Recommended INR Values for Performing Oral-surgical Interventions

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Abstract

Introduction: Patients on oral anticoagulant therapy must be under continuous laboratory control including INR value. If INR values are under therapeutic, there is increased risk of thrombosis, and if higher, prolonged bleeding can occur after oral-surgical intervention.

Objectives: Establishing INR value range safe for oral-surgical interventions find evidence whether modification[1*] of anticoagulant therapy, can enable a successful surgical intervention.

Study Design: The control sample comprises 101 patients on oral anticoagulant therapy. On basis of the calibrated INR value, and in agreement with transfusiologist a decision was brought whether anticoagulant therapy was to be continued with the same dosage, reduced or even excluded one day prior to the intervention.

Results and conclusion: Clinical results and statistical analyses showed that in case INR values range between 2,5-3,5 the oral anticoagulant therapy is not to be discontinued prior to the blood-provoking dental intervention.

Key words: INR, oral anticoagulants, oral surgery

Introduction

Currently, modern medicine recognizes INR – International normalised ratio as the sole valid laboratory value in monitoring the effects of anticoagulant therapy. All patients who receive oral anticoagulant therapy must have their INR tested, at least on a monthly basis. On the basis of the obtained values, the doctor must bring a decision on the daily medication dose for each day, respectively. The obtained values of Prothrombin Time in procentages (%) and INR are recorded in special medical cards along with the recommended medication dose for each consecutive day in week. The patient must heed the recommended therapy until the next check-up when the medication therapy is altered in accordance with the newly obtained INR values. The aim of the medication therapy is to keep the INR values within the acceptable bounds, and thus prevent any thromboembolic complications.

Simultaneously, although anticoagulant therapy prevents blood clotting there is an increased risk of bleeding, particularly after blood-provoking surgical interventions.

The question being raised at this point is how to treat patients on anticoagulant therapy who must undergo an oral-surgical intervention.[1]

The traditional approach to the above question implied the discontinuation of anticoagulant therapy prior to any oral- surgical intervention, including tooth extraction.

Nevertheless, in the relevant literature on this issue there is no evidence that severe bleeding in patients on anticoagulants such as warfarin, is a result of oral- surgical intervention. On the other hand, several cases have been described registering embolic complications in patients who had warfarin therapy discontinued prior to the oral-surgical intervention.

1 * Modification of anticoagulant therapy means reduction or discontinuation of the medication dose one day prior to the intervention.

In Wahl's study [2] it is emphasized that continual warfarin therapy is beneficial in preventing various medical complications, including thromboembolia. Therefore, it is necessary to bring a decision whether to continue or discontinue anticoagulant therapy in patients who must undergo an oral -surgical intervention.

Out of 526 who had anticoagulant therapy discontinued, five patients suffered serious tromboembolic complications, while four patients died.

Finally, we may conclude that serious thromboembolic complications, including death, are three times more common in patients whose anticoagulant therapy had been discontinued than bleeding which occurs in patients who continue to be on anticoagulant therapy.[2] Many dentists are scared of performing minor surgical intervention in such patients because of bleeding risk. The current scientific findings indicate that the risk of tromboembolia is three to five times higher in patients who have their anticoagulant therapy discontinued than the risk of bleeding which, by contrast, cannot be treated by applying local therapeutic measures.[3]

Anticoagulant therapy has been administered for half a century in order to reduce tromboembolia risk and prolong life of thousands of patients. Many doctors recommend discontinuation of anticoagulant therapy prior to the oral-surgical intervention in order to prevent haemorrhage.

Nevertheless, there appears to be no evidence of severe bleeding after the oral-surgical intervention in patients who are on continuous warfarin sodium therapy, but serious embolic complications have been registered in patients when warfarin sodium therapy has been discontinued during the oral surgical intervention.[1]

The aim of the study conducted by Darens and his associates[4] was to establish the Protocol for tooth extraction in patients who receive vitamin K antagonists without correction of the therapy in case INR value apperas to be below 2,8.

Out of 96 patients who receive vitamin K antagonists 1004 extractions have been performed in the nine-month period. The extractions were performed as long as the INR value did not exceed 2,8. By contrast, the therapy was altered until the desired INR value was obtained.The extractions were performed by applying the local anaesthetic and resorbable hemostatic gauze.[4]

The findings of the above study have also shown three cases of post-operative bleeding. In one case the revision of alveolus with local application of tranexamic acid had to be performed, while in the other case the biological glue was to be applied.

In the research conducted by Scully and Wolf, it is emphasized that in recent years several approaches to treatment of such patients have been adopted: in most cases anticoagulant therapy is not discontinued while oral-surgical interventions are performed regardless of the fact that the laboratory values indicate to considerable proneness to bleeding, but new efficient local measures are applied in prevention of bleeding. The patients who run a serious risk of post-operative complications are recommended for hospital treatment.[5]

In their conclusions they stated that several factors should be taken into consideration in the oral-surgical treatment of patients on anticoagulant therapy, and these factors are as follows: scope and urgency of oral-surgical intervention, laboratory values, available means, the dentist's experience and oral/medical status of a patient.[5]

According to Webster and Wilde [6] there are variations in the treatment of patients with the artificial valves on anticoagulant therapy who must undergo an oral-surgical or maxillofacial intervention. In their study the said authors have proposed a pragmatic, practical approach with regard to adapting the anticoagulant therapy depending on the degree of surgical trauma or the thromboembolia risk. For minor surgical interventions there is no need for alteration of the anticoagulant therapy, provided the INR value is lower than 4,0 and in case tranexamic acid is applied for mouth rinsing as a measure of local hemostasis. In most surgical interventions, warfarin is discontinued prior to intervention and replaced by low-molecular heparins. In urgent surgical interventions anticoagulants are partly discontinued, while low dose K vitamin is administered parenterally.[6]

On the basis of data provided by different sources, Schardt and Sacco believe that there appears to be disagreement on methods of treating patients on anticoagulant therapy such as coumadin prior to oral- surgical intervention. Some authors are in favour of continuation of coumadin therapy, along with the application of local measures in bleeding control, while others are in favour of

discontinuing the coumadin therapy prior to intervention. The third group of authors are in favour of substituting coumadin by heparin therapy.[7]

There are no available references in the literature to support either of the aforementioned attitudes nor a sufficient number of case studies with clearly measureable results.[7]

Jeske and Suchko [8] point to the fact of an increasing need for education of dentists in this particular area apart from practising doctors who, most commonly, administer anticoagulant therapy. The experience has taught us that practising doctors very often decide on discontinuing the anticoagulant therapy prior to oral-surgical interventions without good reason, applying the same rationale as in typical surgical, orthopedic or other interventions. Added to this, is the fact that dentists are not familiar with the latest findings in the relevant literature on this particular problem. There also appears reluctance on part of dentists to consult general practioners in respect of the said problem. Of course, some patients voluntarily get off the anticoagulant therapy even before non-invasive dental interventions, such as radiographic scanning, for fear of severe bleeding.

The question, we need to raise at this point, is why we should run a risk by discontinuing anticoagulant therapy when this decision can prove life-threatening?! Is there a way of reaching a compromise solution instead of opting either for discontinuation of anticoagulant therapy or its continuation during the oral-surgical interventions? What is the most appropriate timing for INR control (should it be on the day of the intervention?) What are the so-called «safe» values of INR which remove a thromboembolia risk by simultaneously providing the appropriate conditions for prevention of severe bleeding ?

These are the issues which need to be addressed and, consequently, we should establish a unique doctrine in treating patients on anticoagulant therapy.

Aims

Establish the INR value range which is safe for successful performance of oral- surgical interventions without fear of excessive haemorrhage and without danger of thromboembolia.

Find evidence whether modification of anticoagulant therapy one day prior to the intervention can enable a successful surgical intervention such as the tooth extraction.

Patients and methods

This study was approved by the local ethics Institutional Review Board, and each patient provided written informed consent to participate. Also, in this study principles of Helsinki Declaration were followed.

The control sample used in this study comprises 101 patients. The majority of patients in the sample have the artificial valves built in. All patients were on oral anticoagulant therapy (etilbiscumacetat, acenocumarol, warfarin).

Each patient who came to the Institute of Transfusiology for a routine control of INR was sent to the Oral Surgery department of the Faculty of Dental Medicine in Sarajevo where he was submitted to a comprehensive dental examination. At the same time, it was established whether there was any need for tooth extraction or ultrasonic scaling. The Questionnaire list was filled in after the examination.

In cases when a need for blood-provoking intervention was established (such as the tooth extraction, minor operation or ultrasonic scaling) it would be suggested to the patient to undergo such an operation.

Each patient, who agreed with the suggested proposal, was sent to the Institute for Transfusiology where he had his/her INR calibrated. After obtaining the INR value the patient would return to the Oral Surgery Department where a decision was brought whether there was a pressing need to modify the anticoagulant therapy prior to the blood-provoking intervention, after consultations with the transfusiologist. At this, three options were considered:

- Anticoagulant therapy was to be continued with the same dosage
- Anticoagulant therapy was reduced one day prior to the blood-provoking intervention
- Anticoagulant therapy was excluded one day prior to the blood-provoking intervention

Local hemostasis was implemented by applying a biological agent for stopping bleeding, or by the surgical suture. The hemostasis control was undertaken 30 minutes after the intervention.

Digital camera was used to take shots in cases of prolonged bleeding.

Venues of research: The Institute of Transfusiology of the Federation of Bosnia&Herzegovina and the Oral Surgery Clinic of the Faculty of Dental Medicine in Sarajevo.

Results

Clinical examination was undertaken to establish if there were any indications for tooth extraction.In this way the state of oral health of the examined patients was assessed.

Consequently, out of the total number of the examined patients we made a diagnosis in 76 patients (75%) that extraction of one or more teeth was indispensable. In the remaining 25 patients (25%) we did not diagnose a need for extraction (Table 1. and Figure 1.).

Table 1. Need for tooth extraction

	Number of patients	%
Tooth extraction	76	75%
Absence of tooth extraction	25	25%

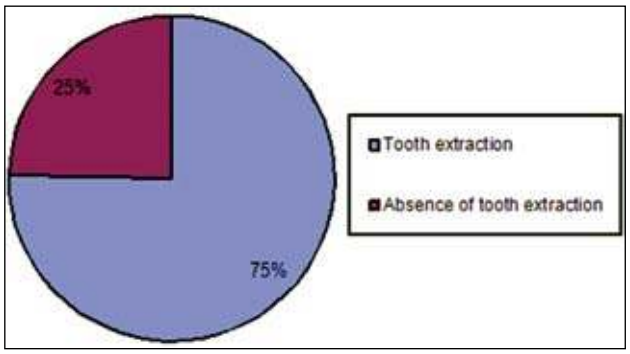

Figure 1. Need for tooth extraction

The total number of 76 patients diagnosed to have tooth extraction, were categorized into groups according to a number of teeth (1,2,3 or more) (Table 2. and Figure 2.).

The tabelar and graphic surveys clearly indicate that the greatest number of patients, i.e. 32 (42%) were diagnosed to have several teeth extracted.By our standards it implies to have more than 3 teeth extracted.

Table 2. Need for tooth extraction with regard to their respective number

	Number of patients	%
1 tooth	29	38%
2 teeth	10	13%
3 teeth	5	7%
More than 3 teeth	32	42%

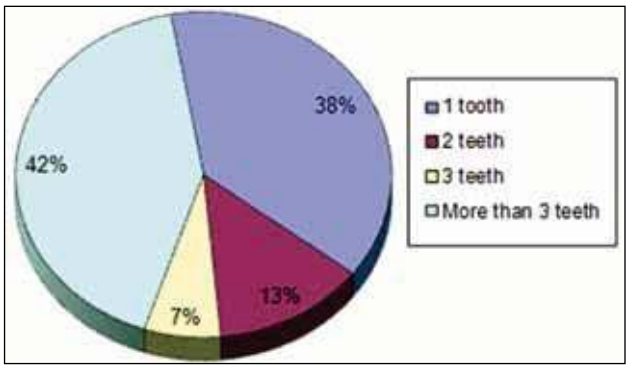

Figure 2. Need for tooth extraction with regard to their respective number

The INR values in blood-provoking interventions, most commonly, tooth extraction or ultrasonic scaling, ranged from 0,96-3,99. At this, prolonged bleeding was registered in some patients as an unwelcome outcome of the said dental interventions.

Figure 3. INR values in blood-provoking interventions without any complications with regard to prolonged bleeding

Hence, the so called „sensitive“ INR values were 3,99; 3,45 and 2,3, respectively.

Figure 4. shows the so called „ safe INR values “ wherein dental intervention was performed free of any complications.

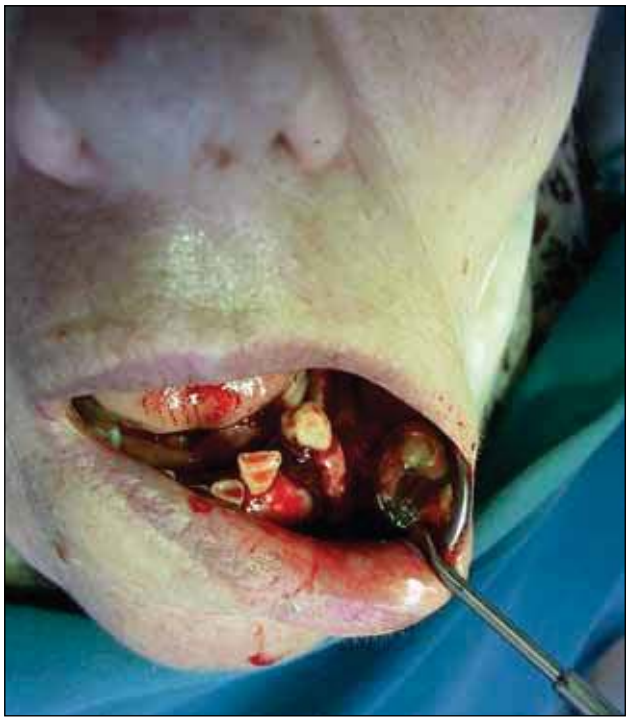

Figure 4. Pathological coagulum

What comes next is a descriptive and graphical account of two cases when bleeding occurred after blood-provoking dental intervention:

Patient Z.B., born in 1947, came to have the remaining tooth root (No 33) extracted. From the case history we found that he had the mitral and aortal valves built in. He had been on anticoagulant therapy (4mg acenocumarol) for 13 years. The INR value on the day prior to the extraction was calibrated as 2,40. An hour preceding the intervention we applied 600mg Clyndamicin and extracted the root with local anaesthesia.The INR value was calibrated again, but this time it amounted to 3,40. In hemostasis control we applied the biological agent for stopping bleeding and sent the patient home.

The next day the said patient came to us complaining of bleeding from the extraction wound which occurred in the evening hours on the day of extraction. By clinical examination we established the pathological coagulum with peroral haematoma by the side of extraction (Figure 4. and Figure 5).With local anaesthesia the wound was cleansed, sown and protected by the iodoform gauze bag (Figure 6.) Anticoagulant therapy was discontinued for one day. Next days the patient was to come for regular check-ups to monitor the wound healing.

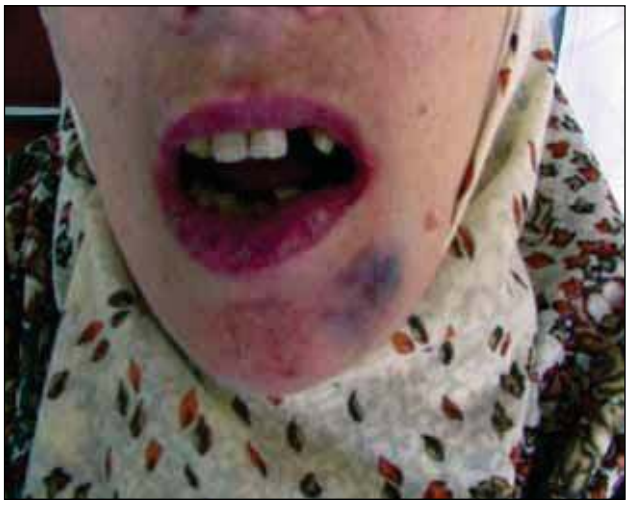

Figure 5. Peroral hematome

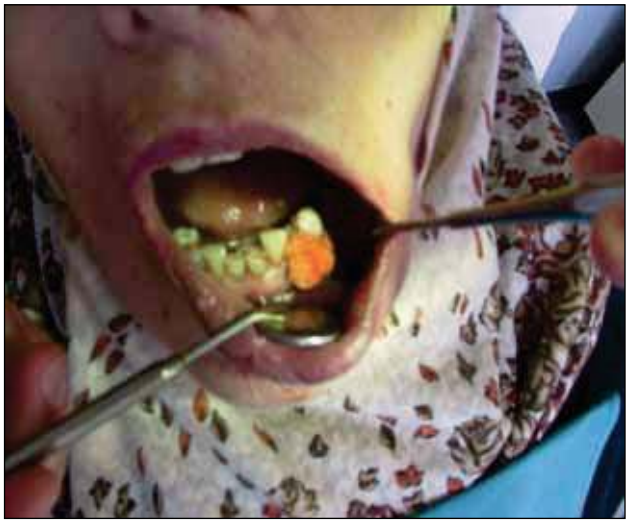

Figure 6. Iodoform gauze bag

The example of the next patient shows that prolonged bleeding may occur after ultrasonic scaling intervention as well.The patient M.B.,born in 1945, who was on anticoagulant therapy for 24 years after he had had the mitral valves built in, underwent the ultrasonic scaling. At this, the calibrated INR value amounted to 3,99. The next day the patient returned complaining of excessive bleeding from gingiva, which was later confirmed by clinical examination (Figure 7 and Figure 8). Again, we attempted to stop bleeding by applying the iodoform gauze, but this time it proved to be inefficient (Figure 9). After that, we applied Coe Pack paste which also proved to be impractical (Figure 10). Finally, bleeding was successfully stopped by applying thermocoagulation (Figure 11).

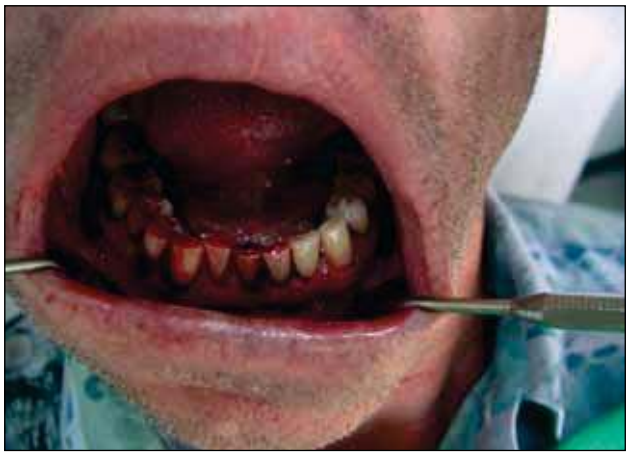

Figure 7. Bleeding from gingiva (mouth open)

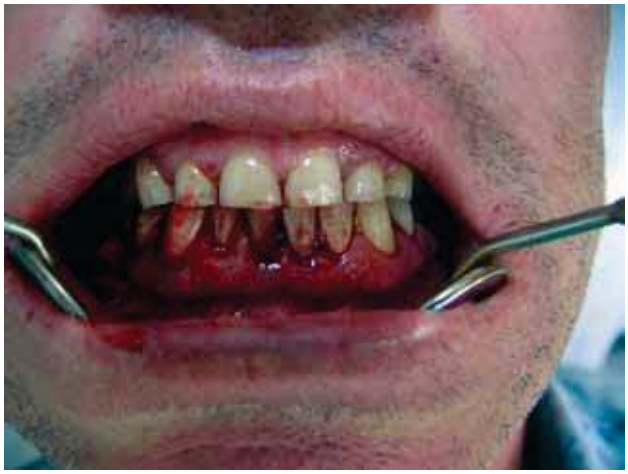

Figure 8. Bleeding from gingiva (mouth closed)

Figure 9. Attempt of iodoform gauze application

One of the aims of this research was to ascertain whether a successful oral-surgical intervention such as tooth extraction, can be performed by modifying anticoagulant therapy one day prior to the intervention. In the process of sample collection we observed hypodosage of anticoagulant therapy in a great number of patients, but also that their respective INR values ranged either below or around therapeutically acceptable values.

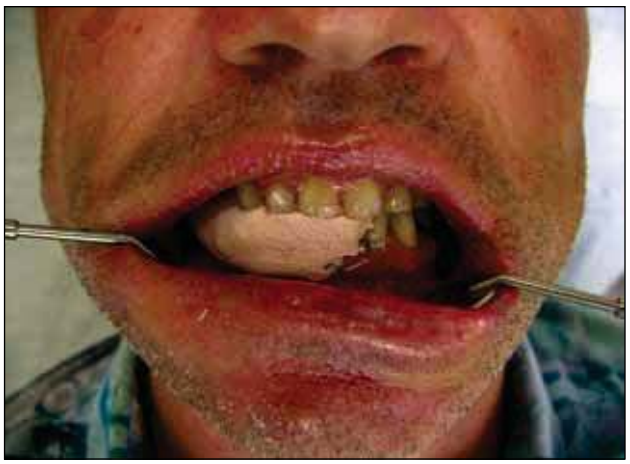

Figure 10. Coe pac paste application

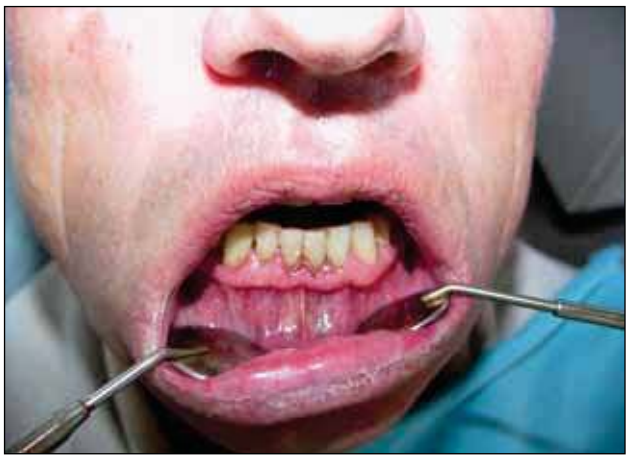

Figure 11. Day after thermocoagulation

Most authors agree that therapeutically acceptable INR values in patients with heart valves built in, amount to 2,5-3 or 2,5-3,5., respectively.

Due to the aforementioned reasons all patients within the examined sample were cathegorized into 2 groups:

- Anticoagulant therapy was continued with the same dosage (77 patients)
- Anticoagulant therapy was either discontinued or reduced one day prior to the intervention (24 patients).

In respect of prolonged bleeding after blood-provoking intervention, by statistically analysing the two examined groups we established that in statistical terms there was no considerable difference: $p>0,05$, $\chi^2 = 0,29$ (Figure 12.).

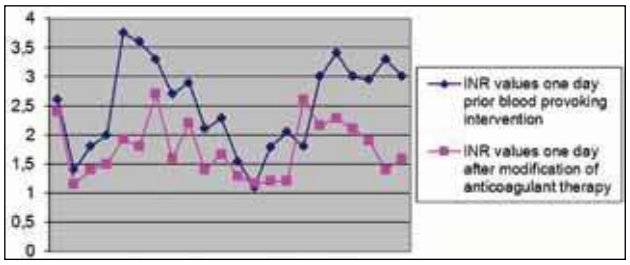

Figure 12. Emergence of prolonged bleeding after blood-provoking intervention

In practical terms it would imply that very often there is no need for modification of anticoagulant therapy prior to dental, blood-provoking interventions since possible prolonged bleeding does not occur more often compared with the group of patients who have had the anticoagulant therapy altered modified.

One of the aims of the present research was to ascertain to what extent the modification of anticoagulant therapy, in the sense of its discontinuation or reduction one day prior to the intervention, can affect the INR value. Hence, out of the total number of 101 patients we modified the therapy in 24 patients.Out of the latter number, we discontinued therapy in 20 patients, while in 4 patients we reduced it one day prior to the intervention.

By statistical analysis of the data we established a significant statistical difference between the INR values one day prior to the intervention and those after the modification of therapy, resulting in the following: $p < 0,01$; Correlation Coefficient = 0,058; $p = 0,00702$ (Figure 13 and Figure 14). This means that modification of anticoagulant therapy results in a significant decrease of INR value which, in turn, can trigger off a propensity for thrombotic complications.

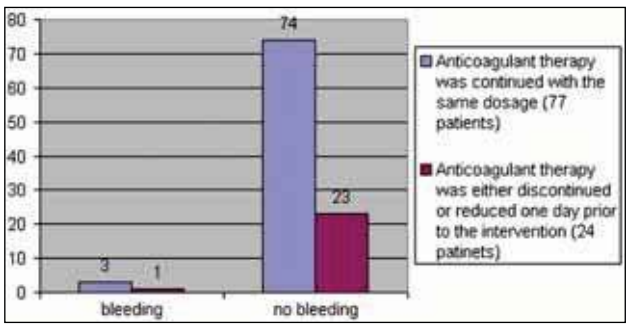

Figure 13. Ratio of INR values after modification of therapy

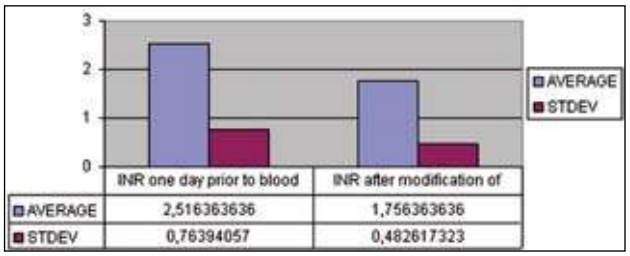

Figure 14. Average INR values one day prior to blood-provoking intervention and after modification of therapy

Discussion

Patients with artificial valves built in, represent a high-risk group for developing thromboembolia and, as such, they are prescribed anticoagulant therapy on a life-long basis.[9,10]

In our study 50% of the total number of subjects were patients with the artificial valves built in, either with the mitral valve or aortal valve or the combination of the two.

Although medical regulations make it imperative for each patient to undergo a comprehensive dental examination and treatment prior to the artificial valve implantation or heart surgery, unfortunately, this has not been proved in practice.On the other hand, on account of fear of bleeding following the tooth extraction, such patients tend to avoid dental appointments.

On the basis of the Questionnaire findings we confirmed that 69% of such patients had problems with their teeth. After dental examination we discovered that 75% of such patients needed to have a tooth extraction. As a result, on the basis of individual personal assessment of patients and the objective dental examination, we could unquestionably establish a need for a dental intervention. The fact that in 42% of patients there was a need for extraction of more than 3 teeth, clearly substantiates our original claim.

It is the very problem of post-extraction bleeding which makes this subject matter interesting for a great number of authors who are concerned with the problem itself. It has always been a dilemma how to prepare a patient on anticoagulant therapy for an oral-surgical intervention. The fundamental question is whether to continue or discontinue anticoagulant therapy.[11,12]

Wahl [1] is against discontinuation of anticoagulant therapy. He believes that discontinuation of warfarin therapy does not necessarily reduce the risk of bleeding but, on the other hand, it can cause hypercoagulability. Discontinuation of warfarin therapy prior to surgical intervention can cause rebound thrombosis which, in turn, can damage the artificial valves with a lethal outcome in some dental patients after blood-provoking interventions.The same author emphasizes that warfarin therapy is not to be discontinued unless severe bleeding is expected.[1]

Other authors hold similar views on this problem. Thus, Sacco[7] states that anticoagulant therapy must never be discontinued without agreement of the practising doctor in charge, while Devani and his associates [13] consider that oral-surgical interventions can be performed without discontinuation of anticoagulant therapy provided that INR values do not exceed 3,5. Ball [14] classifies patients on anticoagulant therapy into three groups:1. low-risk interventions which do not require discontinuation of anticoagulant therapy; 2. medium-risk interventions in which coumadin therapy is discontinued two days prior to the intervention but with the calibration of the INR value on the day of intervention; 3. high-risk interventions which imply administration of heparin therapy .[14]

In the research conducted by Wahl and Howell[15] it was found that 70% of the examined therapists suggested discontinuation of anticoagulant therapy even for the smallest dental intervention. Since warfarin, as the most commonly administered anticoagulant, has a life span of 36 hours, its administration is typically discontinued two days prior to the surgical intervention in order to bring the coagulation process to a normal level.

Some practicioners,who are in favour of discontinuation of warfarin therapy, suggest that heparin should be administered in its place.

In our research we established that in a great number of patients the INR values range below or around therapeutically acceptable levels. For this reason we believe that it would be very unethical to discontinue anticoagulant therapy to hypodosed patients one day prior to intervention and, thus, make them vulnerable to thrombotic complications.This also accounts for the fact that in our sample we modified the anticoagulant therapy only in 24 patients while the group of 77 patients had the anticoagulant therapy continued with the same dosage. In respect of prolonged post-extraction bleeding, no statistically significant difference between the two groups was found ($p > 0,05$ $\chi^2 = 0,29$). Therefore, the statistical interpretation of data supports the view that anticoagulant therapy should not be discontinued. At this, we must emphasize that this refers to patients whose INR values range between 2,5-3,5 at the moment of oral-surgical performance.

Many dentists believe that the solution to the problem with regard to anticoagulant therapy discontinuation is in extensive consultations with the practising doctor. However, many practising doctors are not familiar with the nature of dental interventions, and it should not come as a surprise that they more often than not suggest discontinuation of anticoagualant therapy in patients who must undergo endodontic treatment rather than in patients who must have teeth ultrasonic scaling [2]

The findings of our research support the views of those authors who disagree with routine discontinuation of anticoagulant therapy.Our belief is that in some cases it does not suffice to allow the practising doctor to decide on discontinuation of anticoagulant therapy on his own.We believe that the dentist, in particular the oral surgeon, who is familiar with the nature of blood-provoking intervention a patient must be submitted to, should actively participate in decision making in respect of a need for continuation or discontinuation of anticoagulant therapy. We have often witnessed random decisions on part of practicing doctors who suggested discontinuation of anticoagulant therapy for a couple of days prior to any dental intervention. It also appears that patients themselves are afraid of bleeding more often than of any contingent thrombolic complications.

In our research we paid attention to regular control of INR values prior to performing any blood-provoking dental intervention. In other words, each patient had his/her INR value calibrated in the appropriate laboratory one day prior to the intervention. On the basis of the obtained value a decision was made whether to modify oral anticoagulant therapy or not. A small number of patients had voluntarily discontinued the anticoagulant therapy one day prior to the intervention for fear of

bleeding. The INR values, in which blood-provoking interventions were performed, ranged from 0,96-3,99. At the values in the range of 3,99; 3,45 and 2,3, respectively, post-extraction bleeding occurred. In patient with the INR value of 3,99 we took into consideration the latest value from the patient's medical card for INR which amounted to 1,71. This approach proved to be wrong since the value in question was far lower than the real value of 3,99. Hence, on the basis of our own experience we believe that the best approach is to determine the INR value one day prior to the intervention since this is the best procedure to obtain the most reliable value of the level of anticoagulation.

Conclusions

If the INR values are in the range of 2,5-3,5 oral anticoagulant therapy should not be discontinued prior to dental intervention.

The INR value range of 2,5-3,5 is safe for a successful performance of oral-surgical or other blood-provoking dental interventions.

If the INR value is higher than 3,5 a decision on modification of anticoagulant therapy should be made as a team after consultations of the dentist with the practising doctor.

Acknowledgments

Special thanks to Professor Drita Mustagrudić for her useful advices during clinical investigation in this study.

This study was financially supported by Goverment and Ministry of Education Canton Sarajevo - Federation of Bosnia and Herzegovina and Faculty of Dental Medicine University of Sarajevo, Bosnia and Herzegovina.

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