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EVALUATION LIFE QUALITY OF ORAL ANTICOAGULATED PATIENTS FOLLOWING ORAL SURGICAL INTERVENTIONS

Cena Dimova[1*], Milka Zdravkovska[1]

[1]Department of Oral and Maxillofacial Surgery and Dental implantology, Faculty of Medical Sciences, "Goce Delcev" University, Krste Misirkov 10-a, 2000 Stip, Macedonia

[*]e-mail: cena.dimova@ugd.edu.mk

Abstract

The aim of this study was to evaluate patients on oral anticoagulants about their experience of life quality following different oral surgery interventions.

The study consisted of 260 patients referred for oral surgical treatment. An equal number of patients were assigned to each group (60 individuals). Group 1 was with deep venous thrombosis, group 2 was with myocardial infarct, group 3 with cerebrovascular insult, and group 4 with artificial heart valves. Control group consisted of 20 healthy individuals. After performing the oral surgery interventions, all patients were given a questionnaire with 15 questions to evaluate their quality of life for ten days after the oral surgery interventions. The local hemostasis was realized by applied three different local modalities: tranexamic acid 5%, sorbacel gauze, Tachocomb - fibrin glue. The statistical evaluation included descriptive and analytical methods (Kruskal - Wallis test).

The average time needed for completion the surgical procedure was approximately 30 minutes. The results showed that patients in group 1 reported significantly more pain on the first and second day after the interventions. The bleeding index showed no statistical differences in the study groups. The results showed statistical difference between the four groups after 24 h ($H = 13.248$; $p = 0.0113$), after 48 h ($H = 0.425$; $p = 0.0338$) and after 7 days ($H = 9.7603$ $p = 0.0447$), and no statistical difference between the four groups after ten days ($H = 4.2327$ $p = 0.3754$).

The management of oral surgery procedures on patients treated with oral anticoagulants should be influenced by several factors: laboratory values, extent and urgency of the intervention, treating physician's recommendation, available facilities, dentist expertise, and patient's oral, medical, and general condition. There is need more scientific investigation about life quality of oral anticoagulated patients following oral surgical procedure.

Key words: *Oral surgery, Oral anticoagulants, Quality of life, Local hemostasis, Pain.*

1. Introduction

Arterial and venous thromboembolism is still the most frequent cause of morbidity and mortality in high- and middle-income countries, as well as in emerging economies. Thrombosis and the complicating embolism that can result are among the most important causes of sickness and death in developed countries. Thrombosis is of greater overall clinical importance in terms of morbidity and mortality than all of the hemorrhagic disorders combined. Excessive activation of coagulation or inhibition of anticoagulant mechanisms may result in hypercoagulability and thrombosis. Injury to the vessel wall, alterations in blood flow, and changes in the composition of blood are major factors leading to thrombosis [1].

Vitamin K is a fat-soluble vitamin and serves as a co-factor for production of clotting factors: II, VII, IX, X, protein C, S, and Z. it has been reported to aid in bone and cartilage metabolism [2, 3]. The primary sources of vitamin K-contain foods are dark green vegetables and oils. Other source of vitamin K include processed foods and fast food because of the oils used in their production [4]. The term oral anticoagulant (OAC) refers to oral vitamin K antagonists, including mainly sodium warfarin (the most widely used agent in Anglo-Saxon countries) and acenocoumarol (widely used in some countries of Europe) [5]. Oral anticoagulants

are the group of drugs used to treat many cardiovascular diseases. The vitamin K antagonists, among which are warfarin and acenocoumarol, have low therapeutic index as its pharmacological management is difficult and need continuous monitoring, also have multiple interactions with other drugs and food. Many of the patients being treated with warfarin have an inadequate anticoagulation [6].

The anticoagulant effect in turn depends on the half-life of the inhibited factors. In this sense, the half-lives of factors VII, IX, X and II are 6, 24, 40 and 60 hours, respectively. Blood coagulation factor VII is the first to be affected, prolonging prothrombin time (PT). Factors IX, X and II are posterior affected: factor IX prolongs activated partial thromboplastin time (aPTT), while factors X and II prolong both PT and aPTT. These are well tolerated drugs, with rapid absorption via the oral route. The peak plasma concentrations are reached one hour after administration, though the reduction in coagulation factors takes place 48 - 72 hours after dosing. The half-life of warfarin is 48 - 72 hours, versus 8 - 10 hours in the case of acenocoumarol. Thus, the effects of warfarin are longer lasting in terms of both the induction and disappearance of therapeutic action [5, 7 - 9].

The oral and maxillofacial surgeons are frequently asked to manage patients who are receiving oral anticoagulants. The goal of treatment is to minimize the risk of hemorrhage while continuing to protect the patient against thromboembolism formation. The ordinary treatment includes the interruption of anticoagulant therapy for oral surgery interventions to prevent hemorrhage. However, this practice may logically increase the risk of a potentially life-threatening thromboembolism. Thus, this issue is still controversial [10 - 13].

The aim of this study was to evaluate patients on oral anticoagulants about their experience of life quality following different oral surgery interventions. The specific intention was to highlight the evidence of oral anticoagulants interaction with food, herbs and dietary supplements and to highlight the areas of major concern, as well as to suggest specific practical steps to minimize their potential interactions with the traditional and the new oral anticoagulants.

2. Materials and Methods

The study consisted of 260 patients of both sexes (137 males and 123 females) aged 60.1 (± 8,1 years) referred for oral surgical treatment at the Department of Oral and Maxillofacial Surgery and Dental Implantology, at the Faculty of Medical Science, "Goce Delcev" University, Stip, Macedonia. The study was approved by the Faculty Ethics Committee. The patients have been asked for anamnestic data, clinical examinations were performed, as well as radiograph analysis. Informed consent was obtained from all patients included in the study. Medical and dental history, age gender and tooth number were recorded for each patient. All oral surgery interventions were performed in the morning by one and the same operator.

An equal number of patients were assigned to each group (60 individuals). Group 1 was with deep venous thrombosis (DVT), group 2 was with myocardial infarct (MI), group 3 with cerebrovascular insult (CVI) and group 4 with artificial heart valves (AHV). Control group consisted of 20 healthy individuals aged 42.8 (± 8.2 years). The patient's average international normalized ratio value (INR) was 2.00 (± 0.27). The local hemostasis was realized by applied three different local modalities: tranexamic acid 5%, sorbacel gauze, and tachocomb - fibrin glue.

After performing the oral surgery interventions, all patients were given postoperative instructions verbally by the operator and in a written form. At the same day, each patients received a questionnaire with 15 questions to evaluate their quality of life with 5-point scale, ranging from 1 ("not at all") to 5 ("very much") for ten days after the oral surgery interventions (Table 1). The questionnaire included questions about limitation (ability to chew and speak, day activity and sleeping), prolonged bleeding, swelling, pain, bad taste/breath and nausea. Patients had to contact the surgeons if they experienced bleeding, severe pain or swelling. The statistical evaluation included descriptive and analytical methods (Kruskal - Wallis test).

Table 1. Quality of life questionnaire

No	Questions	Answers*
1	Do you have bleeding?	
2	Do you have swelling?	
3	Do you have bruises?	
4	Do you feel nausea?	
5	Do you feel a bad taste or breath?	
6	What is the worst pain that you felt?	
7	What is the average degree of pain that you felt?	
8	Did you take any pain-killers today?	
9	Do you experience any difficulties with mouth opening?	
10	Do you experience any difficulties with chewing	
11	Are there any foods that you can't eat now?	
12	Do you experience any difficulties with speaking?	
13	Do you experience any difficulties with sleeping?	
14	Have you missed your work/school?	
15	Do you experience any difficulties with your daily activities?	

*Answers for day 1 to 10:

Not at all (1); Very little (2); Some (3); Quite a bit (4); Very much (5).

3. Results and Discussion

3.1 Results

There were no significant differences of patients according to age, gender, tooth diagnosis and the site of operation between four groups.

The average time need to complete the oral surgery procedures for group 1 (DVT) and group 3 (CVI) were approximately 25 (range 17 to 33 minutes), for group 2 (MI) approximately 35 (range 20 to 45 minutes), for group 4 (AVH) approximately 30 (range 20 to 45 minutes).

Table 2 presents different complications first, second and seventh day after oral surgery treatment. The bleeding index showed no statistical differences in the study groups (Table 3). The results showed statistical difference between the four groups: after 24h (H = 13.248; p = 0.0113), after 48h (H = 0.425; p = 0.0338) and after 7 days (H = 9.7603 p = 0.0447), and no statistical difference between the four groups after ten days (H = 4.2327 p = 0.3754).

There were no significant differences of bleeding 24 hours after oral surgery treatment between the groups, Kruskal - Wallis - test of rang sum was H = 9.0122 p = 0.0608. Bleeding index is showed on Table 3. Kruskal - Wallis - test of rang sum showed that there were no no significant differences of bleeding 24 hours after oral surgery treatment between the four groups: G1 (DVT) H = 1.129 p = 0.5684; G2 (MI) H = 1.5324 p = 0.4648; G3 (CVI) H = 0.00 p = 1.0; G4 (VSV) H = 1.5733 p = 0.4554);

Table 4 presents the average values of patients' experience for quality of life for four groups. Patients reported significant more difference and difficulties in average degree of pain postoperatively and 38% of the patients took analgesics after surgery. There were no significant differences of patients according to absence from work and difficulties with daily routine activities and 82% of patients reported different factors, such as day of treatment, type of occupation and design of insurance system.

Table 2. Local complications first, second and seventh day after surgery

GROUP	LOCAL COMPLICATIONS AFTER 24h					
	pain	swelling	hematoma	trismus	dry socket	other
G1 (DVT) = 60	17 (28%)	18 30%)	18 (30%)	5 (8%)	0	0
G2 (MI) = 60	8 (13%)	9 (15%)	14 (23%)	6 (10%)	6 (10%)	3 (5%)
G3 (CVI) = 60	3 (5%)	6(10%)	9 (15%)	3 (5%)	0	0
G4 (AHV) = 60	8 (13%)	11(18%)	14 (23%)	0	0	0
KG = 20	0	5 (25%)	3 (15%)	0	0	0
Total 260	36 (14%)	49 (19%)	58 (22%)	14 (5%)	6 (2%)	3(1%)
GROUP	**LOCAL COMPLICATIONS AFTER 48 h**					
	pain	swelling	hematoma	trismus	dry socket	other
G1 (DVT) = 60	4 (7%)	5 (8%)	12 (20%)	0	4 (7%)	0
G2 (MI) = 60	3 (5%)	1 (2%)	10 (17%)	0	0	0
G3 (CVI) = 60	3 (5%)	0	6 (10%)	1(2%)	0	0
G4 (AHV) = 60	0	7 (12%)	7 (12%)	0	0	0
KG = 20	0	2 (10%)	4 (20%)	1(5%)	0	0
Total 260	10 (4%)	15 (6%)	39 (15%)	2 (0.8%)	4 (1.5%)	0
GROUP	**LOCAL COMPLICATIONS AFTER 7 days**					
	pain	swelling	hematoma	trismus	dry socket	other
G1 (TDV) = 60	0	5 (8%)	2 (3%)	0	2 (3%)	0
G2 (MI) = 60	0	5 (8%)	0	1 (2%)	1 (2%)	0
G3 (CVI) = 60	0	3 (5%)	0	0	0	0
G4 (VSV) = 60	0	2 (3%)	8 (14%)	0	0	0
KG = 20	0	0	0	0	0	0
Total 260	0	15 (6%)	10 (4%)	1 (0.4%)	3 (1%)	0

Legend:
DVT - deep venous thrombosis
MI - myocardial infarct
CVI - cerebrovascular insult
AHV - artificial heart valves

Table 3. Bleeding index after oral surgery procedures

24h	Bleeding index 0	Bleeding index 1	Total
G1 (DVT)	43 (72%)	17 (28%)	60 (100%)
G2 (MI)	49 (82%)	11 (18%)	60 (100%)
G3 (CVI)	48 (80%)	12 (20%)	60 (100%)
G4 (AHV)	45 (75%)	15 (25%)	60 (100%)
KG	20 (100%)	0	20 (100%)
Total	205	55	260
48h	**Bleeding index 0**	**Bleeding index 1**	**Total**
G1 (DVT)	56 (93%)	4 (7%)	60 (100%)
G2 (MI)	55 (92%)	5 (8%)	60 (100%)
G3 (CVI)	56 (93%)	4 (7%)	60 (100%)
G4 (AHV)	53 (88%)	7 (12%)	60 (100%)
KG	20(100%)	0	20 (100%)
Total	240	20	260

Legend:
DVT - deep venous thrombosis
MI - myocardial infarct
CVI - cerebrovascular insult
AHV - artificial heart valves

Table 4. Patients' experience for quality of life for four groups

Question		Day									
		1	2	3	4	5	6	7	8	9	10
1.	Bleeding	2,4 (±1,3)	2,2 (±1,3)	2,1 (±1,3)	2,0 (±1,2)	1,5 (±0,9)	1,3 (±0,3)	1,1 (±0,1)	1,1 (±0,1)	1,0 (±0)	1,0 (±0)
2.	Swelling	3,3 (±1,3)	3,2 (±1,3)	2,9 (±1,3)	2,5 (±1,2)	1,8 (±0,5)	1,5 (±0,3)	0,3 (±0,3)	1,1 (±0,1)	1,0 (±0)	1,0 (±0)
3.	Bruises	3,1 (±1,3)	3,3 (±1,3)	3,1 (±1,3)	3,1 (±1,5)	2,8 (±1,3)	2,5 (±1,5)	2,3 (±1,3)	1,5 (±0,3)	1,3 (±0,2)	1,0 (±0)
4.	Nausea	1,8 (±0,3)	1,8 (±1,3)	1,5 (±0,2)	1,3 (±0,3)	1,3 (±0,3)	1,3 (±0,1)	1,2 (±0,3)	1,0 (±0,3)	1,0 (±0)	1,0 (±0)
5.	Bad taste or breath	2,1 (±0,3)	2,1 (±0,3)	1,9 (±0,3)	1,8 (±0,3)	1,3 (±,53)	1,1 (±0,3)	1,0 (±0,3)	1,0 (±0,1)	1,0 (±0,1)	1,0 (±0)
6.	The worst pain	3,8 (±1,3)	3,3 (±1,3)	3,1 (±1,3)	2,9 (±1,4)	2,5 (±1,5)	2,2 (±1,3)	1,9 (±0,9)	1,5 (±0,5)	1,3 (±0,8)	1,2 (±0,3)
7.	Average degree of pain	4,3 (±1,3)	4,1 (±1,3)	4,1 (±0,9)	3,5 (±1,3)	3,3 (±1,5)	2,9 (±1,3)	2,1 (±1,4)	1,7 (±0,3)	1,3 (±0,7)	1,1 (±0)
8.	Taking any pain-killers	2,9 (±2.7)	2,9 (±1,9)	2,7 (±1,5)	2,6 (±1,5)	2,5 (±1,1)	2,1 (±1,0)	1,6 (±0,9)	1,3 (±0,1)	1,1 (±0,3)	1,1 (±0,2)
9.	Difficulties with mouth opening?	2,1 (±1,9)	2,0 (±1,8)	2,0 (±1,6)	1,9 (±1,4)	1,5 (±0,3)	1,4 (±0,4)	1,3 (±0,2)	1,2 (±0,2)	1,0 (±0,2)	1,0 (±0,1)
10.	Difficulties with chewing	2,2 (±1,9)	2,0 (±1,8)	1,9 (±1,6)	1,8 (±1,4)	1,5 (±0,2)	1,3 (±0,4)	1,2 (±0,2)	1,2 (±0,2)	1,0 (±0,2)	1,0 (±0,1)
11.	Difficulties with eating	2,0 (±1)	2,1 (±0,9)	1,8 (±0,3)	1,8 (±0,3)	1,7 (±0,3)	1,3 (±0,3)	1,3 (±0,1)	1,2 (±0,2)	1,1 (±0,1)	1,1 (±0,1)
12.	Difficulties with speaking?	1,8 (±0,3)	1,8 (±0,3)	1,5 (±0,4)	1,3 (±0,3)	1,3 (±0,3)	1,2 (±0,1)	1,1 (±0,1)	1,1,3 (±0,1)	1,1 (±0,1)	1,1 (±0)
13.	Difficulties with sleeping	3,3 (±1,9)	3,1 (±1,5)	3,1 (±1,3)	2,9 (±1,1)	2,5 (±1,3)	2,3 (±1,3)	2,1 (±1,3)	1,3 (±0,3)	1,1 (±0,3)	1,0 (±0,1)
14.	Missed work/ school?	3,8 (±1,9)	3,2 (±1,8)	3,3 (±1,3)	2,8 (±1,3)	2,8 (±1,1)	2,5 (±1,3)	2,3 (±0,3)	2,1 (±0,8)	1,3 (±0,3)	1,3 (±0,1)
15.	Difficulties with daily activities?	3,3 (±1,3)	3,3 (±13)	2,9 (±1,3)	2,8 (±1,5)	2,5 (±0,3)	1,9 (±0,3)	1,7 (±0,3)	1,3 (±0,2)	1,2 (±0,2)	1,1 (±0,1)

Legend:
(1) Not at all. (2) Very little. (3) Some. (4) Quite a bit. (5) Very much.

3.2 Discussion

3.2.1 Interruption and limitations of oral anticoagulants

Assael [14] said that the hemostasis care of the oral anticoagulated patients is a shared responsibility and oral and maxillofacial surgeons, and the hematology/coagulation team huddle to determine the steps. The surgeon is faced with the choice of altering or stopping oral anticoagulants and risking thromboembolism or leaving the patient on the oral anticoagulants and risking uncontrolled bleeding. A common approach to managing patients with a low risk of thromboembolism needing surgery is to interrupt oral anticoagulants therapy for several days before and after surgery. Patients with a high risk of thromboembolism commonly stop OAC and bridge anticoagulation with unfractionated heparin (UHF) or low-molecular-weight heparin (LMWH) [15]. Depending on the existing thromboembolic risk, the American Heart Association/American College of Cardiology Foundation Guide to Warfarin Therapy recommends different heparin management regimens for the patients with moderate, high and low thromboembolic risk. In general, heparins are not reintroduced before 12 hours post-surgery and dosing is postponed for longer periods in the case of evidence of bleeding [16].

However, patients who interrupt oral anticoagulants therapy are at risk of developing a thromboembolism with or without bridging therapy. On the other hand, oral anticoagulants therapy can be continued without interruption for procedures such as dentoalveolar surgeries that rarely cause significant or life-threatening bleeding. Stopping oral anticoagulants is problematic because of its slow unpredictable reversal [17 - 21].

The goal of managing anticoagulated patients who need surgery is to prevent major or life-threatening bleeding while protecting against thromboembolism. Some procedures such as intra-abdominal, intrathoracic, major cancer surgery, removal of head and neck tumors, and extra oral open reduction of facial fractures are associated with considerable bleeding [22 - 24]. Some patients are particularly sensitive to OACs, and the activity of these drugs moreover can be affected by a range of factors including individual patient response, diet, or the simultaneous administration of other commonly used drugs such as antibiotics, analgesics, or even herbal remedies [9].

The ACCP 2008 guidelines for antithrombotic and thrombolytic therapy recommend in patients who require a minor dental procedure, continuing OKAs with an oral prohemostatic agent or stopping VKAs

Table 5. Vitamin K (phylloquinone) content in common vegetables

Food	Serving size	Vitamin K classification content (mcg)	(per serve)
Alfalfa	1/4 cup	10	Low
Asparagus	4 spears	30	Medium
Beans (green)	1/2 cup	11	Low
Broccoli (cooked)	1/2 cup	110	High
Brussel sprouts	1/2 cup	114	High
Cabbage (cooked) 36	1/2 cup	36	Medium
Capsicum (green) 9	1 capsicum	9	Low
Carrot	1/2 cup	11	Low
Cauliflower	3 florets	7.5	Low
Lettuce (gourmet) e.g. butter lettuce	1 cup	97	High
Lettuce (Iceberg)	1 cup	13	Low
Mushrooms (cooked)	1 cup	0.2	Low
Parsley	10 sprigs	164	High
Peas (frozen, cooked)	1/2 cup	24	Low
Potatoes	1 potato	3	Low
Pumpkin	1/2 cup	1	Low
Silverbeet (cooked)	1/2 cup	346	High
Soybeans (cooked, boiled)	1/2 cup	16	Low
Soya milk	1/2 cup Low	4**	Low
Spinach (cooked)	1/2 cup	444	Low
Spinach (raw)	1 cup	150	High
Sweet potato (cooked, baked)	1 potato	3.4	Low
Tomatoes	1 tomato	10	Low

(warfarin) 2 to 3 days before the procedure instead of alternative strategies [25]. Local methods to prevent or control bleeding are several: local pressure (biting on gauze or tea bags); site packing (Gelfoam™, Surgicel™, Avitene™), additional suturing, electrocautery, topical thrombin, mouth rinse(s) of cold water or aminocaproic acid 5% mouth rinse (5 grams in 100 mL of sterile water). Hemorrhage is common complication after dental surgery in oral anticoagulated patients, as well as pain and swelling during the postoperative period [26].

3.2.2 Traditional oral anticoagulants and food

Since traditional oral anticoagulants (warfarin) act by reducing activity of Vitamin K in blood clotting processes, a large change in patient intake of vitamin K, either through dietary source of mineral supplements, may disrupt the beneficial effects of warfarin. Most people taking warfarin experience no problems related to the amount of vitamin K in their diet. However, if excessive amount of vitamin K-rich foods are consumed, the effect of warfarin may be reduced, resulting in decrease in INR. Conversely, a reduction in Vitamin K intake could increase the effect of warfarin, leading to an increase in bleeding and INR levels. As a result, it is recommended that people taking warfarin try to keep their intake of Vitamin K-rich foods relatively stable in order to prevent INR [27].

High amounts of vitamin K are generally found in green leafy vegetables, such as spinach, broccoli, silver beet (Table 5) [28]. In contrast, all breads, cereal grains and their products, nuts, most fruits, fish, meat, chicken, pork, tofu, eggs, dairy products, fats and oils, roots and tubers contain low quantities of Vitamin K.

Herbal teas that contain coumarin derivatives such as tonka beans, melilot (sweet clover) and sweet woodruff may also interfere with warfarin and therefore are best avoided (Table 6). People taking oral anticoagulants should eat a normal, balanced diet and maintain a consistent amount of vitamin K intake. Ideally it is recommended that daily variation in intake of Vitamin K-rich foods not exceed 250 - 500 micrograms [29 - 33].

There are some other important dietary tips:

- Not to eat grapefruit or drink grapefruit juice. Grapefruit and grapefruit juice decrease the body's ability to metabolize coumadin.

Table 6. List of possible interactions between herbal medicines and warfarin

Herbal / mineral supplement (common name)	Potential effects on Warfarin and blood coagulation	Potential effect on INR
Chamomile	Increased anticoagulant effect	INR could increase
Cranberry juice	Increased anticoagulant effect	INR could increase
Danshen	Increased anticoagulant effect	INR could increase
Devil's claw	Increased anticoagulant effect	INR could increase
Dong Quai	Increased anticoagulant effect	INR could increase
Fenugreek	Increased anticoagulant effect	INR could increase
Feverfew	Increased anticoagulant effect	INR could increase
Fish oils (Omega-3)	Increased anticoagulant effect	INR could increase
Garlic (capsules)	Increased anticoagulant effect	INR could increase
Gingko Biloba	Increased anticoagulant effect	INR could increase
Ginseng	May reduce the effect of Warfarin	INR may decrease
Green Tea	May reduce the effect of Warfarin	INR may decrease
Saw palmetto	Increased anticoagulant effect	INR could increase
St. John's Wort	May reduce the effect of Warfarin	INR may decrease
Iron, Magnesium, Zinc supplements	No effect likely, if taken 2 hours apart from Warfarin	No change
Glucosamine/chondroitin	Unlikely to have an effect, but could potentially increase bleeding	INR could increase
Co-enzyme Q10	May reduce the effect of Warfarin	INR may decrease
Vitamin B family	No effects reported	No change
Vitamin C3 (Ascorbic acid)	Unlikely to have any effect	No change
Vitamin E3 (Tocopherol)	Unlikely to have an effect, but could potentially increase bleeding	INR could increase
Vitamin K (Phylloquinone)	Will reduce the effect of Warfarin	INR reading may decrease

- Alcohol can change the response to coumadin.
- Avocados are high in vitamin K, although the amount varies from avocado to avocado. Vitamin K content in guacamole can vary by as much as 40 times. Because avocados can unpredictably affect the PT/INR, it may be best to avoid them.
- Although dried basil, thyme and oregano contain high levels of vitamin K, a teaspoon of these herbs in their fresh form contain only a small amount and can be used.
- Store-bought margarine contains unknown amounts of various vegetable oils. As a result, the amount of vitamin K in these foods is unpredictable.
- Store-bought mayonnaise also contains unknown amounts of various vegetable oils and therefore has an unpredictable vitamin K content. Mayonnaise should be homemade with oils that are lower in vitamin K. If store-bought products are used, they should be the "light" variety with only small portions consumed (such as no more than several teaspoons).
- For the same reasons as with margarine and mayonnaise, be cautious of store-bought salad dressings. Homemade dressings are preferred.
- Exposing oils to sunlight or fluorescent light destroys about 85% of vitamin K. Expose high vitamin K oils to light for at least 48 hours by placing them in a transparent container in the sunlight.
- The vitamin K content of food is not altered by cooking or gamma irradiation.
- Some daily multi-vitamins contain vitamin K.
- Vitamins A, E and possibly C may also affect coumadin works [31 - 34].

The authors advise the food mentioned in Table 5 and Table 6 should be avoided before major and minor surgery, because food in Table 5 decreases the effect of oral anticoagulants and the food and herbal medicines in table 6 increases or reduces it. In general, the food and herbal medicines listed in the tables should be consumed in moderation.

4. Conclusions

- The currently available anticoagulant agents all target thrombin or FXa, either indirectly or directly. Thrombin is a logical target because of its multiple roles in coagulation.

- The management of oral surgery and other surgery procedures on patients treated with anticoagulants should be influenced by several factors: laboratory values, extent and urgency of the intervention, treating physician's recommendation, available facilities, dentist expertise, and patient's oral, medical, and general condition.

- The use of some vegetables, herbs and dietary supplements in patients taking anticoagulants needs to be routinely assessed and documented. Patients need to be educated about the risk versus the benefits of such food and supplements.

- Special care needs to be undertaken in patients undergoing various surgical interventions as use of some foods, herbs and supplements can increase the risk of bleeding. It is necessity to avoid and discontinue all dietary supplements at least one-two week prior to surgery.

- Education of healthcare professional and the patients is crucial. As a recommendation is to avoid and minimize the interaction of food and dietary supplements in order to allow for more stable and safe anticoagulation of patients treated with oral anticoagulants.

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