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## Extractions without eliminating anticoagulant treatment: A literature review

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### Abstract

**Objectives:** To establish whether there is a high enough risk of bleeding in patients who take oral anticoagulants, such that it would justify not using oral anticoagulants when performing a dental extraction, as well as if the reason for and anatomical location of the extraction increases such risk.

**Study Design:** We performed a bibliographic search in order to carry out a meta-analytic study using descriptive statistics.

**Results:** We compiled a sample of 1194 patients from the articles selected. Of these patients, a total of 2392 simple, serial surgical extractions were performed; none of the patients interrupted their anticoagulant treatment with warfarin sodium. Of the sample, 83 patients presented a certain degree of bleeding; in 77 of such cases, the bleeding was controlled with local hemostasis, whereas 6 patients required their dose of oral anticoagulants to be adjusted. There was a higher incidence of bleeding in patients presenting a periodontal pathology, compared to deep caries and pericoronitis.

**Conclusions:** Patients being treated with oral anticoagulants represent a risk that we should be aware of, but local hemostasis has proven to be effective when performing extractions, provided that the INR value is less than 4. There is an increased incidence of bleeding in patients with periodontal problems, due to the greater presence of inflammation in the soft tissues. If the extraction is performed in the maxilla, the incidence of hemorrhagic complications is slightly higher than in the mandible, although this difference is considered to be insignificant.

**Key words:** Oral surgery, anticoagulants, coumarin.

## Introduction

Oral anticoagulants (OAC) are widely used in the treatment and prevention of deep thrombosis and pulmonary embolism in order to prevent arterial thromboembolism in patients with auricular fibrillation and/or a cardiac valvular prosthesis (1).

Oral anticoagulants inhibit the plasma phase of coagulation, whether by acting on the hepatic synthesis of coagulation factors or by impeding already formed factors (heparins) from acting. Thus, the term anticoagulants can be defined as oral vitamin K antagonists (1). OACs can be derived from coumarin or indandiones; those derived from coumarin are the most frequently used, and within this group, warafin sodium (Coumadin®) and acenocoumarol (Sintrom®) are the most common.

They are well-tolerated drugs and have a rapid oral absorption, with plasma peaks being reached at the time of ingestion, although reducing the coagulation factors takes place 48-72 hours after taking the drug (2). Warfarin has an average life of 48-72 hours and acenocoumarol has an average life of 8-10 hours; thus, the effects of warfarin last longer, both in the induction as well as in the disappearance of the therapeutic action.

In 1978, the World Health Organization (WHO) recommended standardizing the prothrombin time (PT) and in 1983, it introduced the INR (International Normalized Ratio), publishing recommendations for calculating the degree of anticoagulation (3) [INR = (patient PT/mean normal PT) ISI]. The mean normal PT is the PT based on the geometric average of fresh plasma from 20 healthy patients; ISI is the International Sensitivity Index (3); and the PT is standardized by means of this formula, comparing it independently of the thromboplastin used by the different laboratories, thus offering a higher reliability in monitoring treatment with oral anticoagulants. At the same time, the international cardiology and hematology societies (1-3) have made recommendations about the therapeutic levels of anticoagulation at which patients must be maintained, depending on the existing pathology, with the INR value ranging from 2 to 3.5 (2,4). There is a strong correlation between the INR value and the risk of bleeding, but there are also other factors that can make bleeding more likely to occur. These factors must also be taken into account, such as the underlying clinical pathology (5) (ex. hepatic illness, alteration in the osseous medulla, anemia, malabsorption, kidney disease) and taking certain drugs that intensify their effects. Therefore, it would be recommendable to perform more frequent analytical controls after starting a new medication (4,5).

## Material and Methods

In the present meta-analytic study, we performed a bibliographic search in the PubMed and Medline databases, using the keywords: oral surgery, anticoagulation

and coumarin. From this search, we obtained 50 references from specialized journals, selecting 12 of these for carrying out the meta-analysis. As inclusion criteria, the anticoagulant therapy had to consist of using oral anticoagulants and not antiplatelet drugs, and such treatment with OACs could not be suspended at the time of performing the extractions.

The variables taken into account were: the patient's sex, INR value, age, presence of bleeding—whether immediately or later during the post-extraction period—and the local measurements used for controlling hemostasis. We also examined other variables during the study, such as whether the extraction was carried out in the maxilla or the mandible, and the reason for the extraction.

A table was created for all of these variables (Table 1), where the different variables analyzed in the study were recorded, subsequently carrying out a descriptive statistical study in order to obtain our results.

## Results

In the articles selected, the total number of patients studied was 1194, there being a total of 2392 extractions performed on these patients. The patients ranged in age from 7 to 92 years old, with a mean age of 64.3 years old.

All of the patients were prescribed long-term anticoagulant treatment with warfarin sodium. The anticoagulant treatment was not suspended in any of the cases and the INR value was maintained within therapeutic ranges—the mean INR being 2.6, with a range of 0.9-5.0.

On a sample of 1024 patients, the patients under treatment were predominantly male—given that the sex was not recorded by the authors for the other 170 patients, there being 605 males (59.08%) and 419 females (40.92%). The presence of bleeding depending on the patient's gender could not be studied, given that the authors did not record this variable for the patients who suffered hemorrhagic complications.

A total of 2,392 simple, serial surgical extractions were performed, amounting to an average of 2 extractions per patient, with a range of 1 to 5 extractions per patient. Of the 1194 patients, 83 (6.95%) presented some degree of bleeding, 6 (8.57%) of which required their dose of OACs to be modified by their doctor. The rest of the patients were controlled using local measures. In 48 patients (57.83%), the bleeding was controlled by applying compression with gauze on the wound; whereas in 21 patients (25.30%), the bleeding was controlled by applying tranexamic acid on the wound or gelatin sponges and compression. Curettage of the alveolus was performed in addition to using dense autologous fibrin glue and compression in 7 patients (8.43%), 2 patients (2.40%) required resuturing, and electrocoagulation was applied in only one case (1.20%).

In the patients who presented post-extraction bleeding,

**Table 1.** Patients undergoing teeth extractions under anticoagulant therapy. Max.( Maxillar), Mand.(Mandible), P (Periodontitis), C (Car-ies), AFA (Autologous Fibrin Adhesive).

Authors	Patients	Teeth extracted	Max	Mand	Gender		INR (mean)	Age (mean)	Reason for extraction	Hemostatic means	Bleeding
					M	F					
Campbell JH et al.(6)	12	38	14	24			1.2-2.9 (2.0)			Oxidized cellulose Tranexamic acid	1 patient
Carter G, Goss A.(7)	85	201	90	111	54	31	(2.8)	21-86 (65.7)	P 88 Deep C 109 Others 4	Tranexamic acid	3 patients
Bodner L et al.(8)	69	188					1.0-5.0			Fibrin sealant	3 patients
Martinowitz U et al.(9)	40	63					2.5-4.5 (3.25)	32-75 (55)		Biological adhesive (Beriplast)	1 patient
Della Valle A et al.(10)	40	147			22	18	2.0-4.0	43-66		Platelet-rich plasma	18 patients
Salam S et al.(11)	150	279			92	58	0.9-4.2 (2.5)	33-92 (66.1)		Surgicel®	10 patients
Ferrieri GB et al.(12)	239	314			13 5	10 4	3-5.4 (2.5)	27-89 (67.8)		Tranexamic acid	5 patients
Evans IL et al.(13)	57	69			36	21	1.2-4.7 (2.5)	36-92 (67)		Surgicel®	15 patients
Devani P et al.(14)	33	69			15	18	(2.7)	30-82 (64.6)		Surgicel®	1 patient
Morimoto Y et al.(15)	270	513			16 6	10 4	1.5-3.7	7-91 (60.5)	219 Marginal P 246 Periapical P 48 pericoronitis		11 patients
Carter G et al.(16)	49	152					2.1-4.0	24-85 (65)	60 P 92 Deep C	Tranexamic acid AFA	2 patients
Blinder D et al.(17)	150	359	214	145	85	65	1.5-4.0 (2.7)	35-90 (64)	293 P 60 Deep C	Gelatin sponge, AFA Tranexamic acid	13 patients

**Table 2.** INR Range-types of bleeding.

INR Range	Patients	Light Bleeding	Mild Bleeding	Persistent bleeding
1.4-2.5	23	11	8	4
2.51-3.5	35	11	12	12
>3.5	25	7	9	9

the range of age varied from 24 to 85 years old, with the mean age being 64.74 years old. The range of INR value varied from 1.45 to 7.6—the mean INR value being 2.67 (Table 2), with 25 patients presenting persistent bleeding, 29 presenting moderate bleeding and 29 presenting light and intermittent bleeding. Bleeding occurred in the patients during the immediate post-operative period and continued for up to 10 days afterward.

With respect to whether the post-extraction bleeding is related to the anatomical location of the extraction, we were only able to study 211 patients, given that this data was not recorded for the rest of the patients. A total of 318 extractions were carried out in the maxilla and 280 in the mandible, with bleeding present in 24 extractions

in the maxilla and in 15 extractions in the mandible, which represents a 7.54% incidence of bleeding in the maxilla and a 5.35% incidence of bleeding in the mandible.

With respect to the reason for the extraction, the study was carried out on 554 patients, which amounted to a total of 1,225 extractions. The most common cause of the extraction was due to a periodontal problem in 660 of the extractions (53,87%), followed by deep caries in 507 of the extractions (41.38%), pericoronitis in 49 of the extractions (3.91%), and unspecified reasons in 4 of the extractions (0.32%). Bleeding was present in 29 patients, with the majority of such incidents being related to a periodontal problem, as was the case with 20 patients, followed by deep caries in 7 patients and pericoronitis in 2 patients.

**Discussion**

In the present study, it was observed that post-extraction bleeding can be controlled by using local measures, provided that the protocol for caring for a patient on anticoagulant treatment is followed: evaluate the risk of thromboembolism / bleeding, use the most atraumatic

technique possible and provide the patient with post-operative care instructions.

Performing extractions in patients under anticoagulant treatment is a safe procedure, even with elevated INR values, provided that these values do not exceed a maximum of 4.

This meta-analytic study only included patients who had neither suspended nor reduced their treatment with anticoagulants, a procedure that is accepted by the large majority of authors (4, 6-12, 18,19). Other authors such as Devani et al. (14) included a control group in which they suspended the anticoagulant treatment with warfarin sodium 2 days before the procedure and resumed the anticoagulant treatment the day after the procedure, using Surgicel® and placing a suture in all of the patients. In their study, bleeding complications were present in one patient in each group, which was controlled by local measures.

Another similar study was conducted by Evans et al. (13), who followed the same procedure when suspending and resuming the warfarin sodium, with the range of INR value being between 2 and 4 in the group that continued the treatment and less than 2 in the group that suspended the treatment. The incidence of bleeding was 24% in patients who continued treatment with OACs and 16% in patients who suspended the treatment. This difference was considered to be insignificant and the bleeding was controlled by applying pressure with gauze. Campbell et al. (6) compared patients with and without suspension of OACs with patients who had never taken OACs, not specifying additional measures for controlling the post-operative bleeding in any of the patients, finding that there were no differences in the bleeding during the procedure.

As for authors who are against suspending treatment with OACs, we may refer to the data obtained by Wahl (18) on the post-operative management of patients treated with anticoagulants. Wahl analyzed 2014 procedures of oral surgery. Serious bleeding only occurred in 12 procedures, and of these, 5 of the patients presented an INR above the therapeutic range. In addition, he recorded 493 patients who suspended treatment with warfarin sodium; five of these patients developed a serious thromboembolic problem, leading to death in 4 of these patients, concluding that the risk of bleeding after an oral procedure is not high enough to raise the risk of thromboembolism, provided that the INR is between 2 and 4.

The study presented by Blinder et al. (17) on 150 patients, compares three local measures for controlling bleeding. All of the patients continued treatment with OACs and the INR value ranged between 1.5 and 4 on the day of the procedure. The first group used gelatin sponges and sutures; in the second group, gelatin sponges, suture and traneximic acid mouth rinses were used

4 times per day; and in the third group, gelatin sponges, fibrin glue and sutures were used. The results showed that 11 patients presented post-operative bleeding—equally distributed among the three groups, which was controlled by curettage of the alveolus, replacing the fibrin sponges or fibrin glue and resuturing the wound. None of the patients required a hospital stay.

Martinowitz et al. (9) studied 40 patients, in which a total of 63 extractions were performed, without altering the dose of OAC. Hemostasis was achieved with a biological adhesive after placing gauze moistened with thrombin in the alveolus for a period of three minutes. On the day of the procedure, the INR value ranged between 2.5 and 4. There were no significant episodes of post-operative bleeding. Only one patient presented bleeding on the third day of the post-operative period, which was controlled by applying pressure with gauze. In contrast, in the study by Carter et al. (16), two local methods for controlling bleeding were compared: irrigation of the alveolus with tranexamic acid and placement of autologous fibrin glue. On the day of the procedure, the INR ranged between 2 and 4. The results showed that two patients presented significant bleeding, included in the group that used fibrin glue, 2 days after the procedure, presenting an INR value of 5.9 and 7.6, and thus, the local measures were not sufficient, requiring the doctor to adjust the dose of OAC.

In addition, in the study presented by Morimoto et al. (15), in which they performed extractions on patients with an INR value of less than 3, four patients required modifying the dose of OAC and one of them required taking vitamin K, given that on the day of the bleeding—between 2 to 6 days post-extraction—the INR value had exceeded 3.5. The local measures taken to control the bleeding consisted of oxidized cellulose and sutures.

Given all of the aforementioned reasons, continuing with the oral anticoagulant therapy when undergoing a dental extraction would be justified as long as the INR value is within the therapeutic range, given that the risk of uncontrollable bleeding is relatively low and does not justify the risk of thromboembolism. However, maintaining the INR value under control is rather complicated, given that treatment with OACs is quite sensitive to multiple factors such as diet, minimal changes when taking the tablets and the interactions of different medicines (2,12).

Despite the fact that several authors advise against extraction with INR values above 4, there are studies (8, 11-13) that include patients with INR values above this number. A study published by Blinder et al. (19) on 249 patients who were grouped according to their INR values, did not find a correlation between the INR value and the incidence of bleeding during the post-operative period, even in patients who had an INR value greater

than 4. They concluded that the INR value alone will not predict the risk of post-extraction bleeding, rather this value must be taken into consideration along with a careful evaluation of the risk of bleeding / thromboembolism that each patient presents and a detailed examination of each patient's clinical history.

In order to obtain optimum conditions for limiting the intra and post-operative bleeding as much as possible, an effort must be made during the pre-surgery phase to quantitatively reduce the irritants and reduce inflammation of the soft tissues. Patients must maintain proper hygiene of the oral cavity one week before the procedure, including supragingival tartrectomy, if required (12), prescribing mouth rinses with chlorhexidine twice per day for a period of 7 days.

With regard to performing a correct surgical technique, all of the authors describe an extraction that is as atraumatic as possible, such as that described by Scully et al. (2) and Evans et al. (13). If a flap must be lifted, it must always be the mucoperiosteic flap, and stress on the flap must be minimized. When an odontosection and ostectomy must be performed, it must be done by conserving the cortical bone in order to aid coagulation of the wound. A careful and meticulous curettage of the alveolus must be performed in order to eliminate the inflammatory and granulation tissue, considering this to be a key step to minimize bleeding in the wound, placement of fibrinogenous elements and suturing the wound to ensure the primary closure. As far as gauze compression is concerned, there are authors who consider that the gauze must be moistened with fibrinogen (7,13,16) and others that affirm that this is only necessary if gauze compression alone is not sufficient. In accordance with the data obtained in this study, placing fibrinogen inside of the alveolus (fibrin glue, oxidized cellulose, etc.) is not entirely necessary, given that moistening the gauze with tranexamic acid and compression is already sufficient for obtaining hemostasis.

There are numerous protocols for describing the post-operative care that the patient must follow. Some authors such as Carter et al. (7) recommend mouth rinses with tranexamic acid. In contrast, Ferrieri et al. (12) consider that mouth rinse increases the risk of dissolving the coagulant, compared to the benefit that is obtained by the fibrinogen substance, ultimately concluding that this procedure must be omitted. The patient must also be instructed not to touch the wound or make suction with the tongue (2,4). Following the post-operative care instructions must be emphasized, given that in some cases, the occurrence of bleeding several days after the procedure is caused as a result of the patient not following the post-operative care instructions properly (7,10,12), in which case the patient must be reminded of the instructions and the importance of following them.

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