithelization of their palatal. No postoperative bleeding was reported in any of the groups.

## CONCLUSION

The trial results suggest that Alvogel is a viable option as a practical palatal dressing agent, comparable with absorbable gelatin sponge, in haemostasis, pain reduction, and palatal wound re-epithelization supporting properties.

### Implications for practice

Alvogel, could be considered as another viable option to protect the denuded donor areas of the palate when undertaking grafting procedures in the palate.

**Reference**

1. Ehab K, Abouldahab O, Hassan A, El-Sayed KM. Alvogel and absorbable gelatin sponge as palatal wound dressings following epithelialized free gingival graft harvest: a randomized clinical trial. Clinical Oral Investigations. 2020; Mar 6:1-9.

# 2. Comparison of four different suture materials as regards oral wound healing, microbial colonization, tissue reaction and clinical features

Dragovic M, Pejovic M, Stepic J, Colic S, Dozic B, Dragovic S, Lazarevic M, Nikolic N, Milasin J, Milicic B. Comparison of four different suture materials in respect to oral wound healing, microbial colonization, tissue reaction and clinical features-randomized clinical study. Clinical oral investigations. 2019; Jul 24: 1-5.

Sutures support the damaged or injured tissues until continuity of surface and enough tensile strength is re-gained during the process of wound healing.[1] Oral wound healing follows the well-known general principles of wound healing but with certain peculiarities.

First of all, oral mucosa is colonized by bacteria which, in conjunction with food detritus, form biofilm and facilitate wound infection. Secondly, oral wounds cannot be immobilized due to the function of oral tissues. Lastly, these wounds are often in contact with avascular structures (enamel, ceramic, metal) and thus devoid of active metabolic exchange during the healing process.[1]

Clinically, there are two types of wound healing: healing by primary intention, resulting in regeneration of specific tissues with the same characteristics as the tissue prior to trauma and healing by secondary intention where the tissue is not regenerated but only repaired and replaced with nonspecific scar tissue.[1]

In contemporary oral surgery, primary healing enabled by the use of sutures along with an adequate intraoperative handling of soft tissues is an absolute imperative in order to obtain optimal functional and aesthetic long-term results.

Sutures can increase the risk of postoperative as oral microbes can attach themselves to the surfaces of the suture material. Sutures also can induce inflammatory reactions due to them being foreign bodies introduced into the oral cavity during wound repair/treatment.

Dragovic and colleagues (2019)[1] reported on a trial that sought to compare four different suture materials used in oral surgery in terms of their biocompatibility, degree of bacterial colonization and inflammatory reaction, influence on wound healing, and basic clinical parameters.

## MATERIALS AND METHODS

A total of 32 patients (21 females and 11 males) aged 18-25 indicated for surgical extraction of four totally impacted wisdom teeth were included in the study. Only healthy patients, non-smokers without systemic and/or oral diseases, were included. Using standard surgical protocols, unilateral upper and lower wisdom teeth have been extracted at the same time.

In the mandible, an envelope design for the mucoperiosteal flap was used with sulcular incision going from the first molar, engaging second molar and extending buccally along the external oblique ridge. In the maxilla, standard triangular flap was performed with the vertical releasing incision made at the distal part of interdental papilla between first and second molar. Several interrupted sutures were placed in order to obtain primary wound healing. After a period of 4-5 weeks, impacted molars from the other side were extracted following the described procedure. Each wound was closed with a different suture material taking care of equal distribution between jaws. Suture positions for the first patient were determined by toss of a coin and after that, clockwise rotation was done until each suture material was placed in every quadrant equal number of times. Stitches were removed 7 days postoperatively.

Patients were given uniform postoperative instructions which included antibiotics regime (amoxicillin 500 mg or clindamycin 300 mg) and rinsing with chlorhexidine solution 0.2%, three times a day for 7 days. Patients were also told to apply cold packs immediately after surgical procedure until bedtime with breaks on every 15 min. Before the operation and the day after, 4 mg of dexamethasone was administered in order to reduce postoperative swelling and patient discomfort. For pain control, ibuprofen 400 mg was prescribed four times a day for the first 2 days postoperatively.

The suture materials used in this study were Sofsilk® (non-absorbable natural multifilament wax coated silk); *Surgipro*® (non-absorbable synthetic monofilament polypropylene); *Polysorb*® (absorbable multifilament co-polymer of glicolide and lactase 9:1-*Lactose*® coated with Ca-stearate and E-caprolactone); and *Caprosyn*® (absorbable monofilament co-polymer of E-caprolactone, glicolide, trimethylen carbonate, lactase 6:2:2:1-*Polyglytone 6221*®). All sutures were applied with a 4–0 gauge with 19 mm, 3/8 circle “reverse cutting” needle.

In order to visualize the surface and the structure of sutures, samples of all materials used in this trial were chosen randomly and analyzed using scanning electron microscopy (SEM).

In order to assess suture material biocompatibility, an MTT (3-(4,5-dimethylthiazolyl-2)-2,5 diphenyltetrazolium bromide) assay was done using gingival fibroblasts obtained from a healthy male patient, 18 years old. The cells were cultured at 37 °C in humidified atmosphere containing 5% $CO^2$. Ten thousand cells were seeded onto a 96-well plate. After 24 h, four different suture materials were suspended in 100 µl of growth medium with cells. The growth medium was replaced every second day. After 7 days, MTT was added to each well, incubated for 4 h, and the supernatant with suture ma-

terials was discarded. Precipitates were dissolved in 100 µl dimethyl sulfoxide (Sigma-Aldrich) by shaking at 37 °C. Optical density (OD) was measured at 540 nm using an ELISA reader. The percentage of viable cells was calculated using the following formula: % of viable cells = OD (sample)/OD (control) × 100. All experiments were done in triplicate. For micro-organism quantification, PCR testing was done.

For histological analysis, one knot of every suture material from each patient was obtained on the day of the removal and immersed in 10% neutrally buffered formalin solution. Only the part of the suture that was implanted in the tissue was sectioned. Individual sections were stained with hematoxylin and eosin (H&E) and examined under optical microscope. Inflammatory cells were counted on three different sections of each suture sample and according to average number, indirect assessment of inflammatory reaction was scored as follows:

(1). **No** inflammatory reaction (0 inflammatory cells).
(2). **Mild** inflammatory reaction (< 30 inflammatory cells).
(3). **Moderate** inflammatory reaction (30 - 60 inflammatory cells).
(4). **Strong** inflammatory reaction (> 60 inflammatory cells).

Clinical assessments were done on the first, third, and seventh days postoperatively. Soft tissue healing was judged by the oral surgeon with the help of a healing index (HI). Using a visual analogue scale (VAS), the operator rated threads with respect to ease of intraoperative handling immediately after the intervention and ease of removal 7 days later.

Patients, using the same scale, evaluated the discomfort and suture removal pain for each type of suture. Postoperative amount of slack was assessed for every suture material with the help of graduated probe UNC 15. The knot was carefully lifted with cotton pliers, and the distance from the knot to the tissue was measured to the nearest 0.5 mm. In the lower jaw, this procedure was carried out on the suture which was placed at the interdental papilla between first and second molar. In the upper jaw, measuring was done on the suture placed at the mesial corner of the mucoperiosteal flap.

## RESULTS

All suture threads were analyzed, and substantially more amount of dental plaque was found on multifilament sutures compared to monofilament ones as seen on representative micrographs. Microscopic analysis showed more pronounced inflammatory reaction around multifilament sutures, as a significantly higher number of inflammatory cells were found around these sutures compared to monofilaments. The highest number of inflammatory cells was found around NA-Multi (*Sofsilk*®) and the smallest number around NA-Mono (*Surgipro*®). A statistical difference in the number of inflammatory cells was also found between all sutures compared between them, except between NA-Multi (*Sofsilk*®) and A-Multi (*Polysorb*®). Moreover, incidence and degree of inflammatory reaction differed significantly among all sutures NA-Multi (*Sofsilk*®) was the suture that attracted gingival fibroblast the most. Moreover, a statistically significant difference in percentage of viable fibroblast around this suture compared to NA-Mono (*Surgipro*®) and A-Mono (Caprosyn®) ($p = 0.023$*, $p = 0.004$* respectively) was observed.

A total of 128 suture samples were examined for microbial adherence, and significantly lower amount of microbial load was found on monofilament compared to multifilament sutures. Statistically significant differences were found between suture types compared between them ($p = 0.000$*) except for the comparison of NA-Multi (*Sofsilk*®) and A-Multi (*Polysorb*®) ($p = 0.243$). Clinically, there was significantly better healing around all synthetic materials NA-Mono (*Surgipro*®), A-Mono (*Caprosyn*®), and A-Multi (*Polysorb*®) compared to natural multifilament NA-Multi (*Sofsilk*®) both on the third and seventh day postoperatively.

Significant statistical differences were found between all sutures regarding the ease of handling and ease of removal. For suture removal pain, statistically significant difference was found between all sutures except between NA-Multi (*Sofsilk*®) and A-Multi (*Polysorb*®) ($p = 0.849$). Although NA-Mono (*Surgipro*®) caused the greatest discomfort to patients among all suture types, the statistical significance was found only for the seventh day postoperatively between this suture and NA-Multi (*Sofsilk*®) and A-Mono (*Caprosyn*®) ($p = 0.037$*, $p = 0.003$* respectively). NA-Mono (Surgipro®) was the suture that exhibited the least postoperative amount of slack compared to all other sutures throughout the entire postoperative period.

In the linear regression model in which microbial adherence was used as dependent variable, the following explanatory variables were found to be independent predictors of variabilities among patients: suture type, suture slack (seventh day), ease of suture removal, postoperative infection.

## CONCLUSIONS

Non-resorbable polypropylene sutures showed superior clinical characteristics among all sutures. Moreover, the best healing of soft tissue and the least inflammatory reaction was found around this thread. The poorest soft tissue healing was found around non-resorbable silk suture. This suture elicited strongest inflammatory reaction and showed the greatest microbial adherence affinity compared to alternative sutures.

### Implications for practice

Monofilament synthetic suture should be used in order to obtain the best soft tissue healing, reduce the risk of postoperative infection, and alleviate the suturing after oral surgery procedures.

### Reference

1. Dragovic M, Pejovic M, Stepic J, Colic S, Dozic B, Dragovic S, Lazarevic M, Nikolic N, Milasin J, Milicic B. Comparison of four different suture materials in respect to oral wound healing, microbial colonization, tissue reaction and clinical features - randomized clinical study. Clinical oral investigations. 2019; Jul 24: 1-5.