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Wound management after the application of bone grafting substitutes in the orofacial region

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Surgical dressing after the application of bone grafting material depends on the type and size of the defect. A complete and tension-free wound closure has proved to be successful. In this context the infection problem needs special attention. Bone graft substitutes with an adequate surface structure, porosity and chemical properties, in combination with sufficient blood circulation, hold osteoconductive potential. They serve as a guide rail for the osteoblast-induced formation of new bone tissue, which at best may lead to complete replacement of the grafting material.

Key words: bone graft substitutes, wound care, infection prophylaxis

INTRODUCTION

A wound is defined as a disruption of the continuity of body tissues, with or without loss of substance. Wound healing after dental surgery may be classified into three stages (exsudation, proliferation and repair), which proceed differently as primary or secondary healing. *Sanatio per primam intentionem* is the desired healing of surgical wounds and proceeds within 6 to 8 days as epithelial closure with sparse connective tissue formation in smooth-edged wounds as after a primary suture. In contrast, *sanatio per secundam intentionem* occurs in dehiscent wound edges which, after defect filling with granulation tissue and secondary adaptation of the wound edges, often take as long as weeks to heal, resulting in a clearly visible scar [1–3].

Despite the physiological colonisation of the oral cavity and the complex nature of wound healing with its associated susceptibility to possible disturbances, the latter can be reduced to a minimum or even avoided altogether, particularly in dentoalveolar surgery, by adequate surgical dressing and as a result of excellent blood circulation in the oral-maxillofacial area [3]. The application of bone substitute material for the filling or reconstruction of multi-walled osseous defects has nowadays been established in dental surgery, implantology, and periodontology. In orthodontics the use of bone graft substitutes may be considered after tooth extraction in order to avoid alveolar ridge atrophy in the preparation for space closure.

CLINICS

Surgical dressing after the application of bone substitute material depends upon the type and size of the underlying defect. The extirpation of large cysts is jeopardised by blood clot retraction associated with

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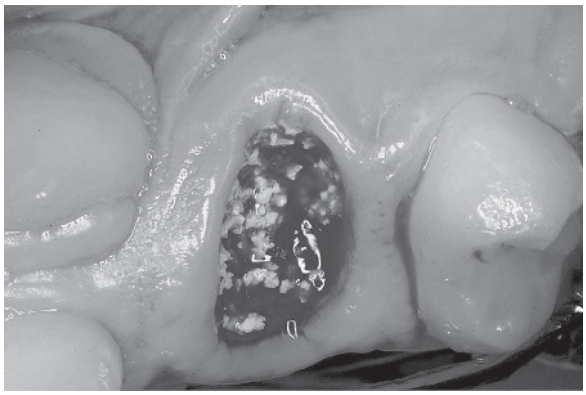

Figure 1. Extraction alveolus with open wound dressing.

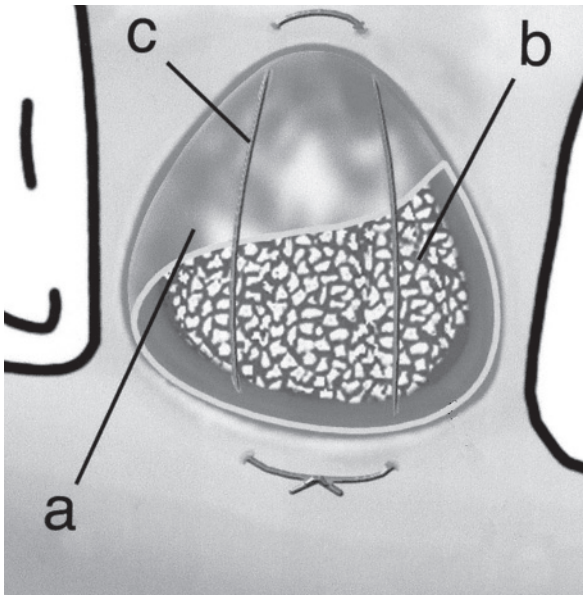

Figure 2. Bio-Col-Site preservation technique after Sclar [4].

the formation of wide margin gaps with a high susceptibility to infection. After defect filling with alloplastic bone substitute material, a primary, complete and tension-free wound closure is achieved by the previously prepared mucoperiosteal flap. A simultaneous procedure is also performed after treatment using bone graft substitutes in large osseous defects resulting from root-tip resection or the surgical removal of an impacted tooth. In reparative periodontal treatment the filling of wide two-walled and three-walled osseous defects with bone substitute material provides a therapeutic alternative. After tension-free adaptation of the previously prepared mucoperiosteal flap, infection prophylaxis including local application of a disinfecting rinsing solution for two to three weeks and systemic antibiotic therapy for a couple of days is recommended [3].

During implant care or in the preparation for orthodontic space closure the extraction alveolus provided with bone substitute material may, given a minimally traumatic technique, be dressed using different techniques for preservation of the alveolar process: open surgical dressing, commonly used after uncomplicated extractions, with free alveolar granulation on the one hand (Fig. 1), a loose adaptation suture or a primary suture on the other hand and the Bio-Col-Site preservation technique described by Sclar [4, 5]. This last comprises condensation of a resorbable collagen wound dressing (a) over the bone substitute filling (b) and a horizontal mattress suture performed with (c) subsequent application of a tissue adhesive for isolation of the grafted area against the oral cavity (Fig. 2).

DISCUSSION

Adequate wound care is the basis of rapid and infection-free wound healing. The most desirable type of healing has the aim of a *restitutio ad integrum* primary healing of surgical wounds [3]. The infection problem deserves special attention, as alloplastic bone graft substitutes, irrespective of their structure and composition, represent foreign matter to the human organism. Since application of bone substitution material to vast osseous defects, after cystectomies or the surgical removal of impacted teeth for instance, is nowadays a largely accepted albeit controversially discussed procedure, primary tension-free wound closure using the previously prepared mucoperiosteal flap is also an established surgical dressing technique.

Besides sealing the wound against the oral cavity, this procedure has the advantage of good blood perfusion of the bone substitute and the opportunity for osteoblasts to immigrate from the periosteum by the access site of the cavity. The filling of extraction alveoli after complication-free tooth removal for dimensional preservation of the alveolar ridge is conceivable for orthodontic treatment of crowding in preparation for space closure.

Different approaches lend themselves to wound care. On the one hand there is dressing of the open wound using bite swabs as after uncomplicated single tooth extractions. The advantages of this method are its simplicity and cost-effectiveness and the absence of pressure-dependant resorption of the bone substitute or alveolar ridge due to primary suture tension. This contrasts with the hazard of increased loss rates and the risk of delayed or disturbed wound healing

as a result of an open connection with the oral cavity. The alternative uses a loose adaptation suture and provides the advantages but cannot distinctly reduce the disadvantages of open wound dressing, and so its use may be challenged. Closure of the extraction alveolus by means of a specially prepared mucoperiosteal flap offers the above-mentioned advantages, although it involves a risk of possible vestibule flattening besides the aesthetic impairment of soft tissue architecture. The Bio-Col site preservation technique suggested by Sclar [4, 5] may provide the most promising conditions for bone regeneration and undisturbed wound healing of the grafted alveolus, although the increased time and, in particular, a financial burden have to be accepted.

The question of possible over-therapy has to be critically discussed with respect to both the mucoperiosteal flap technique and the Bio-Col site preservation technique after Sclar as methods of choice for wound management of uncomplicated extraction alveoli after filling with bone graft substitutes.

The ultimate decision in favour of or against one of the methods described is still to be made, with the treating dentist weighing up the advantages and disadvantages. This decision should, economic factors aside, largely be governed by the provider's skills and experience, with regard to handling as well as to clinical results, to ensure the best possible care for the patient.

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