5th Asia Pacific Congenital and Structural Heart (APCASH) Intervention Symposium 2014

Allied Health Session

What You Need to Know for Complication Management in Structural Heart Intervention (From Instrument to Procedure)

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Common Structural Heart Interventions

- Atrial Septal Defect (ASD) Occluder
- Patent Ductus Arteriosus (PDA) Occluder
- Ventricular Septal Defect (VSD) Occluder
- Mitral Valve Angioplasty

Complicated Structural Heart Interventions

- Left Atrial Appendage Occlusion (LAAO)
- Trans-Aortic-Valve Implantation (TAVI)
- MitraClip Implantation

Strategies in Complication Management

- Prevention
- Detection
- Correction

Detection of Complication

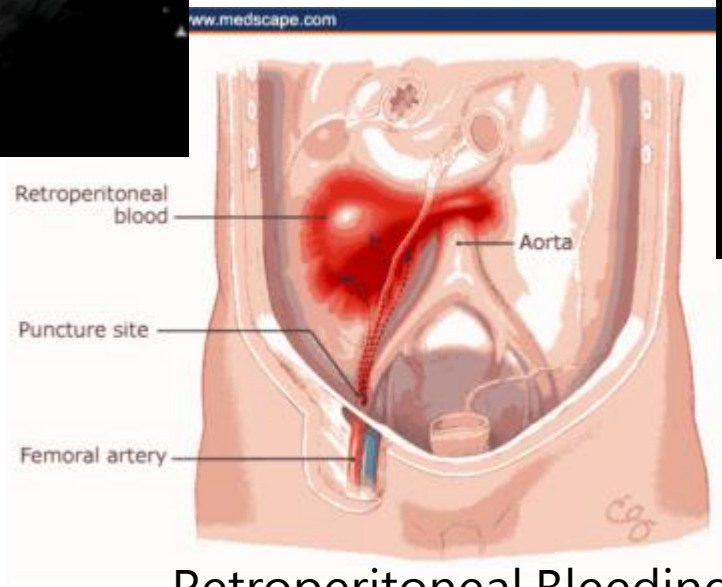
- ABP / NBP
- ECG rhythm & morphology,
- Limbs circulation
- Puncture site
- R/R & SpO2
- Blood result
  - Hb, WBC, PT/APTT/INR, Crea, Na, K, CPK/Troponin I
- CXR,
- GCS level
- Urine Output
- Echocardiogram
- Coronary Angiogram

Complications

- Bleeding
  - Perforation of heart Chamber
    - Cardiac tamponade
  - Vascular complication
- Acute Coronary Event
- Device Dislodgement
- Arrhythmia – VT/VF or Heart Block
- Stroke

Bleeding

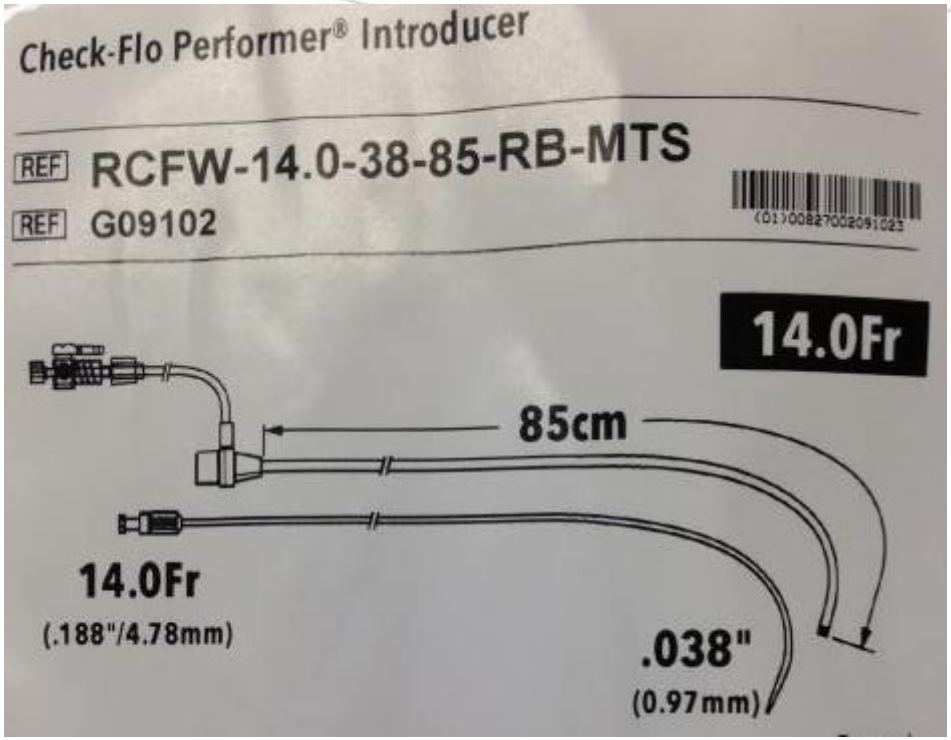
Pericardial Effusion



Retroperitoneal Bleeding

Pseudoaneurysm

Sheath Size



Outer Diameter: 4.78

Outer Diameter: 4.67

Possible Cause of Cardiac Tamponade

- Devices caused perforation
  - Catheter,
  - Wire,
  - Transeptal needle

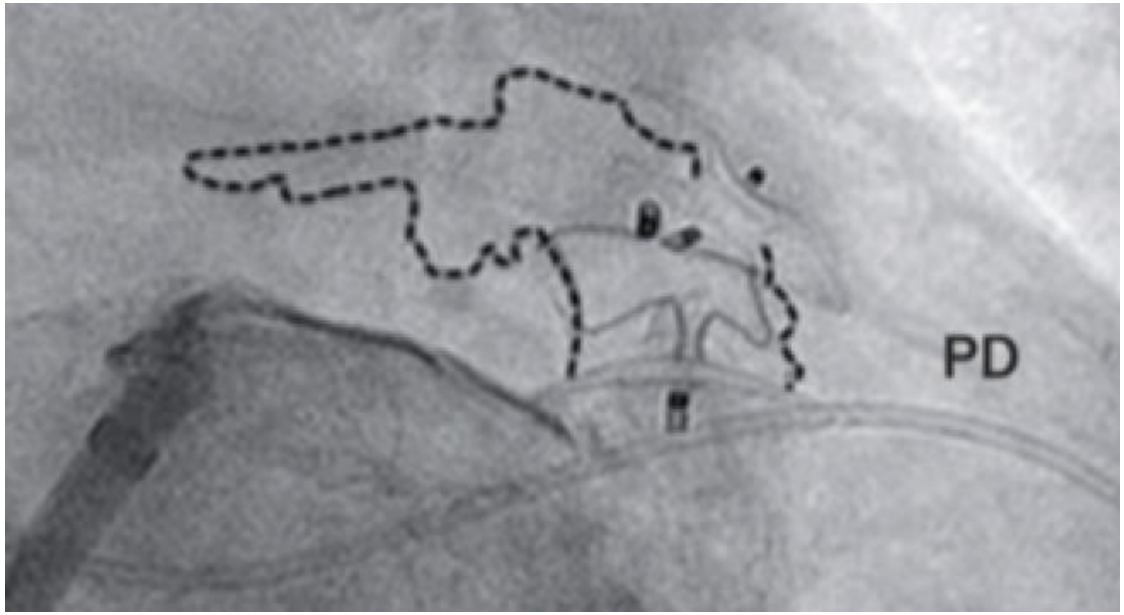
Management of Cardiac Temponade

- start CPR if developed PEA
- perform echocardiogram to confirm diagnosis
- stop anti-coagulation therapy as instruction
- correct APTT (by IV Protamine), INR (by FFP) as instruction

  (if procedure continue, no need to correct anti-coagulation therapy)
- Preform pericardial tapping
- measure volume of tapping fluid
- connect the drainage catheter to BSB or low suction
- Maintain low blood pressure to prevent active bleeding

Small ASD Occluder to Plug the Perforation

Occlusion of perforation was achieved with a 10 mm AMPLATZER® (AGA Medical Corporation, Plymouth, MN, USA) septal occluder and redeployment of the 12 mm ACP was successful. A pericardial drain (PD)



Yu, C.-M. *et al.* (2013) Mechanical antithrombotic intervention by LAA occlusion in atrial fibrillation *Nat. Rev. Cardiol.* doi:10.1038/nrcardio.2013.158

Instrument Preparation

- Disposable Pericardial Tapping Kit

- Septal Occluder ≤ 12mm and Delivery system

AMPLATZER™ Septal Occluder
Ordering Information View Catalog

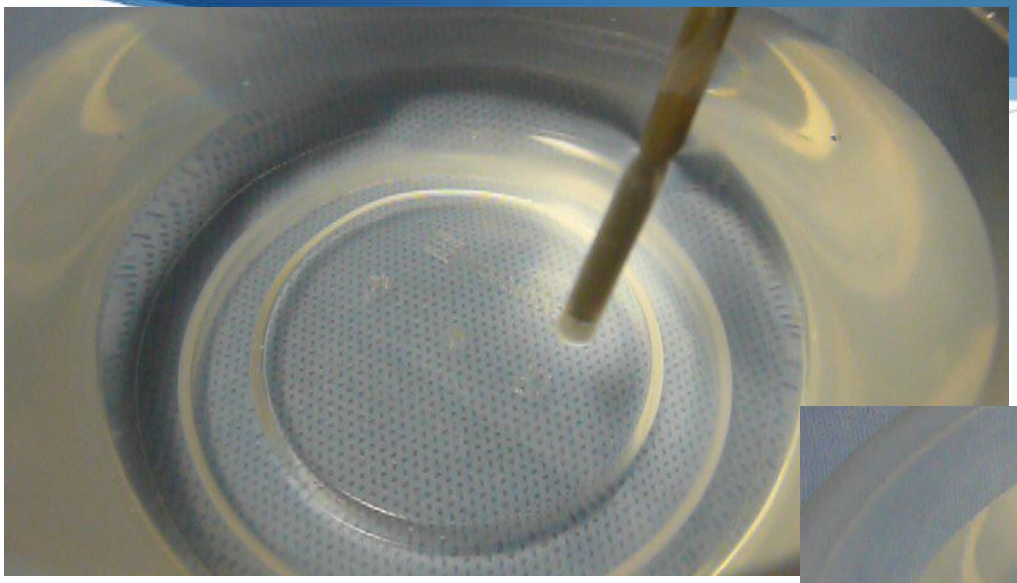
Contents: 1 occluder

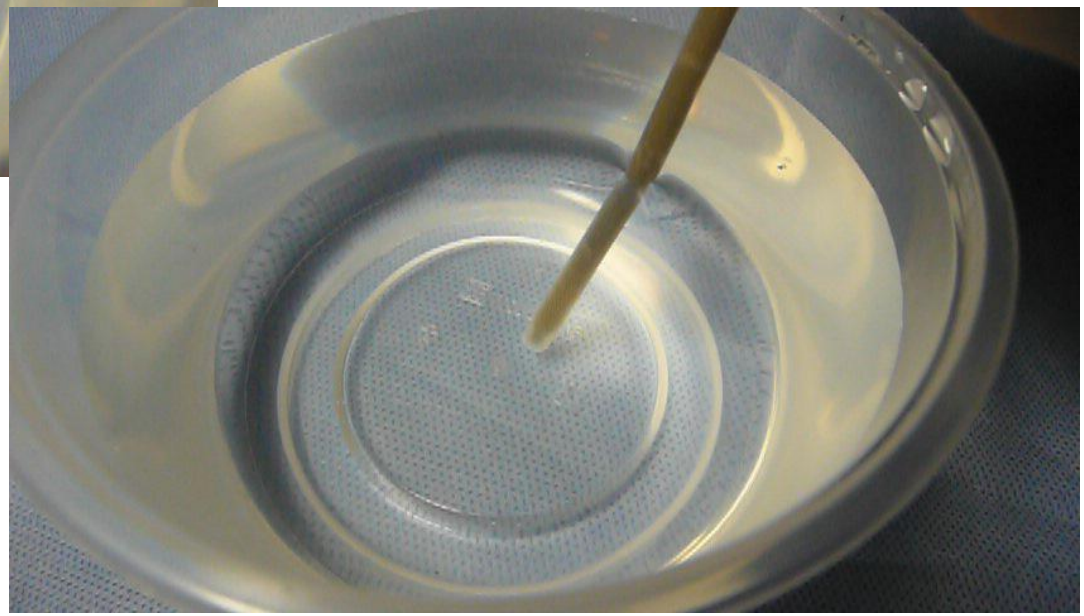
Reorder Number	Device Size/ Waist Diameter (mm)	Waist Length (mm)	Right Atrial Disc Diameter (mm)	Left Atrial Disc Diameter (mm)	Min. Recommended Sheath Size (AMPLATZER™ TorqVue™ Delivery System)
9-ASD-004	4	3	12	16	6 F; 45° Curve
9-ASD-005	5	3	13	17	6 F; 45° Curve
9-ASD-006	6	3	14	18	6 F; 45° Curve
9-ASD-007	7	3	15	19	6 F; 45° Curve
9-ASD-008	8	3	16	20	6 F; 45° Curve
9-ASD-009	9	3	17	21	6 F; 45° Curve
9-ASD-010	10	3	18	22	6 F; 45° Curve
9-ASD-011	11	4	21	25	7 F; 45° Curve
9-ASD-012	12	4	22	26	7 F; 45° Curve

Acute Coronary Event

- Air embolism to coronary arteries
- Thrombus for prolonged procedure
- Obstruct coronary blood flow by device

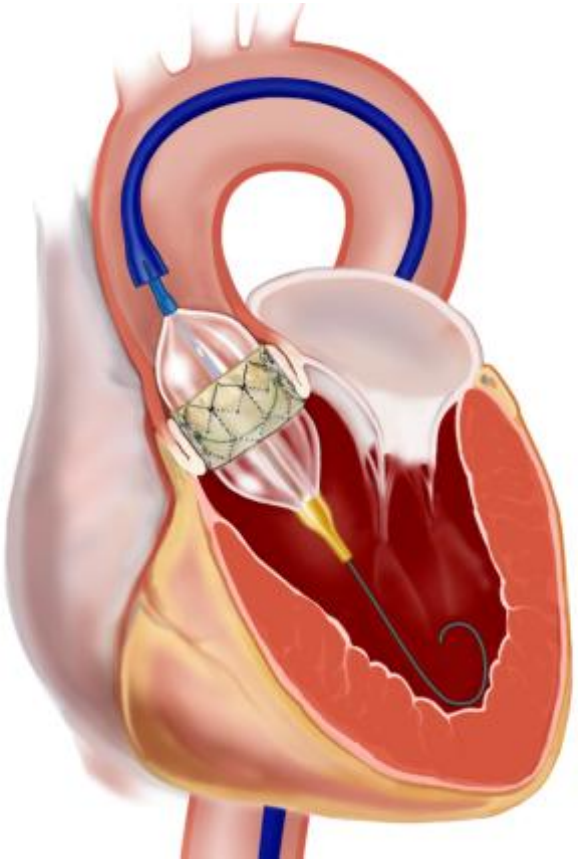
Air Embolism





TAVI & Coronary Obstruction

Valve position may obstruct the blood flow to coronary arteries

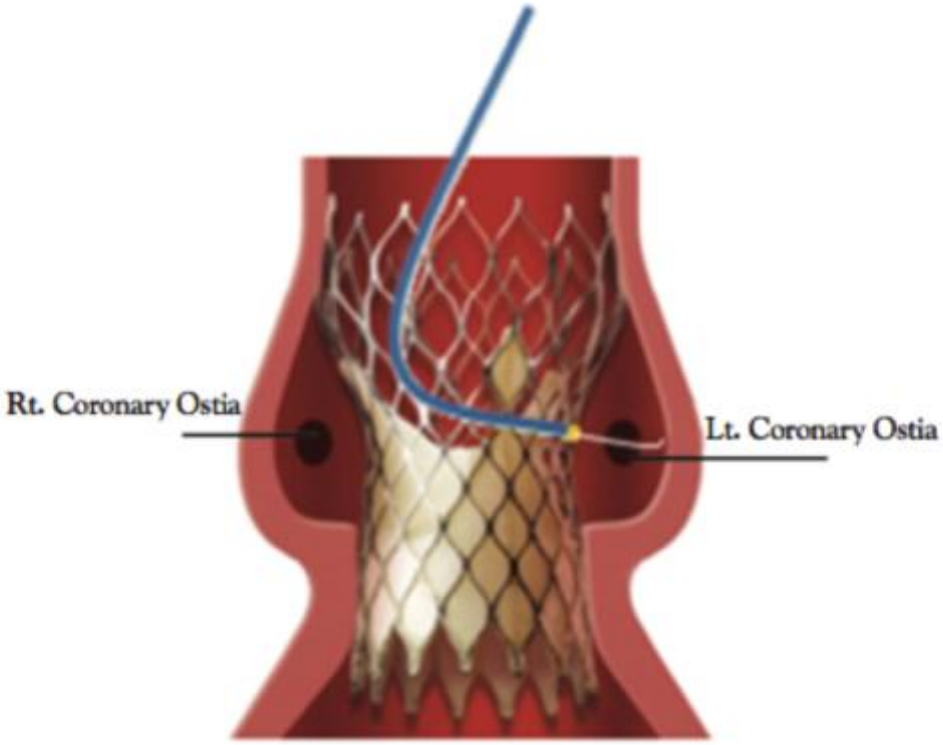


Ischaemia

S/S:ECG with ST change and dropped in ABP

Instrument Preparation

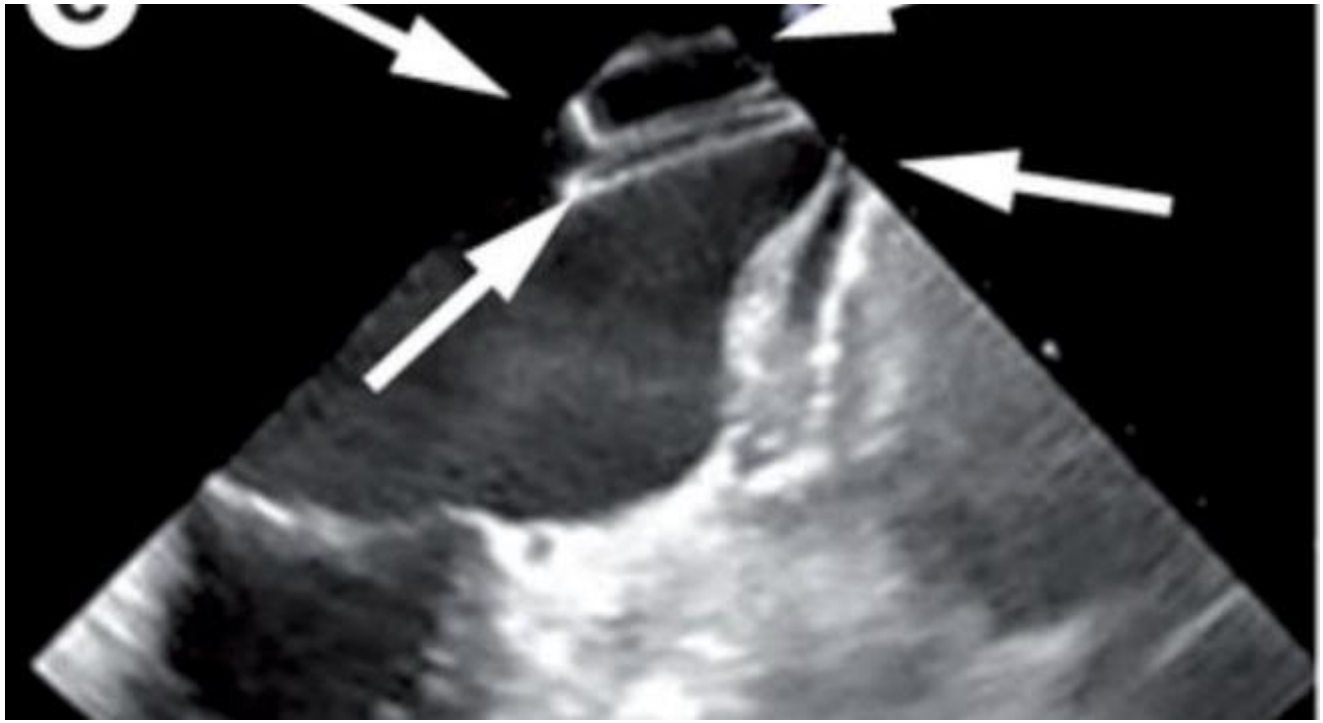
- Instrument for PC



Gabriel Greenberg, MD and Ran Kornowski, MDJ INVASIVE CARDIOL 2013;25(7):361-363

Dislodgement of Occluder

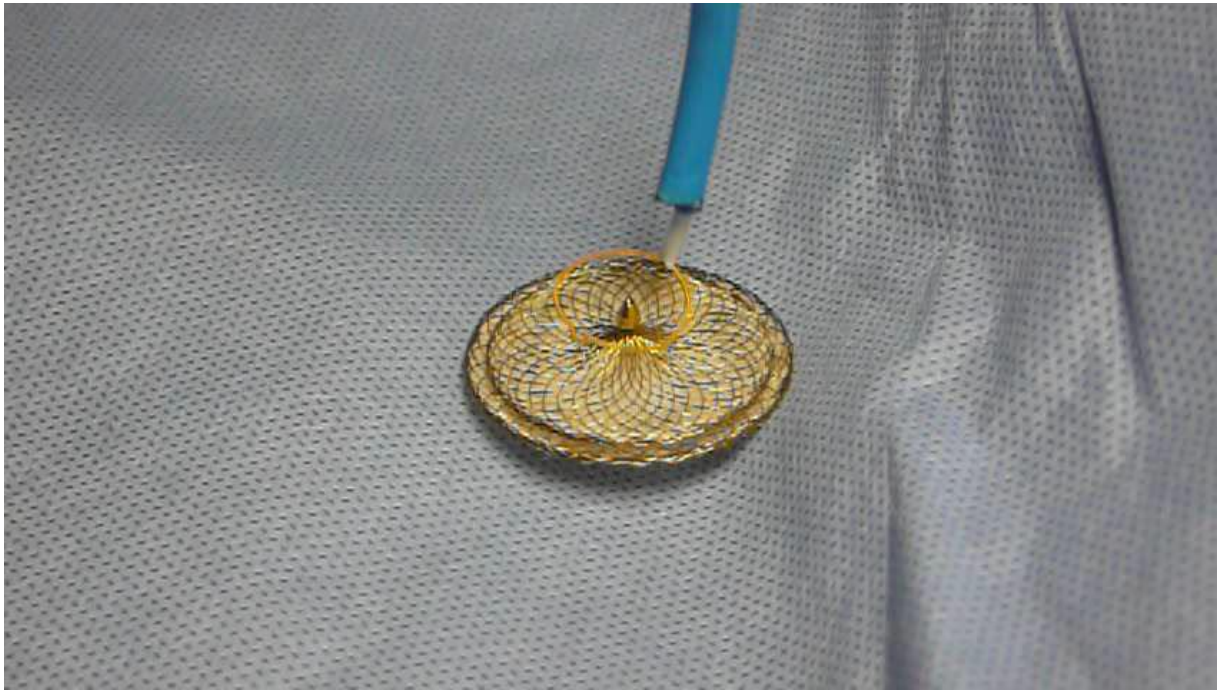
This TEE image shows the device floating freely in the left atrium (arrows).



Yu, C.-M. *et al.* (2013) Mechanical antithrombotic intervention by LAA occlusion in atrial fibrillation *Nat. Rev. Cardiol.* doi:10.1038/nrcardio.2013.158

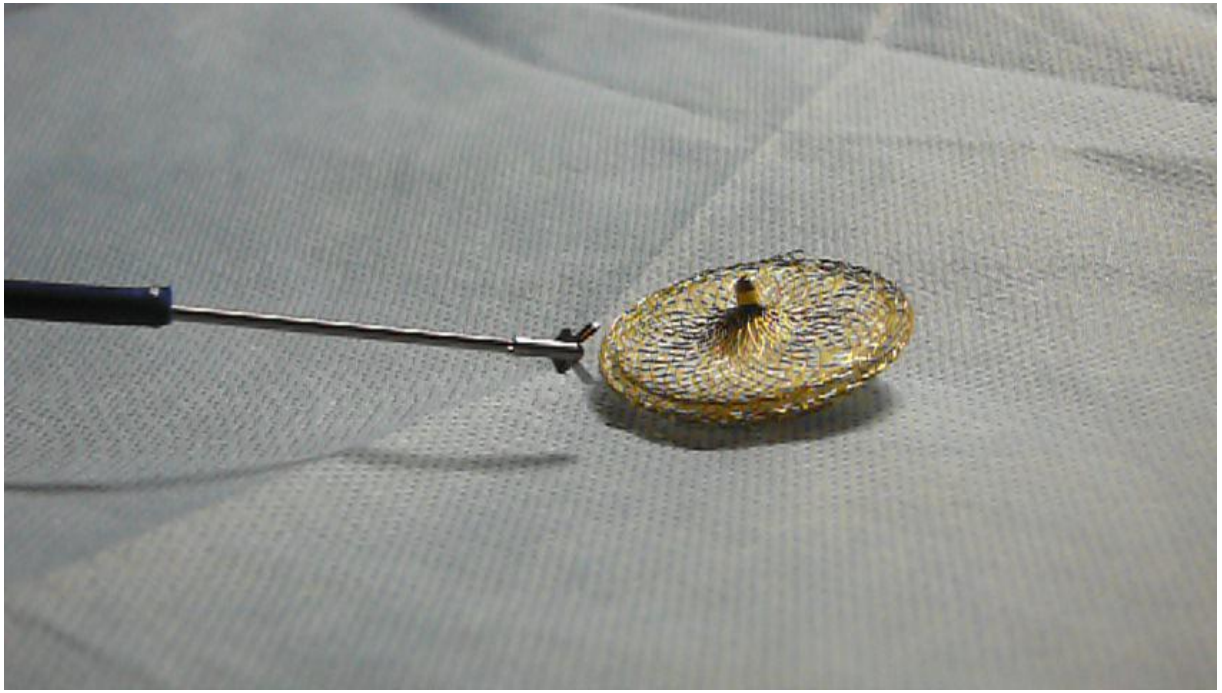
Failed Capture of Dislodged Occluder by Goose Snare & 13Fr Sheath

Capture of Dislodged Occluder by Goose Snare & 14Fr Sheath

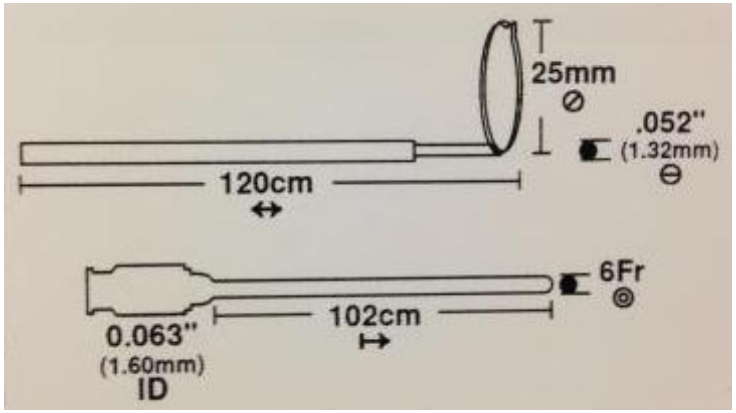


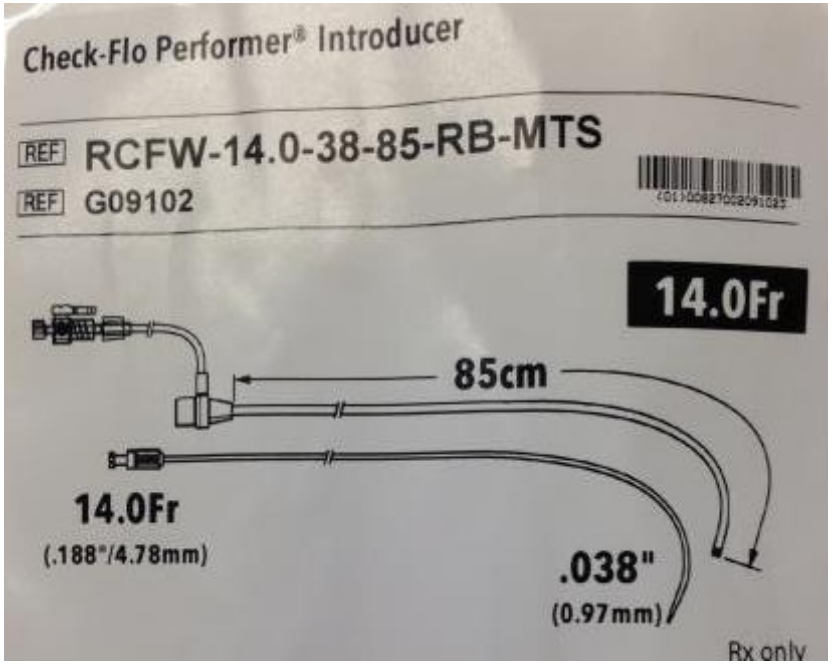
Capture of Dislodged Occluder by EN Snare & 14Fr Sheath

Holding of Dislodged Occluder by Biopsy Forcep



Instrument Preparation





- Goose Neck Snare Kit 15-25mm
- 14Fr 85cm Mullins Sheath

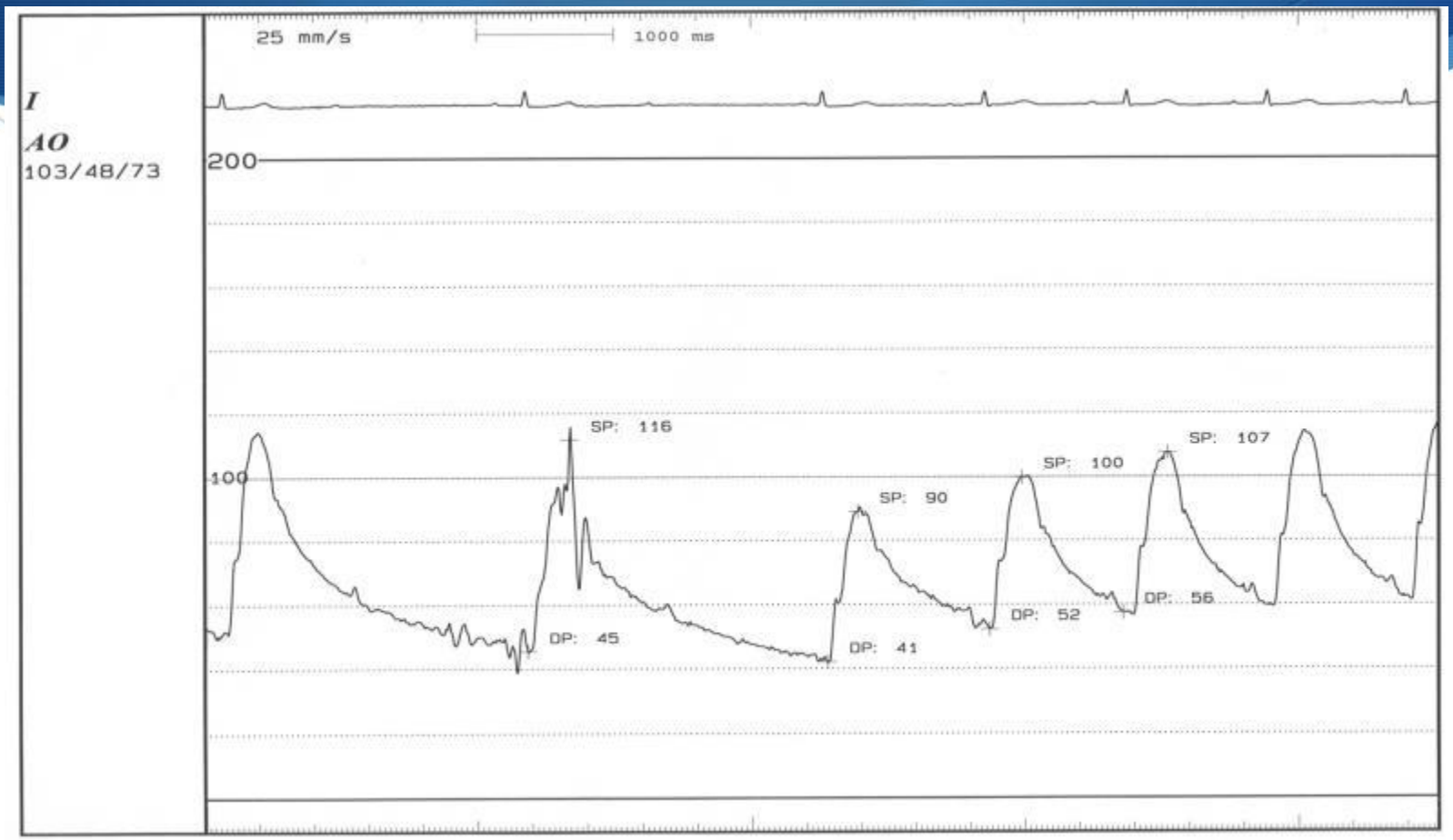
Instrument Preparation

- 5.5Fr Biposy forcep 104cm long (outer diameter 1.85mm)
- 7 Fr Guiding Cather 90cm long (Inner diameter 2.06mm)

Arrhythmia – VT / VF

S/S: ↓ABP, ↓ GCS, seizure and ECG with VT /VF

Arrhythmia - Bradycardia



S/S: dizziness, ↓ GCS ↓ ABP

Tachyarrhythmia

- Cause by pacing stimulant

Intervention

- Perform DC version or defibrillation for VT/VF
- Prepare antiarrhythmic agents

Defibrillation

Bradyarrhythmia

- Trauma by occluder
- MI

Intervention

- Give medication
  - Atropine, dopamine or adrenaline infusion
- Temporary Transvenous or Transcutaneous Pacing

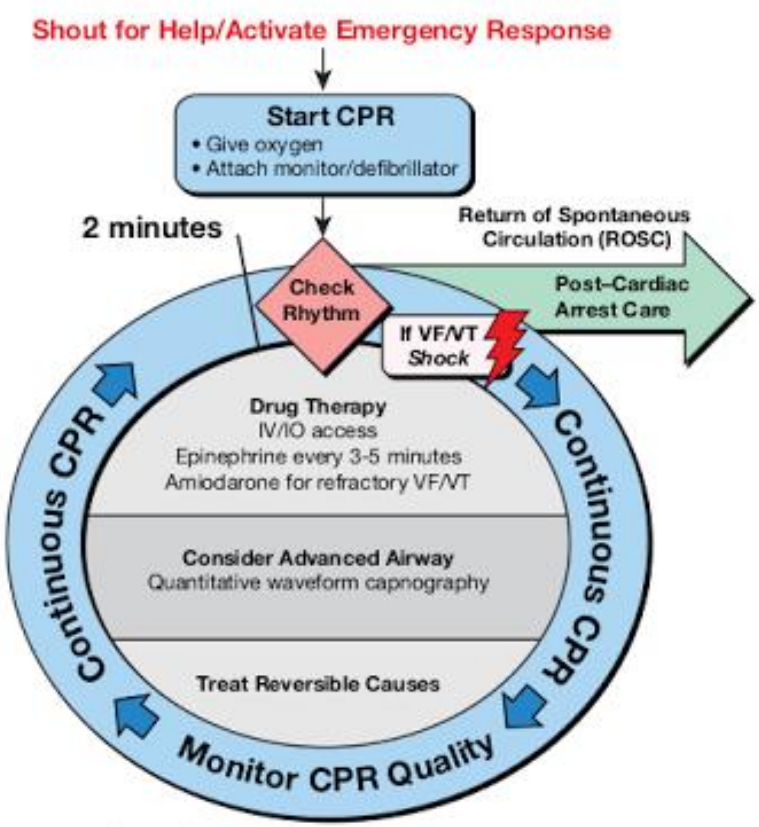
Prevention of Stroke

Prepare Echocardiogram for baseline and post-op assessment to rule out intra cardiac thrombus

- Intracardiac Echocardiogram
- 2D Echocardiogram
- 3D Echocardiogram

Principle of Resuscitation

Circular ACLS Algorithm



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CPR Quality
- Push hard (≥2 inches [5 cm]) and fast (≥100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 30:2 compression-ventilation ratio
- Quantitative waveform capnography
  - If P_{ETCO_2} <10 mm Hg, attempt to improve CPR quality
- Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality

Return of Spontaneous Circulation (ROSC)
- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Shock Energy
- **Biphasic:** Manufacturer recommendation (120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy
- **Epinephrine IV/IO Dose:** 1 mg every 3-5 minutes
- **Vasopressin IV/IO Dose:** 40 units can replace first or second dose of epinephrine
- **Amiodarone IV/IO Dose:** First dose: 300 mg bolus. Second dose: 150 mg.

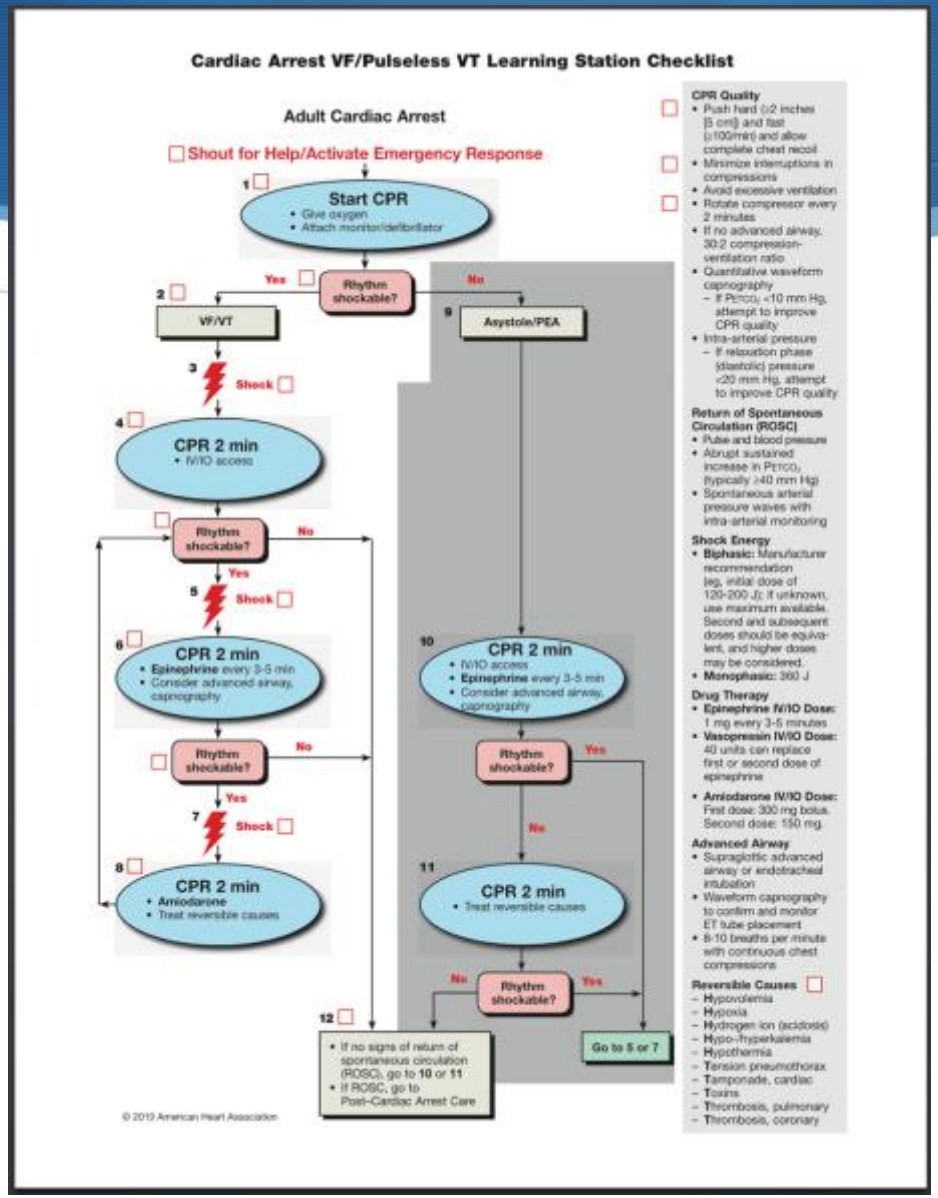
Advanced Airway
- Supraglottic advanced airway or endotracheal intubation
- Waveform capnography to confirm and monitor ET tube placement
- 8-10 breaths per minute with continuous chest compressions

Reversible Causes
- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

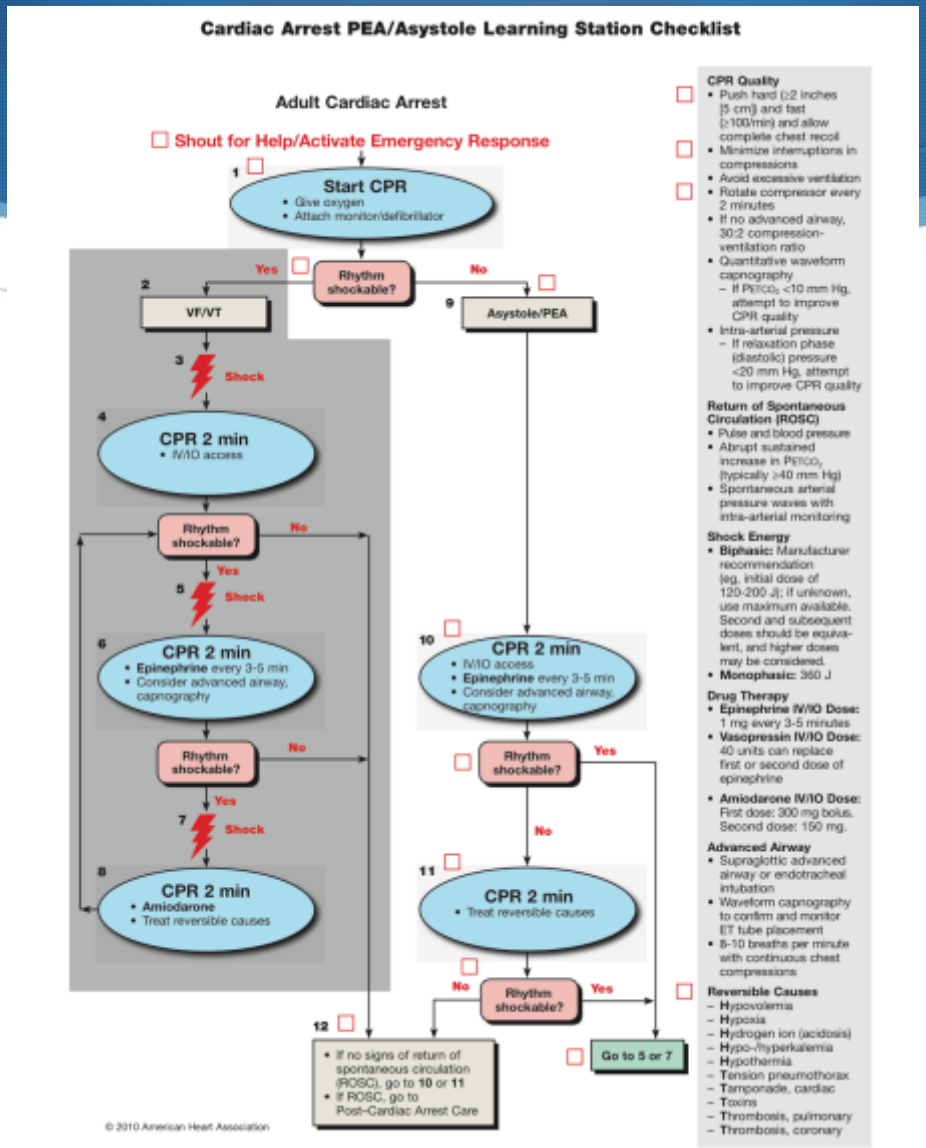
Team Approach as Resuscitation

- Team Leader
- Airway
- Compressor
- IV/IO/Medications
- Monitor /Defibrillator
- Observer / Recorder

ACLS Algorithm – Cardiac Arrest VT / VF



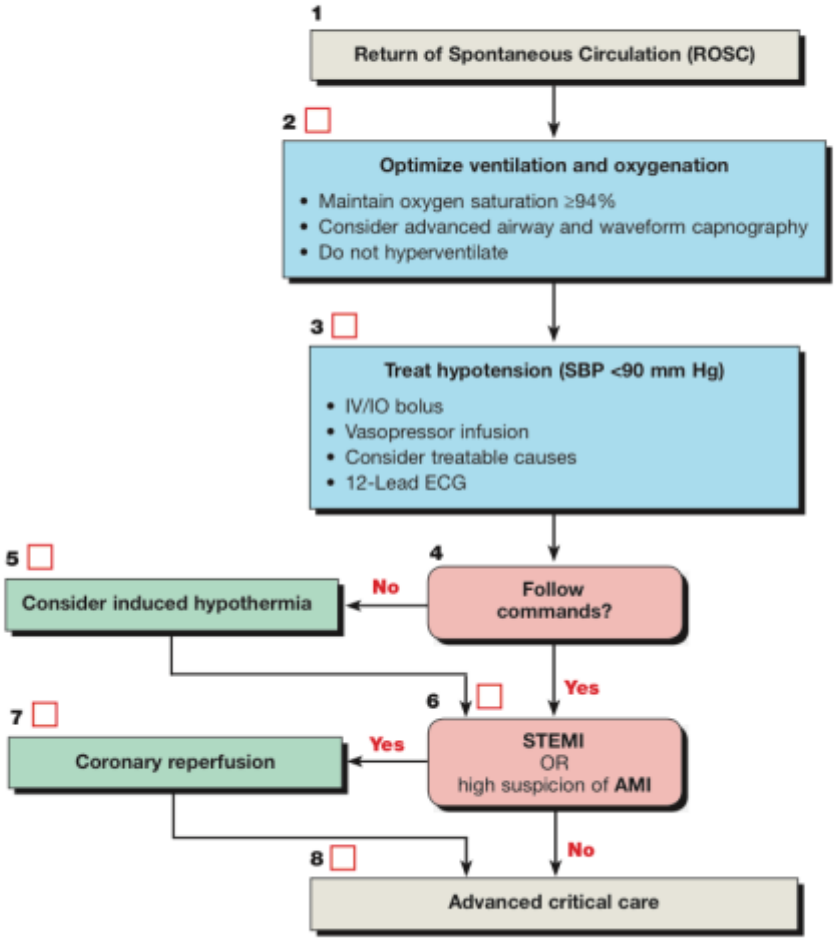
ACLS Algorithm – PEA / Asystole



Post Cardiac Management

Immediate Post–Cardiac Arrest Care Learning Station Checklist

Adult Immediate Post–Cardiac Arrest Care



Doses/Details

Ventilation/Oxygenation
Avoid excessive ventilation. Start at 10-12 breaths/min and titrate to target P_{ETCO_2} of 35-40 mm Hg. When feasible, titrate F_{IO_2} to minimum necessary to achieve Spo_2 ≥94%.

IV Bolus
1-2 L normal saline or lactated Ringer's. If inducing hypothermia, may use 4°C fluid.

Epinephrine IV Infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

Dopamine IV Infusion:
5-10 mcg/kg per minute

Norepinephrine IV Infusion:
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

Reversible Causes
- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

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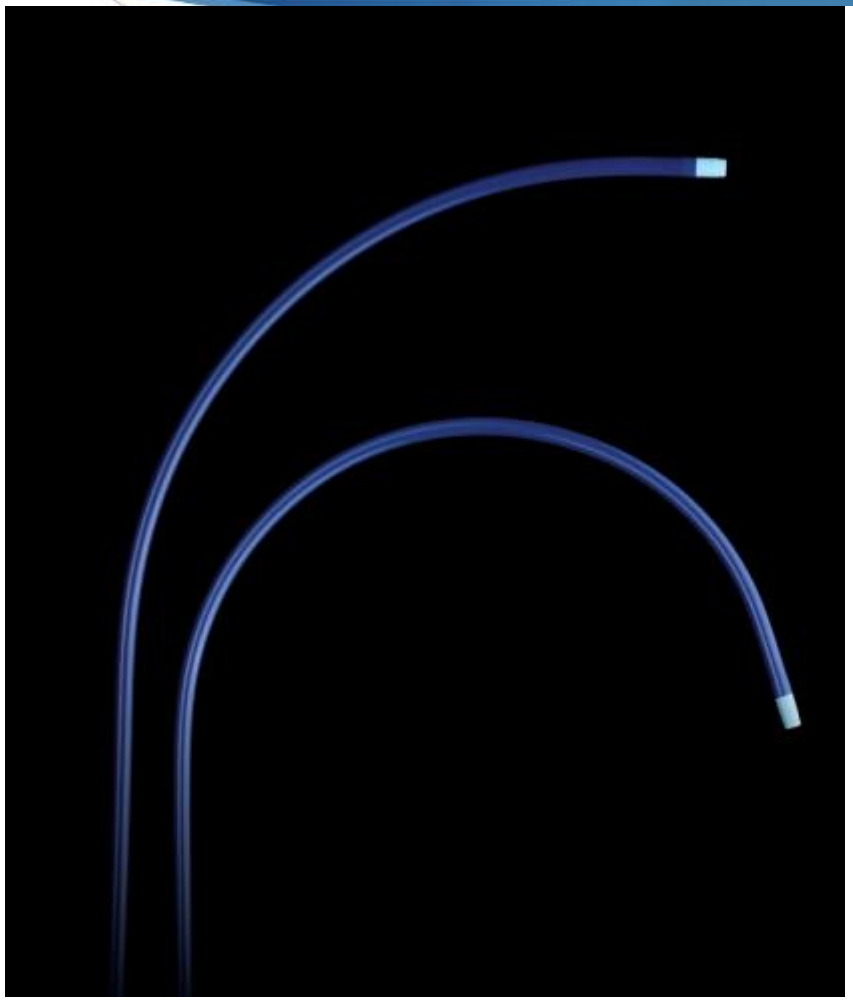
Emergency Cardiac Surgery

- Stabilize the patient
- insert IABP or ECMO
- Arrange operation with CTSU
- Inform relative and obtain consent
- Arrange and collect blood product for OT
- Prepare all nursing records & discharge summary
- Collect all lab. result, ECG, CXR, Coro. Film, PTCA report and medication for transfer
- Arrange emergency ambulance with oxygen, defibrillator and confirm location to pick up patient (CCL/ CCU)
- Escort patient direct to OT
- Inform CTSU that patient is on the way

Prevention of Complications

- Availability of techniques, equipment and facilities (good stocking & good maintenance)
- Staff Training
  - BLS & ACLS training, CPR drill in CCL
  - Ventilator checking
- Stabilize patient's condition
  - Transvenous pacing
  - IABP insertion
  - ECMO insertion
- Good pre-operative preparation
  - Pre Op assessment
    - Coronary angiogram, echocardiogram, ECG,CXR, CBP, R/LFT, PT/APTT/INR
  - Withold anticoagulation therapy

Proper Stocking of Consumables

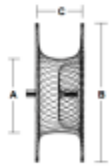


AMPLATZER™ Muscular VSD Occluder

Ventricular Septal Defect Closure Device

Product Highlights

- Self-expanding, double-disc device designed for closure of muscular ventricular septal defects
- The 7 mm waist length accommodates the thickness of the muscular ventricular septal wall
- Symmetrical design allows a venous or arterial delivery approach
- Device can be easily recaptured and redeployed for optimal placement
- Nitinol and interwoven polyester promote occlusion and tissue in-growth



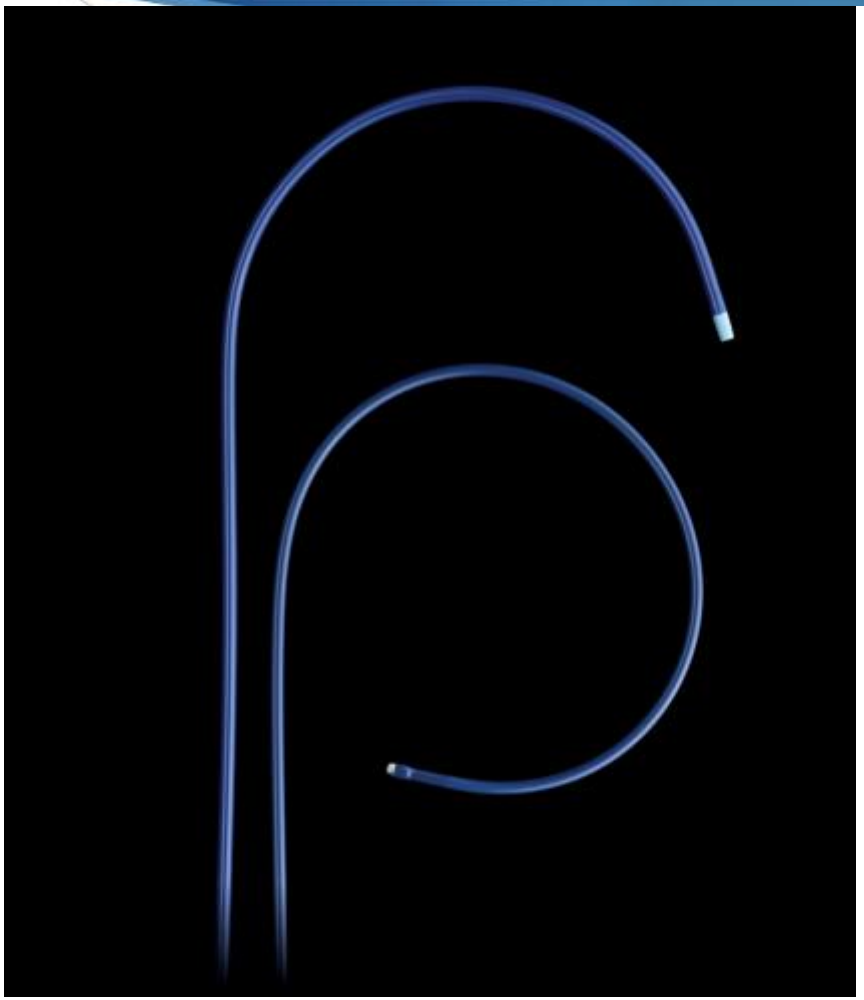
Ordering Information

Contents: 1 occluder

Model/Reorder Number	Device Size/ Waist Diameter (mm) [A]	Disc Diameter (mm) [B]	Waist Length (mm) [C]	Min. Recommended Sheath Size[a]
9-VSD-MUSC-004	4	9	7	5 F, 180° Curve or 6 F, 45° Curve
9-VSD-MUSC-006	6	14	7	6 F, 45° or 180° Curve
9-VSD-MUSC-008	8	16	7	6 F, 45° or 180° Curve
9-VSD-MUSC-010	10	18	7	6 F, 45° or 180° Curve
9-VSD-MUSC-012	12	20	7	7 F, 45° or 180° Curve
9-VSD-MUSC-014	14	22	7	8 F, 45° or 180° Curve
9-VSD-MUSC-016	16	24	7	8 F, 45° or 180° Curve
9-VSD-MUSC-018	18	26	7	9 F, 45° or 180° Curve

a. AMPLATZER™ TorqVue™ 45° or 180° Delivery System is recommended for use with the AMPLATZER Muscular VSD Occluder.

Proper Stocking of Consumables



AMPLATZER™ Membranous VSD Occluder

Ventricular Septal Defect Closure Device

Product Highlights

- Self-expanding, double-disc device designed for closure of perimembranous ventricular septal defects
- Non-concentric design allows for placement that avoids interference with the aortic or atrioventricular valves
- Device can be easily recaptured and redeployed for optimal placement
- Nitinol and interwoven polyester promote occlusion and tissue in-growth

Ordering Information

Contents: 1 occluder

Model/Reorder Number	Device Size/ Waist Diameter (mm) [A]	Right Ventricular Disc Diameter (mm) [B]	Left Ventricular Disc Diameter (mm) [C]	Recommended Sheath Size[a]
9-VSD-MEMB-004	4	8	10	7 F, 180° Curve
9-VSD-MEMB-005	5	9	11	7 F, 180° Curve
9-VSD-MEMB-006	6	10	12	7 F, 180° Curve
9-VSD-MEMB-007	7	11	13	7 F, 180° Curve
9-VSD-MEMB-008	8	12	14	7 F, 180° Curve
9-VSD-MEMB-009	9	13	15	7 F, 180° Curve
9-VSD-MEMB-010	10	14	16	7 F, 180° Curve
9-VSD-MEMB-011	11	15	17	7 F, 180° Curve
9-VSD-MEMB-012	12	16	18	7 F, 180° Curve
9-VSD-MEMB-013	13	17	19	8 F, 180° Curve
9-VSD-MEMB-014	14	18	20	8 F, 180° Curve
9-VSD-MEMB-015	15	19	21	9 F, 180° Curve
9-VSD-MEMB-016	16	20	22	9 F, 180° Curve
9-VSD-MEMB-017	17	21	23	9 F, 180° Curve
9-VSD-MEMB-018	18	22	24	9 F, 180° Curve

a. AMPLATZER™ TorqVue™ Delivery System with Pusher Catheter is required for use with the AMPLATZER Membranous VSD Occluder.

Thank You