

Hypercholesterolemia

Risk

- Incidence in USA: 71 million American adults have high LDL-C levels. Nearly 31 million adult Americans have a total cholesterol level >240 mg/dL.
- Risk factors for ASCVD include being a male age >45 y, being a woman age >55 y, family Hx of premature CAD, current cigarette smoking, DM, obesity, obstructive sleep apnea, Htn, CAD, high stress, high LDL-C, and low HDL-C.
- The LDL-C level of ≥ 190 mg/dL and HDL-C <40 increases the risk for CHD.
- A high triglyceride level combined with low HDL-C level in adults increases the risk of CHD and stroke.
- Familial hypercholesterolemia, an autosomal dominant trait (LDL >260 mg/dL), increases risk for premature CHD.
- Perioperative risks:
 - Acute coronary syndrome, myocardial ischemia, infarction, and ventricular tachyarrhythmia.
 - Cardiac events and worsened CHF.
 - Stroke or death.
 - Knowledge gap exists on whether statin therapy causes periop cognitive dysfunction or delirium in some circumstances.

Worry About

- New-onset angina or increasing frequency or severity of angina, stent thrombosis, bleeding, periop myocardial ischemia, and infarction

- Hypotension, Htn, ventricular arrhythmia, worsening, or new-onset CHF
- TIAs or stroke of the CNS
- Peripheral atherosclerosis, acute pancreatitis

Overview

- Association between high level of LDL-C and an increased risk of ASCVD, including coronary heart disease, stroke, and peripheral arterial disease.
- Desirable or target cholesterol levels are variable and based on existing CV disease and risk of developing CV disease in future and statin therapy.
- The ASCVD risk assessment for 10 y and lifetime can be estimated using various web-based ASCVD risk estimator tools.
- Preop treatment with statins is associated with significant improvement in postop mortality and early clinical outcome in pts undergoing cardiac, vascular, and noncardiac surgery.

Etiology

- Can be primary or secondary to systemic illness such as diabetes, nephrotic syndrome, chronic renal failure, hypothyroidism, or drugs that increase LDL such as anabolic steroids.
- Obesity, sedentary lifestyles, and diets high in saturated fats, trans fat, and cholesterol increase the risk of high LDL-C.

Usual Treatment

- Lifestyle modification, including dietary, physical exercise, and weight control are critical components of reducing cholesterol and ASCVD risk reduction.
- 2013 ACC/AHA updated guideline on treatment of blood cholesterol to reduce ASCVD risk in adults emphasizes lifestyle modification and use of high-, moderate-, and low-intensity statin therapy to four groups of pts, including history of clinical ASCVD, history of diabetes, LDL-C level, and estimated ASCVD risk.
- HMG CoA reductase inhibitors or statins like rosuvastatin (Crestor), lovastatin (Mevacor), pravastatin (Pravachol), simvastatin (Zocor), atorvastatin (Lipitor), and fluvastatin (Lescol) are drugs of choice in most pts with hypercholesterolemia, as they reduce LDL levels effectively.
- In high-risk pts with high triglyceride or low HDL levels, consideration can be given to combine a fibrate or nicotinic acid with an LDL-lowering drug.
- The combination treatment with HMG reductase inhibitor and cholesterol absorption inhibitor (ezetimibe) is highly synergistic in treating high-risk pts.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Myocardial ischemia and infarction Left ventricular dysfunction	Angina or its equivalents Dyspnea, edema, exercise intolerance, coronary stent location and type	Displaced PMI, S ₃	ECG, CXR, stress test, ECHO, cardiac MRI, coronary angio
RESP	CHF	Dyspnea, orthopnea, cough	Rales and rhonchi	CXR
RENAL	Impaired renal perfusion	Nighttime urinary frequency		Cr
CNS	Cerebrovascular atherosclerosis Peripheral vascular atherosclerosis	TIAs Poor leg circulation Cramping, pain, heaviness	Carotid bruit ABI	Carotid US and angio Doppler/duplex US, MRA, CT Angiogram

Key References: Stone NJ, Robinson JG, Lichtenstein AH, et al.: 2013 ACC/AHA guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines, *J Am Coll Cardiol* 63(25 Pt B):2889–2934, 2014; Turan A, Mendoza ML, Gupta S, et al.: Consequences of succinylcholine administration to patients using statins, *Anesthesiology* 115(1):28–35, 2011.

Perioperative Implications

Preoperative Preparation

- Assess for CAD, DM, valvular disease, and PVD.
- Assess and screen for obesity, related OSA, and metabolic syndrome.
- Routine preop liver function testing is not necessary for pts on statins.
- For pts currently on statins and undergoing noncardiac surgery, statins should be continued.
- For pts undergoing vascular surgery with or without clinical risk factors, initiation of statins should be considered.
- Periop statins have a protective effect on cardiac complications during noncardiac surgeries. Initiation of a statin prior to cardiac surgery may reduce risk of postsurgical AKI.
- Pts with hypercholesterolemia and another risk factor (smoking, diabetes, hypertension or age >60) should be started on a beta-blocker 2 to 7 d prior to surgery. Starting a beta-blocker 1 d prior to surgery shows no benefit and may be harmful.
- Assess for myopathy, liver damage, cognitive impairment, and new onset DM in moderate or high intensity statin therapy and older pt groups.

Monitoring

- Consider appropriate invasive monitoring in presence of large fluid shifts, ischemic Hx, and high-risk surgery.

- Implement ST-T measurement or mapping in pts with CHD or risk factor for CHD.

Airway

- May be overweight and difficult to intubate or ventilate

Induction

- Succinylcholine induced fasciculations and mild elevation of plasma myoglobin are clinically not significant to cause rhabdomyolysis or renal injury in pts on statin therapy in absence of myopathy. Succinylcholine should be avoided in pts with myopathy, muscle pain, injury, breakdown, prolonged muscle compression after being intoxicated, or surgery involving elevated risk for developing rhabdomyolysis, whether they are on statins or not.
- Implement aggressive treatment for tachycardia, Htn, or hypotension during induction.

Maintenance

- Maintain hemodynamic stability without hypothermia or anemia; ideal Hct may be >27%.
- No anesthetic agent or technique has proven superior.
- Monitor for ischemia and CHF.
- Rhabdomyolysis is a rare complication of statins. Monitor for darker urine myoglobinuria, increase in serum CK, and acute renal failure.

Extubation

- For noncardiac surgery, this is the period of greatest risk for ischemia.

Postoperative Period

- High incidence of tachycardia, ischemia, and MI for several d after noncardiac surgery.
- Treat pain, unstable hemodynamic, and biochemical abnormality aggressively.
- Statin therapy initiated prior to surgery should continue postop.

Adjuvants

- Depends on end-organ disease

Anticipated Problems/Concerns

- Problems are related to atherosclerosis in multiple organs, including heart, kidneys, and brain.
- Risk factors for rhabdomyolysis involving skeletal muscle breakdown are young age, obesity, diabetes, CKD, periop bleeding, exaggerated position such as flank, lithotomy, and prone position with prolonged muscle compression.
- Pts with intense physical activity while on statins may have increased the risk of developing rhabdomyolysis.