syndrome), chronic liver disease, prolonged heparin therapy, and increased protein catabolism
- Conflicting data about role of oral contraceptive use, pregnancy, and CAD

Usual Treatment

- Medical therapy: LMWH, unfractionated heparin, sodium warfarin, or combination of oral anticoagulants
- Periop: FFP, cryo-precipitate, AT III concentrate (plasma derived or recombinant), and heparin (heparin resistance can be treated with FFP).

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	CAD		Angina, dyspnea	ECG, CXR, angiography
PVS	DVT Arterial occlusion		Gangrene, absent pulses	
RESP	Pulm embolus	Dyspnea Exercise tolerance decreased	SOB	CXR V/Q scan
GI	Mesenteric artery/vein occlusion Decreased AT III	Abdominal pain Chronic liver disease symptoms	Rectal bleeding, jaundice, hepatomegaly	Serum albumin, AT III level
HEME	Bleeding and thrombosis	DIC	Petechiae, purpura, thrombosis	FDP, PT, PTT, plt count, AT III level Anti-Xa assay
GU	Decreased albumin and AT III levels	Nephrotic syndrome, proteinuria	Edema	Urinalysis, serum albumin
CNS	CVA	Sudden onset; Hx of other embolic disease	Seizure, loss of vision/motor function	CT scan, angiogram

Key References: Maclean PS, Tait RC: Hereditary and acquired antithrombin deficiency: epidemiology, pathogenesis and treatment options, *Drugs* 67(10):1429–1440, 2007; Paidas MJ, Forsyth C, Quere I, et al: Perioperative and peripartum prevention of venous thromboembolism in patients with hereditary antithrombin deficiency using recombinant antithrombin therapy, *Blood Coagul Fibrinolysis* 25(5):444–450, 2014.

Perioperative Implications

Preinduction/Induction/Maintenance

- Assess whether congenital or acquired; if acquired, treat primary disease if possible.
- Weigh risks of thromboembolic phenomenon versus excessive bleeding.
- Stop oral anticoagulation and substitute FFP or AT III concentrate to bring AT III level to 80% to 120% normal.
- Heparin to provide PTT of >1.5 times control.
- Provide mechanical and pharmacologic thromboprophylaxis.

Monitoring

- Careful attention to temp
- Volume status and resp variables
- PTT, AT III levels, and anti-Xa activity assay

General Anesthesia

- No special concerns with airway, induction, or adjuvant drugs.
- Maintain normothermia to avoid hyperviscosity.
- Maintain intravascular volume.
- IV heparin effect should be monitored.
- Careful evaluations of hypotension or change in $ETCO_2$.

Regional Anesthesia

- Neuraxial techniques require meticulous attention to the timing of
  - Neuraxial anesthesia in relation to the last dose of anticoagulant.
  - First postop dose of anticoagulant in relation to the placement of neuraxial block and/or removal of indwelling cath.
- For plexus and peripheral blocks, follow ASRA guidelines for anticoagulated pts.

Postoperative Period

- Consider ICU for monitoring.
- Continue anticoagulation.
- Early mobilization.
- Remove indwelling cath ASAP.
- Oral anticoagulation might be reintroduced ASAP.

Anticipated Problems/Concerns

- Embolic phenomena can occur intraoperatively
- Monitoring lines may be foci for thrombus formation
- Perioperative thromboembolic events' major concern; continuous anticoagulation is required, as is operative prophylaxis with AT III concentrate (plasma derived or recombinant), FFP, and heparin

Anxiety Disorders

Misako Sakamaki

Risk

- Lifetime prevalence approximately 30% in USA
- Gender: Female (2× more likely compared with male)
- Environmental: Traumatic or stressful events
- Age: Often develop in childhood and early adulthood; however, may occur any time after a stressful event
- Medical conditions: Chronic mental or physical illness
- Genetics: Family psychiatric history

Perioperative Risks

- Generalized anxiety disorder leads to chronic autonomic hyperactivity with increased risks for CAD and Htn.
- Uncontrolled anxiety and fear may predispose pts to greater risk for acute postop pain and postop N/V.
- Increased risk of periop complications due to impaired response to stress.

Worry About

- Inadequately treated anxiety disorders affecting pt's decision-making and communication capacities, which may complicate medical courses
- Altered drug anesthetic requirements and drug metabolisms associated with psychiatric medications
- Systemic side effects from psychiatric medications
- Potential medication interactions with anesthetics
- Signs/symptoms may overlap with other medical conditions (e.g., hyperparathyroidism) and drug-induced causes (e.g., alcohol, caffeine, nicotine, withdrawal), which could be life-threatening.

Overview

- Types
  - Generalized anxiety disorder
  - Panic disorder
  - Social anxiety disorder
  - Specific phobias
  - PTSD
  - OCD
- Characterized by excessive apprehension, physical tension, physiologic symptoms, dissociative anxiety, and fear leading to significant distress or impairment
- Comorbidity with major depression (60%), other mental disorders, and substance abuse
- Associated with a variety of chronic medical conditions

Etiology

- Genetics: ↑ norepinephrine metabolites, ↓ GABA level, ↓ postsynaptic alpha-2 adrenergic receptor sensitivity, and ↓ benzodiazepine binding sites on platelets and lymphocytes; altered central processing involving amygdala and nuclei of basolateral complex that play central roles in fear and anxiety responses
- Stress
- Drugs: Caffeine, alcohol, nicotine, and withdrawals

Usual Treatment

- Lifestyle changes (e.g., regular exercise, reduce caffeine/alcohol/nicotine intake)
- Psychotherapy
- Pharmacotherapy
  - SSRI/SNRI
  - Benzodiazepines
  - Beta-blockers (for phobias)
  - Adjuvants therapy: TCAs, MAOIs, antipsychotics, buspirone, and pregabalin
- Alternative remedies: Kava-kava, valerian root, and passion flower
- Deep brain stimulation (OCD)
- Surgery: Cingulotomy (OCD)

Assessment Points

System	Effect	Assessment/PE	Test
CV	CAD, HTN, increased, dysrhythmias	Decreased exercise tolerance, diaphoresis, palpitations, angina, CHF symptoms	ECG and/or invasive testing if indicated
RESP	Obstructive lung disease, OSA	Decreased exercise tolerance	Generally not needed
GI	Irritable bowel syndrome	Nausea, diarrhea	
ENDO	Increased cholesterol		
CNS	Migraines Insomnia Hyperarousal state	Headaches, fatigue, tremor, sweating, restlessness	
MS	Muscle tension	Headaches and skeletal muscle pain	
IMMUNO	Altered immune response to stress and environment	Hay fever, hives	

Key References: Grant BF, Stinson FS, Dawson DA, et al: Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions, *Arch Gen Psychiatry* 61(8):807–816, 2004; Clarke H, Kirkham KR, Orser BA, et al: Gabapentin reduces preoperative anxiety and pain catastrophizing in highly anxious patients prior to major surgery: a blinded randomized placebo-controlled trial, *Can J Anesth* 60(5):432–443, 2013.

Perioperative Implications

Preoperative Preparation

- Discuss the periop needs and benefits of psychiatric intervention with surgeons and psychiatrists.
- Continue outpatient medications; abrupt cessation may cause withdrawal.
- Treat acute anxiety with benzodiazepine or beta-blockers if indicated.
- Alpha-2-delta blockers such as gabapentin and pregabalin may be effective in reducing preop anxiety and postop pain.
- Assess cardiovascular status: HR, cardiac rhythm, and BP.
- Review pt's medications, which may have significant interactions with periop medications.

Monitoring

- Myocardial ischemia, cardiac dysrhythmias, and BP control
- Altered temperature regulations; hyperpyrexia

Induction

- Sudden reduction of autonomic hyperactivity may cause BP and HR fluctuations.

Maintenance

- Altered drug metabolism and anesthetic requirements and potential drug interactions with intraop medications, incl:
  - SSRIs: CYP450 inhibitor (fluoxetine) associated with serotonin syndrome (tramadol, dextromethorphan, pethidine, and pentazocine)
  - TCAs: ↑MAC, ↑response to indirect-acting vasopressors and sympathetic stimulations, increased response to indirect-acting vasopressors (e.g., ephedrine) and sympathetic stimulation
  - MAOIs: Orthostatic hypotension, tyramine-induced hypertensive crisis, excessive effects of sympathomimetic drugs and sympathetic stimulation and serotonin syndrome (meperidine)
  - Antipsychotics: Orthostatic hypotension, increased QT and PR intervals, decreased BP under GA, extrapyramidal side effects (typical antipsychotics), decreased seizure threshold, abnormal temperature regulation, sedation, and neuroleptic malignant syndrome
  - Benzodiazepine: Diazepam, clonazepam, and midazolam are metabolized via CYP-mediated oxidation: Increased duration of effect with liver impairment; synergistic effects among benzo, hypnotics, and opioids
  - Kava-kava: Decreased SVR, increased effects of CNS depressants, abnormal platelet aggregation, and liver toxicity

Extubation

- Confusion and combativeness
- Prolonged narcosis

Postoperative Period

- Continue psychiatric medications to avoid acute relapse.
- Consider early psychiatric intervention.

Anticipated Problems/Concerns

- Anticipate enhanced postop acute pain and PONV.
- Anticipate complications related to substance abuse (e.g., alcohol withdrawal).
- Anticipate and treat postop delirium.
- Anticipate prolonged hospital course.
- Be cautious before introducing any new medications for potential drug interactions.

Aortic Regurgitation

Robert B. Schonberger | Paul G. Barash

Risk

- There are on the order of 100,000 aortic valve surgeries each year, with approximately 18,000 of them performed annually in the USA.
- Of aortic valves, 20% to 30% have isolated regurgitation at time of replacement.
- At time of replacement, 12-30% of aortic valves have combined regurgitation and stenosis.
- M:F ratio: 3:1.
- Racial predominance: None known.

Perioperative Risks

- Left ventricular failure
- Right ventricular failure
- Subendocardial ischemia
- Splanchnic ischemia

Worry About

- Underlying causes of acute aortic regurgitation including aortic dissection, a malfunctioning valve prosthesis, or endocarditis
- Hypertension, which increases aortic regurgitation and decreases cardiac output
- Bradycardia, which increases aortic regurgitation and decreases cardiac output
- When going onto bypass, avoid LV distention from fibrillatory arrest before aortic cross-clamping (frequently occurs during cooling on pump) until LV decompression is immediately achievable

Overview

- Long latency period between onset of hemodynamic changes and symptoms with the exception of acute aortic regurgitation (~20-30 y)
- Myocardial ischemia uncommon
- Bicuspid valve +/– ascending aortic aneurysm frequently associated with aortic regurgitation
- Abdominal pain a manifestation of splanchnic ischemia

Etiology

- Congenital bicuspid valve
- Damage to leaflets
- Aortic root dilatation
- Loss of commissural support

Treatment

- Medical: Control of systolic hypertension via vasodilators (e.g., ACE inhibitor), calcium channel blockers, and diuretics.
- In Marfan syndrome, which is often accompanied by aortic regurgitation and root dilation, angiotensin receptor blockers are a promising treatment to prevent or slow the progression of aortic dilation.
- Surgical: Aortic valve replacement.