Glossopharyngeal Neuralgia

R. David Todd

Risk

- Majority of cases of GPN are idiopathic.
- Increased prevalence with extracranial neoplasms, trauma/infection/inflammation to tonsils, and pharynx, arachnoiditis.
- More common in pts older than 50 y and middle-aged females.

Perioperative Risks

- Vagoglossopharyngeal neuralgia occurs in 10% of pts with GPN. Attacks of pain can trigger bradycardia/asystole, arterial hypotension, syncope, ECG changes (arrhythmias), or even cardiac arrest.
- Tonic-clonic limb jerking and facial movements that resemble seizure activity can accompany attacks of pain.

Worry About

- Bradycardia, asystole, arterial hypotension, syncope, arrhythmias, and cardiac arrest during pain attacks
- Drug interactions with anticonvulsants: Carbamazepine, phenytoin, and oxcarbazepine
- Chronic narcotic use

Overview

- Rare: Represents ~1% of facial pain cases.
- Sudden, sharp, and excruciating pain shooting to the pharynx, tonsil, base of tongue, with possible radiation to eustachian tube and inner ear structures and/or mandible angle.
- Attacks may be triggered by swallowing (most common), chewing, talking, coughing, or yawning.
- Paroxysms of pain are usually <1 min and can recur after brief periods.
- Clusters of attacks last from weeks to months.
- Trigger zones can be located when application of topical anesthetic solution relieves pain.
- Pain typically stays on same side, and left side symptoms are more common (3:2).
- Attacks can precipitate bradycardia, syncope, tachycardia, and arterial hypotension.
- Cranial nerve (IX) receives afferent input from chemoreceptor and stretch baroreceptor of carotid body and carotid sinus, which may be responsible for CV reflex symptoms.
- Differential Dx can include trigeminal neuralgia, superior laryngeal neuralgia, cluster headache, or sick sinus syndrome.

Etiology

- Usually idiopathic
- Secondary causes:
  - Vascular compression of the glossopharyngeal nerve (most common)
  - Neoplasms (cerebellopontine, skull base, pharynx, tongue, laryngeal carcinomas)
  - Infection (tonsillitis, pharyngeal abscess, arachnoiditis)
  - Trauma (skull base fractures, tonsillectomy, dental extraction, neck dissection)
  - Other (Chiari I malformation, MS, elongated styloid process [Eagle's syndrome])

Usual Treatment

- Pharmacologic treatment involves anticonvulsants: Carbamazepine, gabapentin, phenytoin, oxcarbazepine, pregabalin.
- Nerve block and possible neurolysis.
- Microvascular decompression is the best surgical treatment, with >70% success rate.
- Rhizotomy of the glossopharyngeal (IX) nerve is surgical alternative for MVD.
- Evolving care includes gamma knife surgery and stereotactic radiosurgery.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	Bradycardia, tachycardia, syncope, hypotension	Syncope, palpitations	BP HR/rhythm	ECG or biotelemetry to capture pain attacks
CNS	Pain in IX/X distribution	Paroxysmal pain attacks in IX/X distribution with various triggers	Attempt to trigger pain and find distribution	MRI/MRA to ID etiology and vascular compression

Key References: Blumenfeld A, Nikosskaya G: Glossopharyngeal neuralgia, *Curr Pain Headache Rep* 17(7):343, 2013; Kandan SR, Khan S, Jeyaretna DS, Lhatoo S, Patel NK, Coakham HB: Neuralgia of the glossopharyngeal and vagal nerves: long-term outcome following surgical treatment and literature review, *Br J Neurosurg* 24(4):441–446, 2010.

Perioperative Implications

Preoperative Evaluation

- Assess triggers and subsequent pain with emphasis on Hx of bradycardia, palpitations, syncope, and seizures.
- Check medications, dosing, and efficacy, and review potential side effects along with drug interactions. Maintain preop regimen.

Monitoring

- Monitor preinduction arterial line in pts with significant CV symptoms and central venous catheter when temporary pacemaker might be indicated (vagoglossopharyngeal neuralgia).

Airway

- Direct laryngoscopy can trigger an attack.
- Topical anesthesia to oropharynx prior to laryngoscopy can blunt CV symptoms.
- Glossopharyngeal nerve block is an alternative to topical anesthesia for prophylaxis.

Maintenance

- Remain vigilant and promptly treat cardiac symptoms and labile BP.
- Watch for sudden arterial hypotension, bradycardia, and cardiac arrhythmias.

Extubation

- Look for possible IX/X nerve palsy and subsequent vocal cord paralysis following microvascular decompression surgery.

Anticipated Problems/Concerns

- Direct laryngoscopy triggering a pain attack with hypotension, bradycardia, and cardiac arrhythmias
- Periop pain attack with severe uncontrolled pain
- Chronic narcotic use and tolerance

Glucose-6-Phosphate Dehydrogenase Deficiency

Stephanie Huang | Lee A. Fleisher

Risk

- Most common enzyme deficiency in the world.
- Due to X-linked recessive inheritance.
- Worldwide incidence: 400 million.
- Regions with highest prevalence include Africa, Southeast Asia, the Mediterranean, and the Middle East.
- In USA, G6PD deficiency is prevalent among black males and immigrant populations from the previously listed regions. Approx 10% of African-American males have G6PD deficiency.

Perioperative Risks

- Increased risk of acute hemolysis of RBCs with exposure to oxidative stressors.
- Infection and surgical stress can lead to hemolysis.
- Severe hemolysis may require transfusion and acute renal failure requiring hemodialysis.

Worry About

- General anesthesia masks early signs and symptoms of hemolytic crisis. Hypotension with hemolysis can be attributed to other causes, delaying diagnosis of acute hemolytic crisis.
- Early recognition and treatment of hemolytic anemia is required to prevent permanent neurologic damage, renal failure, or death.

Overview

- Enzyme deficiency is associated with chronic and/or acute hemolysis of RBCs.
- Most pts with G6PD deficiency are clinically asymptomatic unless exposed to triggers.
- Hemolysis occurs when pts are exposed to an oxidative stressor: infection, oxidative drug, fava beans, metabolic derangements.
- Hemolysis is usually seen 1–3 d after exposure.
- Clinical manifestations include fatigue, lumbar pain, abdominal pain, jaundice, splenomegaly, hemoglobinuria, scleral icterus, hypotension, tachycardia, dyspnea, headache, and pallor.
- Acute hemolysis is self-limited; resolution occurs within 4–7 d.
- Chronic nonspherocytic hemolytic anemia with severe deficiency may occur (<10% of normal enzyme levels).
- Associated with neonatal jaundice.

Etiology

- G6PD is an enzyme that catalyzes NADP into NADPH in the pentose phosphate pathway. NADPH then generates antioxidants that protect cells against oxidative damage.
- RBCs' only source of NADPH is through the pentose phosphate pathway. G6PD deficiency results in

RBCs being unable to protect themselves from oxidative stress. This leads to eventual cell death.
- There are over 180 different known mutations to the G6PD gene that lead to deficiency.
- Frequency, risk, and severity of hemolysis varies depending on severity of deficiency.
- Drugs to avoid include sulfonamides, dapsone, methylene blue, nitrofurantoin, phenazopyridine, primaquine, rasburicase, and toluidine blue.

Usual Treatment

- The main treatment for G6PD deficiency is preventative; avoid oxidative stressors.
- If hemolysis were to occur, discontinue the offending agent and maintain urine output with IVF and diuretics.
- Hemodialysis may be indicated in severe acute renal failure.
- PRBC transfusion can be necessary in cases of severe anemia or hemodynamic compromise.
- Folic acid and iron are beneficial.
- Splenectomy and antioxidants are not indicated.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
HEENT	Excess bilirubin buildup		Scleral icterus	
CV	Anemia leading to decreased oxygen delivery, compensatory increased CO, tissue hypoxemia	Substernal pain, fatigue	Tachycardia,Hypotension, flow murmur	ECG, ECHO in severe refractory hypotension
RESP	Hypoxemic hypoxia if severe	Dyspnea	Tachypnea, possibly decreased SpO_2	ABG
GI	Destruction of RBCs in spleen, cholelithiasis	Abdominal pain	Splenomegaly, jaundice, RUQ tenderness	LFTs (increased indirect bilirubin), increased LDH, RUQ ultrasound
RENAL	Excretion of excess hemoglobin leads to nephropathy	Dark brown urine	Hemoglobinuria	BUN/ Cr, UA (+RBC)
HEME	Hemolytic anemia		Pallor	CBC (decreased Hgb/Hct), decreased haptoglobin, peripheral blood smear with Heinz bodies and RBC fragments
CNS	Kernicterus (bilirubin encephalopathy) in neonates with severe disease	Lethargy, eventual mental retardation	Early hypotonia leads to late hypertonia, gaze abnormalities, hearing loss, movement disorders	Brain MRI with high signal in globus pallidus on T-2 weighted images
MS	Increased erythropoietic response of the bone marrow	Lumbar pain		Increased reticulocyte count

Key References: Luzzatto L: Hemolytic anemias and anemia due to acute blood loss. In Kasper D, Fauci AS, Hauser SL, Longo D, Jameson JL, Loscalzo J editors: *Harrison's principles of internal medicine, ed 19,* New York, NY, 2015, McGraw-Hill; Elyassi AR, Rowshan HH: Perioperative management of the glucose-6-phosphate dehydrogenase deficient patient: a review of literature, *Anesth Prog* 56(3):86–91, 2009.

Perioperative Implications

Preoperative Preparation

- Consider anxiolytic premedication.
- Clarify severity of disease if possible. If Hgb/Hct is stable and no other clinical signs of hemolytic anemia are present, no further testing is typically needed.
- Adequately treat any infections prior to surgery.

Monitoring

- Monitor urine output and color.
- Consider A-line for frequent labs.

Induction

- Maintain baseline HR/BP; blunt response to airway manipulation to minimize physiologic stress.

Maintenance

- Reduce surgical stress with adequate anesthesia and analgesia.
- Hypotension, decreased urine output, and tachycardia may be early signs of hemolysis.
- Maintain diligent use of hand hygiene and infection prevention methods.
- Monitor temperature; hypothermia can lead to hemolysis.
- Aggressively treat acidemia and hyperglycemia; both can lead to hemolysis.

Extubation

- Avoid hypercarbia.

Postoperative Period

- Watch for signs/symptoms of hemolytic crises. At minimum, monitor daily CBC.
- Adequate multimodal pain control.

Anticipated Problems/Concerns

- While in vitro studies have shown isoflurane, sevoflurane, diazepam, and midazolam to inhibit G6PD activity, there have been no in vivo cases or studies showing these and other common anesthetic agents causing hemolytic crisis in the G6PD deficient pt.
- Avoid medications that can induce methemoglobinemia, such as benzocaine, nitrates, and metoclopramide. The treatment for methemoglobinemia, methylene blue, is a known oxidative drug that can lead to acute hemolysis.
- If possible, minimize use of cardiopulmonary bypass, a known cause of oxidative stress.

Glycogen Storage Diseases

Jeffrey D. Roizen

Risk

- There are a total of 11 GSDs (0–7, 9, 11, and 12; there is no GSD 8 or 10); the most common are GSD I (Von-Gierke), GSD II (Pompe [3 types]) and GSD III (Cori or Forbe), which may each be as common as 1:50,000 individuals. The least common may occur as rarely as 1:1,000,000 or even less.
- GSDs I and III each account for roughly 25% of GSDs in US.
- All of the described diseases are inherited in an autosomal recessive fashion and molecular diagnosis is available for all aside from GSD 0 (what was once type 8 is now a subtype of type 6 and is x-linked recessive; what was once type 10 is now a subtype of type 6).
- No racial predilection for most types of GSD. Non-Ashkenazi Jews in northern Africa have an increased prevalence of GSD 3 (1:5000), and there may also be an increased incidence of GSD 7.

Perioperative Risks

- These diseases have heterogeneous risks.
  - Several are associated with a risk for hypoglycemia (0, 1, 3, 6), with 1 and 3 requiring careful glucose monitoring.
  - Hepatomegaly and liver failure in 1, 3, and 4.
  - Lactic acidosis in several (most extremely in 1) when too much glucose is given. This is not usually a clinically relevant problem, but when supplementing with glucose-containing fluids, it is ideal to keep glucose above 80 and below 160.
  - Myopathies (and specifically cardiac failure) in several. For cardiac failure, 2, 3, 4, and 7; for 5 (McArdle) tourniqueting can cause muscle damage.
  - The adult form of GSD 2 (Pompe disease) can be associated with sleep apnea later in life (all forms can be associated with limited respiratory reserve. The infantile form has a lethal outcome caused by progressive cardiorespiratory insufficiency, which usually starts by the end of the first year of life. The juvenile form has a slower course with some individuals living into their 20s or 30s).
  - In GSD type 5 and 7, rhabdomyolysis can cause renal failure.
  - In GSD II, macroglossia can be present.