Learning From Others:

A Case Report From the Anesthesia Incident Reporting System

Anesthesia Quality Institute
ANESTHESIA INCIDENT REPORTING SYSTEM (AIRS)

Detailed review of unusual cases is a cornerstone of anesthesiology education. Each month, the AQI-AIRS Steering Committee will provide a detailed discussion based on a case submission to the Anesthesia Incident Reporting System (AIRS). Feedback regarding this item can be sent by email to **r.dutton@asahq.org**.

Report incidents in confidence or download the free AIRS mobile application (Apple or Android) at www.aqiairs.org.

Case 2015-7: A Question of Timing

"Right TKA with femoral nerve catheter for postop pain. Patient received rivaroxaban 10 mg on POD #1 at 0800. Catheter site was reported as oozing in the afternoon. At 2330 the patient reported blood in the bed. Gross bloody drainage was observed. The catheter was removed and pressure applied. On the morning of POD #2, a large hematoma had formed at the catheter site and the hemoglobin had dropped. Hematoma became larger throughout the day. General surgery consulted. Preventable Incident? Yes. Contributing factors: Rivaroxaban given on POD #1 at 0800 regardless of time of patient's surgery."

Discussion

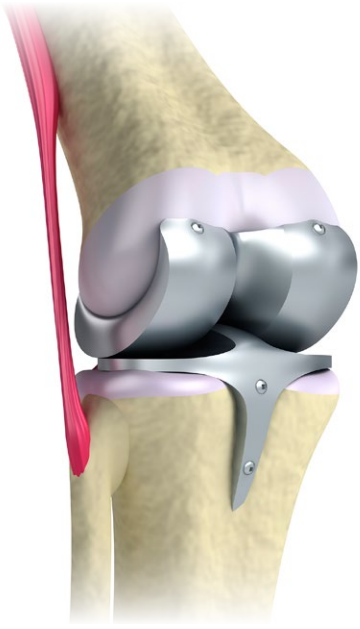
A number of nationwide patient safety measures are devoted to ensuring the implementation of venous thromboembolism (VTE) prophylaxis in surgical patients.[1] Despite these measures (or perhaps because of increased awareness of risk leading to more diagnostic attention), the number of secondary diagnoses of VTE has increased.[2] Patients having major orthopedic surgery such as total knee or hip arthroplasty carry the highest risk for VTE. Without prophylaxis, the current estimated risk of nonfatal, symptomatic VTE after major orthopedic surgery is 4.3 percent. With prophylaxis, the risk drops to 1.8 percent.[3]

The current American College of Chest Physicians guideline recommends 10 to 14 days of thromboprophylaxis after total knee arthroplasty (TKA). Agents used are low molecular weight heparin (LMWH), fondaparinux, apixaban, dabigatran, rivaroxaban, low-dose unfractionated heparin, adjusted-dose vitamin K antagonist or aspirin. In the RECORD3 trial, rivaroxaban was found to be superior to LMWH at the primary composite endpoint of deep vein thrombosis, pulmonary embolism or death.

Rivaroxaban is a direct inhibitor of clotting factor Xa. It is available in oral form and – like other novel oral anticoagulants – there is no antidote. Because of the need to balance bleeding and clotting complications, timing is important in administering rivaroxaban. The manufacturer's dosing instructions for rivaroxaban state that for thromboprophylaxis the first dose should be taken six to 10 hours after surgery, followed by doses 24 hours apart. The medication reaches its maximum plasma concentration within two to four hours. The terminal elimination half-life is five to nine hours. In this case, the reporter felt that the rivaroxaban should have been started later than 0800, likely because surgery ended late the previous evening.

Placement of a peripheral nerve block catheter with postoperative local anesthetic infusion for TKA reduces time to discharge readiness.[4] In general, peripheral nerve block catheters are associated with less opioid use and improved sleep.[5]

One advantage of peripheral nerve block catheters over epidural catheters is that a hematoma at the catheter site does not risk spinal cord injury. However, there are different opinions as to when and whether the nerve block catheter should be removed before thromboprophylaxis is administered. The most recent American Society of Regional Anesthesia and Pain Medicine practice advisory recommends that the same timing recommended for neuraxial anesthesia also be used for peripheral nerve analgesia.[6] However, several physician



anesthesiologists have questioned this stance and feel it is safe to leave catheters in place after thromboprophylaxis has begun. In a retrospective analysis of 3,588 anticoagulated patients who had a continuous peripheral nerve block catheter placed prior to TKA, no perineural hematomas were reported. As this study was performed on cases between 2002 and 2005, warfarin and fondaparinux were the most frequently used anticoagulation medications. A recent review of the literature found several case reports of hematoma formation at the site of a peripheral catheter, including one case that required surgical evacuation.[7]

Recent research suggests that few major bleeding complications occur when catheter removal is synchronized to rivaroxaban dosing. In an observational study published last year, a series of 504 patients having TKA were given femoral nerve blocks preoperatively and rivaroxaban prophylaxis postoperatively.[8] The first dose was at 1000 on POD #1. The catheters were removed at 0600 on POD #2. This time was chosen as the best balance between a low rivaroxaban plasma level and time to achieve site hemostasis before the next dose of rivaroxaban. No patients developed hematoma with neurovascular compromise. However, 11 percent developed an ecchymosis by POD #2. In four patients, a palpable mass developed on POD #2, which persisted in two patients for several days.

When treatment goals collide, excellent communication is required for best results. In this case, the need for thromboprophylaxis and for continuous peripheral nerve block must both be satisfied. Dogmatic policies will lead to exceptions (or failure to make exceptions) that can endanger patient safety, as in the present case. An uncontroversial process improvement is to place the necessary information for decision making all on the same page, presented on a clipboard or a computer screen. Every nurse and physician should be able to determine at a glance the time surgery ended, the prophylaxis dosing schedule, the last catheter site assessment, the medication going through the catheter and the time the catheter is to be removed. This "major elective orthopedic surgery dashboard" can be used to guide rounding, unit management and other quality initiatives.

Another point this case raises is that national guidelines are often unable to provide solid advice on new treatments because there is little evidence available from actual clinical experience. Those guidelines rely on a research base that takes time to assemble. In this situation, local experience captured by outcomes reporting provides the best guidance. By assiduously tracking the results of a particular combination of techniques, local policy can be established. It's hard to argue with a process bundle that is backed up with good (or even "not bad") outcomes, and that puts well-organized information in the hands of clinical decision-makers at the moment they need it.

References:

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