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Antithrombotic drugs in dentistry: stop the interruption

A Peer-Reviewed Publication
Written by Michael J. Wahl, DDS

Abstract

Antithrombotic medications including anticoagulants such as warfarin (Coumadin) and antiplatelet agents such as aspirin are used by millions of dental patients to prevent various thrombotic complications including stroke or heart attack. Dentists must weigh the risks of postoperative bleeding in patients whose antithrombotic medications are continued versus the risk of thromboembolic complications if antithrombotic medications are interrupted for dental procedures. The dental and medical literature shows only minimal risk of bleeding complications in patients whose anticoagulation or antiplatelet medication is continued for dental surgery, and if bleeding complications occur, they can usually be easily controlled with local measures for hemostasis. The literature also shows a small but significant risk of catastrophic or fatal embolic complications in patients whose anticoagulation or antiplatelet medications are interrupted for dental procedures. There is usually no good reason to interrupt therapeutic levels of continuous anticoagulation or antiplatelet medications for dental surgery with local measures for hemostasis.

Educational Objectives

After completing this course, the reader should:

1. be familiar with the relative risks of bleeding complications in patients on continuous antithrombotic medications such as warfarin and aspirin undergoing dental surgery,
2. be familiar with the relative risks of thromboembolic complications in patients whose continuous antithrombotic medications are interrupted for dental procedures, and
3. understand the purpose of physician consultation in dentistry.

Author Profile

Michael Wahl practices general dentistry in Wilmington, Delaware, and received his undergraduate and dental degrees from Case Western Reserve University. He has published over 60 articles in several dental and medical journals and lectured at many major national and international meetings on dental treatment of medically compromised patients, amalgam and composite, and practice management, among other topics. He is a part-time assistant attending dentist at Christiana Care Health System.

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Abstract

Antithrombotic medications including anticoagulants such as warfarin (Coumadin) and antiplatelet agents such as aspirin are used by millions of dental patients to prevent various thrombotic complications including stroke or heart attack. Dentists must weigh the risks of postoperative bleeding in patients whose antithrombotic medications are continued versus the risk of thromboembolic complications if antithrombotic medications are interrupted for dental procedures. The dental and medical literature shows only minimal risk of bleeding complications in patients whose anticoagulation or antiplatelet medication is continued for dental surgery, and if bleeding complications occur, they can usually be easily controlled with local measures for hemostasis. The literature also shows a small but significant risk of catastrophic or fatal embolic complications in patients whose anticoagulation or antiplatelet medications are interrupted for dental procedures. There is usually no good reason to interrupt therapeutic levels of continuous anticoagulation or antiplatelet medications for dental surgery with local measures for hemostasis.

Antithrombotic medications including anticoagulants and antiplatelet drugs are used by millions of patients to prevent heart attacks and strokes. Anticoagulants include vitamin K

inhibitors such as warfarin (Coumadin) and direct-acting oral anticoagulants (DOACs) such as dabigatran (Pradaxa), apixaban (Eliquis), rivaroxaban (Xarelto), and edoxaban (Savaysa). Antiplatelet medications include aspirin, cilostazol (Pletal), clopidogrel (Plavix), dipyridamole (Persantine, Aggrenox), ticagrelor (Brilinta), ticlopidine (Ticlid), and prasugrel (Effient) (Health and Human Services) of the Commonwealth of Massachusetts. Anticoagulants and antiplatelet agents. (<https://masshealthdruglist.ehs.state.ma.us/MHDL/pubtheradetail.do?id=110> Accessed July 27, 2017.) [Table 1] These medications slow down the clotting process and are often colloquially called “blood thinners.”

Anticoagulants are prescribed for a variety of conditions, including atrial fibrillation, artificial heart valve, valvular heart disease, left ventricular dysfunction or thrombus, history of deep vein thrombosis or embolism, and history of transient ischemic attack or stroke. Antiplatelet drugs are also prescribed as antithrombotic medications for various conditions, including atrial fibrillation, history of angina or myocardial infarction, coronary artery disease prevention, history of coronary bypass surgery, history of transient ischemic attack or stroke, and asymptomatic carotid artery disease.

Dentists must weigh the risks of potential hemorrhage after dental procedures in patients on antithrombotic medications versus embolic complications if such medications are withdrawn or reduced before the procedure. Fortunately, dental surgery including simple or surgical extractions is different than other types of surgery. Major blood vessels are unlikely to be encountered, and perioperative and postoperative bleeding sites are usually accessible without further surgery. Local measures to aid hemostasis including application of pressure by biting on gauze, tea bags, oxidized cellulose, absorbable gelatin, tranexamic acid mouthwash, and suturing are simple to use and usually effective.

Table 1. Antithrombotic medications and indications

Anticoagulants	Antiplatelet medications
warfarin (Coumadin) apixaban (Eliquis) dabigatran (Pradaxa) edoxaban (Savaysa) rivaroxaban (Xarelto)	aspirin cilostazol (Pletal) clopidogrel (Plavix) dipyridamole (Persantine, Aggrenox) prasugrel (Effient) ticagrelor (Brilinta) ticlopidine (Ticlid)
Anticoagulant indications (for warfarin, recommended therapeutic range for most conditions: INR 2.0-3.0, for some mechanical mitral heart valves: INR 2.5-3.5): atrial fibrillation artificial heart valve valvular heart disease left ventricular dysfunction or thrombus history of deep vein thrombosis or embolism history of transient ischemic attack or stroke	Antiplatelet medication indications: atrial fibrillation history of angina or myocardial infarction coronary artery disease prevention history of coronary bypass surgery history of transient ischemic attack or stroke asymptomatic carotid artery disease

In the past, dental treatment for patients on antithrombotic medication was controversial, since such patients can be at higher risk of hemorrhage after dental procedures. As early as 1956, Askey and Cherry¹ reported on six anticoagulated patients undergoing 14 extractions without bleeding complications and warned that the risk of embolic complications exceeded the risk of bleeding complications for dental extractions in anticoagulated patients. In contrast, Ziffer et al.² in 1957 recommended interrupting anticoagulation for dental extractions after reporting the first cases of serious bleeding requiring more than local hemostatic measures to control (in these cases, injections of vitamin K) after dental extractions in anticoagulated patients.

More recent studies have repeatedly shown that bleeding complications (low morbidity—usually simple to treat with additional local measures for hemostasis) are uncommon in patients on antithrombotic medications undergoing dental surgery with local measures for hemostasis, and concern about potential embolic complications (high morbidity—embolic complications such as stroke or heart attack often have devastating long-term consequences or can possibly be fatal) has outweighed the risk of hemorrhage. Most authorities—including the authors' controlled studies and numerous systematic and narrative reviews—have concluded that therapeutic levels of antithrombotic medications should not be interrupted for most dental surgical procedures, including simple single or multiple extractions.³⁻¹⁹

In spite of overwhelming evidence that therapeutic levels of antithrombotic medications should not be interrupted or reduced for dental surgery, surveys on anticoagulant and antiplatelet drugs in dental procedures have repeatedly found that dentists and physicians overestimate the risk of postoperative hemorrhage and underestimate the risk of thrombotic complications in patients on antithrombotic agents²⁰⁻²⁹ and often prefer interruption to continuation of antithrombotic medications for dental surgery.

Warfarin

Warfarin (named for the Wisconsin Alumni Research Foundation, which funded the research for its discovery) is an anticoagulant used to decrease the risk of thromboembolism, including stroke or transient ischemic attacks, but it can also increase the risk of bleeding. Dental surgery in anticoagulated patients can present a challenge to dentists and physicians. The bleeding risk in continuously anticoagulated patients undergoing dental surgery including extractions must be weighed against the embolic risks in withdrawing or reducing anticoagulation before dental procedures.

Warfarin anticoagulation is now measured by the International Normalized Ratio (INR). The recommended therapeutic range for most patients on continuous anticoagulation with warfarin is INR 2.0 to 3.0, but for some patients with mechanical mitral heart valves, the recommended range is

INR 2.5 to 3.5.³¹ INR levels have traditionally been checked by blood drawn in laboratories or hospitals, but there are now also home testing devices allowing patients to self-monitor their INR levels.³² The American College of Chest Physicians (ACCP) recommends that motivated and competent patients be encouraged to self-test and manage their INR levels.³³

A 2015 narrative review³⁴ revealed that of 5,431 anticoagulated dental patients undergoing over 11,381 surgical procedures (including simple and surgical extractions, full-mouth extractions with alveoplasties, alveolar surgery, and gingival surgery, many with patients at anticoagulation levels significantly higher than present therapeutic levels), only 31 (~0.6% of patients) required more than local measures for hemostasis. Of the 31 bleeding complications requiring more than local hemostatic measures (e.g., vitamin K injection, adjustment of warfarin dose, or transfusion), many were anticoagulated significantly above therapeutic INR levels (which may have contributed to the bleeding), and none was fatal. On the other hand, the review found that of at least 2,673 patients whose anticoagulation was reduced or withdrawn for at least 2,775 dental visits, there were 22 embolic complications (0.8% of cessations), including six fatal events (0.2% of cessations). These results were similar to earlier reviews,^{35,36} which also concluded that anticoagulation should not be interrupted for dental procedures.

In 2007, the Haemostasis and Thrombosis Task Force of the British Committee for Standards in Haematology reviewed the literature and then issued a statement for managing anticoagulated patients undergoing dental surgery.³⁷ These guidelines were reviewed by the British Committee for Standards in Haematology, the British Society for Haematology Committee, the British Dental Association, and the National Patient Safety Agency. The authors found the bleeding risk to be low for dental surgery in patients anticoagulated at INR 2.0 to 4.0 (even above therapeutic levels) and recommended that anticoagulation be continued in most of these patients, with hemostasis controlled by local measures. They also recommended that INR levels be checked on stably anticoagulated patients within 72 hours of surgery. Similarly, there have been at least seven systematic reviews of anticoagulation in dental surgery studies that independently reached the same conclusion: anticoagulation should generally not be interrupted for dental surgery.^{7,11,14-16,37,39} There have been only a few bleeding complications in anticoagulated dental patients, virtually all simple to treat with local measures for hemostasis, and none fatal. On the other hand, there have been some embolic complications in dental patients whose anticoagulation was interrupted, many probably permanently debilitating and some fatal. As a result, when weighing the risks versus benefits, continuing anticoagulation for dental surgery is virtually always more prudent than anticoagulation interruption.

National medical and dental group recommendations

National medical and dental recommendations for anticoagulated patients have been virtually unanimous [Table 2]: The American Academy of Oral Medicine,⁴⁰ the American Dental Association,⁴¹ the Society for Neuroscience in Anesthesiology and Critical Care (supported by the American Society of Anesthesiologists),⁴² the American Academy of Neurology,⁴³ The Haemostasis and Thrombosis Task Force of the British Committee for Standards in Haematology,³⁷ the American Heart Association,⁴⁴ and the American College of Cardiology⁴⁴ all recommend continuing anticoagulation for most dental procedures. Although the American College of Chest Physicians (ACCP) recommended continuing anticoagulation for dental extractions in its statements in 2001, 2004, and 2008, the current 2012⁴⁵ statement recommends a choice of either continuing anticoagulation using a prohemostatic mouthwash such as tranexamic acid to aid in hemostasis for minor dental procedures including extractions, or withdrawing anticoagulation for two or three days before the procedure, partly based on the fact that in four controlled comparative studies⁴⁶⁻⁴⁹ between anticoagulated patients and patients whose anticoagulation was briefly interrupted, there were no postoperative embolic events (and no significant postoperative bleeding problems) in the interruption groups in these studies. What the ACCP failed to mention, however, is that in each of these four studies, there were no differences in blood loss or the incidence of minor postoperative bleeding between the respective anticoagulation or interruption groups. In addition, in each of the four studies, the authors independently concluded that anticoagulation should not be interrupted for dental procedures. Since minor postoperative bleeding is the same whether anticoagulation is continued or interrupted, then prudence would dictate that anticoagulation be continued for dental procedures in spite of the interruption option recommendation.

Direct-acting anticoagulants

Although more expensive than vitamin K antagonists such as warfarin, direct-acting anticoagulants (DOACs) including apixaban, dabigatran, edoxaban, and rivaroxaban do not require INR monitoring, have a more rapid onset, fewer drug and food interactions, and a shorter half-life (5-17 hours versus 20-60 hours for warfarin). As a result of the shorter half-life, when anticoagulation is interrupted for surgical procedures, the standard interruption interval is usually one day for DOACs versus two or three days for warfarin. While studies of dental treatment of patients on DOACs are limited, there is no evidence that bleeding complications are greater in DOAC-treated patients than with warfarin anticoagulated patients,⁵⁰⁻⁵³ and as a result, DOAC anticoagulation should not be interrupted for dental surgery.

Dentists and physicians have often overestimated the risks of bleeding complications in anticoagulated patients and underestimated the embolic risks in patients whose anticoagulation is interrupted for dental procedures. Many dentists are unaware of the risk of serious and sometimes fatal embolic complications in patients whose anticoagulation is interrupted for dental procedures. In a 2010 “decision analysis,” to support the idea that anticoagulation should be reduced or withdrawn for some dental extractions, Balevi incorrectly asserted, “there has been no reported case of a dental extraction causing a cardiovascular accident (CVA) in a patient whose warfarin was temporarily discontinued.”⁵⁴

In fact, there were many documented embolic complications with anticoagulation interruption for dental procedures before 2010, and an update of the 1998 review³⁴ has shown that of at least 3,278 dental patients whose anticoagulation was interrupted for at least 3,380 appointments,⁵⁵ there have now been at least 29 cases of embolic complications (0.9% of patients or visits) after anticoagulation interruption for dental procedures, seven of which were fatal (0.2% of patients or visits), most of which occurred before 2010.⁵⁶⁻⁷³ “For the sake of

Table 2. National medical and dental group statements on anticoagulation and dental procedures

Year	Group	Recommendation
2016 ⁴⁰	American Academy of Oral Medicine	Continue warfarin anticoagulation with INR testing within a few days of the procedure
2015 ⁴¹	American Dental Association	Continue warfarin or DOAC for most patients
2014 ⁴²	The Society for Neuroscience in Anesthesiology and Critical Care (supported by the American Society of Anesthesiologists)	Continue anticoagulation for single dental extractions
2013 ⁴³	American Academy of Neurology	Continue warfarin anticoagulation
2012 ⁴⁵	American College of Chest Physicians	Continue warfarin anticoagulation with oral prohemostatic agent or interrupt anticoagulation for 2-3 days before dental surgery
2007 ³⁷	The Haemostasis and Thrombosis Task Force of the British Committee for Standards in Haematology	Continue warfarin anticoagulation, checking INR levels within 72 hours of dental surgery
2003 ⁴⁴	American Heart Association and American College of Cardiology	Continue warfarin with antifibrinolytic mouthwash

creating balance,” Balevi used a 1% postdental bleeding fatality incidence for his reanalysis even though there has never been a reported fatal bleeding complication (a 0% incidence) in an anticoagulated patient. In addition, he grossly underestimated the risk of embolic complications with a three-day interruption of anticoagulation, using an incidence of only 0.059%. Wysokinski et al.⁷⁴ have shown an embolic complication rate after a four- or five-day interruption (not limited to interruptions for dental procedures) of 1.1% (18 times greater than Balevi’s rate), and Garcia et al.⁶⁵ have shown a rate of 0.4% (more than six times greater than Balevi’s rate) after an interruption of five days or less.

Even accepting a 0.059% embolic complication rate with anticoagulation interruption, that would mean that there would be one embolic complication for every 1,700 interruptions for dental procedures. The choice in this case would be for the patient to have a 1 in 1,700 chance of embolic complication (including death or disability) with interruption versus when anticoagulation is continued an approximately 0% chance of death from a bleeding complication, which, if it occurs, can typically be treated with additional local measures for hemostasis. To think of it another way, there are about 87,000 daily airplane flights in the United States. A 0.059% incidence of crashes would mean there would be 51 daily airplane crashes.⁷⁵ If airplane passengers were informed of this incidence before flying, it is doubtful that many of them would choose to fly.

Another reason some have opposed anticoagulation continuation for dental procedures is that dentists and patients find bleeding complications “troublesome”: to support the idea of interruption for some dental procedures, Todd pointed out that bleeding after dental surgery, “while never life threatening, can be quite disconcerting and require repeated local measures...”⁷⁶ Although postdental bleeding complications in anticoagulated patients can be “troublesome” to both patients and dentists, they are usually simple to treat and have never been shown to be fatal. In contrast, embolic complications such as stroke and heart attack can have devastating consequences, including death. A cardiologist once opined that some patients may prefer death to living with the complications of a stroke. The decision to continue or interrupt anticoagulation for dental procedures has therefore been summarized as “bleed or die.”⁷⁷

Warfarin has a long half-life of about 40 hours, so when warfarin therapy is interrupted, it takes about five days to reach normal hemostasis.⁷⁸ Todd has advocated a brief discontinuation of anticoagulation for oral surgical procedures, partly based on an alleged lack of cases in the literature of thrombotic events in patients whose INR levels fell to 1.5-2.0 (which would still be above the “normal” INR of 1.0).^{76,79} But Akopov et al. in 2005 reported that five patients who suffered thrombotic events were at INR levels between 1.5 and 2.0 at admission to the hospital after anticoagulation withdrawal for medical procedures.⁶¹ In addition, there have been embolic complications reported after anticoagulation interruption pe-

riods of only three days for dental procedures.^{64,71} Looking at medical procedures in general, relatively brief anticoagulation interruption periods of five days or less are associated with unacceptable embolic complication rates.^{65,74} Moreover, the optimal INR range to prevent stroke with minimal risk of hemorrhage has been the subject of intense study and for most patients has been defined as INR 2.0 to 3.0 (INR 2.5 to 3.5 for some high-risk patients). Reducing the dose below these levels to a *suboptimal* level will therefore expose these patients to a higher risk of stroke or even death for little or no benefit in prevention of hemorrhage, which, if it occurs at all, can be treated with local measures. It is true that embolic events are infrequent when warfarin anticoagulation is briefly interrupted, but when an embolic event such as a stroke occurs, it is usually catastrophic and possibly fatal. It also should be noted that bleeding complications can sometimes occur even in patients not anticoagulated with warfarin.

Aspirin



Figures 1 and 2. Felix Hoffmann, a chemist with the Bayer Company in Germany, first isolated pure acetylsalicylic acid (ASA) in 1897, calling it “Aspirin” in 1899.



The therapeutic analgesic effects of aspirin, also known as acetylsalicylic acid (ASA), were first recorded over 2,000 years ago by Hippocrates, when he recommended chewing willow leaves (which contain salicylic acid) during child-

birth.⁸⁰ Charles Frédéric Gerhardt (1816-1856), a chemist at the German company Bayer, discovered acetylsalicylic acid in 1853 although in an impure form.⁸¹ Felix Hoffmann (1868-1946) [Figures 1 and 2], another chemist at Bayer, was the first to isolate pure acetylsalicylic acid in stable form in 1897, naming it “Aspirin” for commercial manufacture and sale in 1899.⁸² Originally a trade name, Bayer eventually lost or sold its rights to the trademark, and aspirin entered the lexicon as a generic name for acetylsalicylic acid. Since then, aspirin’s analgesic, antipyretic, anti-inflammatory, and anti-thrombotic effects have made aspirin a “wonder drug” and one of the most commonly used in all the world. When aspirin is used for antithrombosis, the typical dosage can vary between 75 and 325 mg daily.³¹

Dentists and physicians must weigh the potential bleeding complications in patients on continuous antiplatelet drugs such as aspirin versus the potential for heart attacks or strokes in patients whose antiplatelet therapy is interrupted for dental procedures. There have been four case reports of severe bleeding including two involving platelet transfusions after dental treatment in patients on aspirin, but these reports each include patients at very high dosages or taking other medications that may have been responsible for the bleeding.⁸³⁻⁸⁶ Three of these reports were in the 1970s, and one was in 1997.

There have been more than 6,265 dental surgical procedures in over 3,522 dental patients without interrupting antiplatelet therapy reported in the medical and dental literature.^{19,87} The antiplatelet therapy in these studies included many patients on dual antiplatelet medications such as aspirin and clopidogrel (Plavix) and other newer antiplatelet medications such as cilostazol (Pletal), dipyridamole (Persantine, Aggrenox), prasugrel (Effient), ticagrelor (Brilinta), or ticlopidine (Ticlid). Of these, there were minor bleeding complications (requiring additional local measures for hemostasis) in no more than 86 patients, a minor bleeding incidence of only 2.4%. Only two patients required more than additional local measures for hemostasis, a serious bleeding complication rate of only 0.06%. Over 99% of all dental surgery in patients on antiplatelet medications required no more

than local measures for hemostasis. It can be concluded that the risk of bleeding is extremely low after dental procedures in patients on therapeutic levels of antiplatelet medications. Just as with warfarin anticoagulation, it should be noted that bleeding complications can sometimes occur even in patients not on antiplatelet medications.

Of at least 752 interruptions of antiplatelet therapy in 702 patients, there have been at least 19 embolic complications (2.5% of interruptions), including myocardial infarction, stent thrombosis, coronary artery syndrome, and cerebrovascular strokes. The actual risk is probably significantly lower than 2.5% since this incidence includes only reports and studies in the medical and dental literature, but it is certainly true that the embolic risk increases when antiplatelet therapy is interrupted.

Some physicians and dentists assume that there is little or no risk of serious thrombotic complications in patients whose antiplatelet therapy is interrupted for dental procedures, but in many controlled studies of patients on low-dose aspirin, stroke, myocardial infarction, or death was significantly more likely to occur in those whose antiplatelet therapy was interrupted for any reason (not just dental procedures).⁸⁸⁻⁹² The risk of thrombotic complications with antiplatelet interruption is low but not zero and such complications are potentially serious or even fatal. If aspirin therapy is interrupted for surgery, a seven- to ten-day interruption was thought to be prudent,⁹³ but Sonksen et al. showed that a two-day interruption is sufficient for normal hemostasis⁹⁴ and Brennan et al. recommended no more than a three-day interruption.⁹⁵ If aspirin therapy is interrupted for a dental procedure, it is the physician and not the dentist who should recommend the interruption.

National medical and dental group recommendations for dental surgery in patients on antiplatelet medications

National medical and dental groups are unanimous in recommending against interruption of antiplatelet medications for most dental procedures [Table 3]. The American Dental Association states, “There is strong evidence [that] it is not nec-

Table 3. National medical and dental group statements for dental treatment in patients on antiplatelet medications

Year	Group	Recommendation
2015 ⁴¹	American Dental Association	Continue antiplatelets for dental procedures
2014 ⁴²	The Society for Neuroscience in Anesthesiology and Critical Care (supported by the American Society of Anesthesiologists)	Continue antiplatelets for single dental extractions
2013 ⁴³	American Academy of Neurology	Continue aspirin for dental procedures
2012 ⁴⁵	American College of Chest Physicians	Continue aspirin for dental procedures
2007 ⁹⁶	American Heart Association, American College of Cardiology, Society for Cardiovascular Angiography and Interventions, American College of Surgeons, and American Dental Association	Continue antiplatelets for dental procedures

essary to alter anticoagulation or antiplatelet therapy prior to dental intervention.”⁴¹ These other national medical and dental groups also warn against interrupting antiplatelet medications for most dental procedures: the American Heart Association, Society for Neuroscience in Anesthesiology and Critical Care (supported by the American Society of Anesthesiologists), American Academy of Neurology, American College of Cardiology, Society for Cardiovascular Angiography and Interventions, American College of Surgeons, and American College of Chest Physicians.^{42,43,45,96}

Physician consultation by dentists

C. Edmund Kells [Figure 3] was a pioneer in dental radiography, being the first person to x-ray teeth in live humans, and the inventor of surgical suction, which was probably one of the greatest advances in both general and oral surgery at the time. Born in 1856 in New Orleans, he graduated from New York Dental College, joining his father in dental practice. Kells became the first dentist in the South to use street electric current in his dental office, doing the wiring himself. Kells developed an appreciation for the uses of electricity while in dental school, frequently visiting Thomas Edison’s laboratory across the river. He was also the first dentist in the South to use female dental assistants. Although many dentists considered female dental assistants to be inappropriate, eventually the idea caught on, and unaccompanied females could be comfortable visiting dental offices employing “ladies in waiting” as dental assistants. In addition to many scientific articles, he published a book on practice management, *The Dentist’s Own Book*, in 1925. As a result of his early experiments with dental radiography and the radiation associated with it, Kells developed lesions on his left hand, which eventually spread to the whole arm, which had to be amputated. Kells took his own life in 1928 after finding out that the cancer had gone to his heart and lungs.



Figure 3. C. Edmund Kells, a pioneer in dental radiography, criticized physician consultation for dentists as early as 1920.

As early as 1920, Kells criticized physician consultation.⁹⁷ Dental patients would frequently present with physician recommendations for wholesale and wanton extraction of salvageable and healthy teeth to cure various maladies such as insanity or arthritis, based on the focal infection theory. Dentists would blindly follow such advice, and Kells decried this practice, calling it “the Crime of the Age.... The time will come, however, —the time must come—when no exodontist of *standing* will extract a tooth upon the orders of a physician. A dentist, and no one but a dentist, should sign the death certificate of a tooth. The Lord only knows why physicians should want to sign such certificates. Don’t they sign enough such certificates in their own legitimate line?”

In 2012, Gary and Glick (the editors of the *Journal of the American Dental Association*) discussed the issue of “medical clearance” in dentistry and stated that physician consultation can be a valuable tool, but it should not be a “crutch.”⁹⁸ Many dentists are under the impression that physician consultation somehow insulates dentists from legal liability in a patient’s care. But it is the dentist, not the physician, who is responsible for dental treatment decisions. It may be worthwhile to consult with the physician if information is needed about what a patient’s INR level is, but there is no need to determine if therapeutic levels of anticoagulation should be withdrawn for a simple extraction—anticoagulation at therapeutic levels should be continued for simple extractions. The American Dental Association Division of Legal Affairs has stated that “the dentist who blindly follows the physician’s recommendation, even though it conflicts with the dentist’s professional judgment, will not be able to defend himself or herself by claiming ‘the devil made me do it’ if the patient sues. The courts recognize that each independent professional is ultimately responsible for his or her own treatment decisions.”⁹⁹

There may be some physicians who recommend clinically acceptable amalgam restoration removal and replacement with nonamalgam materials as a cure for multiple sclerosis, but there is no credible evidence amalgam restorations cause or amalgam removal cures multiple sclerosis, and a dentist who follows such advice to his patient’s detriment could be liable for any harm caused by such negligent treatment. Physician consultation for dental surgery in anticoagulated patients is similar to this example.

A dental license is not a license to defer dental treatment decisions to nondentists, even if the nondentist is a physician. While physician consultation can and should be a valuable tool for dentists, especially for gaining information necessary for safe patient treatment (e.g., a patient’s INR level), it is not a substitute for knowledge, experience, and clinical judgment. Physicians have been shown to misunderstand the bleeding risks inherent to dental procedures. For example, in a 1996 survey of physicians, more physicians recommended anticoagulation interruption for conventional endodontic therapy than for professional cleanings even though there is usually little or no

bleeding associated with endodontic therapy, and certainly less so than bleeding associated with professional cleanings.²⁴

There have been at least four separate cases of embolic complications (two fatal) after physician consultation and anticoagulation interruption.⁶² In other words, the dentist consulted the physician, who recommended interruption of warfarin before the dental surgery. The patients in each of these cases suffered strokes, and two died. A lawsuit was filed in each case, and presumably both the dentist and the physician in each case were sued. In these cases, there was no reason to interrupt therapeutic levels of anticoagulation for dental extractions and certainly no reason for the dentist to ask the patient's physician to consider such an interruption (although there may have been a reason to consult with the physician to determine the patient's INR levels).

If before a dental extraction appointment, the dentist requests a physician consultation for antithrombotic medication interruption, and the physician recommends interruption for a dental extraction, then the dentist has a duty to advise the patient that dental surgery can be accomplished with minimal hemostatic risk in patients on continuous antithrombotic medications, and that such an interruption carries a risk of serious and possibly fatal embolic complications. The dentist should explain to the patient that if a bleeding complication occurs at all, it would unlikely be catastrophic or fatal. In no case should a dentist recommend interruption of antithrombotic medications—if the patient's antithrombotic medication is to be interrupted, it is solely the physician and not the dentist who should order the interruption.

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Author Profile

Michael Wahl practices general dentistry in Wilmington, Delaware, and received his undergraduate and dental degrees from Case Western Reserve University. He has published over 60 articles in several dental and medical journals and lectured at many major national and international meetings on dental treatment of medically compromised patients, amalgam and composite, and practice management, among other topics. He is a part-time assistant attending dentist at Christiana Care Health System.

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Questions

1. If aspirin therapy is interrupted for surgery, what is the maximum interruption recommended for normal hemostasis?
 - a. 2-3 days
 - b. 4-5 days
 - c. 6-7 days
 - d. 8-9 days
2. What is the half-life of warfarin?
 - a. 4 minutes
 - b. 40 minutes
 - c. 4 hours
 - d. 40 hours
3. How is dental surgery different than other major surgery?
 - a. Major blood vessels are unlikely to be encountered.
 - b. Perioperative and postoperative bleeding sites are accessible without further surgery.
 - c. Local measures for hemostasis are usually sufficient.
 - d. all of the above
4. Warfarin was named after:
 - a. Albert S. Warfarin
 - b. the Wisconsin Alumni Research Foundation
 - c. the San Francisco Wharf
 - d. none of the above
5. Physician consultation is usually valuable for the treating dentist to determine:
 - a. a patient's INR level before dental surgery
 - b. if continuous warfarin therapy should be interrupted before conventional root canal therapy
 - c. if continuous warfarin therapy should be interrupted before a simple dental extraction
 - d. all of the above
6. Which of the following is not a local hemostatic method?
 - a. biting on gauze
 - b. tranexamic acid mouthwashes
 - c. injection of vitamin K
 - d. suturing
7. Anticoagulants such as warfarin are not used for which of the following conditions?
 - a. atrial fibrillation
 - b. artificial heart valve
 - c. menopause
 - d. deep vein thrombosis or embolism
8. Which of the following national medical or dental organizations recommends interruption of antiplatelet therapy for simple dental extractions?
 - a. American Dental Association
 - b. American Heart Association
 - c. both a & b
 - d. none of the above
9. Salicylic acid is found in which of the following?
 - a. oak leaves
 - b. maple leaves
 - c. willow leaves
 - d. pine needles
10. Which company coined the term "Aspirin"?
 - a. St. Joseph's
 - b. Johnson & Johnson
 - c. Bayer
 - d. none of the above
11. What are the potential complications of a dental extraction in a patient whose warfarin anticoagulation is interrupted?
 - a. bleeding
 - b. stroke
 - c. death
 - d. all of the above
12. What are the potential complications of a dental extraction in a patient whose aspirin therapy is interrupted?
 - a. bleeding
 - b. myocardial infarction
 - c. death
 - d. all of the above
13. In the medical and dental literature, how many cases of dental surgery in anticoagulated patients required more than local measures for hemostasis?
 - a. 5%
 - b. 2%
 - c. 1%
 - d. <1%
14. How many cases of dental surgery in patients on antiplatelet medication required more than local measures for hemostasis?
 - a. 5%
 - b. 2%
 - c. 1%
 - d. <1%
15. When a simple dental extraction is planned for a patient anticoagulated with warfarin at therapeutic levels, the dentist should:
 - a. advise interruption of anticoagulation
 - b. consult with the physician for possible interruption of anticoagulation
 - c. proceed with the planned extraction
 - d. none of the above
16. The most widely-accepted measure of warfarin's anticoagulant effect is the
 - a. Prothrombin Time Ratio (PTR).
 - b. International Normalized Ratio (INR).
 - c. Complete Blood Count (CBC).
 - d. none of the above
17. The recommended therapeutic range of anticoagulation for most patients except mechanical mitral valve on warfarin anticoagulation is INR:
 - a. 1.5-2.5
 - b. 2.0-3.0
 - c. 2.5-3.5
 - d. 3.0-4.0
18. Surveys have shown that for dental procedures in patients on anticoagulant or antiplatelet medications, most dentists and physicians:
 - a. overestimate bleeding risk and underestimate stroke risk
 - b. overestimate stroke risk and underestimate bleeding risk
 - c. overestimate bleeding risk and overestimate stroke risk
 - d. underestimate bleeding risk and underestimate stroke risk
19. If a dentist follows the physician's advice for a dental treatment decision, who is primarily legally responsible for the dental treatment decision?
 - a. the dentist
 - b. the physician
 - c. the patient
 - d. both a & b
20. Which of the following is an anticoagulant drug?
 - a. warfarin (Coumadin).
 - b. dabigatran (Pradaxa).
 - c. rivaroxaban (Xarelto).
 - d. all of the above

Antithrombotic drugs in dentistry: stop the interruption

Name: _____ Title: _____ Specialty: _____

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Requirements for successful completion of the course and to obtain dental continuing education credits: 1) Read the entire course. 2) Complete all information above. 3) Complete answer sheets in either pen or pencil. 4) Mark only one answer for each question. 5) A score of 70% on this test will earn you 3 CE credits. 6) Complete the Course Evaluation below. 7) Make check payable to PennWell Corp. **For Questions Call 800-633-1681**

Educational Objectives

- be familiar with the relative risks of bleeding complications in patients on continuous antithrombotic medications such as warfarin and aspirin undergoing dental surgery,
- be familiar with the relative risks of thromboembolic complications in patients whose continuous antithrombotic medications are interrupted for dental procedures, and
- understand the purpose of physician consultation in dentistry.

Course Evaluation

1. Were the individual course objectives met?

Objective #1: Yes No Objective #2: Yes No

Objective #3: Yes No

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

- | | | | | | | |
|---|-------|-----|---|----|---|---|
| 2. To what extent were the course objectives accomplished overall? | 5 | 4 | 3 | 2 | 1 | 0 |
| 3. Please rate your personal mastery of the course objectives. | 5 | 4 | 3 | 2 | 1 | 0 |
| 4. How would you rate the objectives and educational methods? | 5 | 4 | 3 | 2 | 1 | 0 |
| 5. How do you rate the author's grasp of the topic? | 5 | 4 | 3 | 2 | 1 | 0 |
| 6. Please rate the instructor's effectiveness. | 5 | 4 | 3 | 2 | 1 | 0 |
| 7. Was the overall administration of the course effective? | 5 | 4 | 3 | 2 | 1 | 0 |
| 8. Please rate the usefulness and clinical applicability of this course. | 5 | 4 | 3 | 2 | 1 | 0 |
| 9. Please rate the usefulness of the supplemental bibliography. | 5 | 4 | 3 | 2 | 1 | 0 |
| 10. Do you feel that the references were adequate? | | Yes | | No | | |
| 11. Would you participate in a similar program on a different topic? | | Yes | | No | | |
| 12. If any of the continuing education questions were unclear or ambiguous, please list them. | _____ | | | | | |
| 13. Was there any subject matter you found confusing? Please describe. | _____ | | | | | |
| 14. How long did it take you to complete this course? | _____ | | | | | |
| 15. What additional continuing dental education topics would you like to see? | _____ | | | | | |

If not taking online, mail completed answer sheet to
PennWell Corp.
 Attn: Dental Division,
 1421 S. Sheridan Rd., Tulsa, OK, 74112
 or fax to: 918-831-9804

For IMMEDIATE results,
 go to www.DentalAcademyOfCE.com to take tests online.
INSTANT EXAM CODE 15222
 Answer sheets can be faxed with credit card payment to
918-831-9804.

Payment of \$59.00 is enclosed.
(Checks and credit cards are accepted.)

If paying by credit card, please complete the following: MC Visa AmEx Discover

Acct. Number: _____
 Exp. Date: _____

Charges on your statement will show up as PennWell

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|---------------------|---------------------|
| 1. (A) (B) (C) (D) | 16. (A) (B) (C) (D) |
| 2. (A) (B) (C) (D) | 17. (A) (B) (C) (D) |
| 3. (A) (B) (C) (D) | 18. (A) (B) (C) (D) |
| 4. (A) (B) (C) (D) | 19. (A) (B) (C) (D) |
| 5. (A) (B) (C) (D) | 20. (A) (B) (C) (D) |
| 6. (A) (B) (C) (D) | 21. (A) (B) (C) (D) |
| 7. (A) (B) (C) (D) | 22. (A) (B) (C) (D) |
| 8. (A) (B) (C) (D) | 23. (A) (B) (C) (D) |
| 9. (A) (B) (C) (D) | 24. (A) (B) (C) (D) |
| 10. (A) (B) (C) (D) | 25. (A) (B) (C) (D) |
| 11. (A) (B) (C) (D) | 26. (A) (B) (C) (D) |
| 12. (A) (B) (C) (D) | 27. (A) (B) (C) (D) |
| 13. (A) (B) (C) (D) | 28. (A) (B) (C) (D) |
| 14. (A) (B) (C) (D) | 29. (A) (B) (C) (D) |
| 15. (A) (B) (C) (D) | 30. (A) (B) (C) (D) |

AGD Code 016

PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.

COURSE EVALUATION and PARTICIPANT FEEDBACK
 We encourage participant feedback pertaining to all courses. Please be sure to complete the survey included with the course. Please e-mail all questions to: hhodges@penwell.com.

INSTRUCTIONS
 All questions should have only one answer. Grading of this examination is done manually. Participants will receive confirmation of passing by receipt of a verification form. Verification of Participation forms will be mailed within two weeks after taking an examination.

COURSE CREDITS/COST
 All participants scoring at least 70% on the examination will receive a verification form verifying 3 CE credits. The formal continuing education program of this sponsor is accepted by the AGD For Fellowship/Mastership credit. Please contact PennWell for current term of acceptance. Participants are urged to contact their state dental boards for continuing education requirements. PennWell is a California Provider. The California Provider number is 4527. The cost for courses ranges from \$20.00 to \$110.00.

PROVIDER INFORMATION
 PennWell is an ADA CERP Recognized Provider. ADA CERP is a service of the American Dental Association to assist dental professionals in identifying quality providers of continuing dental education. ADA CERP does not approve or endorse individual courses or instructors, nor does it imply acceptance of credit hours by boards of dentistry.

Concerns or complaints about a CE Provider may be directed to the provider or to ADA CERP at www.ada.org/otocerp/

The PennWell Corporation is designated as an Approved PACE Program Provider by the Academy of General Dentistry. The formal continuing dental education programs of this program provider are accepted by the AGD for Fellowship, Mastership and membership maintenance credit. Approval does not imply acceptance by a state or provincial board of dentistry or AGD endorsement. The current term of approval extends from (11/1/2015) to (10/31/2019) Provider ID# 320452

RECORD KEEPING
 PennWell maintains records of your successful completion of any exam for a minimum of six years. Please contact our offices for a copy of your continuing education credits report. This report, which will list all credits earned to date, will be generated and mailed to you within five business days of receipt.

Completing a single continuing education course does not provide enough information to give the participant the feeling that s/he is an expert in the field related to the course topic. It is a combination of many educational courses and clinical experience that allows the participant to develop skills and expertise.

CANCELLATION/REFUND POLICY
 Any participant who is not 100% satisfied with this course can request a full refund by contacting PennWell in writing.

IMAGE AUTHENTICITY
 The images provided and included in this course have not been altered.

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