

The mythology of anticoagulation therapy interruption for dental surgery



Michael J. Wahl, DDS

ABSTRACT

Background. Continuous anticoagulation therapy is used to prevent heart attacks, strokes, and other embolic complications. When patients receiving anticoagulation therapy undergo dental surgery, a decision must be made about whether to continue anticoagulation therapy and risk bleeding complications or briefly interrupt anticoagulation therapy and increase the risk of developing embolic complications. Results from decades of studies of thousands of dental patients receiving anticoagulation therapy reveal that bleeding complications requiring more than local measures for hemostasis have been rare and never fatal. However, embolic complications (some of which were fatal and others possibly permanently debilitating) sometimes have occurred in patients whose anticoagulation therapy was interrupted for dental procedures.

Practical Implications and Conclusions. Although there is now virtually universal consensus among national medical and dental groups and other experts that anticoagulation therapy should not be interrupted for most dental surgery, there are still some arguments made supporting anticoagulation therapy interruption. An analysis of these arguments shows them to be based on a collection of myths and half-truths rather than on logical scientific conclusions. The time has come to stop anticoagulation therapy interruption for dental procedures.

Key Words. Anticoagulation; embolism; hemorrhage; hemostasis; ischemic stroke; thrombosis; pharmacology.

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Continuous anticoagulation therapy has been used for decades to prevent stroke, heart attack, and other embolic complications in patients with deep vein thrombosis, pulmonary embolism, history of stroke, atrial fibrillation, and mechanical heart valves. When patients receiving anticoagulation therapy undergo dental surgery (defined as any oral procedure involving an incision or other break in the gingiva or mucosa, which can include anything from single simple dental extractions to implant surgery to multiple surgical extractions and alveoloplasties), a decision must be made either to continue anticoagulation therapy and risk bleeding complications or interrupt anticoagulation therapy and risk embolic complications. Although it has been controversial, after more than 60 years of studies, there is now near universal consensus that anticoagulation therapy including either warfarin (Coumadin, Bristol-Myers Squibb) or direct oral anticoagulation therapy with dabigatran (Pradaxa, Boehringer Ingelheim Pharmaceuticals), apixaban (Eliquis, Bristol-Myers Squibb), rivaroxaban (Xarelto, Janssen Pharmaceutica), or edoxaban (Savaysa, Daiichi Sankyo Company) should not be interrupted for most dental surgical patients because the increased risk of developing bleeding complications (which are usually simple to treat and have not been shown to be fatal) with continuation is outweighed by the increased risk of developing embolic complications (which often are permanently debilitating and sometimes fatal) with interruption.¹⁻⁴ Some investigators have called continuing anticoagulation therapy for dental extractions the “gold standard in the perioperative management of anticoagulation.”⁵

NATIONAL MEDICAL AND DENTAL GROUP STATEMENTS

In 7 different statements, no fewer than 9 national medical and dental groups that have addressed the issue independently now recommend continuing anticoagulation therapy for most dental patients, although 1 group has added an option for interruption. The American Heart Association and

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Table. National medical and dental group recommendations on anticoagulation therapy for dental surgery.*

GROUP, Y	MEDICATION	CONTINUE OR INTERRUPT ANTICOAGULATION THERAPY?
American Heart Association, American College of Cardiology, ⁶ 2003	Warfarin	Continue, use antifibrinolytic mouthrinse
Haemostasis and Thrombosis Task Force of the British Committee for Standards in Haematology, ⁷ 2007	Warfarin	Continue, check international normalized ratio levels within 72 hours before dental surgery
American College of Chest Physicians, ¹⁵ 2012	Vitamin K antagonists (warfarin)	Continue, use oral prohemostatic agent; or interrupt for 2 to 3 days before dental surgery
American Academy of Neurology, ⁸ 2013	Warfarin	Continue
Society for Neuroscience in Anesthesiology and Critical Care, American Society of Anesthesiologists, ⁹ 2014	Warfarin	Continue, for single dental extractions
American Dental Association, ¹⁰ 2015	Vitamin K antagonists (warfarin) and direct oral anticoagulants	Continue, for most patients
American Academy of Oral Medicine, ¹¹ 2016	Warfarin	Continue, use international normalized ratio testing within a few days before the procedure

* Adjuvant local measures for hemostasis should be available, including gauze, sutures, absorbable gelatin foam, oxidized cellulose, microfibrillar collagen, or antifibrinolytic agents. Proper ambulation and diet are important to maintain before and after dental surgery with all patients, but especially with patients receiving vitamin K antagonists such as warfarin, which are associated with certain food interactions.

the American College of Cardiology issued a 2003 statement recommending continuing warfarin anticoagulation therapy with an antifibrinolytic mouthrinse for patients undergoing dental procedures.⁶ The Haemostasis and Thrombosis Task Force of the British Committee for Standards in Haematology in 2007 recommended continuing warfarin anticoagulation therapy for patients undergoing dental surgery, with international normalized ratio (INR) levels checked within 72 hours before surgery.⁷ The American Academy of Neurology issued a 2013 statement recommending continuing warfarin anticoagulation therapy for patients undergoing dental surgery.⁸ In a statement supported by the American Society of Anesthesiologists, the Society for Neuroscience in Anesthesiology and Critical Care recommended in 2014 that patients continue anticoagulation therapy for single dental extractions.⁹ In a statement issued in 2015, the American Dental Association recommended continuing warfarin or direct oral anticoagulation therapy for most patients undergoing dental surgery, stating that “it is not necessary to alter anticoagulation or antiplatelet therapy prior to dental intervention.”¹⁰ The American Academy of Oral Medicine in 2016 recommended that warfarin anticoagulation therapy should be continued for patients undergoing dental procedures, stating, “In general, the risk to the patient from altering the warfarin dosage far exceeds the potential problem of bleeding following dental procedures of this nature.”¹¹

The American College of Chest Physicians (ACCP) statements in 2001,¹² 2004,¹³ and 2008¹⁴ recommended continuing anticoagulation therapy for patients undergoing dental surgery. In the 2004 and 2008 statements, the ACCP recommended coadministration of an oral prohemostatic agent. In the 2012 statement (Table),¹⁵ the ACCP recommended continuing warfarin anticoagulation therapy with the addition of an oral prohemostatic agent (“eg, antifibrinolytic drugs, sutures”¹⁵), but now added an option for a 2- or 3-day anticoagulation therapy interruption, such that INR levels would decrease to a range of 1.6 and 1.9 but not to 1.0 (no anticoagulation therapy at all).^{15,16} Todd¹⁷ has favored a similar approach, reducing the level to an INR of 1.5.

Despite overwhelming evidence supporting anticoagulation therapy continuation, these authors and a few others still advocate interrupting anticoagulation therapy for dental surgery. On analysis, however, the arguments favoring anticoagulation therapy interruption are not based on facts but are actually a collection of myths and half-truths.

ABBREVIATION KEY

ACCP: American College of Chest Physicians.
INR: International normalized ratio.

MYTH 1: STUDY RESULTS SUPPORTING INTERRUPTION

In its 2012 statement,¹⁵ the ACCP cited 4 prospective studies in which the investigators compared dental surgery in patients receiving anticoagulation therapy versus that in patients whose

anticoagulation therapy was reduced briefly or interrupted for surgery.¹⁸⁻²¹ A close look at these studies reveals that their results do not support anticoagulation therapy interruption; in fact, they make a persuasive case against it. In each of these studies, there were no embolic complications in the interruption groups, but blood loss and minor bleeding complications were the same in both the anticoagulation therapy and interruption groups, and the authors in each study independently concluded that anticoagulation therapy should not be interrupted for dental surgery.

MYTH 2: AVAILABILITY OF PROHEMOSTATIC AGENTS

Another reason the ACCP gives for a temporary interruption is when oral prohemostatic agents are unavailable for some patients.¹⁶ Prohemostatic agents are defined as any local hemostatic aids, other than gauze, that can be used for compression, and prohemostatic agents typically are the initial postextraction hemostatic aid. Although antifibrinolytic drugs such as tranexamic acid are examples of oral prohemostatic agents that may not be available for many practitioners in the United States, it is unlikely that dental practitioners performing extractions would not have sutures or other prohemostatic agents (for example, absorbable gelatin or oxidized cellulose) available whether treating patients receiving anticoagulation therapy or healthy patients because the practitioner often cannot know in advance whether the sutures will be needed. Sutures should be available any time a dentist performs an extraction in any patient.

Although oral prohemostatic agents (for example, tranexamic acid rinse) may be beneficial for hemostasis, study results have shown that clinicians can perform dental surgery safely in patients receiving anticoagulation therapy without such agents and with only the same local measures for hemostasis used in healthy patients (for example, gauze compression). Bajkin and colleagues²² studied 90 patients receiving warfarin therapy who underwent 1 or 2 extractions and classified them into 1 of 3 equal groups according to method: suturing, absorbable gelatin sponges, and neither suturing nor absorbable gelatin sponges. There were no bleeding complications requiring more than local measures for hemostasis in any of the groups, and the authors concluded that, in most cases, local pressure was sufficient to control hemostasis in patients receiving anticoagulation therapy. Similarly, Soares and colleagues²³ classified 41 patients receiving anticoagulation therapy who underwent at least 2 extractions with sutures into 1 of 3 groups according to extraction sites. Of 84 extraction sites, only 4 (4.8% of extraction sites) showed postoperative bleeding, which was controlled with 1 of 3 different local hemostatic measures. The authors found simple dry gauze compression equally effective as a hemostatic method as gauze soaked in tranexamic acid or fibrin sponge. Of 35 dental extraction patients receiving anticoagulation therapy with warfarin and only gauze compression administered at the extraction appointment, Abdullah and Khalil²⁴ reported only 4 patients (11.4%) with minor postoperative bleeding, none of whom required more than local measures for hemostasis.

MYTH 3: A DECISION TREE ANALYSIS SUPPORTS INTERRUPTION

In 2010, Balevi²⁵ published a decision tree analysis that purported to show that anticoagulation therapy interruption generally is favored slightly over continuation before dental surgery. This analysis has been discredited widely for various reasons by several authors²⁶⁻²⁸ and by the editor of the journal in which the article had been published.²⁹ Although the author did not define major bleeding in the analysis, he cited 2 studies as examples of major bleeding after dental procedures in patients receiving anticoagulation therapy.^{30,31} There were some cases of minor bleeding requiring additional local hemostatic measures in these studies but no clinically significant bleeding requiring more than local measures in any patient in either the anticoagulation therapy interruption or continuation group in either study, and there were no statistically significant differences in bleeding between the interruption or continuation groups in either study, leading the authors of 1 of the studies to conclude that dental extractions are safe without anticoagulation therapy interruption³⁰ and the authors of the other study to conclude that anticoagulation therapy interruption “should be reconsidered.”³¹

Similarly, although Balevi²⁵ correctly asserts that there has never been a report of a fatal bleeding complication after a dental procedure in a patient receiving anticoagulation therapy (a 0% rate of fatal bleeding), he inexplicably assigns a 1% fatal bleeding rate for his analysis, “[f]or the sake of creating balance,” because certain nondental surgeries such as colorectal or major abdominal surgery may have a 1% fatal bleeding rate. It is unclear why an alleged fatal bleeding rate for these

nondental surgeries would be the basis for such a rate in dental surgery: different than other types of surgeries, with dental surgery, major blood vessels are unlikely to be present, and any potential bleeding complications are usually accessible and simple to treat locally both perioperatively and postoperatively. In his analysis, Balevi²⁵ stated that the analysis “can be updated in the future as more accurate and up-to-date data for each of the variables in the model become available,” and this article is intended to help with such an update.

MYTH 4: NARRATIVE REVIEWS MAY SUPPORT ANTICOAGULATION THERAPY (IMPLYING SYSTEMATIC REVIEWS MAY NOT)

Another criticism Balevi³² has made was that the 1998 review¹ was a narrative review, not a systematic review. A 1998 narrative review by Wahl¹ included all studies and case reports that could be found of dental surgery in patients receiving anticoagulation therapy and did not eliminate any studies. Wahl and colleagues³ 2015 updated review was also a narrative review, again including all studies and case reports that they could find. In a systematic review, some case reports and studies (for example, those that are not randomized controlled trials) often are filtered out, leaving only randomized controlled trials or other controlled studies, which usually are pooled together and analyzed. Although our reviews were narrative, there have been at least 10 systematic reviews of dental surgery in patients receiving anticoagulation therapy, all of which came to the same conclusion as the narrative reviews: anticoagulation therapy should not be interrupted for dental surgery.

In a 2003 systematic review, Dunn and Turpie³³ concluded that most patients can safely continue anticoagulation therapy during dental procedures. In their 2007 systematic review, Aframian and colleagues³⁴ concluded that anticoagulation therapy “need not be modified or discontinued for simple dental extractions.” Madrid and Sanz³⁵ concluded in their 2009 systematic review that the risk of developing postoperative bleeding is the same in patients receiving anticoagulation therapy undergoing dental extraction or receiving implants who continue or interrupt therapy and the same as in patients not receiving anticoagulation therapy at all. In another 2009 systematic review and meta-analysis, Nematullah and colleagues³⁶ concluded, “Continuing the regular dose of warfarin therapy does not seem to confer an increased risk of bleeding compared with discontinuing or modifying the warfarin dose for patients undergoing minor dental procedures.” van Diermen and colleagues³⁷ concluded in their 2013 systematic review, “The evidence and subsequent recommendations from published guidelines all point in the same direction: do not interrupt oral antithrombotic medication, not even dual antiplatelet therapy, in simple dental procedures.”

In their 2013 systematic review and statement for the American Academy of Neurology, Armstrong and colleagues⁸ concluded, “Stroke patients requiring warfarin should routinely continue it when undergoing dental procedures... .” In a 2015 systematic review, Weltman and colleagues³⁸ concluded that patients can continue anticoagulation therapy safely for dental procedures. In their 2016 systematic review and meta-analysis, Yang and colleagues³⁹ concluded, “[P]atients continuing anticoagulant therapy do not have an increased risk of bleeding after dental extractions compared to patients who discontinue oral anticoagulant therapy.” In a 2015 systematic review, Kämmerer and colleagues⁴⁰ concluded that patients should continue their anticoagulation therapy for minor oral surgery. In a 2017 systematic review and meta-analysis, Shi and colleagues⁴¹ found that the postoperative bleeding risk was higher in patients receiving anticoagulation therapy than in those not receiving anticoagulation therapy, but then stated, “Fortunately, using careful local hemostatic methods, the bleeding can be stopped effectively.”

MYTH 5: IT IS ALARMIST TO RECOMMEND CONTINUING ANTICOAGULATION THERAPY BECAUSE OF A LOW INCIDENCE OF EMBOLIC COMPLICATIONS WITH INTERRUPTION, AND EMBOLIC COMPLICATIONS HAVE OCCURRED ONLY WITH LONG INTERRUPTION PERIODS

In his 2010 decision tree analysis, Balevi²⁵ asserted, “there has been no reported case of a dental extraction causing a cardiovascular accident (CVA) in a patient whose warfarin was temporarily discontinued.” I later pointed out that Balevi’s assertion was a “fatal error” to the contrary.²⁷ There had been many documented cases of embolic complications after anticoagulation therapy interruption for dental extractions, including 5 identified (4 fatal) in a 1998 review article.¹ Todd⁴² accurately noted that although there are at least 5 documented cases of embolic complications,

in only 2 of the 5 patients who developed embolic complications were interruption times reported, and those interruptions were for 8 and 9 days, whereas those who now recommended anticoagulation therapy interruption for dental procedures considered an interval of 2 or 3 days' interruption sufficient. In addition, the onset of embolic complications was reported in only 3 of the 5 patients, and the onset was fairly long—5, 17, and 19 days after interruption—leading to the possibility that the embolic complication was unrelated to the interruption itself. A long interruption of many days would carry a higher risk of developing an embolism than a brief interruption of 2 or 3 days, but the risk even with a brief interruption should not be underestimated. After intensive study, there is consensus on an optimal INR range for patients receiving anticoagulation therapy with vitamin K antagonist; an INR of 2.0 to 3.0 for most patients and an INR of 2.5 to 3.5 for patients with mechanical mitral heart valves.⁴³ Interrupting anticoagulation therapy for dental surgery, even briefly, leads to a suboptimal INR level with little or no attendant benefit.

Balevi³² stated that the 1% rate of embolic complications found in the 1998 review¹ was “alarmist” because many of the embolic complications, though they occurred after anticoagulation therapy interruption, could not be attributed definitively to the interruption and may have had other causes. But there have been at least 29 reports of serious embolic complications after anticoagulation therapy was interrupted for dental procedures, including at least 14 (3 fatal) after anticoagulation therapy was interrupted for only 1 to 5 days.⁴⁴⁻⁶¹

In the 2015 review by Wahl and colleagues,³ the 0.8% incidence of postinterruption embolic complications was slightly lower than the 1% incidence in the 1998 review,¹ probably because of the decreased (but still present) risk with shorter interruption intervals in more recent years. Balevi³² proposed a much lower risk of approximately 0.059%²⁵ with a 3-day warfarin therapy interruption, calling the 1% rate “flawed.” But Wysokinski and colleagues⁶² showed a 1.1% embolic complication rate in 345 patients whose anticoagulation therapy was interrupted 342 times for 4 or 5 days for medical or dental procedures, including a patient who developed an occipital infarct after the third day of interruption (for a nondental procedure). Sherwood and colleagues⁶³ found 22 embolic complications after 2,980 temporary interruptions of anticoagulation therapy for medical or dental procedures for 3 or more days, an incidence of 0.7%. Garcia and colleagues⁵³ studied 984 patients whose anticoagulation therapy was interrupted 1,293 times for 5 days or less, and 7 developed embolic complications, an incidence of 0.5%. Patel and colleagues⁶⁴ found 31 embolic complications after 8,245 temporary interruptions of more than 3 days, an incidence of 0.4%. In a systematic review and meta-analysis of 1,073 temporary interruptions of dabigatran for catheter ablation, Bin Abdulhak and colleagues⁶⁵ found 5 embolic complications, an incidence reported as 0.4%. These embolic complication incidences of 0.4% to 1.1% after temporary interruption are between 6 and 19 times greater than Balevi's²⁵ proposed 0.059% incidence.

Many of these higher incidences were for interruptions of potentially more days than the 3 days proposed by Balevi,¹⁵ but the “low” 0.059% embolic complication rate still would be an unacceptable rate when determining whether to interrupt anticoagulation therapy for a dental procedure. With a 0.059% rate, of every 1,700 dental procedures in patients whose anticoagulation therapy was interrupted, 1 would develop an embolic complication—possibly serious long-term injury or death. However, to my knowledge, there never has been a documented fatal case of bleeding in patients whose anticoagulation therapy was continued for dental procedures—of more than 5,431 patients at 5,677 dental visits, there were only 31 cases (0.5% of visits) of postoperative bleeding requiring more than local measures for hemostasis,³ and each patient presumably made a full recovery. When interrupting anticoagulation therapy, even for 2 or 3 days for warfarin or 1 or 2 doses for direct oral anticoagulation therapy, the embolic risk increases. Even if the precise increase in risk is not known, there is little or no attendant benefit, given that, to my knowledge, there never has been a documented case of a fatal oral bleeding complication after a dental procedure in a patient receiving anticoagulation therapy.

MYTH 6: DIRECT ORAL ANTICOAGULATION THERAPY SHOULD BE INTERRUPTED FOR MANY DENTAL PROCEDURES

The safety and efficacy of direct oral anticoagulants (which are newer than vitamin K antagonists such as warfarin) are similar to those of warfarin.⁶⁶⁻⁶⁹ Similarly, the embolic risk when interrupting direct oral anticoagulants for medical and dental procedures is approximately the same as the embolic risk when interrupting vitamin K antagonists such as warfarin. In 2014, Sherwood and

colleagues⁶³ studied 2,165 patients receiving rivaroxaban and 2,527 patients receiving warfarin whose anticoagulation therapy was interrupted temporarily for 3 or more days. Of all the interruptions, 17% were for dental procedures. The difference in the embolic complication rate was not statistically significant with rivaroxaban interruption compared with warfarin interruption; of those patients whose temporary interruptions were for dental or medical procedures, there were 8 (0.55% event rate) patients with interrupted rivaroxaban and 14 patients with interrupted warfarin (0.73% event rate) who had a stroke, systemic embolism, myocardial infarction, or died within 30 days of the interruption. The authors concluded, “Temporary interruption of oral anticoagulation should be avoided to minimize adverse outcomes.”⁶³ In 2013, Patel and colleagues⁶⁴ studied 8,245 temporary anticoagulation therapy interruptions of more than 3 days (3,734 rivaroxaban interruptions and 4,511 warfarin interruptions) and found similar rates of thrombotic events (stroke, noncentral nervous system embolism, myocardial infarction, and vascular death); 14 with rivaroxaban and 17 with warfarin. The authors concluded, “In atrial fibrillation patients who temporarily or permanently discontinued anticoagulation, the risk of stroke or non-CNS embolism was similar with rivaroxaban or warfarin.”

In a 2013 systematic review and meta-analysis by Bin Abdulhak and colleagues⁶⁵ of 3,036 patients whose anticoagulation therapy was interrupted for catheter ablation, including 1,073 receiving dabigatran, the thromboembolic incidence was 0.4% for dabigatran interruption (for 12 or 24 hours) compared with 0.1% for warfarin (both interrupted and noninterrupted). The authors concluded that there was no statistically significant difference in the incidence of thromboembolism between dabigatran interruption and warfarin interruption. Direct oral anticoagulants are relatively new, and it is unclear whether any of the documented embolic complications with direct oral anticoagulation therapy interruption were related to interruptions for dental procedures (as opposed to other types of procedures), but the increased embolic risk is related to the interruption itself and not the reason for the interruption. Other factors that can increase embolic risk include poor health status and the postoperative consequences of surgical procedures that can affect diet, hydration, or ambulation.

Results of controlled comparative studies have shown that dental surgery is safe in patients receiving vitamin K anticoagulation therapy and direct oral anticoagulation therapy. Mauprivez and colleagues⁵ studied 51 patients receiving anticoagulation therapy who required dental extractions; 31 patients were receiving direct oral anticoagulants, and 20 patients were receiving vitamin K antagonists. The difference in bleeding complication incidence between the direct oral anticoagulant group and the vitamin K antagonist group was not statistically significant. Only 5 patients in the direct oral anticoagulant group and 4 patients in the vitamin K antagonist group had minor bleeding complications, all of which were managed with local measures. The authors concluded that “dental extractions can be performed safely in an outpatient facility in patients treated with direct oral anticoagulants by applying local hemostatic measures, without interrupting or modifying oral anticoagulant therapy.”

Hanken and colleagues⁷⁰ studied patients receiving rivaroxaban undergoing 52 procedures, including osteotomies involving the removal of between 1 and 6 teeth. Although the authors found a greater incidence of bleeding complications with rivaroxaban (11.5%) than with phenprocoumon (7.4%), all bleeding complications were simple to treat. The authors stated, “According to our results, and considering that discontinuation of anticoagulation therapy may result in fatal thromboembolic events, continuing anticoagulation therapy, including with rivaroxaban, during oral surgical procedures may therefore be recommended.” In 2017, Zeevi and colleagues⁷¹ studied 72 patients receiving direct oral anticoagulants who were undergoing dental procedures and concluded that interruption of direct oral anticoagulation therapy is unnecessary for dental surgery, regardless of the extent or complexity of the procedure, finding “withdrawal of direct oral anticoagulants was not associated with lower risk for postoperative bleeding.” Other authors also have concluded that direct oral anticoagulation therapy should not be interrupted for most dental surgery.^{4,72-75}

Nevertheless, some have advocated direct oral anticoagulation therapy interruption for dental surgery. In a case report, Romond and colleagues⁷⁶ reported a case of 8 extractions, alveoloplasty, and tuberosity reduction without complications in a patient whose dabigatran was interrupted, and they concluded that dabigatran interruption was therefore safe. In 2016, Miclotte and colleagues⁷⁷ showed that, although all bleeding was controlled with local hemostatic measures, the patients receiving direct oral anticoagulants who skipped their morning dose before a dental extraction and

restarted the normal regimen 4 hours after the procedure had more delayed bleeding than did the control group of healthy patients not receiving antithrombotic therapy. In other words, there was more delayed bleeding in the patients receiving anticoagulation therapy, even though their anticoagulation therapy was interrupted. The authors recommended dental extraction patients receiving direct oral anticoagulants skip their morning dose to avoid excess bleeding. A problem with this study is that there was no third group of patients receiving anticoagulation therapy who did not skip any doses, who may have had a postoperative bleeding incidence similar to that of the patients whose anticoagulation therapy was interrupted.

Others also have recommended interrupting direct oral anticoagulation therapy for some dental procedures,⁷⁸⁻⁸¹ but, to my knowledge, there never has been a fatal case of oral bleeding reported after a dental procedure in a patient receiving anticoagulation therapy, whether direct oral anticoagulation therapy or warfarin anticoagulation therapy. I can find reports of only 3 bleeding complications requiring more than local measures in patients receiving direct oral anticoagulation therapy; in 2 cases, the dose of anticoagulant was reduced,^{71,73} and in the other (“severe” bleeding after 18 extractions⁸²), the anticoagulation therapy was withdrawn. A risk of developing delayed bleeding controlled with local hemostatic measures with continuing anticoagulation therapy seems preferable to a higher (possibly fatal) embolic risk with interrupting anticoagulation therapy, even for just 1 dose.

The half-life of warfarin (range, 20-60 hours; mean, 40 hours) is much longer than the half-life of direct oral anticoagulants (range, 5-17 hours), so when interruption is recommended for dental procedures, the duration of the interruption interval is typically less with direct oral anticoagulants than with warfarin. The increased risk of developing embolic complications with an anticoagulant is related directly to the duration of the interruption of that anticoagulant. A shorter interruption (12 or 24 hours) with direct oral anticoagulants for dental procedures is probably preferable to the 2- or 3-day interruption for warfarin, but interrupting even 1 or 2 doses of direct oral anticoagulants would lead to a suboptimal level during the interruption.

MYTH 7: ANTICOAGULATION THERAPY INTERRUPTION IS INDICATED FOR HIGH-RISK DENTAL SURGERY SUCH AS MULTIPLE SIMPLE EXTRACTIONS OR SURGICAL EXTRACTIONS

Some authors have proposed anticoagulation therapy interruption in cases of “high-risk” (versus “low-risk”) dental surgery. Scully and Wolff⁸³ recommended a 2- or 3-day warfarin anticoagulation therapy interruption in the hospital and for patients undergoing more than 3 simple extractions. Thean and Alberghini⁸⁴ advocated consideration of a 2- to 5-day interruption of direct oral anticoagulation therapy for high-risk dental procedures, such as multiple or surgical extractions. However, dental surgery can be performed safely in patients receiving anticoagulation therapy even when they are undergoing complex procedures such as multiple surgical extractions.

In 2015, Bajkin and colleagues⁸⁵ classified 125 patients receiving anticoagulation therapy into 1 of 3 groups. Group A included 54 patients receiving high levels of anticoagulation therapy (INR \geq 3.5) with up to 3 extractions; group B included 60 patients receiving therapeutic anticoagulation therapy (INR, 2.0-3.5) with higher risk dentoalveolar surgery, including more than 3 extractions or other surgical procedure (including reflecting a flap, osteotomy, or biopsy); and group C included 11 patients receiving high levels of anticoagulation therapy with higher risk dentoalveolar surgery. Eighty-five healthy patients undergoing dental surgery similar to those of groups A and B served as controls. There were no bleeding complications requiring more than local hemostatic methods in any patients in any of the groups. The authors concluded,

Dental extractions in patients who are highly anticoagulated (INR \geq 3.5 to 4.2), as well as more extensive oral surgical procedures in patients who are therapeutically anticoagulated, can be performed safely without interruption or modification of the therapy.⁸⁵

In 2017, Zeevi and colleagues⁷¹ studied 72 patients receiving direct oral anticoagulants who were undergoing dental procedures defined as low risk (“eg, scaling and root planing, one to three simple extractions, soft tissue biopsy, and limited bone augmentation”) or high risk (“eg, complicated surgical extractions, more than three tooth extractions, implant insertion, extensive bone augmentation”). There was “no correlation between high-risk interventions and postoperative

bleeding,”⁷¹ although there was a correlation between soft-tissue manipulation and likelihood of postoperative bleeding. The incidence of bleeding complications was approximately the same in the anticoagulation therapy group as it was in the anticoagulation therapy interruption group. All but 1 bleeding complication was treated with local measures for hemostasis. One patient (who underwent a low-risk procedure of 2 simple extractions) required anticoagulant dosage reduction for postoperative oozing. The authors concluded, “The present data suggest that modification of direct oral anticoagulant therapy for dental surgical procedures is unnecessary, regardless of the type, the complexity, or the extent of the procedure.”⁷¹ There have been numerous other reports of multiple simple and surgical extractions with or without flap elevation or alveoloplasties showing that dental surgery is safe in patients receiving anticoagulation therapy.³

MYTH 8: PATIENT ANXIETY AND DENTIST CONVENIENCE SUPPORT INTERRUPTION

Although it acknowledges that dental surgery can be performed safely without interrupting anti-coagulation therapy, ACCP allows an anticoagulation therapy interruption option because post-operative bleeding sometimes can engender “anxiety and distress.”¹⁵ In defending a brief interruption of anticoagulation therapy for some dental extractions, Todd⁴² has stated,

My experience and that of many of my colleagues is that even though *bleeding is never life threatening* [emphasis added], it can be difficult to control at therapeutic levels of anticoagulation and can be troublesome, especially for elderly patients.

Although postoperative bleeding can cause anxiety and distress, interrupting or reducing anticoagulation therapy for a dental procedure increases the risk of experiencing an embolic event. Not addressed was the anxiety and distress such an embolic event could cause if a patient whose anticoagulation therapy is interrupted is fortunate enough to survive, not to mention the anxiety and distress of the survivors if the embolic event were fatal. Bleeding complications can be troublesome, but embolic complications can be much more troublesome, with devastating short- and long-term effects, including possibly death. In addition, bleeding complications even in patients receiving anticoagulation therapy are relatively uncommon and usually fairly simple to treat. Minor bleeding complications typically occur at approximately the same rate in patients receiving anticoagulation therapy as in those whose anticoagulation therapy is interrupted.^{3,18-21,71}

CONCLUSION

Although the arguments for interruption may be based in mythology, the embolic complications these patients can have are all too real. The evidence shows that it is time to stop anticoagulation therapy interruption for dental surgery.

Dr. Wahl is an assisting attending dentist, Department of Oral Maxillofacial Surgery and Hospital Dentistry, Christiana Care Health System, Wilmington, DE, 19801. Address correspondence to Dr. Wahl, 2003 Concord Pike, Wilmington, DE 19803, e-mail WahlDentistry@aol.com.

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