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Oral post-surgical use of a bio-adhesive gel for suture decontamination and healing of the oral tissues post Surgical procedures

Giuseppe Gola, Marisa Roncati

The healing of post-extraction wounds or other surgical procedures is associated with well-known biological processes. Immediately after the removal of the tooth from the socket, in fact, the blood flows to the extraction site and from that moment coagulation is activated thanks to both intrinsic and extrinsic factors. The organization of the clot begins in the first 48 hours also by dilation.

The presence of inflammation can significantly prolong the capillary tion in the residual periodontal ligament, due to leukocyte migration and the formation of a layer of fibrin. In the first week after the beginning of the clot, a temporary structure rich in inflammatory cells is formed. The epithelium at the wound margins therefore develops from the edges of the clot.

The presence of inflammation can significantly prolong the wound healing process after oral surgery, especially due to a condition of oxidative stress induced or altered immunological response. In these cases, impediments are also created to the clinical management of the wound itself.

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Risks and Considerations of Intentional Dental Modifications (IDMs)

Chiara Lorenzi

Intentional body modifications (IDM), which consists of changing nals, such as tattoos, scars and voluntarily piercing the appearance of the girdling teeth, are practices that humanity has through techniques such as extractions, adopted since the Ice Age. These colours, inlays, filings or engravings have often been part of the in- sions. A historical example of IDM's tegrante of religious rituals and traditions was reported in the thirteenth century by cultural scholars, used to express Marco Polo's personal or social identities in his travelogues. Among the and evidenced by recent discoveries forms of body modification falls on the Viking populations.

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Dompé

Oral post-surgical use of a bio-adhesive gel for suture decontamination and healing of oral tissues after surgical procedures

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Sometimes an incongruous coagulation process is the first step of a localized alveolar osteitis that usually has a considerably delayed healing: in the absence of a good granulation tissue matrix, the application of newly formed bone tissue inside the alveolus takes place very slowly. The socket remains infected and partially covered with hyperplastic epithelium.

It is equally evident that in oral surgical therapy a correct technique of suturing the tissues allows appropriate healing, avoiding possible post-surgical infections. However, the same sutures can retain bacterial biofilms, which, precisely through their path, have the possibility of colonizing deeply. The type of suture performed, both in terms of the material used and the technique of making and removing, is an important factor in the adhesion of bacteria to the surgical site.

The post-surgical risk of infection can be controlled thanks to some pre-surgical procedures (strict compliance with asepsis in the preparation of the operating area and the materials used, preliminary decontamination of the patients' oral cavity). A substantial reduction in the aerobic and anaerobic bacterial load can be obtained with the solution of iodinated povidione, or at 1% cetrimide or even thanks to irrigation with 0.2% chlorhexidine. There are conflicting opinions, however, on the efficacy of these active ingredients, applied topically in the post-extraction sites of the oral cavity, both in relation to the prevention of infectious complications, and as a function of the healing process and any unforeseen ones, first of all post-extraction dry alveolitis[1]. This inflammatory pathology in which the alveological cavity appears empty and dry, without granulation tissue, induces localized and persistent pain, halitosis and lymphoadenopathy. In such patients, the pre-liminal clot tends to break down and is associated with insufficient granulation tissue formation. The indicated therapy is substantially local. A maneuver of cautious curettage and alveolar lavage should be associated with daily applications of topical active ingredients. Mouthwashes based on 0.2% chlorhexidine gluconate, but above all gentle rubbing manoeuvres using a gauze soaked in 0.12% chlorhexidine (Digital Brush, Enacare, Micerium), used for a week, can significantly prevent the occurrence of "dry socket" pathology. Even in the treatment of dry alveolitis, there can be a

Good results in pain relief with chlorhexidine, but only if it is placed in situ in a stable way, for example thanks to gelatin sponges saturated with the active ingredient or fragments of Digital Brush (Enacare, Micerium) cut out to the size of a postage stamp and applied like a plaster for an effective release of the active ingredient. Finally, a reduction in post-operative alveolar osteitis has been hypothesized with the use of chlorhexidine gel with both 0.2% and 1% concentration. Also in this hypothesis, the antibacterial action of a chlorhexidine-based gel is effective if it manages to impregnate the sutures used, provided that this gel is slow-release.

The use of chlorhexidine is also often associated with the onset of unwanted side effects2. Finally, the limited or absent healing action of chlorhexidine justifies the search for therapeutic alternatives to this active ingredient. Possible alternatives in post-extraction oral surgery seem to be sutures impregnated with a glycolic acid and lactic acid copo-limer or the use of ozonated oil. Recently, some essential oils applied locally to sutures in extraction sites have been tested. Calendula officinalis and camellia si- nensis have detected antimicrobial activity against bacteria present on the sutures.

In a previous controlled, randomized, blinded clinical trial3, the authors evaluated the levels of complex and specific bacterial growth within suture threads used in oral extractive surgery in the short period following tooth extractions. The aim was to test whether the application of innovative bioadhesive gels could control bacterial contamination along the applied sutures, compared to a chlorhexidine-based gel or simple mechanical removal of biofilms. The sutures, or parts of them, taken

Fig. 1

They were placed in a sterile tube, labeled with the reference patient code for the "blinded" assessment. The samples, stored in the refrigerator, were then sent to the laboratory for the examination of the overall and specific battery count. The microbiological evaluation was carried out with the "Polymerase Chain Reaction" (PCR) technique which involves three reactions for each sample. The first of these quantifies the total amount of bacteria, while the second identifies and quantifies the bacteria of the "red complex" (P. Gengivalis, T. Forsythia, T. Denticola). Finally, the third reaction highlights the presence of Aggregatibacter Acty-nomicete-comitans, Fusobacterium Nucleatum, Campylobacter Rectus.

The results of that investigation highlight how the parameters relating to the total bacterial load and that of the specific types of bacteria showed a tendency to decrease both in cases treated with chlorhexidine gel and in cases treated with Hobagel Plus (Hobama srl). The same considerations applied to the overall Plaque Index, which did not reveal significant alterations. With regard to the bacterial component, the additional treatment with chlorhexidine or the new bioadhesive gel induced overlapping results. A significant variation was observed in the development of three specific clinical parameters (pain, patient comfort and type of recovery) in the short term (one week after surgery). From the data collected, in fact, it was shown that the pain on contact, complained of by patients, was still present at one week, in 87% of cases treated with chlorhexidine or with purely mechanical cleansing of the site. The percentage was reduced to 46% in cases where the Hobagel Plus bioadhesive gel (Hobama srl) was used. Mild overall discomfort was described at one week in 100% of cases with only mechanical cleansing, compared to 87% of cases treated with chlorhexidine and 46% of cases treated with bioadhesive gel. As for a satisfactory healing process, it was evident in 71% of cases with Hobagel Plus (Hobama srl), compared to 54% of cases treated with chlorhexidine.

The clinical results obtained must be interpreted on the basis of the formulation of the new gel, which includes a mix of various substances. The intense bioadhesiveness of the product is determined not only by the lipophilic substrate of many components, but above all by the original mix of rubbers and resins (mixed Na/Ca salt of the methyl-vinyl-ether copolymer and carboxy-methyl-cellulose). The antiseptic activity is obtained by the insertion of cytyl-pyridinium-chloride 0.05% and two essential oils (Mela-leuca and Manuka) active on various oral bacteria. These essential oils are extracted from the leaves of official plants of the myrtaceae family, easily absorbed and particularly rich in terpenes and triketones. The effect of re-epithelialization of the tissues is obtained from the peculiarities of other substances including, in the foreground, hyaluronic acid with different molecular weights. The low weight of the oligomers of the substance favors tissue pene-traction, cell migration and the synthesis of native hyaluronate; The high-weight component, on the other hand, hydrates and stabilizes the cells in the tissue. In addition, the "PVP-hydrogen peroxide 0.1%" complex cleanses and sanitizes the surgical area, while the presence of allantoin, bisabolol, and vitamin E give the gel a soothing, anti-irritative and anti-oxidant capacity.

The data collected by the authors in a previous survey3 highlighted the importance of a consistent bioadhesiveness of local adjunctives in oral sutural decontamination. This evidence had already been described in previous clinical papers. Mati et al.[4] sub-

They underline how a slow-release technology allows the presence of active ingredients on the oral sutures for up to 96 hours, guaranteeing not only antibacterial action but also bio-compatibility. Cruz et al.[5], in turn demonstrated the antiseptic action obtained with adherent ointment on multi-filamentous silk sutures after maxillofacial surgery.

In the oral cavity, bioadhesiveness is obtained thanks to biopolymers which, due to their safety, biodegradability and compatibility, allow not only the release of active ingredients and biomedical regeneration[6], but also an effective antibacterial action completely comparable to that of chlorhexidine 1% gels7. The presence of hyaluronic acid[8], also in combination with hydrogen peroxide9, further contributes to regenerative and healing processes.

The use of Hobagel Plus (Hobama srl) in oral surgery has also demonstrated its effectiveness in other clinical investigations. Scotti et al.[10], after applying it to a group of patients undergoing biopsy sampling of oral lesions, conclude that the gel shows excellent hemostatic, antiseptic, pain-relieving and re-epithelializing capabilities, thus constituting a valid alternative to the use of sutures and chlorhexidine.

Even in the avulsive treatment of the lower third molars, the bio-a-desive gel finds an effective clinic response: Anello et al.[11], in fact, showed an overlap in the action of Hobagel (Hobama srl), compared to a 0.5% chlorhexidine gel, as regards the percentage of alveolitis and inflammatory complications. The perception of post-surgical pain from 3 to 7 days after surgery was also adequately controlled.

The clinical results of this research also indicate that the application of innovative bioadhesive gels

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Fig. 2

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Hobagel 365, Hobagel Plus (Hobama srl) represent a possible and effective alternative to the use of chlorhexidine, following dental surgical treatments.

The peculiarities of these gels lie in the mix of active ingredients that make them

Compose. Among them, Citylperidinium chloride, a bactericide very active on gram+ bacteria and on some gram-, which is associated with two essential oils (Melaleuca and Manuka) which, extracted from plants of the Myrtaceae family, are rich in terpenes and triketones, with a strong action not only in the

Tiseptic but also anti-inflammatory. Tissue regeneration, after surgical protocol, in the context of the gel is favored by the presence of hyaluronic acid at different molecular weights, which in turn is enhanced by hydrogen hydroxide.

The oligomers of hyaluronic acid, in particular, by virtue of their low molecular weight, penetrate rapidly into the treated tissue, binding water and promoting fibroblast proliferation and migration.

The patient who has undergone surgery receives a le-

The gel is immediately evident both because of the presence of bisabolol and allantoin, but also because the gel, which is in anhydrous form, adheres, persists and protects the tissues. The adhesive polymers, originally formulated from a mix of salts and natural resins.


Fig. 3

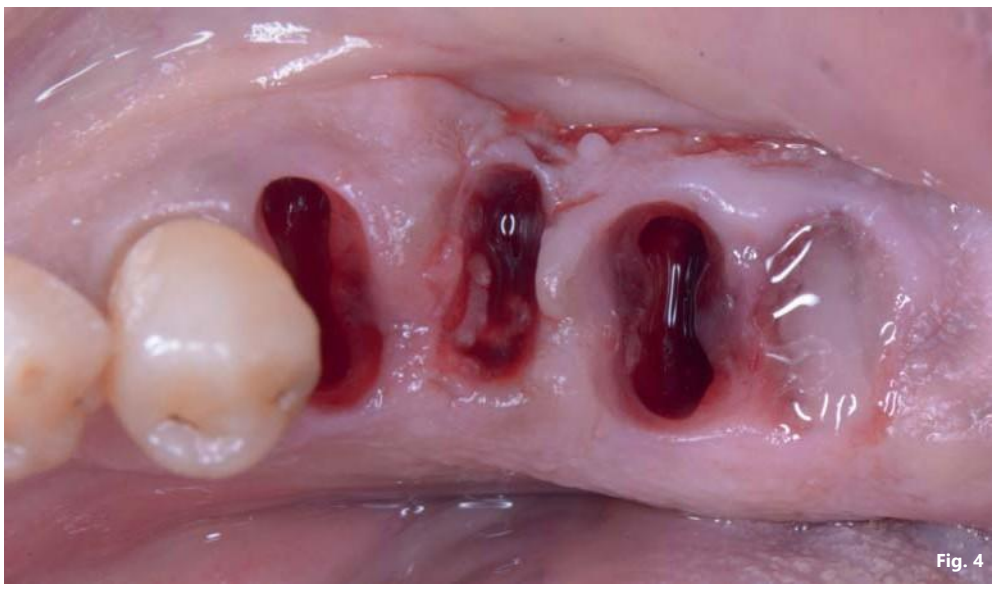
Fig. 4


Fig. 5


Fig. 6


Fig. 7


Fig. 8

Fig. 1 - Clinical application of Hobagel Plus; **Fig. 2** - Use of a conveyor to distribute the gel on the post-extraction alveoli; **Fig. 3** - Post-extraction sockets of 3.6 and 3.7; **Figs. 4-7** - Progressive positioning of Hobagel PLUS, its ability to remain in the socket during the operational phases is appreciated; **Fig. 8** - Healing after 15 days where complete epithelialization is highlighted.

Photo courtesy of Dr. Alberto Pispero.

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