

SAFETY AND EFFICACY OF BONE WAX IN PATIENTS ON ORAL ANTICOAGULANT THERAPY

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Abstract: Cardiovascular conditions, apart from neoplastic diseases, remain the major cause of death in developed countries; therefore, the number of patients receiving oral anticoagulants is constantly increasing. Anticoagulant therapy considerably reduced mortality in patients with history of myocardial infarction among others. Although many interventions may be performed without withdrawal of the anticoagulant and tooth extraction was qualified as a procedure of low hemorrhage risk, a majority of dentists refer the patient to a cardiologist several days before the elective tooth extraction to withdraw anticoagulants. The aim of the study was to evaluate the efficacy and safety of bone wax used to stop bleeding after dental procedures in a group of patients on chronic anticoagulant therapy and find an answer to a question, whether it is justified to temporarily withdraw anticoagulants for this type of procedures. The study involved 176 patients on chronic anticoagulant therapy undergoing tooth extraction (154 subjects) or surgical extraction of a retained tooth (48 subjects). After the procedure, in each case the alveolus was filled with bone wax to stop bleeding. In all patients involved in the study bleeding from the alveolus was successfully stopped during the procedure. None of the subjects reported increased bleeding from the operational site after coming back home. Bone wax is a good, efficient, and safe material to block bleeding from the alveolus following tooth extractions, also in patients on chronic anticoagulant therapy. The study demonstrated that withdrawal or adjustment of anticoagulant therapy is not necessary before an elective tooth extraction.

Keywords: post-extraction bleeding, bone wax, anticoagulants, cardiovascular disease

Many systemic diseases require anticoagulant therapy. The conditions, which should be mentioned here, include ischemic stroke, arterial embolism, pulmonary embolism, atrial fibrillation or preventive treatment of myocardial infarction, as well as many others (1–3). Cardiovascular conditions, apart from neoplastic diseases, remain the major cause of death in developed countries (4, 5). In 2010, the ischemic heart disease led to 12.9 million deaths in the world (4), which constitutes a quarter of the total number of deaths (4, 6).

Introduction of acetylsalicylic acid combined with oral anticoagulants or antiplatelet drugs considerably reduced mortality and the number of subsequent ischemic events in patients with history of myocardial infarction (7–9). In spite of optimal pharmacological treatment as well as compliance with the rules of secondary prevention, several percent of patients annually develop new coronary

events or die (10, 11). Oral anticoagulants require often INR (International Normalized Ratio) testing and consequently, corrections of the drug dose as the INR increase above the therapeutic range raises the risk of hemorrhage complications (1, 2). Sustained INR level of 2–3.5 in patients treated with oral anticoagulants results in low risk of bleeding (1, 12).

The number of patients on chronic antiplatelet and anticoagulant therapy is increasing, which creates a challenge for doctors performing procedures affecting tissue continuity. Due to the risk of hemorrhage, the management algorithm compels doctors to withdraw the drugs or use a bridge therapy for several days before and after the surgical procedure.

In a patient treated with anticoagulants, who is being prepared for an invasive procedure, the risk of major bleeding with procedure-related death must be assessed and compared to the thromboembolic risk caused by temporary withdrawal of drugs (13).

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Many interventions may be performed without withdrawal of anticoagulants to prevent “paying off” a minor invasive procedure with permanent disability (e.g., due to a stroke) or death (13, 14). Tooth extraction was qualified as a procedure of low hemorrhage risk (3, 13, 14) to be performed without the anticoagulant therapy being necessarily withdrawn (1, 15–19). However, most dentists recommend a consultation with a cardiologist as routine management before withdrawing anticoagulants for several days due to elective tooth extraction.

The study was designed to evaluate efficacy and safety of bone wax used to stop bleeding after tooth extraction or surgical extraction in a group of patients on chronic anticoagulant therapy as well as to answer the question whether it is justified to withdraw anticoagulants for this type of procedures, which is established a standard management recommended by dentists.

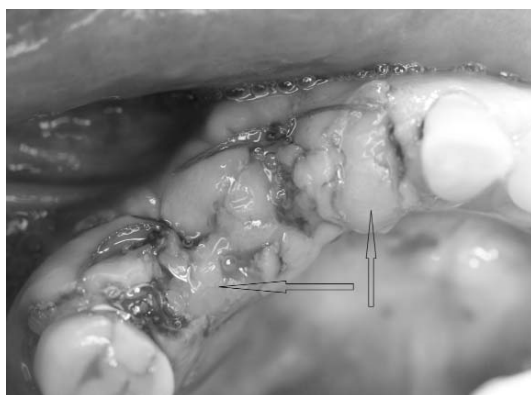


Figure 1. Surgical wax sitted into the alveolus

MATERIALS AND METHODS

The study involved 176 patients reporting for tooth extraction. All of the subjects took oral anticoagulants (Table 1). Patients with a history of myocardial infarction occurring later than 6 months before the procedure, uncontrolled background disease requiring anticoagulant therapy as well as patients receiving intramuscular anticoagulants were excluded from the study.

The study consisted in 154 extractions of erupted teeth and 48 surgical extractions of retained teeth. The procedure was performed under local anesthesia on an outpatient basis. After each tooth extraction or surgical extraction the alveolus was filled with non-absorbable bone wax to seal the interrupted vessels of the bone. The wax consisted of 80% beeswax and 20% isopropyl palmitate. The wound of the mucous membrane was sutured, which prevented the wax from falling out too quickly and closed the space left after the tooth was removed, mechanically blocking bleeding from soft tissues (Fig. 1). The procedures were performed before noon to enable an hour observation of the patient following the procedure.

After 5–7 days of the procedure, patients reported for follow-up and wax removal, if it had not been washed out.

RESULTS

In all the patients involved in the study bleeding from the alveolus was successfully stopped during the procedure. At the follow-up visit none of the subjects reported increased bleeding from the oper-

Table 1. Drugs received by patients qualified for treatment.

	Number of patients	Background disease	Mode of action	Trade name
ANTIPLATELET DRUGS			COX- 1 inhibition	
Acetylsalicylic acid	135	Coronary disease, myocardial infarction, arterial thrombosis in carotid arteries and lower limb arteries, stroke.		Aspirin, Acard, Polocard
Ticlopidine	10	Use: see above when aspirin is contraindicated.		Aclotin
VITAMIN K ANTAGONISTS			vit. K inhibition	
Acenocoumarol	31	Atrial fibrillation, history of venous thrombosis, pulmonary embolism, artificial heart valves.		Acenocoumarol, Sintrom

ational site after coming back home. No case of purulent exudate from the wound was found. In nearly 1/3 of subjects (65 alveoli) the applied bone wax stayed within the site for 7 days and required mechanical removal.

Among the study group, 32 subjects did not report for the follow-up visit at the scheduled date and in 12 cases prolonged presence of bone wax caused local inflammation within the healing wound. No case of allergic reaction was found.

DISCUSSION

Apart from wax, which is the oldest and the cheapest hemostatic material, bleeding control after tooth extraction may be obtained by mouth rinsing with solution of tranexamic acid q.i.d. for 2 days or 25% solution of α -aminocaproic acid (1, 2, 15) or local wound dressing with materials like spongostan, fibrin sealant or cellulosic acid (15, 19).

Patients treated with oral anticoagulants should not receive NSAIDs or paracetamol as analgesics during the perioperative period due to increased risk of hemorrhage while taking both types of medications simultaneously (1, 20). The first line analgesics in those patients are ibuprofen, naproxen or tramadol (15). INR testing should be made a day before the procedure and the value must be within the reference range. With $\text{INR} > 3.5$ the anticoagulant dose should be adjusted and 1 mg of vitamin K should be administered orally before the procedure or on the day of the procedure (1, 19). In case of procedures with higher hemorrhage risk (multiple extractions, periodontal procedures) introduction of low-molecular-weight heparin is required several days before and after the procedure.

This management algorithm generates numerous problems for the patients, who are often severely ill, as it requires multiple blood taking to perform a range of necessary tests. This management is even more burdensome in case of a patient reporting toothache and taking anticoagulants at the same time. It limits the time frame and urges the doctor to perform the procedure as soon as possible.

Although dental surgery procedures were qualified to the group of low post-operational hemorrhage risk (3, 13, 14), this possibility must always be considered. Usually a visit at the dentist's surgery involves stress and anxiety that may increase blood pressure temporarily, which, in combination with received medications, may evoke hemorrhage. In this case, bone wax constitutes a very good protection as it mechanically blocks vessel openings, in a similar way to a tampon. In order to minimize the

risk of hemorrhage, it is advisable to perform single tooth extractions.

Apart from numerous advantages of bone wax, available literature provides many examples of complications related to its use. Already in the 1950s, Geary and Frantz observed hindered healing of bone fractures while using wax in dogs (21). Bone wax may also penetrate into the lungs and cause embolism (22).

Excessive pressure resulting from wax application during neurological procedures of the spinal cord may lead to chronic pain (23) and even irritation of peripheral nerve function (24) or granuloma (25–27). Katre et al. described inferior alveolar nerve paralysis as complication after extraction of the wisdom tooth (28). Such a reaction was not found in this study but in view of anatomic proximity of the inferior alveolar nerve and the roots of the mandibular third molar, special care should be taken while using wax to reduce postoperative bleeding.

The most common complication while using this type of hemostatic material in surgery is inflammation (23, 29, 30). Leaving the wax longer than it is required for covering the wound with epithelium may result in irritation of the surrounding tissues, which was observed in this study. To avoid this condition, the wax should be precisely removed following 5–7 days of extraction without the risk of hemorrhage from the wound.

CONCLUSIONS

This study implies that bone wax is a good, efficient, and safe material to block bleeding from the alveolus following tooth extractions. Its efficacy was confirmed also in the group of patients receiving anticoagulants, eliminating the necessity of temporary withdrawal or adjustment of the anticoagulant therapy before the elective tooth extraction.

Due to possible allergic reactions to beeswax it is necessary to take medical history considering that issue before the procedure is done. As the material is not absorbed, it is important to instruct the patient about the necessity to remove residue wax from the alveolus after several days of the procedure or to schedule a follow-up visit to remove the wax. If the wax was left behind, local inflammation may occur caused by irritation of a foreign matter irritating the healing tissues.

Apart from hemostatic properties of the wax, authors of this article observed decreased tissue edema resulting from limited exudate as well as prevention of alveolar osteitis after using the described material. However, these observations need further investigation.

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