

Evidence to Support an Individualized Approach to Modification of Oral Anticoagulant Therapy for Ambulatory Oral Surgery

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The question of whether modification of oral anticoagulation (OA) is necessary for oral surgical procedures has been debated for some time. There are numerous references advocating various protocols and management therapies for anticoagulated patients requiring surgical procedures. Over the past 5 years, more articles advocate maintaining the anticoagulated patient in therapeutic range without considering the individual patient, the reason for anticoagulation, or the planned surgical procedure. During my 10 years as an oral surgeon in private practice, I have managed many hundreds (possibly thousands) of such patients with a variety of techniques and believe that an individualized approach is best. While I believe that in many cases procedures can be carried out with patients in the therapeutic INR (international normalized ratio) range, I believe that flexibility is required and in some cases modification of the anticoagulation regimen is beneficial for performance of the procedure and the postoperative course. Despite using a variety of local measures to control bleeding and attempts at "atraumatic procedures," I have found that patients in the therapeutic range of INR at times do have postoperative bleeding that is worrisome to them and occurs anywhere from several hours to 3 to 4 days postoperatively. In this article, the literature on this topic is reviewed. I advocate an individualized approach to anticoagulated patients that allows for communication between the surgeon, the patient, and the responsible physician. My approach has an acceptably low risk of thromboembolic events as well as a low risk for postoperative problem bleeding.

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Literature Review

Two detailed literature reviews on management of patients receiving oral anticoagulant therapy were published in 2003. Dunn and Turpie¹ published a review of the literature on the perioperative management of patients receiving oral anticoagulant therapy, and made specific recommendations for a variety of procedures including "dental procedures" (as opposed to oral surgical procedures) and stated that most patients can undergo "dental procedures" without alteration of their regimen. The authors' main source for this conclusion was Wahl.² Dunn and Turpie determined from their review that the overall rate of thromboembolism and stroke for patients having a variety of procedures and surgeries was 1.6% and 0.4%, respectively. The rate of thromboembolism for those continued on OA was 0.4%, and for those patients who had OA withdrawn without administration of intravenous heparin or subcutaneous low-molecular-weight heparin (LMWH), the rate was 0.6%. In their conclusions, Dunn and Turpie also state, "*It is not possible to draw firm conclusions on the relative efficacy and safety of different management strategies using the available literature owing to variations in patient populations, procedures, anticoagulation regimens, definitions of events, and durations of follow-up.*"¹ The second review of the topic published in 2003 is from the Sixth Consensus Conference on Antithrombotic Therapy.³ In this publication, the American College of Chest Physicians (ACCP) made the following recommendations for patients undergoing "dental procedures": 1) warfarin therapy should not be discontinued in patients undergoing "dental procedures" who are not considered to be at high risk for bleeding, and 2) in patients who are at high risk for bleeding, warfarin therapy should be discontinued. Specific procedures were not spelled out for this latter group of patients, but one presumes that the authors are referring to more invasive procedures. Again, the main source for these recommenda-

tions is Wahl.² A third recommendation made by the ACCP was to use tranexamic acid or ϵ -aminocaproic acid mouthwash when local bleeding must be controlled without interrupting oral anticoagulant therapy.

The 1998 article by Wahl² is itself a literature review and not a prospective study. This is a good review article, and I invite all who are interested in this debate to read it. Wahl argues against discontinuation of OA therapy for dental surgery as he believes that the risk of hemorrhage is minimal and is outweighed by the risk of thromboembolic events. To show the risk of withdrawal of anticoagulation, he cites that in 542 documented cases of withdrawal of anticoagulation therapy for dental procedures, 5 patients (1%) had serious embolic complications, including 4 deaths. A detailed examination of these 5 cases, however, shows that the period of withdrawal of OA was either unknown (2 cases), 9 days, "3 to 7" days, or 4 days.³⁻⁷ These extended periods of withdrawal of OA therapy would likely normalize coagulation status. However, one has to wonder if these complications would have occurred had the OA therapy been discontinued for 2 to 3 days before the procedure (so that the INR was about 1.5) and then resumed the day of surgery. It seems to me that these 5 cases in the literature (of which 4 are from 1968 or earlier) should not make the case against discontinuation of OA therapy for oral surgical procedures.

In reviewing options for treatment of the patient on OA therapy, it is helpful to understand the risks of thromboembolism. The ACCP classifies patients into risk categories for arterial thromboembolism as low risk (<4%) annually, moderate risk (4% to 7%) annually, and high risk (>7%) annually. Patients in the low-risk category include those with atrial fibrillation (Afib) without a history of stroke and patients with cardiomyopathy without Afib. Moderate-risk patients are those with a mechanical aortic valve. The high-risk group includes patients with a mechanical mitral valve or a history of Afib with thromboembolic stroke. Patients who have had venous thromboembolism within the past 3 months are also considered high risk. Based on these risk categories, recommendations for the therapeutic range of INR are listed as 2.0 to 3.0 for low- and moderate-risk patients and between 3.0 and 4.5 for high-risk patients. The risk of adverse bleeding increases with an increasing INR,⁸⁻¹² and this would apply to oral surgical procedures as well.^{13,14} The consequences of a thromboembolytic event have been estimated. Twenty percent of arterial thromboembolisms are fatal and 40% result in serious permanent disability. Approximately 6% of venous thromboembolisms are expected to be fatal and about 2% of such patients with recurrent events will have serious permanent disability.¹⁵ Further complicating this topic is the high degree of variability in maintain-

Table 1. RISK OF THROMBOEMBOLIC STROKE (ANNUAL RISK WITHOUT ANTICOAGULATION)

Low risk (<4%)
Atrial fibrillation without history of stroke
Cardiomyopathy without atrial fibrillation
Moderate risk (4% to 7%)
Mechanical aortic valve
High risk (>7%)
Atrial fibrillation with history of stroke
Mechanical mitral valve
First 3 months after deep venous thrombosis

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ing patients in a targeted therapeutic range. A recent abstract¹⁶ found that patients were in therapeutic range only 44% of the time.

Intuitively, anticoagulation would be expected to result in increased bleeding with oral surgical procedures, and a review of the literature shows this.^{14,17-26} In contrast, many studies show no difference in bleeding after minor oral surgical procedures compared with control groups.²⁷⁻³¹ Many approaches have been suggested to gain control of hemostasis, including tranexamic acid mouthwash, ϵ -aminocaproic acid mouthwash, oxidized cellulose, fibrillated collagen, fibrin glue, and cyanoacrylate glue. I have tried, and continue to use, most of these approaches. However, I have not had consistent success in obtaining hemostasis without modifying the OA therapy.

Treatment Recommendations

I propose an approach to the anticoagulated patient that is outlined in Tables 1 and 2. This is a similar approach to that outlined by Bierne and Koehler³² but with a lower INR. This approach is in agreement with the recommendations by the ACCP³ and with those of Dunn and Turpie¹ and Kearon and Hirsh.³³ My approach is based on the following considerations:

1. Notwithstanding that some studies show no statistical difference in bleeding for oral surgical procedures in anticoagulated patients versus control groups, I have found that postoperative hemostasis can be difficult to achieve despite application of a variety of local measures.³⁴
2. I can find no references in the English literature in the past 25 years showing a complication of cerebrovascular accident, myocardial infarction, or pulmonary embolism with an approach of allowing the INR to fall in the 1.5- to 2.0-range. This information, together with 10 years of clinical experience with no complications using such an approach, tells me that the risk of

Table 2. APPROACH TO PATIENT BASED ON PROCEDURE AND RISK OF THROMBOGENESIS

- A. Low risk for postoperative bleeding
Simple extraction(s), simple biopsy
No need to modify anticoagulation as long as INR is in therapeutic range
- B. Higher risk for postoperative bleeding
Multiple extractions, alveoloplasty, Tori removal, vestibuloplasty, free gingival graft, block bone graft, etc.
1. Low-risk patient for thromboembolism
Withhold oral anticoagulation*
 2. Moderate-risk patient for thromboembolism
Withhold oral anticoagulation,* consider treatment with subcutaneous low-molecular-weight heparin (LMWH)† or intravenous heparin while INR is subtherapeutic
 3. High-risk patient for thromboembolism
Withhold oral anticoagulation,* administer treatment-dose intravenous heparin, or subcutaneous LMWH† while INR is subtherapeutic

NOTE. Use local measures for all patient groups.

*Withhold oral anticoagulant therapy for 2 to 3 days before the procedure to allow the INR to fall between 1.5 and 2.0. Check INR the morning of the planned procedure. Resume oral anticoagulant therapy the day of the procedure.

†For LMWH, withhold subcutaneous injection the morning of the procedure and resume it that evening.⁴¹ Resume oral anticoagulant therapy the day of the procedure. Follow standard nomograms for intravenous heparin therapy.⁴² Recommend 4% tranexamic acid mouth rinse for 2 minutes 4 times daily for 5 to 7 days postoperatively.

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thromboembolism after discontinuation of OA therapy for patients in the low-risk category is indeed very low. Although the INR is subtherapeutic, there is presumably some protection against thromboembolism.³⁵⁻³⁷ Russo et al³⁸ used this approach in 104 patients with prosthetic valve replacement (patients at high risk for thromboembolism) and found no thromboembolic events up to 3 months postoperatively. Sour et al³⁹ also found no thromboembolic events in 240 patients who were also at high risk for thromboembolism and were managed with this approach.

3. Literature references in various articles need to be examined critically. Several references citing thrombogenesis with withdrawal of OA therapy are from the 1960s and early 1970s, when more thrombogenic valve prostheses were used. In addition, references need to differentiate between dental procedures (oral hygiene prophylaxis, restorations) and oral surgical procedures as well as simple extractions of 1 or 2 teeth (where postoperative bleeding would be expected to be lower) versus more extensive oral surgical procedures.
4. My conclusion from a review of the literature is similar to that of Dunn and Turpie noted above. With regard to oral surgical procedures, I disagree with Wahl's conclusion that in general the risk of postoperative bleeding is minimal when OA therapy is maintained and the risk of thromboembolism is high when it is temporarily discontinued.

In his editorial "Hemostasis Is a Shared Responsibility," Assael⁴⁰ discussed the many aspects of managing hemostasis. I am aware that this topic is controversial, but I believe that an individual approach to each patient is best and that the oral and maxillofacial surgeon should consult with the patient and the patient's physician to determine the best method to treat the anticoagulated patient. A brief discontinuation of OA therapy, along with local measures to control hemostasis, is a safe and simple method for most patients who require oral surgery procedures.

References

1. Dunn AS, Turpie AGG: Perioperative management of patients receiving oral anticoagulants: A systematic review. *Arch Intern Med* 163:901, 2003
2. Wahl MJ: Dental surgery in anticoagulated patients. *Arch Intern Med* 158:1610, 1998
3. Ansell J, Hirsh J, Dalen J, et al: Managing oral anticoagulant therapy. *Chest* 119:22S, 2001
4. Akbarian M, Austen WG, Yurchak PM, et al: Thromboembolic complications of prosthetic cardiac valves. *Circulation* 37:826, 1968
5. Behrman SJ, Wright IS: Dental surgery during continuous anticoagulant therapy. *J Am Dent Assoc* 62:172, 1961
6. Marshall J: Rebound phenomena after anticoagulation therapy in cardiovascular disease. *Circulation* 28:329, 1963
7. Ogiuchi H, Ando T, Tanaka M, et al: Clinical reports on dental extraction from patients undergoing oral anticoagulant therapy. *Bull Tokyo Dent Coll* 26:205, 1985
8. Tulloch J, Wright IS: Long-term anticoagulant therapy: Further experiences. *Circulation* 9:823, 1954
9. Hylek EM, Singer DE: Risk factors for intracranial hemorrhage in outpatients taking warfarin. *Ann Intern Med* 120:897, 1994
10. Fihn SD, McDonell M, Martin D, et al: Risk factors for complications of chronic anticoagulation: A multicenter study. *Ann Intern Med* 118:511, 1993
11. Landefeld CS, Goldman L: Major bleeding in outpatients treated with warfarin: Incidence and prediction by factors known at the start of outpatient therapy. *Am J Med* 87:147, 1989

12. Landefeld CS, Rosenblatt MW, Goldman L. Bleeding in outpatients treated with warfarin: Relation to the prothrombin time and important remedial lesions. *Am J Med* 87:153, 1989
13. Campbell JH, Alvarado F, Murray RA: Anticoagulation and minor oral surgery: Should the anticoagulation regimen be altered? *J Oral Maxillofac Surg* 58:131, 2000
14. Yoshimura Y, Oka M, Kishimoto H, et al: Hemodynamic changes during dental extraction and post-extraction bleeding in patients with prosthetic valves. *Int J Oral Maxillofac Surg* 16:425, 1987
15. Kearon C, Hirsh J: Management of anticoagulation before and after elective surgery. *N Engl J Med* 336:1506, 1997
16. Bhandari V, Wang F, Schilliinger D: Racial and linguistic disparities in quality of anticoagulation control. *Circulation* 108:716, 2003 (suppl IV)
17. Bandowsky T, Vorono AA, Borris TJ, et al: Amoxicillin-related postextraction bleeding in an anticoagulated patient with tranexamic acid rinses. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 82:610, 1996
18. Kwapis BW: Anticoagulant therapy and dental practice. *J Am Dent Assoc* 66:172, 1963
19. McIntyre H: Management, during dental surgery, of patients on anticoagulants. *Lancet* 2:99, 1966
20. Ramstrom G, Sindet-Pedersen S, Hall G, et al: Prevention of postsurgical bleeding in oral surgery using tranexamic acid without dose modification of oral anticoagulants. *J Oral Maxillofac Surg* 51:1211, 1993
21. Shira RB, Hall RJ, Guernsey LH: Minor oral surgery during prolonged anticoagulant therapy. *J Oral Surg* 20:93, 1962
22. Sindet-Pederson S, Ramstrom G, Bernvil S, et al: Hemostatic effect of tranexamic acid mouthwash in anticoagulant-treated patients undergoing oral surgery. *N Engl J Med* 320:840, 1989
23. Wood GD, Deeble T: Warfarin: Dangers with antibiotics. *Dent Update* 20:350, 1993
24. Ziffer AM, Scopp IW, Beck J, et al: Profound bleeding after dental extractions during dicumarol therapy. *N Engl J Med* 256:351, 1957
25. Scopp IW, Frederics H: Dental extractions in patients undergoing anticoagulant therapy. *Oral Surg Oral Med Oral Pathol* 11:470, 1958
26. Bloomer C: Excessive hemorrhage after dental extractions using low-molecular-weight heparin (Lovenox) anticoagulation therapy. *J Oral Maxillofac Surg* 62:101, 2004
27. Devani P, Lavery M, Howell CJT: Dental extractions in patients on warfarin: Is alteration of the anticoagulant regime necessary? *Br J Oral Maxillofac Surg* 35:107, 1998
28. Souto JC, Oliver A, Zuaz-Jausoro I, et al: Oral surgery in anticoagulated patients without reducing the dose or oral anticoagulant: A prospective randomized study. *J Oral Maxillofac Surg* 45:27, 1996
29. Martinowitz U, Mazaar A, Taicher S, et al: Dental extraction for patients on oral anticoagulant therapy. *Oral Surg Oral Med Oral Pathol* 70:274, 1990
30. Al-Belasy AM: Hemostatic effect of n-butyl-2-cyanoacrylate (Histocryl) glue in warfarin-treated patients undergoing oral surgery. *J Oral Maxillofac Surg* 61:1405, 2003
31. Carter G, Goss A, Lloyd J, et al: Tranexamic acid mouthwash versus autologous fibrin glue in patients taking warfarin undergoing dental extractions: A randomized prospective study. *J Oral Maxillofac Surg* 61:1432, 2003
32. Bierne OR, Koehler JR: Surgical management of patients on warfarin sodium. *J Oral Maxillofac Surg* 54:1115, 1996
33. Kearon C, Hirsh J: Management of anticoagulation before and after elective surgery. *N Engl J Med* 336:1506, 1997
34. Kuzon W, Urbanek M, McCabe S: The seven deadly sins of statistical analysis. *Ann Plast Surg* 37:265, 1996
35. Bern MM, Lokich JJ, Wallach SR, et al: Very low dose warfarin can prevent thrombosis in central venous catheters; a randomized prospective trial. *Ann Intern Med* 112:423, 1990
36. Levine M, Hirsh J, Gent M, et al: Double-blind randomized trial of a very-low dose warfarin for prevention of thromboembolism in stage IV breast cancer. *Lancet* 343:886, 1994
37. Stroke Prevention in Atrial Fibrillation Investigators: Adjusted-dose warfarin versus low-intensity, fixed-dose warfarin plus aspirin for high risk patients with atrial fibrillation: Stroke Prevention in Atrial Fibrillation III randomized clinical trial. *Lancet* 348:633, 1996
38. Russo G, Corso LD, Blasiolo A, et al: Simple and safe method to prepare patients with prosthetic valves for surgical dental procedures. *Clin Appl Thromb Hemost* 6:90, 2000
39. Saour J, Ali H, Mammo L, et al: Dental procedures in patients receiving oral anticoagulation therapy. *J Heart Valve Dis* 3:315, 1994
40. Assael L: Hemostasis is a shared responsibility. *J Oral Maxillofac Surg* 61:1377, 2003
41. Todd DW, Roman A: Outpatient use of low-molecular weight heparin in an anticoagulated patient requiring oral surgery. A case report. *J Oral Maxillofac Surg* 59:1090, 2001
42. Mehra P, Cottrell D, Bestgen S, et al: Management of heparin therapy in the high-risk, chronically anticoagulated, oral surgery patient: A review and a proposed nomogram. *J Oral Maxillofac Surg* 58:198, 2000