Ventricular Fibrillation

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Risk

- VFIB/VTach: Most frequent rhythm in sudden cardiac arrest and the most frequent cause of death in pts with coronary disease.
- Risk of VF complicating an acute MI: 4–7%; has remained unchanged for several years.
- 1-y mortality in survivors of near sudden death: 20–30% if nonresponsive to antiarrhythmics (20–50% of survivors).

Perioperative Risks

- Primary VFIB associated with acute infarction may not affect prognosis if treated promptly with defibrillation.
- Secondary VFIB (preceded by pump failure or hypotension) associated with 75–80% mortality during hospitalization

Worry About

- Hypoxemia, hypercarbia, hyperkalemia or hypokalemia, ischemia, hypomagnesemia, digitalis toxicity, acid–base abnormalities, and coronary graft failure
- Antiarrhythmic drug levels
- Availability of defibrillator, myocardial ischemia, and early revascularization

Overview

- Asynchronous, chaotic contractions of ventricles with no organized ventricular depolarization and therefore no QRS complexes and no cardiac output.
- Coarse VFIB indicates recent onset and is readily correctable with prompt defibrillation.
- Fine VFIB (coarse asystole) indicates delay since collapse; successful resuscitation is more difficult.

Etiology

- Usually ischemic; often associated with an LV aneurysm
- Idiopathic cardiomyopathy
- Coronary spasm or graft failure, especially in the immediate postop period
- Hypothermia
- Long-QT syndrome is associated with VTach, especially torsades de pointes (one type of polymorphic VTach; other types are not associated with long-QT).

Usual Treatment

- Definitive emergency Rx is always electrical defibrillation: External—either manual or automatic (AEDs)—or internal (ICD may be implanted).
- Time to defibrillation is a major determinant of survival, with chances of success reduced by 10% each minute.
- Early bystander CPR and early defibrillation with return of spontaneous circulation has been associated with decreased mortality.
- Vasopressors such as epinephrine and vasopressin are indicated after three successive countershocks fail to terminate VFIB. Vasopressors improve coronary and cerebral perfusion pressures; increased coronary perfusion pressure is assoc with increased likelihood of return of spontaneous circulation.
- Vasopressin may have fewer side effects than epinephrine while being equally or more effective, particularly in acidotic pts. Vasopressin's longer duration of action (10–20 min) has led to the recommendation of a single, one-time dose for VFIB.
- Amiodarone is the only antiarrhythmic associated with improved resuscitation rates from VFIB; it is recommended after three successive shocks, an IV vasopressor (epinephrine or vasopressin), and a subsequent fourth shock are unsuccessful in restoring a perfusing rhythm.
- Prospective trials of lidocaine and bretylium in VFIB pts have shown no benefit regarding outcome. However, based on historical use and the lack of side effects, lidocaine is considered an alternative to amiodarone in VFIB, especially in the setting of amiodarone toxicity.
- Owing to inconsistent availability, side effects, and lack of confirmed benefit, bretylium is no longer recommended for VFIB.
- Evidence supporting procainamide use in VFIB is limited. Although the need for slow infusion makes it less than ideal, it may be an alternative when amiodarone is contraindicated.
- Magnesium may be beneficial in torsades de pointes (polymorphic VTach associated with long-QT), but routine use does not improve outcome.

Assessment Points

System	Effect
HEENT	Right radical neck dissection assoc with increasing QT interval
CV	No effective cardiac output
RESP	Apnea should be anticipated
CNS	Glucose administration may worsen CNS outcome

Key Reference: ECC Committee, Subcommittees and Task Forces of the American Heart Association: 2005 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care, *Circulation* 112(Suppl 24):IV1–IV203, 2005.

Perioperative Implications

Preoperative Preparation

- Antiarrhythmic drug levels in optimal therapeutic range
- If for EPS, ablation, or ICD, antiarrhythmic drugs may be held on the day of procedure with ECG monitoring.
- Avoid anticholinergic premedication or sympathetic stimulation.
- For pts with prolonged QT syndrome, consider β-blockers or prophylactic left stellate ganglion block.

Monitoring

- Consider ECG and pulse oximetry en route to OR.
- Consider arterial cath for procedures involving greater than minimal risk, especially during ablative procedures in the cath lab.

Airway

- Apnea expected with acute VFIB; oxygenation should be supported with 100% O_2 and bag mask ventilation. Once successful ventilation established, interruption of CPR for a definitive airway is not recommended.
- Airway secured with ETT if three successive countershocks fail to restore perfusing rhythm.

Induction

- Avoid ketamine; intubate after adequate depth of anesthesia.

Maintenance

- Suppress sympathetic responses to stimulation.

Extubation

- Suppress sympathetic stimulation; extubate when spontaneous ventilation with oropharyngeal reflexes has been restored.
- Reversal of NMBs acceptable.
- Regional: Serum levels of local anesthetics given epidurally may affect intraop defibrillation threshold testing during ICD placement.
- Defibrillator should be available with sterile defibrillator paddles on the surgical field; pharmacologic therapy required for dysrhythmia conversion/maintenance and for treating Htn and tachycardia, which frequently follow defibrillation; bradycardia may require pacing.

Postoperative Period

- Cardiac monitoring; resumption of preop antiarrhythmics, maintaining adequate oxygenation and ventilation
- Avoid lyte abnormalities and treat promptly if they appear.
- Postdefibrillation pain score: 1–3 from chest wall and psychic disturbances.
- Psychiatric counseling if pt is disturbed by shock or has "out of body" experience.

Anticipated Problems/Concerns

- PA cath insertion may induce VT or VFIB in dysrhythmia-prone pts; if PA cath necessary, consider central venous placement with advancement after ventricular dysrhythmia procedure has been completed. If PA cath is essential, consider placement of defibrillation pads prior to placement of the cath.
- In pts with long-QT syndrome, avoid drugs that prolong the QT interval (class Ia antiarrhythmic drugs such as quinidine and procainamide).
- Psychic disturbances from defibrillation in aware state.