Surgery for acute type A aortic dissection on oral anticoagulants: Being the dispatcher of a 911 call

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Received for publication Sept 6, 2017; accepted for publication Sept 8, 2017; available ahead of print Oct 18, 2017.

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J Thorac Cardiovasc Surg 2018;155:e5-6

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2017.09.028>

No documented consensus exists for the optimal management of acute type A aortic dissection in patients who are receiving novel oral anticoagulants (NOACs). In this issue of the *Journal*, Hamad and colleagues¹ raise this important issue in their case report of 2 patients who underwent delayed surgery with satisfactory results and minimal blood product use. Hamad and colleagues¹ also described 8 other published cases in which 4 patients survived “at the price of significant transfusions” and 4 died of intractable coagulopathy. These equivocal findings make drawing conclusions challenging.

In 2010, the term “novel” in NOACs was first used to describe dabigatran, which directly binds to clotting factor IIa (thrombin). In the latest CHEST guideline² for antithrombotic therapy in venous thromboembolism, the *N* in NOAC stands for “non-vitamin K” instead of “novel,” even though this new definition is not widely adopted. Another designation gaining support is direct oral anticoagulants. In 2011, the US Food and Drug Administration approved rivaroxaban, which binds directly to clotting factor Xa and activates the conversion of prothrombin to thrombin. Since then, apixaban and edoxaban have been developed, both of which directly inhibit clotting factor Xa. Emerging alternative strategies for reversing the effects of these anticoagulants include prothrombin complex concentrates, also known as factor IX complex; activated prothrombin complex concentrates, such as factor VIII inhibitor bypassing activity; and recombinant factor VIIa. The US Food and Drug Administration recently approved idarucizumab, a monoclonal antibody specifically designed to reverse the effects of dabigatran. In addition, hemodialysis and ultrafiltration can reduce the plasma concentration of dabigatran but are ineffective for other NOACs. The US Food and Drug Administration is reviewing the results of clinical trials of andexanet alfa, a decoy bioengineered

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Central Message

In patients with acute type A dissection on oral anticoagulants, the safe level of inhibition of the anticoagulant effect for undergoing major surgery has not been identified, and studies are needed.

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factor X protein that lacks binding and enzymatic site activity and is designed to neutralize the effect of any factor X anticoagulant.

Despite the availability of the previously named products and potential new antidotes, the question remains: What should we do in patients with a type A aortic dissection who are taking these oral anticoagulants? Do we take them directly to the operating room, or do we take them to the intensive care unit to assess the bleeding risk and implement reversal therapy before surgery? In a type A aortic dissection emergency, we are the receivers and dispatchers of the 911 call, and we are called to act.

The honest answer to these questions is that it depends. Coagulopathy under hypothermic circulatory arrest is expected to a certain degree. Moreover, adding both the variable of NOAC use and the risk of the surgery itself, which carries significant mortality and morbidity even in the most specialized centers, creates a lethal combination. The role of measuring for an ongoing anticoagulant effect needs to be considered (eg, measuring anti-Xa activity in the case of apixaban, rivaroxaban, or edoxaban use, or assessing thrombin time in dabigatran use). The absence of inhibition should be a green light to proceed with surgery. Unfortunately, a safe level of inhibition for undergoing major surgery has not been established, and studies are needed to address this issue. Although clinical trial data for dabigatran use show that surgery can be safely performed almost

immediately after administering the 5-g recommended dose of idarucizumab, those trials were not conducted in patients surgically treated for acute type A aortic dissection.

A waiting period for reversal may be advisable while the patient is on anti-impulse therapy (systolic blood pressure <100 or 110 mm Hg). The same cautionary principle applies to treating acute type A aortic dissection in the middle of the night with a suboptimal team versus the next morning with the best available team.

It is important to identify patients with type A aortic dissection who can wait for anticoagulant reversal pharmacotherapy to take effect before surgery. The following patients may fall into that category: patients with previous sternotomy or previous coronary artery bypass grafting, aortic valve replacement, or other cardiac surgery (eg, ventricular septal defect repair), and patients without pain, pericardial effusion, malperfusion (visceral ischemia, spinal cord ischemia, myocardial infarction), and significant aortic insufficiency. As Hamad and colleagues¹ state, the “period of delay and the acceptable

level of residual anticoagulation remain unknown,” and further investigation is required. If delaying surgery is not an option, the use of a multimodal approach is imperative; some strategies for this approach include preoperative and postoperative use of activated and nonactivated prothrombin complex concentrates, intraoperative administration of idarucizumab or use of hemodialysis (to reverse the effects of dabigatran), adding a hemoconcentrator into the cardiopulmonary bypass circuit, and performing blood ultrafiltration during bypass. A continuous postoperative infusion of an antifibrinolytic as a general hemostatic aid and administration of fresh-frozen plasma to avoid further hemodilution can be used for emergency support.

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