Coronary Artery Spasm

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Risk

- Disease affecting mostly middle- and old-aged men and postmenopausal women
- Gender difference: Higher incidence in women
- Periop CAS: Prevalent in elderly male pts with coronary risk factors
- Teenagers and young adults with illicit substance abuse, primarily cocaine
- Occurs in 1–5% of percutaneous coronary interventions
- Ethnic differences: Higher frequency in eastern populations
- Type A behavior pattern, severe anxiety, and panic disorder
- Age, smoking, and high sensitivity C-reactive protein (marker of inflammation)

Perioperative Risks

- Change of sympathetic activity: may trigger CAS
- CAS can lead to myocardial ischemia.
  - Chest pain and ischemic ST segment changes on ECG
- May be result of or associated with myocardial infarction
  - Coronary thrombosis: May trigger CAS, leading to acute MI, unstable angina, or ischemic sudden death

Worry About

- Cardiogenic shock: Decreased LV and RV compliance and decreased pump function
- In pts with CAS, tachyarrhythmias associated with anterior ST segment elevations, ventricular arrhythmias, and even ventricular fibrillation
- Bradyarrhythmias: More frequent with inferior CAS, potentially resulting in complete atrioventricular block, associated with hypotension and syncope

Overview

- Abnormal constriction of epicardial coronary arteries
- Classical CAS (Prinzmetal for variant or spastic angina):
  - Diagnosed if pt has severe chest pain, usually at rest, with concurrent ST segment elevation on ECG
  - Characterized by spasm of normal coronary arteries on arteriography
- Other forms of CAS:
  - Silent angina (without chest pain), diagnosed with Holter monitoring
  - CAS with concurrent atherosclerotic disease at the site or distant from the organic stenosis
  - Effort angina, unstable angina, or microvascular angina (female prevalence)
  - ECG changes, which may include either ST segment elevation, ST depression, or T wave abnormalities
  - Coronary arteriography: Can demonstrate normal or diseased coronary arteries

Etiology

- The exact mechanism of CAS is unknown. Several contributing factors are thought to play a role:
  - Change in sympathetic activity
  - Vagal withdrawal
  - Coronary thrombosis
  - Smooth muscle dysfunction
  - Compromised endothelium-mediated vasodilation
  - Increased Ca^{2+} sensitivity
  - Reduced endothelial NO activity
  - *eNOS* gene polymorphism
  - Signs of chronic low-grade inflammation
  - Oxidative stress

Usual Treatment

- Cessation of smoking
- Calcium-channel blockers (primary)
- Long-acting nitrates (short when symptomatic)
- Beta-blockers (when associated with fixed lesions)
- Magnesium supplementation (may have a preventive effect)
- Statin therapy (improving endothelial function)
- Coronary angioplasty (medically intractable)
- Coronary artery bypass surgery (medically intractable)
- Automatic defibrillator implantation (life-threatening arrhythmias)

Assessment Points

System	Effect	Assessment by Hx	PE	Test
GENERAL		Risk factor search: smoking and illicit drug use, especially cocaine		High sensitive C-reactive protein level
CV	Chest pain, myocardial ischemia, cardiogenic shock, ischemic sudden death, arrhythmias	Chest pain at rest or exertion, Hx of rapid heart rate, and Hx of syncope	Palpitations, cold sweat, nausea, vomiting, syncope, hypotension	Coronary arteriography with acetylcholine spasm provocation test ECG, ST segment analysis, Holter, exercise testing TEE or TTE—Wall motion abnormalities, cardiac biomarkers

Key Reference: Yasue H, Nakagawa H, Itoh T, Harada E, Mizuno Y: Coronary artery spasm: clinical features, diagnosis, pathogenesis, and treatment, *J Cardiol* 51(1):2–17, 2008.

Perioperative Implications

Preoperative Preparation

- Continue treatment medication until the morning of surgery.
- Ensure IV nitroglycerin, nicardipine, and beta-blockers are available.
- Have a plan for postop pain control.
- Consider regional or neuraxial techniques.

Monitoring

- Use two-lead (II and V5) ECG and ST segment analysis.
- Consider arterial line.

Airway

- Blunt intubation reflexes and avoid sympathetic surcharge on intubation.

Preinduction/Induction

- Cardio-stable induction
- Avoidance of hypotension and tachycardia

Maintenance

- Heart rate and BP control (maintain adequate diastolic BP).
- Avoid hypothermia.
- Maintenance of Hct.
- Optimization of supply/demand.

Extubation

- Smooth opioid wake up and extubation
- Heart rate and BP control
- Avoidance of hypercapnia and hypoxemia

Postoperative Period

- Adequate pain control
- Heart rate and BP control
- Treatment of shivering

Adjuvants

- Careful ST segment monitoring throughout periop period
- Immediate recognition and treatment of coronary ischemia by optimizing supply and demand, with special attention to adequate diastolic blood pressure

Anticipated Problems/Concerns

- Anticipate potentially life-threatening arrhythmias.
- Anticipate myocardial ischemia or infarction and LV and RV dysfunction
- Place defibrillator pads for high-risk pts.

Craniofacial Clefts

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Risk

- Cleft lip and palates are the most common birth defects in USA.
- Cleft lip and/or palate incidence in USA is 1:600 newborns.
- Craniofacial clefts are rare, with incidence of 1:1000 births worldwide.
- Increased prevalence with Asians, Latinos, and Native Americans.
- Increased prevalence with exposure to radiation, infections (toxoplasmosis, rubella, and CMV), maternal age, maternal smoking exposure, and vitamin deficiencies.

Perioperative Risks

- Increased risk of airway obstruction, difficult airway management, and adverse airway events in the periop period
- Hemorrhage
- Seizures
- Associated congenital heart disease

Worry About

- Adverse airway events, including hypoxia, difficult intubation, airway obstruction, laryngospasm, bronchospasm, and accidental extubation
- Eating and speech problems

- Ear infections/hearing loss
- Choanal atresia

Overview

- Clefts can be cranial or facial in origin and are defined as a gap in soft tissue and/or bone.
- Significant variability in severity exists with craniofacial clefts and subsequent implications for surgical and anesthetic management.
  - Can be unilateral or bilateral with multiple clefts occurring at the same time.
  - Can be as minor as a cutaneous manifestation or as extreme as skeletal malformations.
- Classically, clefts were described and classified by Paul Tessier; his classification uses facial meridians to describe the location of clefts, with a clock-face analogy numbering (0–14) to describe the locations with midline as (0). Facial clefts are numbered from 0–7, and cranial clefts from 8–14, in a counter clockwise rotation.

Etiology

- Exact etiology is unknown, but most cases have associations to familial, genetic, and environmental factors.
- Possible theories include failure of the fusion process, failure of mesodermal growth/penetration, and/or disorder of migration of neural crest cells.
- Drug exposures in utero, including anticonvulsants, Accutane, and methotrexate, are associated with clefts.
- Infectious causes and exposure in utero.

Usual Treatment

- Definitive treatment with surgical repair with surgical type depending on craniofacial cleft manifestation and severity of disease

Assessment Points

System	Effect	Assessment by Hx	PE	Test
HEENT	Craniofacial cleft Craniofacial abnormality Hearing loss Chronic ear infections Difficult airway	Fevers, previous history of difficult airway	Thorough airway exam	
RESP	Airway obstruction	Dyspnea, poor feeding and weight gain	Tachypnea	CXR
CV	ASD/VSD	Dyspnea Lethargy	Heart murmur	ECG, ECHO
GI	Poor oral intake	Poor weight gain, malnourished, dry mucous membranes, poor skin turgor	Low weight for age Dry mucous membranes Sunken fontanels	Chemistry, serum albumin
CNS	Elevated ICP	Irritability, lethargy Headache, seizures, vomiting	Papilledema Bulging fontanels	Head CT, MRI
HEME	Anemia Coagulopathy	Age, nutrition status Bleeding gums, infections Easy bruisability Fatigue		CBC Type and screen/cross PT, PTT

Key References: Tessier P: Anatomical classification of facial, cranio-facial and latero-facial clefts, *J Maxillofac Surg* 4(2):69–92, 1976; Jackson O, Basta M, Sonnad S, Stricker P, Larossa D, Fiadjoe J: Perioperative risk factors for adverse airway events in patients undergoing cleft palate repair, *Cleft Palate Craniofac J* 50(3):330–336, 2013.

Perioperative Implications

Preoperative Preparation

- Assess for significant associated comorbidities such as elevated ICP and congenital cardiac disease.
- Particular attention to the airway examination.
- Assess for volume status because clefts can make feeding difficult, leading to malnourished and dehydrated pts.
- Communicate and coordinate with surgical teams on repair and surgical concerns.
- Weigh risks and benefits of premedication with anxiolytics because of risk of airway obstruction.

Monitoring

- Consider large vascular access for blood loss in extensive surgical repairs.
- Consider arterial line for hemodynamic monitoring in complex repairs.

Airway

- Conduct thorough airway examination and prepare in advance for a difficult airway.
- Mask ventilation and intubation can be difficult depending on severity and location of the craniofacial cleft.
- Airway devices including video scopes and flexible fiberoptic and laryngeal mask airways should be available.
- Consider presence of ENT surgeons during induction/airway management, especially if nasal passages are not patent or mouth opening is severely limited.

Induction

- Consider maintaining spontaneous ventilation during induction with either inhalation agents or IV agents.
- Difficult mask ventilation is uncommon, but difficult intubation can be anticipated based on location of the cleft.

Maintenance

- Be vigilant for accidental extubation and ETT obstruction or damage during the surgical repair.
- Monitor for blood loss and volume status and consider transfusion in complex craniofacial cleft repairs.

Extubation

- Ensure throat packs are removed (if used) and the oropharynx is clear of blood.
- Elevated risk for adverse airway events, including laryngospasm, bronchospasm, obstruction, accidental extubation, and subsequent hypoxia.

Adjuvants

- Infraorbital nerve blocks can provide postop analgesia for cleft lip repairs.
- Multimodal analgesia for postop pain control.

Postoperative Period

- Pts may require ICU monitoring postoperative, particularly pts with syndromic diagnosis.

Anticipated Problems/Concerns

- Monitor carefully for airway obstruction and postop bleeding in first 12–24 h.
- Monitor for blood loss and volume status.

Craniosynostosis

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Risk

- Occurs in 1:2000-2500 live births.
- May be spontaneous, syndromic, or familial, but it most commonly presents as an isolated abnormality; however, it can present as a component of a syndrome or genetic disorder in 15–40% of pts.
- Familiarity with associated head shapes can allow bedside diagnosis and differentiation from positional plagiocephaly. Rarely a CT scan will be required to differentiate plagiocephaly from synostosis.
- Craniosynostosis is diagnosed within the first months of life in most infants, but it can also present later.
- Surgical intervention should be performed during infancy, preferably in the first 6 mo of postnatal life, to prevent the further progression of the deformity and possible complications associated with increased ICP.

Perioperative Risks

- Precipitous hemorrhage can occur with inadvertent dural venous tears or disruption of large emissary veins.
- Venous air embolism: The incidence is high (83%); however, the vast majority is clinically silent and not associated with hemodynamic compromise. Incidence is much lower with endoscopic procedures (8%).
- Intracranial hypertension, which is usually diagnosed by ophthalmic examination (papilledema) or CT scan or by clinical symptoms such as headache in older children, is more commonly seen in syndromic craniosynostosis involving multiple sutures (47%).
- Avoid hypothermia.