Abstract: The purpose of this study was to evaluate the anticoagulant levels of patients whose oral anticoagulant therapy was temporarily terminated (stopped) for dental extractions.

Thirty one patients were required to temporarily terminate or reduce their amount (dose) of warfarin in order to decrease their thrombotest (TT) values to the range of 30 - 50% prior to (before) dental extractions. At the time of the initial assessment the mean (standard division) TT value of all patients was $15.2 \pm 4.4\%$. The TT value on the day of the operation was $34.8 \pm 25.4\%$ (under 10% in one patient, 10 - 15% in 2 patients, 15 - 20% in 6 patients, 20 - 25% in 10 patients, 25 - 30% in one patient, 30 - 50% in 4 patients, 50 - 60% in 2 patients, and 80 - 90% in 5 patients). Thus only 4 of the 31 patients (12.7%) had TT values in the acceptable range on the day of the dental extraction. The results of this study on dental extraction in patients on anticoagulant therapy suggest that interrupting oral anticoagulant therapy is ineffective.

Key words: warfarin, dental extraction, anticoagulant therapy

Introduction

Warfarin is the most commonly used drug for continuous oral anticoagulant therapy, but this therapy may result in hemorrhage and thromboembolism after dental extractions $^{1,2}$. However, a few patients on oral anticoagulant therapy who underwent dental extractions had been told to reduce or temporarily terminate warfarin by their physician. Interrupting oral warfarin therapy prior to dental extractions has been widely accepted and used to manage patients on warfarin $^{5,6}$. This approach appears to offer the advantage of decreasing the risk of postoperative hemorrhage, but preoperative variation of anticoagulant activity is unpredictable $^{3,7}$. We measured the TT values on the day of surgery to evaluate anticoagulant activity after termination the warfarin therapy for dental extraction.

Patients and methods

Dental extractions were performed in 31 patients, 24 men and 7 women, after termination of oral anticoagulant therapy. The indications for warfarin therapy are cardiac valvular disorders $^{3,4}$, history of myocardial infarctions, and cerebrovascular accidents. Anticoagulant activity of the warfarin was assessed based on TT values measured on the day of
Table 1 Patients under warfarin anticoagulation undergoing dental extractions

<table>
<thead>
<tr>
<th>Gender</th>
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<tbody>
<tr>
<td>Male</td>
<td>24</td>
</tr>
<tr>
<td>Female</td>
<td>7</td>
</tr>
</tbody>
</table>

Mean age (range) 57.6 (35-74)

Indications warfarin anticoagulation

<table>
<thead>
<tr>
<th>Disorder</th>
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<tbody>
<tr>
<td>Cardiac valvular disorder</td>
<td>26</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>6</td>
</tr>
<tr>
<td>Cerebrovascular accident</td>
<td>2</td>
</tr>
</tbody>
</table>

Dose of warfarin / mg 3.09 ± 0.9

surgery. To prepare for dental extractions, the patient's physician gave instructions to terminate warfarin therapy prior to the day of the operation in order to decrease the TT values to range of 30 - 50%.

We performed all dental extractions if the patient's TT value was not within the acceptable range on the day scheduled for extraction. To reduce the risk of bacterial endocarditis, we administered cephem or cephapresporin 1.5g per day to all patients from the day prior to surgery to the third postoperative day. The dental extractions were carried out under local anesthesia using 2 % lidocaine with 1: 80000 adrenaline. After dental extractions, local hemostasis was achieved by application of pressure with gauze packs. Whenever it was not achieved, the dental socket was packed with gelatin sponge in 14 patients, sutures in 17 patients and application of an acrylic splint in 4 patients.

Results

The results of the study are summarized Table 1. The study group consisted of 31 patients, 24 men and 7 women, ranging from 35 to 74 years of age and their mean age was 57.6 years. The reason for administration of anticoagulant therapy was cardiac valvular disorder in 26 patients, history of the myocardial infarction in 6 patients, and a cerebrovascular accident in 2 patients. The average dose of warfarin was 3.09mg daily (range 1.5 - 4.5).

In 22 of the 31 patients warfarin therapy was temporarily terminated for 2 or 3 days prior to the day of dental extraction and in the other 9 patients the dose of warfarin was gradually tapered to zero within 3 to 7 days prior to the day of dental extraction.

At the time of initial assessment the mean (standard deviation) TT value of all patients was 15.2 ± 4.4%. It was under 10% in 3 patients, 10 - 15% in 13 patients, 15 - 20% in 11 patients, 20 - 25% in 3 patients, and 25 - 30% in one patient. The TT value on the day of the dental extraction was 34.8 ± 25.4%. It was under 10% in one patient, 10 - 15% in 2 patients, 15 - 20% in 6 patients, 20 - 25% in 10 patients, 25 - 30% in one patient, 30 - 50% in 4 patients, 50 - 60% in 2 patients, and 80 - 90% in 5 patients. Thus, only 4 (12.9%) of the 31 patients had TT values in the acceptable range on the day of the tooth extraction (Fig. 1).

Discussion

The results of this study demonstrated that the anticoagulant levels of patients who were instructed to terminate their oral anticoagulant drugs prior to dental extractions was unacceptable.

Warfarin is the most commonly used continuous oral anticoagulant. The risk of intraoperative or postoperative bleeding among patients who are continuously taking warfarin may be encountered during
tooth extraction. Our studies\textsuperscript{3,4} and the results of studies conducted by other investigators\textsuperscript{7~9} suggest that temporary termination of anticoagulant therapy is not required for dental extractions if the anticoagulant activity is within therapeutic level. However, a few patients on oral anticoagulant therapy who have undergone dental extractions have been instructed by their physician to terminate their warfarin therapy. Oral anticoagulant therapy is terminated prior to dental extractions to prevent intraoperative and postoperative hemorrhage. This approach increases the risk of perioperative thromboembolism, since reduction in TT value on the day of tooth extraction is unpredictable\textsuperscript{3,7}. However, it is ineffective that anticoagulant activity is within acceptable level on the day of operations. The aim of our study was to determine whether anticoagulant activity on the day of tooth extraction justifies the necessity of terminating anticoagulant therapy prior to dental extractions.

In this study temporary termination of warfarin for 2 or 3 days or the tapering of the dose of warfarin to zero within 3 to 7 days prior to dental extractions. The aim of anticoagulant activity was to reduce TT values to between 30\% and 50\%, and the average TT value on the day of tooth extraction was 34.8±25.4\%. Although only 4 (12.7\%) of the 31 patients had TT values in the acceptable range, 19 of these patients had TT values within the therapeutic range.

On the other hand, TT values often elevates above 80\% and may lead to a rebound hypercoagulable state\textsuperscript{6,8~11}, and in this study 5 (12.7\%) of these patients had the same TT values. Some authors have reported fatal thromboembolic complications after termination of anticoagulant therapy\textsuperscript{3,12,13}. Our study demonstrated that the number of patients experiencing rebound hypercoagulable state was 5.

**Conclusion**

In conclusion, this study provides evidence that anticoagulant therapy in dental extraction patients should not be terminated completely or temporarily if their anticoagulant activity is within the therapeutic range of anticoagulant activity.

**References**

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ワーファリン服用者の抜歯に関する検討
—中止例における凝固能の変動について—

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要旨：ワーファリン服用者の抜歯は同様を中止することなく、服用下で行うことが血栓・塞栓形成の危険性を回避することで望ましい。また、止血に関しては凝固能が治療域に調節されているのであれば支障なく行うことが可能であり、当科においてはワーファリン投与下での抜歯を基本方針としている。しかし歯科主査者の指示によりワーファリン中断下での処置を行うこともあるが、抜歯前定日に希望の凝固能に調整されるのは少数である。今回、われわれはワーファリン中止下に抜歯を行うことに妥当性があるか凝固能の調節性の面から検討を行った。

対象は男性 24 名、女性 7 名の計 31 名で、このうち中止は 22 名、減量は 9 名であり、減量、中止の決定ならびにワーファリン服用の調節は歯科主査の指示によって、減量例ではワーファリンを術前 7 日よろしく減量の当日日に中止し、中止例では術前 3 または 2 日前に中止した。ワーファリン中止前のトロンボテスト値（以下、TT 値）は 15.2 ± 4.4% であり、ワーファリン中止後、抜歯時の TT 値は 34.8 ± 25.4% （10〜15% 1 例、10〜15% 2 例、15〜20% 6 例、20〜25% 10 例、25〜30% 1 例、30〜50% 4 例、50〜60% 2 例、80〜90% 5 例）であった。TT 値を 30〜50% に目標としたが調整可能であった症例は 4 例 (12.9%) で、TT 値 80% 以上の rebound hypercoagulable state に達していたのは 5 例であった。

ワーファリンの中止により抜歯時に凝固能を目標値に調節することは困難であり、この点からもワーファリン維持量下での処置が適切と考えられる。

キーワード：ワーファリン、抜歯、抗凝固療法