- Most common presenting symptom is fatigue related to anemia.
- Anemia can be caused by combination of factors: Decrease in red cell survival, impaired erythropoiesis, hemolysis, plasma volume expansion, and blood loss from GI tract.
- Potentially severe adverse neurologic, hematologic, and CV problems periop.
- Anesthetic concerns similar to those in multiple myeloma, except that hypercalcemia and bone lesions are rare; renal failure and proteinuria less common.

Etiology

- Familial clustering: First-degree relatives of pts with WM have a 20-fold increased risk of WM.
- L265P mutation in myeloid differentiation primary response 88 gene (*MYD88*) is detectable in more than 90% of pts.
- Role of environmental factors remains to be clarified.

Usual Treatment

- Alkylating agents (chlorambucil, cyclophosphamide), purine analogues (cladribine, fludarabine), monoclonal antibody (rituximab), and dexamethasone
- Stem cell transplantation
- Plasma exchange to treat hyperviscosity symptoms

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Hyperviscosity (high output cardiac failure, valvular dysfunction, MI)	Angina Dyspnea Fatigue	Venous thrombosis Fluid overload	Serum viscosity >4 g/dL
RESP	Pulm involvement	Dyspnea	Hypoxia	CXR (pleural effusion, diffuse pulm infiltrates)
HEME	Coagulopathy (multifactorial)	Episodic epistaxis, mucosal and gum bleeding		Coagulation studies
	Anemia (multifactorial)	Fatigue	Pallor	CBC (normocytic, normochromic anemia)
	Cryoglobulinemia	Cold intolerance Raynaud syndrome Arthralgia	Purpura	Cryoglobulin assay
	Lymph node involvement		Lymphadenopathy	
RENAL	Glomerulonephritis	Dehydration Uremic symptoms		BUN/Cr UA (proteinuria)
CNS	Leukoencephalopathy Abn cerebrovascular permeability (hyperviscosity)	Headaches Blurred vision	Mental status changes Retinal hemorrhage, papilledema	
PNS	Demyelinating peripheral neuropathy		Symmetric, distal sensorimotor neuropathy, ataxic gait	
GI	Organomegaly secondary to IgM infiltration		Hepatomegaly Splenomegaly	

Key References: Gertz MA: Waldenström macroglobulinemia: 2015 update on diagnosis, risk stratification, and management, *Am J Hematol* 90(4):347–354, 2015; Leff J, Shore-Lesserson L, Fischer GW: Hematologic diseases. In Fleisher LA, editor: *Anesthesia and uncommon diseases,* ed 6, Philadelphia, PA, 2012, Elsevier, pp 350–358.

Perioperative Implications

Preinduction/Induction/Maintenance

- Consider plasmapheresis and transfusion.
- All drugs: Theoretical unpredictable pharmacokinetics due to alterations of relative proportions of globulins in blood and expanded plasma volume.
- Judicious fluid management.

Monitoring

- Normothermia to prevent cryoglobulin precipitation.

General Anesthesia

- Macroglossia if amyloidosis (rare).

Regional Anesthesia

- Relative contraindication in presence of peripheral neuropathy.

Postoperative Period

- Transient postop paresis due to disease rather than anesthetic management.

Anticipated Problems/Concerns

- Hyperviscosity symptoms (<15% of pts; rare in pts with IgM concentration <4 g/dL):
  - Symptoms are due primarily to shear forces of excessive IgM that rupture venous channels.
  - Capillary blood flow impaired, leading to decreased O_2 delivery through microcirculation and tissue ischemia.
  - Epistaxis, gingival bleeding, and visual changes due to retinal hemorrhage are common presenting manifestations.
  - Severe cases of hyperviscosity syndrome may be associated with confusion, dementia, stroke, and coma.
  - CV manifestations secondary to expanded plasma volume include angina, high output cardiac failure, valvular dysfunction, or MI.
  - Plasma exchange is the fastest, most effective method to reduce plasma viscosity. Should be considered a temporizing measure until systemic therapy reduces IgM protein concentration.
- Anemia:
  - Hgb value may be artificially reduced by 2 g/dL secondary to increased plasma volume.
  - Transfusion may precipitate CHF or hyperviscosity syndrome (by increasing serum viscosity) and potentially decrease O_2 delivery.
  - Consider plasmapheresis before transfusion.
- Coagulopathy
- Cryoglobulinemia (5% risk):
  - Precipitation of cryoglobulins at cold blood temp triggers complement activation, which results in immune complex vasculitis and ischemia.
  - Raynaud syndrome, arthralgia, purpura, peripheral neuropathy, hepatic dysfunction, and renal failure may develop.

Wegener Granulomatosis (Granulomatosis With Polyangiitis)

Christopher J. Cullom | Alan David Kaye

Risk

- Prevalence of 3:100,000 persons affected
- More common in the white race; however, no gender affinity
- Respiratory failure
- Upper airway compromise
- Cardiovascular instability
- Acute renal failure
- Peripheral neuropathy
- Bleeding disorder

Perioperative Risks

- Medication toxicity, side effects, and interactions
- Systemic involvement, primarily respiratory, cardiovascular, and renal systems
- Airway compromise

Overview

- Systemic vasculitis of small, medium, and occasionally large arteries
- Characterized by necrotizing granulomatosis of upper and lower respiratory tracts in addition to glomerulonephritis

Etiology

- Autoimmune disorder of unknown etiology.
- Type II hypersensitivity reaction.
- May involve lack of alpha-1 antitrypsin.
- Antineutrophilic cytoplasmic antibodies are involved.
- Symptoms include
  - Upper airway involvement in 95% of pts, including paranasal sinus drainage and nasal mucosa ulceration.
  - Subglottic stenosis present in 9–16% of pts.
  - Pulm involvement manifests as cavitating granulomatous lesions.
  - Pulm arterial/venous vasculitis creates V/Q mismatch and pulm shunting.
  - Lower resp tract findings also may be present including cough, dyspnea, and hemoptysis.
  - CXR may reveal alveolar opacities, diffuse hazy opacities, nodules, and pleural opacities.
  - 77% of pts manifest with renal failure.
  - Eye involvement in 52% of pts including conjunctivitis, scleritis, keratitis, uveitis, and episcleritis.
  - Skin symptoms include papules, vesicles, purpura, ulcers, and nodules occurring in 40% of pts.
  - Nonspecific symptoms include night sweats, malaise, fatigue, arthralgias, anorexia, and weight loss.
- Diagnosis:
  - Biopsy of nasopharyngeal lesion preferred, showing necrotizing granulomatous vasculitis
  - Biopsy of kidney or lung showing segmental necrotizing glomerulonephritis with no immunoglobulin deposition
  - Elevated ESR, leukocytosis, normocytic anemia, and thrombocytosis

Usual Treatment

- Cyclophosphamide combined with oral glucocorticoid.
- Complete remission may take 1–2 y.
- 90% of pts achieve improvement, and 75% have remission.
- 50% of pts in remission have relapse.
- Morbidity from disease includes renal insufficiency, hearing loss, tracheal stenosis, and saddle nose deformity.
- Drug considerations:
  - Glucocorticoid side effects include diabetes, cataracts, osteoporosis, and Cushingoid features.
  - Cyclophosphamide side effects include cystitis, bladder cancer, myelodysplasia, and infertility.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	MI PVD	H/o ischemic heart disease		ECG
RESP	Destructive lesions of epiglottis, pharynx, or larynx V/Q mismatch and pulm shunting, destructive lesions pulm parenchyma		SOB, cough, hemoptysis, pleuritic CP, upper airway ulcerations	PFTs, CXR, ABG
RENAL	Glomerular destruction and tubular atrophy	Caution with drugs dependent on renal excretion		Renal function panel, renal biopsy, urinalysis
HEME	Bleeding propensity	CH/o cyclophosphamide or methotrexate treatment	Petechiae, bleeding gums	CBC, clotting studies
OPHTH	Vision loss, keratitis, scleritis, conjunctivitis, uveitis		Ophthalmic exam	Visual acuity test
ENT	Nasal mucosal ulceration or obstruction	Nasal discharge or drainage, epistaxis, hyposmia, epiphora	Upper airway exam	Nasal biopsy
NEURO	Peripheral neuropathy		Peripheral neuro sensory exam	
DERM	Ulceration distal arms/legs			Skin biopsy

Key References: Rookard P, Hechtman J, Baluch AR, et al.: Wegener's granulomatosis, *Middle East J Anaesthesiol* 20(1):21–29, 2009; Kahn AM, Elahi F, Hashmi SR, et al.: Wegener's granulomatosis: a rare, chronic, and multisystem disease, *Surgeon* 4(1):45–52, 2006.

Perioperative Implications

Preoperative Preparation

- Upper airway assessment to identify ulcerations or obstructing lesions, CXR, and PFTs.
- Screen for symptoms including cough, dyspnea, hemoptysis, or pleuritic chest pain.
- Consider RA when possible, but be aware that pts may have peripheral neuropathy and coagulation disorders that may add risk to the procedure.

Intraoperative Considerations

- Upper airway considerations should include careful physical inspection using laryngoscopy for ulcers of the palate, pharynx, or epiglottis. Care should be taken during intubation to avoid bleeding or displacement of brittle tissue. May consider regional anesthesia to avoid airway manipulation.
- Respiratory considerations include increased dead space and V-Q mismatch due to pulmonary artery and vein vasculitis. Bronchial obstruction and destruction may occur; thus frequent suctioning may be required. Monitoring of ABG ensures adequate oxygenation.
- Cardiovascular considerations include increased risk of MI due to not only peripheral but also coronary vasculitis as well. Avoid situations of increased preload, afterload, heart rate, or coronary spasm.
- Pts on corticosteroid therapy should be given 100 mg hydrocortisone prior to surgery to avoid Addisonian hypotensive crisis.
- Renal considerations include avoidance of anesthetics that require renal excretion such as morphine, meperidine, diazepam, midazolam, vecuronium, pancuronium, and nitroprusside.
- Cyclophosphamide inhibits pseudocholinesterase, which prolongs the activity of succinylcholine, thus warranting consideration when determining paralytic drug choice.

Postoperative Period

- Close observation of the upper airway following extubation should be performed, as edematous granulation tissue from intubation is possible.

Wilms Tumor

Peter J. Davis

Risk

- Most common malignant renal tumor in childhood.
- Accounts for 6% of all childhood malignancies.
- 5-7.8 cases per million children <15 y old in the USA.
- Prevalence: Males equal to females.
- Peak age is 1–3 y.
- 5% bilateral.
- Relapse-free survival rate at 2 y: 90%.
- Pts with favorable staging have an 80–90% chance of cure. Pts with metastasis have 50% long-term survival.
- Overexpression of HER-2 oncoprotein is a good predictor of survival.
- Along with hepatoblastoma, more common in Beckwith-Wiedemann syndrome.

Perioperative Risks

- Increased intraabdominal pressure
- Immunocompromised
- Tumor extension into renal vein, IVC, and heart
- Some treated with chemotherapy prior to surgery
- Associated Htn
- Acquired Von Willebrand syndrome, 10%

Worry About

- Anomalies:
  - Aniridia 1%, hemihypertrophy 2%
  - Neurofibromatosis
  - Beckwith-Wiedemann syndrome
  - GU abnormalities, horseshoe-shaped kidney, cryptorchidism, gonadal dysgenesis, hypospadias, duplication of collecting systems
- Metastatic disease: Lymph nodes, lung, liver, brain