

الله أكبر



# **Preoperative Medication Management**

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- **Some medications have beneficial effects during surgical procedures, whereas others may be detrimental.**
- **In some cases, abrupt *withdrawal* of medications can have a negative effect.**

# Antihypertensive medications

- In general, all long-term antihypertensive treatment should be continued up to the day of surgery, with the possible exception of angiotensin-converting enzyme inhibitors (ACEIs [captopril](#), [enalapril](#), [lisinopril](#)..) and angiotensin receptor blockers (ARBs [losartan](#), [Valsartan](#)..).
- Administration of these medications within 24 hours before surgery is consistently associated with increased risks of intraoperative hypotension.

- Accordingly, it is reasonable to withhold these medications for 24 hours before surgery, provided that they are restarted postoperatively once patients are hemodynamically stable.
- Individuals on diuretic antihypertensives (e.g., **chlorthalidone, hydrochlorothiazide**) may require evaluation of electrolytes.

- diuretics (e.g., **furosemide**) can be continued on the day of surgery for most procedures since this strategy does not increase risks of intraoperative hypotension or adverse cardiac events.
- The exception is lengthy high-risk procedures with projected significant blood loss or fluid requirements, in which potent diuretics should be held on the morning of surgery.

- Conversely, most long-term cardiovascular medications in patients with IHD should be continued up to surgery, including  **$\beta$ -adrenergic blockers** (Propranolol, Carvedilol, Bisoprolol, Metoprolol, Atenolol, Timolol...), **statins**, and most other antihypertensive medications. Nonetheless, there are some exceptions.
- Most medical therapy, including  **$\beta$ -adrenergic blockers, hydralazine, nitrates**, and **digoxin**, should be continued preoperatively.

# Non-insulin antidiabetic medications

- Normal treatment regimen for most noninsulin diabetic medications (metformin, sulfonylureas, repaglinide, GLP-1 agonists, DPP-4 inhibitors) should be continued until the day before surgery but held on the morning of surgery.
- The possible exception pertains to SGLT2 inhibitors (e.g., empagliflozin), which have been associated with euglycemic diabetic ketoacidosis in the postoperative setting. Thus, some guidelines recommend that the medications be discontinued at least 24 hours before elective surgery.



- **Diabetic patients should discontinue *shortacting* insulin while fasting.**
- **The exception pertains to patients with continuous subcutaneous insulin infusion pumps.**

- A reasonable approach is for patients with type 1 diabetes mellitus to take a small amount (**one third to one half**) of their usual morning dose of intermediate-acting or long-acting insulin (e.g., lente, isophane) to avoid diabetic ketoacidosis.
- Patients with type 2 diabetes mellitus can either take **no insulin or up to one half** of their usual dose of intermediate-acting, long-acting, or combination (e.g., 70/30 preparations) insulin on the morning of surgery.

# Asthma medications

- Bronchodilators, corticosteroids (inhaled and oral), and any antibiotics must be continued on the day of surgery.
- $\beta$ -adrenergic agonists (salbutamol and terbutaline) are a useful prophylactic intervention to lower the risk of bronchospasm after induction of anesthesia.
- This therapy can be supplemented with a short preoperative course of oral corticosteroids (prednisone 20 mg-60 mg daily for 3-5 days) in any newly diagnosed or poorly controlled asthmatic patient.

- **Thyroid Disease**

All thyroid replacement therapy and antithyroid drugs should be continued on the day of surgery.

- **Statins**

Continue on the day of surgery.

# Adrenal Disorders

- Thus, supplementation is not required for individuals who have received less than 5 mg prednisone (or its equivalent) daily, or less than 3 weeks of corticosteroids (regardless of dose).
- patients taking prednisone (or its equivalent) in daily doses exceeding 20 mg/day for more than 3 weeks, and patients with Cushing syndrome should have perioperative corticosteroid supplementation.

- The need for supplementation is unclear for patients who have taken prednisone (or its equivalent) at a daily dose of 5 to 20 mg for more than 3 weeks.
- The options are to simply empirically provide perioperative corticosteroid supplementation or refer the patient to an endocrinologist for formal evaluation of their hypothalamic-pituitary-adrenal axis.

## **NSAIDs** (Non-steroidal anti-inflammatory drugs)

- NSAIDs have *reversible* antiplatelet effects; hence, once the drugs have been eliminated, platelet function returns to normal.
- Concomitant NSAID use does not appear to increase the risk of spinal hematoma with neuraxial anesthesia.

- Preoperative discontinuation of NSAIDs may be of value in patients at risk for perioperative AKI(*Acute kidney injury*).
- Typically, NSAIDs are discontinued 24 to 72 hours preoperatively.
- Earlier discontinuation does not increase safety, and it may be burdensome to many patients with significant arthritis or chronic pain.



- **COX-2 inhibitors** (e.g., celecoxib) have minimal effect on platelet function and can usually be continued in the perioperative period.
- COX-2 inhibitors Continue on the day of surgery unless the surgeon is concerned about bone healing.

# management of preoperative anticoagulant therapy

- Based on the 2018 ASRA guidelines, recommendations for management of preoperative anticoagulant therapy are more conservative if perioperative neuraxial techniques are being considered.
- These guidelines recommend that **warfarin** should be discontinued **5 or more days** before surgery, and a repeat preoperative INR should confirm a normalized value before neuraxial blocks are performed.

- The last **prophylactic** dose of **LMWH** should be 12 or more hours before any planned neuraxial block, whereas the last **therapeutic** dose (including bridging therapy) of LMWH should be **24 or more hours** beforehand.
- Preoperative unfractionated **intravenous heparin** should be stopped **6 or more hours** beforeplanned spinal or epidural anesthesia.

- Though the safety of performing neuraxial techniques in the presence of **low-dose subcutaneous unfractionated heparin** (i.e., 5000 units twice daily) has been described.
- the 2018 ASRA guidelines include a Grade 2C recommendation for waiting **4 to 6 hours** after subcutaneous injection before performing neuraxial blocks in patients receiving subcutaneous unfractionated heparin (i.e., 5000 units 2 or 3 times daily).

# Preoperative Antiplatelet Therapy

- Therefore, a reasonable standard approach for most surgical patients is to discontinue aspirin temporarily 3 days before surgery, with some notable exceptions.
- Continue aspirin in patients with prior percutaneous coronary intervention (PCI), high-grade IHD, and significant CVD (cerebrovascular disease).

- These medications (P2Y<sub>12</sub> inhibitors) include oral medications (**clopidogrel, ticagrelor, prasugrel, ticlopidine**) and an intravenous formulation (**cangrelor**).
- The usual recommended time interval for discontinuing these medications before surgery (including cases where neuraxial blocks are planned) is 5 to 7 days for **clopidogrel**, 5 to 7 days for **ticagrelor**, 7 to 10 days for **prasugrel**, 10 days for **ticlopidine**, and 3 hours for **cangrelor**.

- Do not discontinue P2Y12 inhibitors in patients who have drug-eluting stents until they have completed **6 month** of dual antiplatelet therapy, unless patients, surgeons, and cardiologists have discussed the risks of discontinuation.
- The same applies to patients with bare metal stents until they have completed **1 month** of dual antiplatelet therapy.

- current ASRA guidelines recommend discontinuing extended-release **dipyridamole** 24 hours before performing any neuraxial block.
- Platelet glycoprotein IIb/IIIa inhibitors (e.g., **abciximab**, **eptifibatide**, **tirofiban**) exert profound effects on platelet aggregation.
- Following administration, the time to restoration of normal platelet aggregation is 24 to 48 hours for abciximab, and 4 to 8 hours for eptifibatide and tirofiban.
- Rivaroxaban 3 days



# Anti-seizure medications

- Anti-seizure medications have multiple side effects(e.g., bone marrow suppression, macrocytic anemia, leucopenia, hyponatremia), and testing may be needed based on suspected abnormalities. The most commonly ordered tests are CBC and electrolyte concentrations.
- All anticonvulsant therapy should be continued perioperatively.

- Postmenopausal hormone replacement therapies that contain **estrogen** increase the risk of thromboembolic events. It may therefore be reasonable to discontinue these medications before operations.
- Estrogens must be stopped approximately 4 weeks preoperatively for coagulation function to return to baseline.

- Most modern oral contraceptives contain low doses of estrogen. Nonetheless, these medications are still associated with some elevation in thrombotic risk.
- Since the risk of unanticipated pregnancy may outweigh the benefits of discontinuing oral contraceptives preoperatively, it is reasonable to continue oral contraceptives in most patients during the perioperative period.

- In patients who are deemed to be a high risk for postoperative VTE (see section on “Venous Thromboembolic Disorders”), consideration may be given to stopping oral contraceptives 4 weeks before surgery (and temporarily switching to other forms of contraception).

# **Antidepressants, anxiolytics, and other psychiatric medications**

- Most medications for psychiatric and psychological problems should be continued into the preoperative period.
- Thus, most antidepressants, antipsychotics, and benzodiazepines are best maintained to avoid exacerbations of symptoms.

- Historically, monoamine oxidase inhibitor (MAOI e.g. Isocarboxazid , Phenzelzine , Selegiline , Tranylcypromine ) were discontinued preoperatively.
- however, elimination of the risks associated with many of these drugs required drug discontinuation at least 3 weeks before surgery.

- Preoperative withdrawal of these drugs has potential risks. Specifically, case reports of suicides or severe depression following discontinuation of MAOIs have been reported.
- Thus, the safest approach may be to continue these drugs and adjust the anesthetic plan accordingly (e.g., avoid **meperidine** and indirect-acting vasopressors such as **ephedrine**).

- Patients receiving tricyclic antidepressants require a preoperative ECG, given the potential for a prolonged QT interval.
- Because tricyclic antidepressants block the reuptake of norepinephrine and serotonin, high doses may also result in augmented responses to vasopressor drugs, with the potential for exaggerated hemodynamic changes.



- Patients taking **lithium** require evaluation of electrolyte and creatinine concentrations. Discontinuation of lithium has also been associated with suicide.
- Continued perioperative use of selective serotonin reuptake inhibitors (**SSRIs**) are associated with increased surgical bleeding, whereas abrupt discontinuation of SSRIs can also cause dizziness, chills, muscle aches, and anxiety.

- Overall, it is still reasonable to continue SSRI perioperatively in most patients, aside from those undergoing procedures where bleeding could have significant postoperative sequelae (e.g., intracranial surgery).

# MUSCULOSKELETAL AND CONNECTIVE TISSUE DISEASES

- Most medications, including **corticosteroids** and non-biological disease modifying agents (e.g., **hydroxychloroquine, cyclosporine, azathioprine, tacrolimus**) should be continued.
- Patients on long-term corticosteroid therapy may need perioperative stress dose corticosteroids.

# CANCERS AND TUMORS IN PREOPERATIVE PATIENTS

- Other important chemotherapy-associated side effects include
  - cardiomyopathy with **trastuzumab**
  - and anthracyclines (e.g., **doxorubicin**);
  - pulmonary toxicity with **bleomycin**;
  - nephrotoxicity with **cisplatin**;
  - hemorrhagic cystitis with **cyclophosphamide**;
  - and peripheral neuropathy with **vincristine or cisplatin**.

- Many chemotherapeutic agents are toxic to the bone marrow, and patients commonly exhibit preoperative anemia.
- Patients who received corticosteroids as part of their cancer treatment may be at risk for adrenal insufficiency. These individuals may require supplemental perioperative corticosteroids;

- **Opioid medications** Continue on the day of surgery.
- Patients who are taking **disulfiram** because of a history of alcohol abuse suggest that disulfiram be discontinued 10 days before the surgical procedure.
- For patients taking **naltrexone** for a history of alcohol abuse, consideration should be given to discontinuing it 3 days preoperatively.

# Complementary and alternative medications

- Complementary and alternative medications may interact with anesthetic drugs, alter effects of prescription medications, and increase bleeding.
- In addition, many patients do not consider these drugs “medications,” and may not list them among their medications unless specifically asked.

- **GARLIC** : discontinuation of garlic at least 7 days before surgery, especially if postoperative bleeding is a particular concern or other anticoagulants are given.
- **Ginger (*Zingiber officinale*)**: discontinuation of ginger at least 2 weeks before surgery.
- **GINSENG** : ginseng use should be stopped at least 2 weeks before surgery.



- **GREEN TEA** : green tea should be discontinued at least 7 days before surgery.
- **Coenzyme Q10**: CoQ10 should be discontinued at least 2 weeks before surgery.
- **GLUCOSAMINE AND CHONDROITIN SULFATE**: Considering the reported interaction between glucosamine-chondroitin and warfarin, these supplements should be discontinued 2 weeks before surgery, especially if warfarin will be given during the perioperative period.
- **Fish oil** be discontinued 2 weeks before surgery, especially for patients taking large doses.

Thank You!

