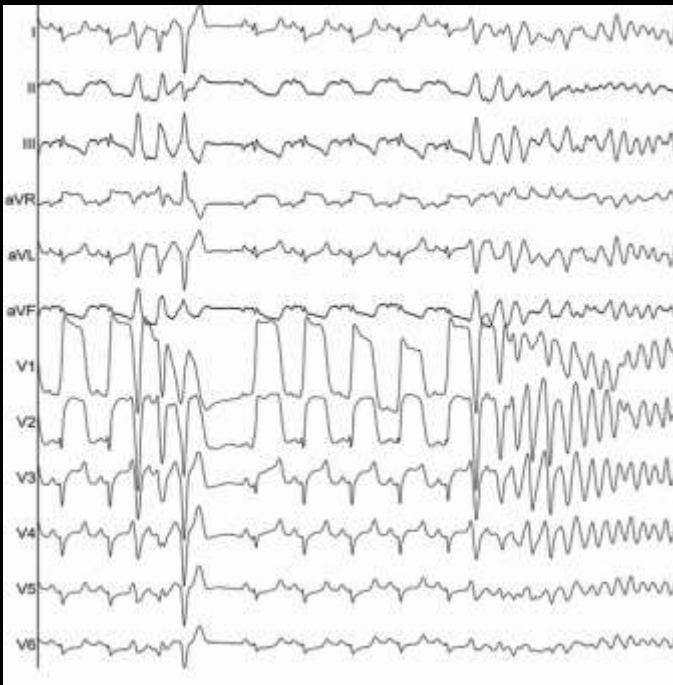


Arrhythmias in Acute Coronary Syndrome

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Management concepts to all kinds of arrhythmias during ACS

- Assess and support hemodynamic status
- Resolve or relieve myocardial ischemia
- Correct electrolytes imbalance (esp. K & Mg)



Ventricular Arrhythmia

Mechanisms of VT/VF by the duration after MI

Time after MI	Cellular Mechanisms	Arrhythmia Mechanisms	Type of ventricular arrhythmias
2-10 minutes	Changes in membrane potential.	Reentry, automaticity, and triggered activity	PVCs, VT (mono and polymorphic), VF
10-60 minutes	Irritable myocardium from wall stress and high catecholamines	Automaticity and triggered activity	VT (mono and polymorphic), VF
1-48 hours	Firing from surviving Purkinje cells	Automaticity	PVCs, NSVT, AIVR
>48 hours	Scar with the interdigitation of viable myocardium	Reentry (mostly)	Monomorphic VT

Waldo AL & Kaiser GA. Circulation. 1973;47(6):1222, Campbell et al. Br Heart J 1981; 46: 351-7, Dimarco et al. J Am Coll Cardiol. 1985;6(4):759.

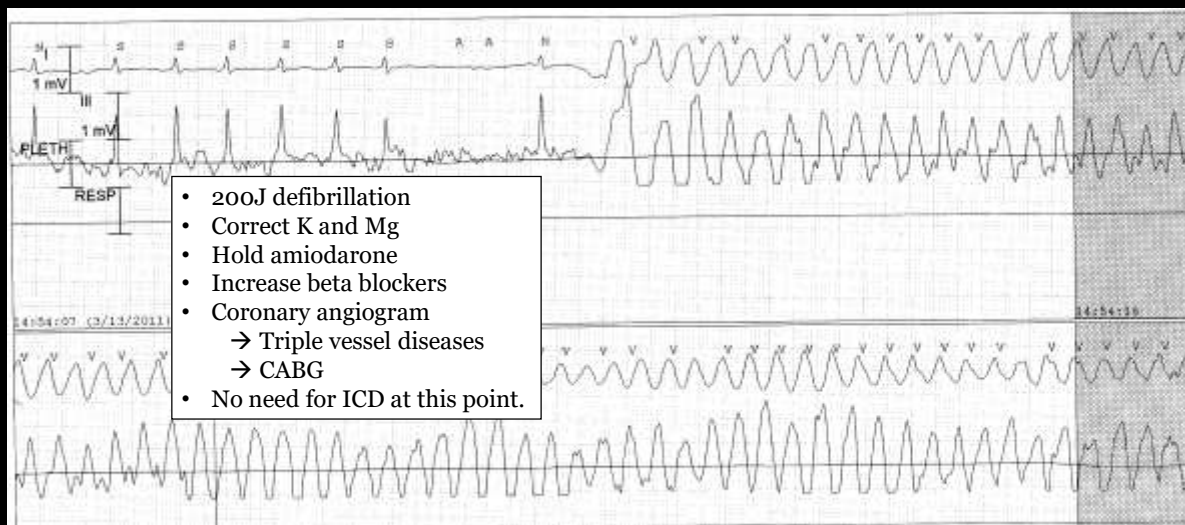
Mechanisms of VT/VF by the duration after MI

Time after MI	Cellular Mechanisms	Arrhythmia Mechanisms	Type of ventricular arrhythmias
Acute Phase (<48hrs)	<p>Changes in membrane potential.</p> <p>Irritable myocardium from wall stress and high catecholamines</p> <p>Firing from surviving Purkinje cells</p>	<ul style="list-style-type: none"> • แก้ ischemia • แก้ electrolyte imbalances • Beta blockers • ไม่มีผลต่อ long-term prognosis 	<p>All types are reported.</p> <p>Polyomorphic > monomorphic VT.</p> <p>More VF than in chronic phase.</p>
Chronic Phase	Scar with the interdigitation of viable myocardium	Need antiarrhythmic agent + High risk of SCD	

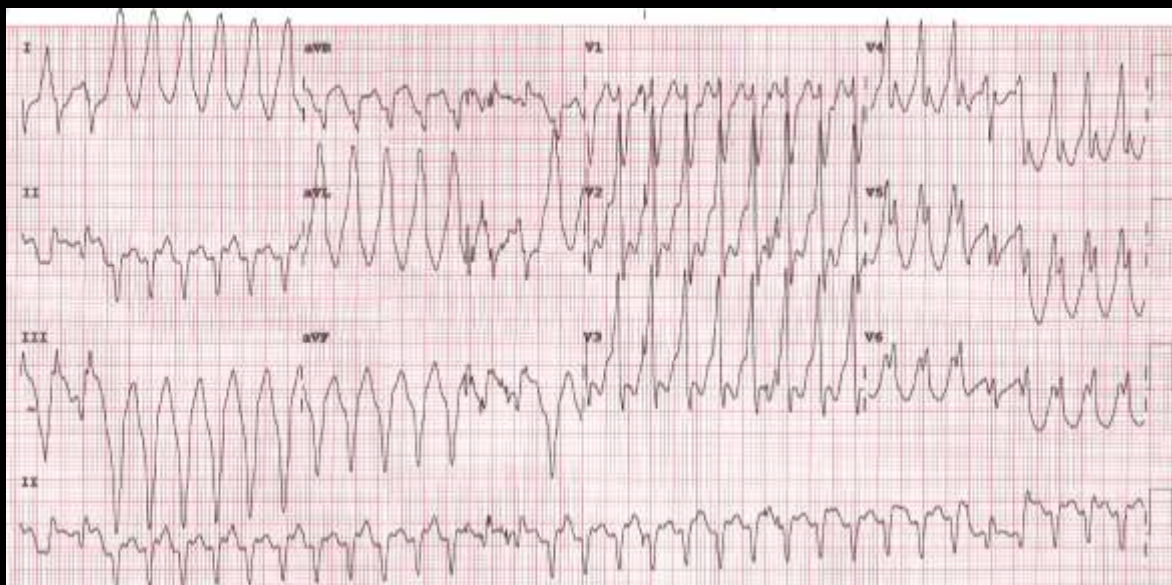
Waldo AL & Kaiser GA. Circulation. 1973;47(6):1222, Campbell et al. Br Heart J 1981; 46: 351-7, Dimarco et al. J Am Coll Cardiol. 1985;6(4):759.

70F; while being treated for pneumonia in ICU.

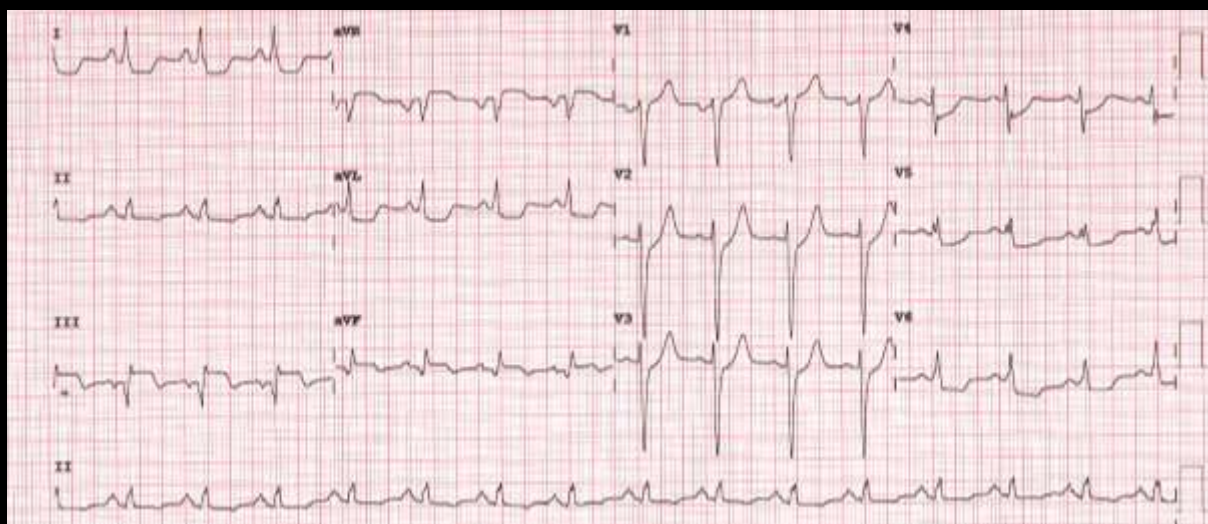
Hx of AF, on amiodarone. Potassium 3.1 mEq/L.



55M w/ CAD s/p inferior wall STEMI 3 wks ago.

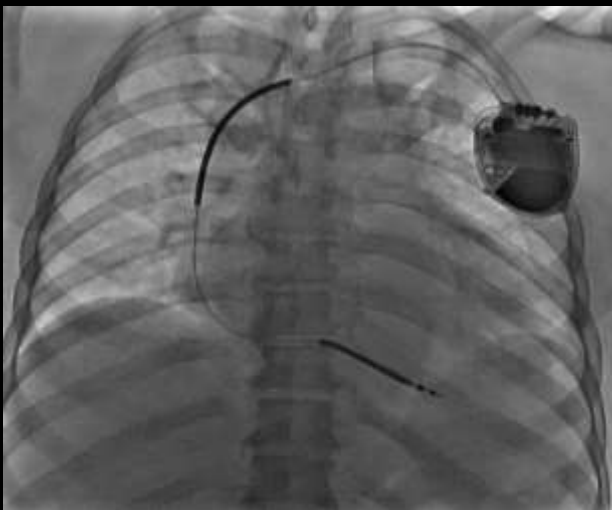


After a 200J cardioversion, ECG is as shown.

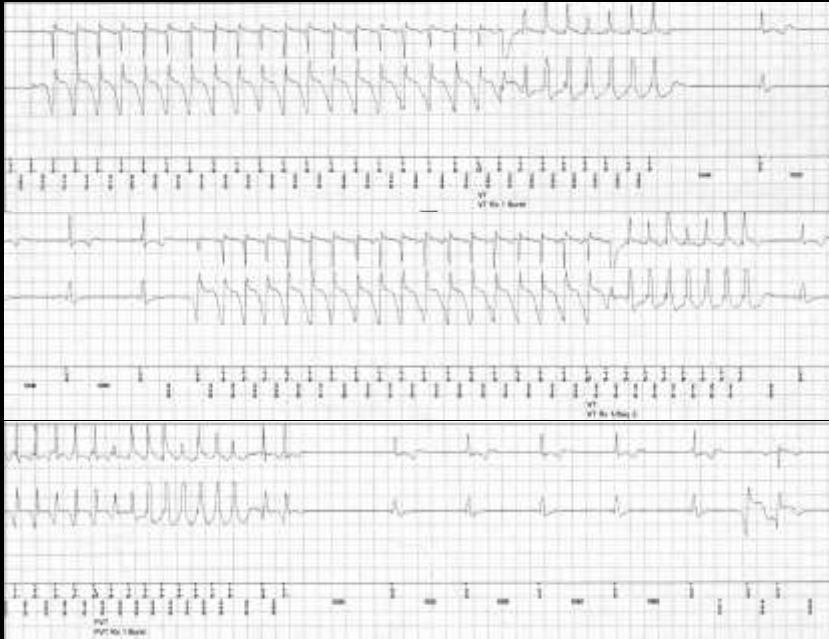


CAG: Patent RCA stent. No new lesions.

Symptomatic monomorphic VT from old infarction.



- ICD for secondary prevention; regardless of LVEF or NYHA class.
- Beta blocker
- Amiodarone



What to do if
ventricular
arrhythmias keep
coming back?

Electrical Storm: The Triggers

- » Triggers
 - » Ischemia
 - » Electrolyte Imbalance
 - » Worsening Heart Failure
 - » Drug Toxicity

Treatment Option

- » Sympathetic blockade with intravenous beta blockers, usually in conjunction with benzodiazepines
- » Antiarrhythmic agents
- » Overdrive pacing
- » General anesthesia
- » Intra-aortic balloon counterpulsation
- » Stellate ganglionic blockade
- » Catheter ablation

2006 ACC/AHA/ESC Guidelines for Ventricular Arrhythmias

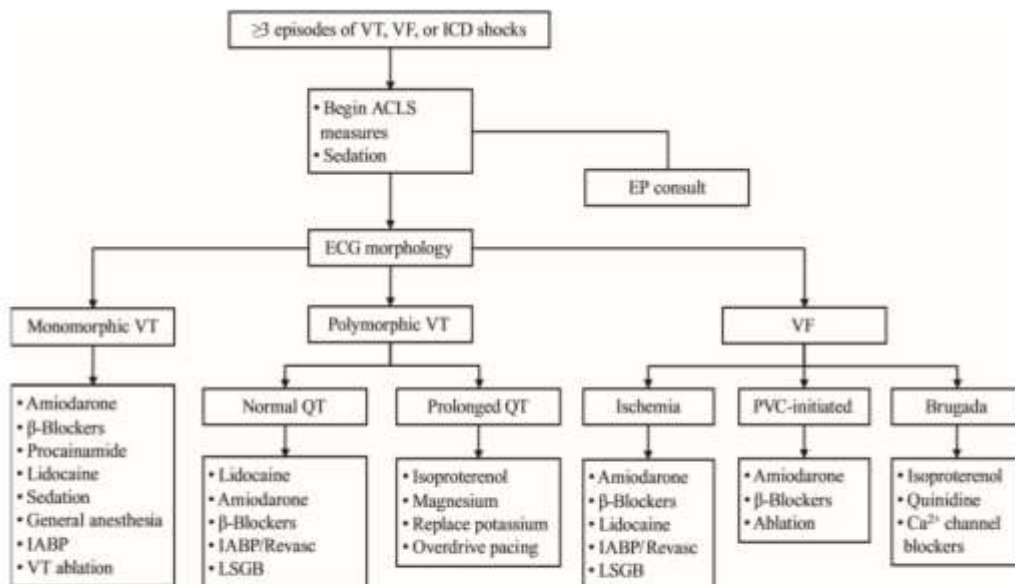
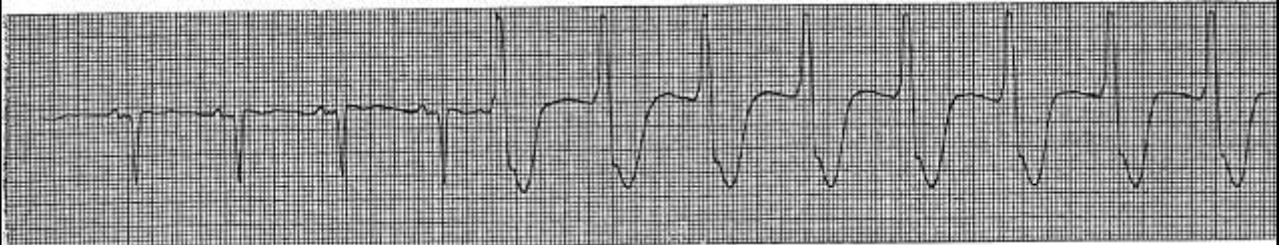


Fig. 1 Management of electrical storm.

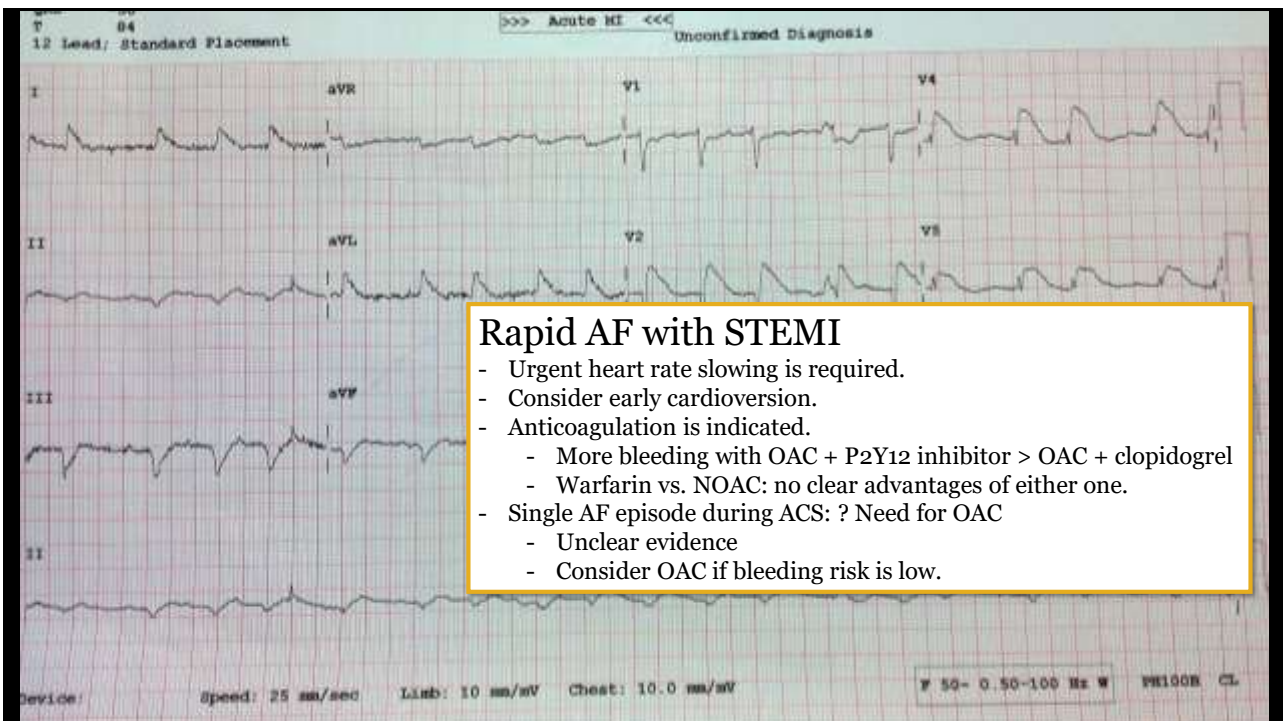
ACLS = advanced cardiac life support; ECG = electrocardiographic; EP = electrophysiology; IABP = intra-aortic balloon pump; ICD = implantable cardioverter-defibrillator; LSGB = left stellate ganglion blockade; PVC = premature ventricular contraction; Revasc = revascularization; VF = ventricular fibrillation; VT = ventricular tachycardia

Eifling et al. Tex Heart Inst J 2011;38(2):111-21.

Automatic idiopathic ventricular rhythm (AIVR)



- Slower ventricular tachycardia (<120 bpm).
- Not always associated with neither reperfusion nor ischemia.
- Tx: correct electrolytes, ischemia.
- Beta blockers.



Rapid AF with STEMI

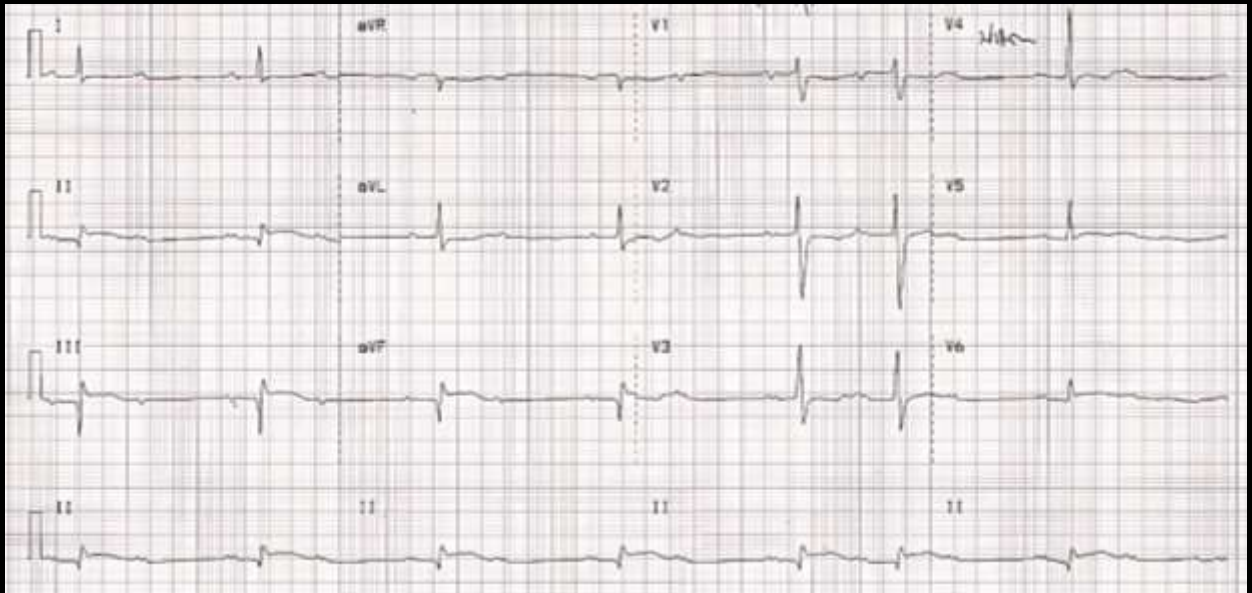
- Urgent heart rate slowing is required.
- Consider early cardioversion.
- Anticoagulation is indicated.
 - More bleeding with OAC + P2Y12 inhibitor > OAC + clopidogrel
 - Warfarin vs. NOAC: no clear advantages of either one.
- Single AF episode during ACS: ? Need for OAC
 - Unclear evidence
 - Consider OAC if bleeding risk is low.

Blood supplies of cardiac conduction system

Structures	Most common blood Supply	Variations
SA node	RCA	LCx or RCA+LCx
AV node	AV nodal branch from RCA	LCx or RCA+LCx
His bundle	Septal branch from LAD	RCA or LAD+RCA
Left anterior fascicle	Septal branch from LAD	RCA (AV nodal branch) or LAD+RCA
Left posterior fascicle	AV nodal branch from RCA	LAD (septal branch) or RCA+LAD
Right bundle branch	Septal branch from LAD	RCA (AV nodal branch) or LAD+RCA

Futami et al. Surg Radiol Anat. 2003 Apr;25(1):42-9.

Low grade AV block in inferior STEMI





NSTEMI
s/p PCI of LAD 7
days ago.
LVEF 40%.

- Continue to observe
- Dual chamber pacemaker
- Cardiac resynchronization therapy

Cardiac Pacing during Acute Coronary Syndrome

- Permanent pacemaker is indicated only if AV block becomes permanent; ie. >7 days after ACS (class I).
- For transient AV block, may consider permanent pacemaker in a patient with advanced conduction defect (ie. Bifascicular block).
- Consider CRT for HFrEF + AV block (class I).
- Temporary pacemaker
 - For significant AV block only
 - Higher risk than non-ACS patients for perforation and tamponade.

CONCLUSIONS

- Tachyarrhythmias
 - Beta blocker is the drug of choices in almost all situations.
 - VT/VF during the acute phase of ischemia is caused by irritable and ischemic myocardium. ICD is not indicated.
 - VT/VF during the chronic phase is related to the scar tissue. Recurrence rate is high. ICD is indicated.
 - No specific treatments for NSVT, PVCs, AIVR .
- Bradyarrhythmias
 - Consider temporary pacemaker in high grade AV block with significant hemodynamic disturbances.
 - Consider permanent pacemaker in persistent AV block.
 - Consider CRT in high grade AV block with HFREF.
- For all arrhythmias: Correct electrolytes & Ischemia.