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Anticoagulation in dental surgery: Is it rude to interrupt?

WHEN I WAS GROWING UP, my mother frequently told me that it was rude to interrupt. Although she was referring to conversations, she may have been onto something bigger.

In the nearly three quarters of a century since their discovery, vitamin K antagonist anticoagulant drugs have been used by millions of patients to prevent heart attack and stroke. Before these patients undergo surgery, a decision to continue or interrupt anticoagulation must be made, weighing the risks of postsurgical hemorrhage with continuation of anticoagulation against the risks of stroke or other embolic complications with interruption of anticoagulation. Bleeding after dental surgery when anticoagulation is continued is rarely or never life-threatening. On the other hand, embolic complications of interrupting anticoagulation are almost always consequential and often lead to death or disability. Although consideration may be different for other types of surgery, there is no need to interrupt lifesaving anticoagulation for dental surgery.

■ EVIDENCE THAT SUPPORTS CONTINUING ANTICOAGULATION

As early as 1957, there were reports of prolonged postoperative bleeding after dental extractions in patients taking anticoagulants. But there were also reports of embolic complications in patients whose anticoagulation was interrupted for dental procedures. Since then, there has been a plethora of literature in this area.

A review published in 2000 showed that of more than 950 anticoagulated patients undergoing more than 2,400 dental surgical procedures (including simple and surgical extrac-

tion, alveoplasty, and gingival surgery), only 12 (< 1.3%) required more than local measures for hemostasis (eg, fresh-frozen plasma, vitamin K), and no patient died,¹ leading to the conclusion that the bleeding risk was not significant in anticoagulated dental patients. Other studies and systematic reviews have also concluded that anticoagulation for dental procedures should not be interrupted.^{2,3} In a recent review of 83 studies, only 31 (0.6%) of 5,431 patients taking warfarin suffered bleeding complications requiring more than local measures for hemostasis; there were no fatalities.⁴

The risk of embolism

There have been many reports of embolic complications in patients whose anticoagulation was interrupted for dental procedures. A 2000 review of 575 cases in 526 patients whose anticoagulation was interrupted for dental procedures showed that 5 patients (0.9%) had a serious embolic complication, and 4 died.¹ In a more recent review of 64 studies and more than 2,673 patients whose anticoagulation was interrupted for dental procedures, 22 patients (0.8%) suffered embolic complications, and 6 (0.2%) died of the complications.⁴ Of those with embolic complications, the interruption period was often not reported; however, the interruption ranged from 1 to 4 days. A 2003 systematic review by Dunn and Turpie found a 0.4% embolic complication rate when anticoagulation was interrupted for dental surgery.²

■ BLEEDING AFTER DENTAL SURGERY

Bleeding after dental surgery can occur with either anticoagulation continuation or interruption, and minor postoperative bleeding requiring additional local hemostatic methods

Bleeding is rarely life-threatening, but embolic complications often are

occurs at about the same rate in anticoagulated patients as in those whose anticoagulation is interrupted.

In our recent literature review,⁴ about 6% of patients in whom anticoagulation was interrupted (and 7% in whom it was not interrupted) had minor bleeding requiring additional local hemostasis, and only 0.2% of patients required more than hemostatic measures (eg, vitamin K injection, plasma transfusion), the same rate found by Dunn and Turpie.² All patients who required more than local hemostatic measures presumably made a full recovery, while at least 6 who suffered postoperative embolic complications died, and the rest may have had permanent disabilities.

Although bridging therapy with low-molecular-weight heparin can decrease the time without anticoagulation for a dental procedure to only 12 hours, it can be complicated to implement, and there appears to be no benefit in terms of the rates of bleeding or embolic complications. Of the 64 anticoagulation interruption studies,⁴ 17 used heparin or low-molecular-weight heparin in conjunction with temporary warfarin interruption. In 210 instances of bridging therapy in 202 patients undergoing dental procedures, there were 2 embolic complications (1% of bridging cases) and 20 bleeding complications, with 3 (1.4%) requiring hemostasis beyond local measures.⁴

Many of the studies analyzed independently showed there was no significant difference in postoperative bleeding with:

- Anticoagulation continuation vs interruption for a few days
- Lower vs higher international normalized ratio (INR), including some over 4.0
- Surgical vs nonsurgical extraction
- Few vs many extractions.⁴

Some studies of anticoagulation and anticoagulation interruption for dental surgery had important limitations. Many of the anticoagulation studies excluded patients at high risk of bleeding, those with a high INR (> 4.0), and those with severe liver or kidney disease, and their exclusion could have lowered the incidence of bleeding complications. Many studies of anticoagulation interruption excluded patients at high risk of embolism, including patients with a previous embolic event and patients with an artificial heart

valve, and this could have skewed the results lower for embolic complications.

■ WHY DO SOME CLINICIANS STILL RECOMMEND INTERRUPTION?

The choice seems clear: for dental surgery in anticoagulated patients, the small risk of a nonfatal bleeding complication in anticoagulated patients is outweighed by the small risk of a disabling or fatal embolic complication when anticoagulation is interrupted. Most authors have concluded that anticoagulation should be continued for dental surgery. Yet surveys of dentists and physicians have shown that many still recommend interrupting anticoagulation for dental surgery.^{5,6}

Medical and dental association positions

The American Academy of Neurology⁷ and the American Dental Association⁸ recommend continuing anticoagulant medications for dental surgery. The American College of Chest Physicians also recommends continuing anticoagulation but in 2012 added an option to interrupt or decrease anticoagulation for 2 to 3 days for dental surgery.⁹ Their recommendation was based partly on the results of four controlled prospective studies¹⁰⁻¹³ comparing anticoagulated dental surgical patients with patients whose anticoagulation was interrupted. In each study, there were no embolic or bleeding complications requiring more than local methods for hemostasis in the interruption groups, leading the American College of Chest Physicians to conclude that brief anticoagulation interruption for dental surgery is safe and effective.

But the results of these studies actually argue against interrupting anticoagulation for dental surgery. In each study, rates of postoperative bleeding complications and blood loss were similar in both groups, and there were no embolic complications. The authors of each study independently concluded that anticoagulation should not be interrupted for dental surgery.

The optimal INR range for anticoagulation therapy is widely accepted as 2.0 to 3.0, and 2.5 to 3.5 for patients with a mechanical mitral valve.¹⁴ Interrupting warfarin anticoagulation for 2 or 3 days leads to a suboptimal INR. Patel et al¹⁵ studied the incidence of em-

Bleeding can occur after dental surgery whether anticoagulation is continued or interrupted

bolic complications (including stroke, non-central nervous system embolism, myocardial infarction, and vascular death) within 30 days in 7,082 patients taking warfarin with and without an interruption of therapy of at least 3 days (median 6 days). The observed rate of embolic events in those with temporary interruption (10.75 events per 100 patient-years) was more than double the rate in those without interruption (4.03 per 100 patient-years).¹⁵ However, this study was designed to compare rivaroxaban vs warfarin, not interrupting vs not interrupting warfarin.

■ A DECISION-TREE REANALYSIS

In 2010, Balevi published a decision-tree analysis that slightly favored withdrawing warfarin for dental surgery, but he 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.”¹⁶ Now that there are more accurate and up-to-date data, it is time to revisit this decision-tree analysis.

In Balevi’s analysis, major bleeding is not defined. But major bleeding after dental surgery should be defined as any bleeding requiring more than local measures for hemostasis. In calculating probabilities for the analysis, Balevi cited studies allegedly showing high incidences of major bleeding after dental extractions with warfarin continuation.^{17,18} There were some minor bleeding complications necessitating additional local measures for hemostasis in these studies, but no major bleeding complications at all in the warfarin-continuation or warfarin-interruption group. There were no significant bleeding events in either study, and the differences in bleeding rates were not significantly different between the two groups. In both studies, the authors concluded that warfarin interruption for dental surgery should be reconsidered.

Similarly, Balevi accurately asserted that there has never been a reported case of fatal bleeding after a dental procedure in an anticoagulated patient, but “for the sake of creating balance,”¹⁶ his decision-tree analysis uses a fatal bleeding probability of 1%, based on an estimated 1% risk for nondental procedures (eg, colorectal surgery, major abdominal surgery). It is unclear how a 1% incidence creates

“balance,” but dental surgery is unlike other types of surgery, and that is one reason there has never been a documented postdental fatal hemorrhage in an anticoagulated patient. Major vessels are unlikely to be encountered, and bleeding sites are easily accessible to local hemostatic methods.

Balevi used an embolic complication incidence of 0.059% with warfarin interruption of 3 days. Perhaps he used such a low embolic probability because of his incorrect assertion that “there has been no reported case of a dental extraction causing a cardiovascular accident in a patient whose warfarin was temporarily discontinued.”¹⁶ In fact, our group has now identified at least 22 reported cases of embolic complications after temporary interruption of warfarin therapy in patients undergoing dental surgery.⁴ These included 12 embolic complications (3 fatal) after interruption periods from 1 to 5 days.^{19,20} In addition, there are numerous cases of embolic complications reported in patients whose warfarin was temporarily interrupted for other types of surgery.^{21,22}

The literature shows that embolic complications after temporary warfarin interruption occur at a much higher rate than 0.059%. Many documented embolic complications have occurred after relatively long warfarin interruption periods (greater than 5 days), but many have occurred with much shorter interruptions. Wysokinski et al²¹ showed that there was a 1.1% incidence of thromboembolic events, more than 18 times greater than Balevi’s incidence, in patients whose warfarin was interrupted for 4 or 5 days with or without bridging therapy. One of these patients developed an occipital infarct within 3 days after stopping warfarin without bridging (for a nondental procedure). Garcia et al²² showed that of 984 warfarin therapy interruptions of 5 days or less, there were 4 embolic complications, a rate (0.4%) more than 6 times greater than that reported by Balevi.

Even if one were to accept a 0.059% embolic risk from interruption of warfarin, that would mean for every 1,700 warfarin interruptions for dental procedures, there would be one possibly fatal embolic complication. On the other hand, if 1,700 dental surgeries were performed without warfarin interruption,

Several organizations recommend continuing anticoagulation for dental surgery

based on the literature, there may be some bleeding complications, but none would be fatal. If airline flights had a 0.059% chance of crashing, far fewer people would choose to fly. (There are 87,000 airline flights in the US per day. A 0.059% crash rate would mean there would be 51 crashes per day in the United States alone.)

But regardless of whether the embolic risk is 0.059% or 1%, the question comes down to whether an anticoagulated patient should be subjected to a small but significant risk of death or permanent disability (if anticoagulation is interrupted) or to a small risk of a bleeding complication (if anticoagulation is continued), when 100% of cases up until now have apparently resulted in a full recovery.

As a result, the decision-tree analysis was fatally flawed by grossly overestimating the incidence of fatal bleeding when warfarin is continued, and by grossly underestimating the incidence of embolic complications when warfarin is interrupted.

■ IS WARFARIN CONTINUATION 'TROUBLESOME'?

An oral surgeon stated, “My experience and that of many of my colleagues is that even though *bleeding is never life-threatening* [emphasis mine], it can be difficult to control at therapeutic levels of anticoagulation and can be troublesome, especially for elderly patients.”²³ The American College of Chest Physicians stated that postoperative bleeding after dental procedures can cause “anxiety and distress.”²³ Patients with even minor postoperative bleeding can be anxious, but surely, postoperative stroke is almost always far more troublesome than postoperative bleeding, which has never been life-threatening. Although other types of surgery may be different, there is no need to interrupt lifesaving anticoagulation for innocuous dental surgery.

My mother was right—it can be rude to interrupt. Anticoagulation should not be interrupted for dental surgery. ■

■ REFERENCES

1. **Wahl MJ.** Myths of dental surgery in patients receiving anticoagulant therapy. *J Am Dent Assoc* 2000; 131:77–81.
2. **Dunn AS, Turpie AG.** Perioperative management of patients receiving oral anticoagulants: a systematic review. *Arch Intern Med* 2003; 163:901–908.
3. **Nematullah A, Alabousi A, Blanas N, Douketis JD, Sutherland SE.** Dental surgery for patients on anticoagulant therapy with warfarin: a systematic review and meta-analysis. *J Can Dent Assoc* 2009; 75:41.
4. **Wahl MJ, Pintos A, Kilham J, Lalla RV.** Dental surgery in anticoagulated patients—stop the interruption. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2015; 119:136–157.
5. **van Diermen DE, van der Waal I, Hoogvliets MW, Ong FN, Hoogstraten J.** Survey response of oral and maxillofacial surgeons on invasive procedures in patients using antithrombotic medication. *Int J Oral Maxillofac Surg* 2013; 42:502–507.
6. **Ward BB, Smith MH.** Dentoalveolar procedures for the anticoagulated patient: literature recommendations versus current practice. *J Oral Maxillofac Surg* 2007; 65:1454–1460.
7. **Armstrong MJ, Gronseth G, Anderson DC, et al.** Summary of evidence-based guideline: periprocedural management of antithrombotic medications in patients with ischemic cerebrovascular disease. Report of the Guideline Development Subcommittee of the American Academy of Neurology. *Neurology* 2013; 80:2065–2069.
8. **American Dental Association (ADA).** Anticoagulant antiplatelet medications and dental procedures. www.ada.org/en/member-center/oral-health-topics/anticoagulant-antiplatelet-medications-and-dental-. Accessed May 16, 2016.
9. **Douketis JD, Spyropoulos AC, Spencer FA, et al; American College of Chest Physicians.** Perioperative management of antithrombotic therapy. *Antithrombotic therapy* and prevention of thrombosis, 9th ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest* 2012; 141(suppl 2):e3265–e3505.
10. **Campbell JH, Alvarado F, Murray RA.** Anticoagulation and minor oral surgery: should the anticoagulation regimen be altered? *J Oral Maxillofac Surg* 2000; 58:131–135.
11. **Devani P, Lavery M, Howell CJT.** Dental extractions in patients on warfarin: is alteration of anticoagulation regime necessary? *Br J Oral Maxillofac Surg* 1998; 36:107–111.
12. **Gaspar R, Brenner B, Ardekian L, Peled M, Laufer D.** Use of tranexamic acid mouthwash to prevent postoperative bleeding in oral surgery patients on oral anticoagulant medication. *Quintessence Int* 1997; 28:375–379.
13. **Blinder D, Manor Y, Martinowitz U, Taicher S.** Dental extractions in patients maintained on oral anticoagulant therapy: comparison of INR value with occurrence of postoperative bleeding. *Int J Oral Maxillofac Surg* 2001; 30:518–521.
14. **Whitlock RP, Sun JC, Fremes SE, Rubens FD, Teoh KH; American College of Chest Physicians.** Antithrombotic and thrombolytic therapy for valvular disease: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest* 2012; 141(suppl 2):e5765–e6005.
15. **Patel MR, Hellkamp AS, Lokhnygina Y, et al.** Outcomes of discontinuing rivaroxaban compared with warfarin in patients with nonvalvular atrial fibrillation: analysis from the ROCKET AF trial (rivaroxaban once-daily, oral, direct factor Xa inhibition compared with vitamin K antagonism for prevention of stroke and embolism trial in atrial fibrillation). *J Am Coll Cardiol* 2013; 61:651–658.
16. **Balevi B.** Should warfarin be discontinued before a dental extraction? A decision-tree analysis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2010; 110:691–697.
17. **Al-Mubarak S, Al-Ali N, Abou Rass M, et al.** Evaluation

We found 22 reported cases of embolic complications after interruption of warfarin in patients undergoing dental surgery

of dental extractions, suturing and INR on postoperative bleeding of patients maintained on oral anticoagulant therapy. *Br Dent J* 2007; 203:E15.

18. **Evans IL, Sayers MS, Gibbons AJ, Price G, Snooks H, Sugar AW.** Can warfarin be continued during dental extraction? Results of a randomized controlled trial. *Br J Oral Maxillofac Surg* 2002; 40:248–252.
19. **Yasaka M, Naritomi H, Minematsu K.** Ischemic stroke associated with brief cessation of warfarin. *Thromb Res* 2006; 118:290–293.
20. **Akopov SE, Suzuki S, Fredieu A, Kidwell CS, Saver JL, Cohen SN.** Withdrawal of warfarin prior to a surgical procedure: time to follow the guidelines? *Cerebrovasc Dis*

2005; 19:337–342.

21. **Wysocki WE, McBane RD, Daniels PR, et al.** Peri-procedural anticoagulation management of patients with nonvalvular atrial fibrillation. *Mayo Clin Proc* 2008; 83:639–645.
22. **Garcia DA, Regan S, Henault LE, et al.** Risk of thromboembolism with short-term interruption of warfarin therapy. *Arch Intern Med* 2008; 168:63–69.
23. **Todd DW.** Anticoagulated patients and oral surgery [letter]. *Arch Intern Med* 2003; 163:1242.

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