

THE PREOPERATIVE EVALUATION: Considerations of Medications

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The preoperative evaluation office visit is a time to fully review the patient's past medical history, presenting condition, current medications, and any risk factors that may increase their chance for surgical complications. This is a great opportunity to optimize the patient's medical conditions, and ensure that proper preoperative risk assessment is carried out. It is common for a patient to take many different medications, and they can sometimes have a list so long that they cannot even remember the reason why they are taking certain medications. Even though perioperative medication management is essential to patient safety, there is very limited evidence that stems from randomized controlled studies that help direct perioperative medication management. Much of the information available relies on expert consensus, case reports, in vitro studies, and other data (1). This article will focus on whether to continue or stop medications preoperatively. We do not include every medication available in today's market, but focus on those that are most commonly seen in a patient undergoing foot and ankle surgery.

It is imperative that all medications taken preoperatively be documented with the exact name, dosage, and frequency. Prescription strength, over the counter medications, vitamins, and supplements should all be recorded. There are three general considerations to help determine if medications should be continued throughout the operative period or if they should be discontinued (1), specifically: is there a potential for withdrawal if the medication is stopped; will there be disease progression with drug interruption; and are there any interactions with the anesthetic agents that will be administered?

WITHDRAWAL POTENTIAL

Medications that can cause withdrawal or rebound syndrome if discontinued abruptly are generally continued throughout the perioperative period. Common medications that can cause withdrawal symptoms are clonidine, beta-blockers, statins, corticosteroids, and selective serotonin reuptake inhibitors (SSRIs) (1). Each of these medications will be

reviewed below, and appropriate communication between the anesthesiologist and preoperative medical consultant is always helpful and recommended to determine the best course of action for these medications.

ANTIHYPERTENSIVES

Many patients seen in the clinic have a history of hypertension or other cardiac conditions that require medication. Adequate blood pressure control is essential prior to elective surgery to help reduce the risk of perioperative ischemia, and subsequent cardiac morbidity. General recommendations are to continue beta blockers, alpha 2 agonists, calcium channel blockers, digoxin, and statin drugs. Cardiovascular drugs that are not recommended to be taken the morning of surgery are angiotensin-converting enzyme inhibitors (ACEi), angiotensin receptor blockers (ARBs), diuretics, and non-statin (Niacin, bile sequestrants) (2).

Beta blockers taken perioperatively help reduce the risk of myocardial infarctions by decreasing the myocardial oxygen demand, and help prevent arrhythmias by lessening the postoperative sympathetic drive. Alpha 2 agonists (i.e., clonidine) if discontinued, can cause rebound hypertension. They also have anxiolytic, analgesic, and anti-shivering properties (3). Calcium channel blockers have been shown to reduce ischemia and atrial arrhythmias, and digoxin can help control atrial fibrillation and supraventricular tachycardia perioperatively (2). Statin drugs have been shown to help improve endothelial function, and reduce vascular inflammation.

ACEi and ARBs if given less than 10 hours preoperatively, have been shown to intensify the hypotensive effects of anesthesia induction. Rosenman et al (4) recently published a meta-analysis on continuing or withholding ACE inhibitors and ARBs in the preoperative period. There was a significant increase in the incidence of perioperative hypotension in patients in whom the drugs were continued compared with those in whom the drugs were withheld, but there was no significant difference in the rate of perioperative myocardial ischemia between the two groups.

In all the studies analyzed, the indication for ACE inhibitors or ARB use was hypertension, and not heart failure. From the study outcomes it has been recommended that if the patient's only indication is for hypertension and their blood pressure is well controlled these can be discontinued on the day of surgery (in the case of ARBs 24 hours before surgery because of their long half-life). If the patient's blood pressure is not well controlled, or there is another indication that they are taking the ACEi or ARBs then a discussion is necessary with the prescribing doctor and anesthesiologist (1).

Diuretics could potentially cause an adverse volume depletion and hypokalemia when interacting with administered anesthetic agents. They are typically held on the morning of surgery. Non-statins (Niacin, and fibric acid derivatives) could cause myopathy and rhabdomyolysis perioperatively, and bile sequestrants could interfere with bowel absorption. These are typically discontinued the day before surgery (5).

RESPIRATORY

It has been recommended that inhaled beta-agonists, anticholinergics, and steroids be continued perioperatively. Theophylline should be discontinued the day before surgery because it can cause serious arrhythmias and neurotoxicity if taken perioperatively (6).

Ideally, tobacco use should be stopped 6 to 8 weeks preoperatively to decrease the chance of pulmonary complications perioperatively. The immune system has been shown to recover before surgery if smoking cessation takes place 4 to 6 weeks preoperatively, which will help decrease the chance of postoperative infection. The half-life of both carbon monoxide and nicotine is 12 hours, so at the very least smoking cessation should take place 12 to 72 hours preoperatively to decrease the risks of hypoxia that can lead to poor wound healing (7).

ENDOCRINE

Diabetic patients are commonplace for the foot and ankle surgeon's practice, and the goal perioperatively is to maintain fluid and electrolyte balances, prevent ketoacidosis, and avoid marked hyperglycemic and hypoglycemic events. The target blood glucose levels are as follows: fasting should be less than 140 mg/dL, random glucose should be less than 180 mg/dL, and a patient's hemoglobin A1C should be less than 7% (8,9). Communication with the treating physician and anesthesiologist is very helpful in preparing these patients for surgery.

For type 2 diabetics treated with oral medications it has been recommended that their morning dose of anti-diabetic medications be held. The exception is metformin, it should be held preoperatively for 48 hours because it has been associated with the development of lactic acidosis. Metformin can be restarted 48 to 72 hours postoperatively as long as no acute renal dysfunction has occurred (10).

Type 1 diabetics or type 2 diabetics that are insulin treated have the following recommendations: 50% of their long-acting insulin that is taken in the morning should be given, and their short-acting morning insulin should be held (3). If the patient has "tight" control, and is border-line hypoglycemic, their supertime or night time intermediate-acting insulin should be reduced. It is mandatory that type 1 diabetics continue some insulin to prevent ketoacidosis (11). These modifications are best handled by the treating physician, or hospitalist if the patient is being treated in the hospital.

Contraceptives and hormonal replacement therapy, if possible, should be discontinued 4 weeks preoperatively as recommended by the heart and estrogen-progestin replacement study (12). This recommendation was made because there was an 18-fold increase of venous thromboembolism with lower extremity fractures. The study was too small to produce definite conclusions, but there are no other such studies to validate or contradict these findings. If these medications are continued perioperatively deep vein thrombosis prophylaxis is warranted.

CENTRAL NERVOUS SYSTEM

Patients taking phenytoin, carbamazepine, or valproic acid for seizures should continue these throughout the perioperative period. If they cannot tolerate oral medications, the patient may need to switch to phenobarbital intravenously during the interim. These medications should be maintained at serum levels in the upper half of their therapeutic range (2).

Antiparkinsonian agents typically cause an abrupt withdrawal if discontinued without tapering. This withdrawal could cause Parkinson flares, or a neuroleptic malignant syndrome (3). Carbidopa/levodopa has a short duration of action (3 to 4 hours), and can be given the night before surgery. It is recommended that dopamine agonists with longer half-lives, such as ropinirole, should be discontinued the evening before surgery to avoid hypotension. Arrhythmias could occur due to carbidopa/levodopa interacting with anesthetic agents, but the benefits generally outweigh the risks (3). These agents

should be tapered to the lowest effective dose possible 2 weeks prior to surgery, and this should be cleared by the treating physician and anesthesiologist.

Psychotropic Agents

There are many patients that have a history of depression, and are currently being medically treated for this condition. Selective serotonin reuptake inhibitors (SSRIs) can cause significant withdrawal symptoms, and there are no interactions with anesthetics known.

Evidenced based guidelines are lacking for patients taking tricyclic antidepressants (TCAs), such as amitriptyline. TCA's can increase the risk of arrhythmias during the perioperative phase, and cause anticholinergic effects (5). If they are not tapered and discontinued due to the psychological condition or because of an emergent surgery, Anesthesia will have to closely monitor the patient for developing arrhythmias.

Monoamine oxidase inhibitors (MAOIs) should be tapered over a 2 week period if discontinuing prior to surgery. Meperidine and sympathomimetic agents (ephedrine) should be avoided with MAOIs to prevent a life threatening reaction similar to neuroleptic malignant syndrome (1).

Patients that take benzodiazepines long-term can have significant withdrawal symptoms if these are discontinued abruptly. It can take several days to weeks for the active metabolites to subside after discontinuation, and because of this, it is recommended that these be continued perioperatively.

Lithium can be continued in the bipolar patient in minor surgeries if serum levels are not toxic, and if there is normal renal function and stable electrolytes. If the above mentioned criteria are not present the lithium should be discontinued 2-3 days preoperatively, and can be restarted postoperatively once renal function and electrolytes are stable (2).

NONSTEROIDAL ANTI-INFLAMMATORIES (NSAIDS)

Inhibition of cyclooxygenases (COX) leads to a decreased production of thromboxane A₂, which causes a decrease in platelet aggregation. NSAIDs cause a reversible inhibition of COX, and generally platelet function is normalized within 3 days of discontinuation of these medications. It is generally recommended that NSAIDs be discontinued 3 to 5 days preoperatively. Ibuprofen and indomethacin have shorter half-lives, and therefore can be discontinued 24 hours preoperatively (2).

ANTITHROMBOTIC AGENTS

Aspirin irreversibly inhibits platelet COX. In the 2012 Chest guidelines, it was recommended that aspirin be continued in moderate to high risk patients for cardiovascular events during the perioperative phase. Patients are high-risk if they have a history of cerebrovascular disease or a history of myocardial infarction, as well as unstable angina or coronary stenting. In low risk patients, it was recommended that it be discontinued 7 to 10 days preoperatively to allow for reversal of the anticoagulant effect. If aspirin is discontinued preoperatively, it can be continued 24 hours postoperatively when adequate hemostasis is achieved (13).

Explicit discussion between the primary care physician, cardiologist, and surgeon needs to take place on the management of patients taking aspirin and clopidogrel bisulfate. The discussion needs to weigh the cardiovascular risks of stopping the aspirin/clopidogrel bisulfate versus the risk of bleeding from the procedure. There are different timeframes on how long clopidogrel bisulfate needs to be administered depending on what condition or stent the patient has, which is beyond the scope of this paper. It has been suggested that clopidogrel bisulfate use should be stopped at least 5 days prior to most elective surgery unless it is given for recent drug-eluting stent implantation (14).

Anticoagulant therapy

Warfarin therapy is sometimes utilized in the patient with atrial fibrillation. If a patient is low risk, the warfarin can be stopped safely without interim use of low molecular weight heparin (LMWH) or heparin for bridge therapy. However, if the patient is high risk (a history of prior embolization) then bridge therapy may be required. The recommendations should always be verified by the cardiologist treating the patient, but in general LMWH should be initiated when the international normalized ratio (INR) is less than 1.8. LMWH should be discontinued 12 hours before surgery, but if spinal anesthesia is anticipated it should be stopped 24 hours preoperatively. LMWH clearance can be prolonged in patients with renal insufficiency so proper laboratory monitoring is essential preoperatively (15). Major surgery can be performed relatively safely in patients with an INR of less than 1.5, and in minor surgeries the procedure can be performed relatively safely with an INR of less than 2 (16).

PERIOPERATIVE STEROIDS

Steroid stress dosing during the perioperative phase is only recommended in the patient who has been treated with prednisone for longer than 3 weeks continuously. The anesthesiologist will generally give between 25 to 100 mg

of hydrocortisone at induction, and an additional 100 mg of hydrocortisone at discharge. The normal adrenal gland, under nonstressful conditions, will produce approximately 25-30 mg of cortisol per day. Under major stress it will produce approximately 200-500 mg per day (2).

ANTIRHEUMATICS

There have been concerns in the past in patients taking disease-modifying antirheumatic drugs (DMARDs) on wound healing and postoperative infection risks. In 2001, Grennan et al (17) suggested that methotrexate did not cause early postoperative complications or wound healing issues. Their recommendation was not to discontinue the DMARD days or weeks before surgery. However, caution needs to be taken in patients that develop renal failure or sepsis because many DMARDs are excreted through the kidneys, and impaired kidney function can lead to accumulation of their metabolites with consequent bone marrow suppression.

HERBAL MEDICATIONS

Herbal medications are popular among many patients. The problem with these medications is that they are not regulated by the U.S. Food and Drug Administration. Herbal medications can prolong bleeding postoperatively, decrease postoperative healing, interact with anesthetic agents, and prolong the effects of warfarin. There are many other adverse effects that have occurred with these medications, and because many of the perioperative effects are not fully understood it is recommended that these agents be stopped at least 1-2 weeks preoperatively (3).

CONCLUSION

This article does not provide information on every available medication in the market today, but does include medications that are often taken by patients commonly seen by the ankle and foot surgeon. There are no concrete recommendations available to date, and very limited evidence originating from randomized controlled studies exist to help direct perioperative medication management. Much of the information currently available relies on expert consensus, case reports, in vitro studies, and other data. It is imperative to execute a thorough history and physical examination, and record all medications and dosages preoperatively. Communication between the surgeon, medical treating physician, and anesthesiologist is necessary to fully optimize the patient's medical conditions and ensure that proper preoperative risk assessment is performed.

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