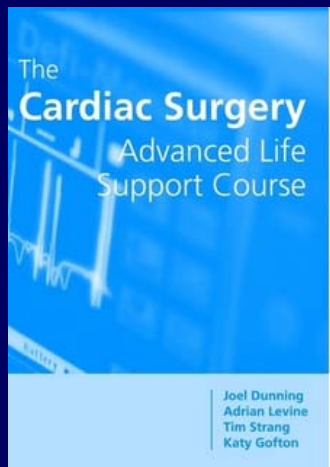


Cardiac Arrest after Cardiac Surgery

Is it different from ACLS?



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European Resuscitation Council (ERC)

Guideline

Guideline for resuscitation in cardiac arrest after cardiac surgery

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Latest Edition of Guideline for Resuscitation -2009

Introduction

Cardiac Arrest After Cardiac Surgery New Guideline

Includes detailed section on the resuscitation of patients with cardiac arrest after cardiac surgery



Management of cardiac arrest post cardiac surgery is different



After cardiac surgery, certain variables may dictate differences in the management when compared to other situations

Introduction

	Europe 2009	CSICU KFHI 2010
Cardiac Surgery -per year-	250,000 Pts.	795 Pts.
Post surgery Cardiac Arrest	0.7-2.9%	1.3%
Ventricular Fibrillation	25-50%	9%
Survival to Hospital Discharge	17 -79%	45%

Issues Addressed:

Timing of emergency resternotomy

Number of attempts at defibrillation before reopening

Administration of epinephrine

Ventilation

Infusions

Pacemaker settings

Emergency resternotomy

Use of the intra-aortic balloon pump (IABP)

Cardiac arrests on the ward and in special circumstances

LOE & Grading Recommendations

Levels of evidence

LOE 1:	Randomised controlled trials (RCT) (or metaanalyses of RCTs)
LOE 2:	Studies using concurrent controls without true randomisation
LOE 3:	Studies using retrospective controls
LOE 4:	Studies without a control group (case series)
LOE 5:	Studies not directly related to the specific patient population

Proposed Protocol for Cardiac Surgical Patients in ICU

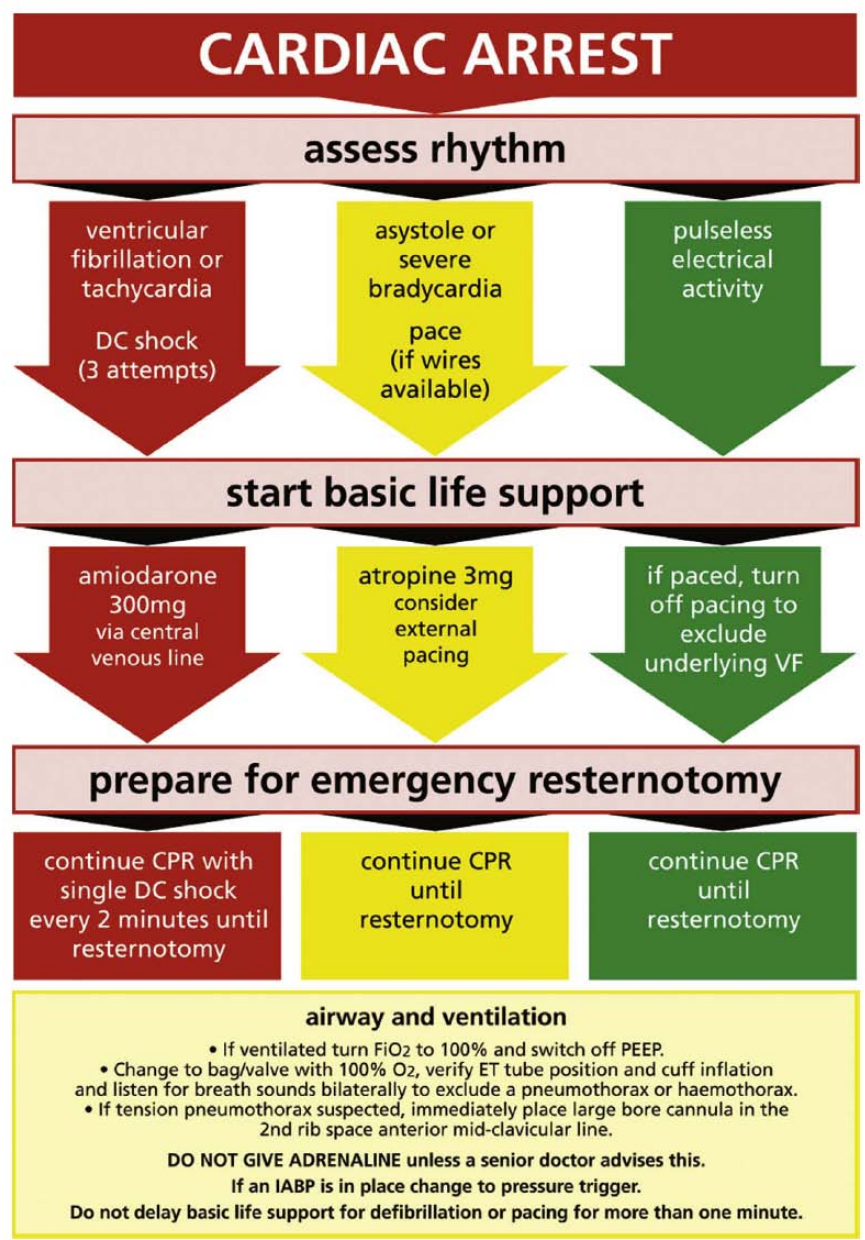


Fig. 1. EACTS guideline for resuscitation of a patient who arrests after cardiac surgery.

Identification of Arrest & Initiation of BLS in ICU

- Pts. are monitored and often intubated and ventilated
- Cardiac arrest is most likely to be signalled by monitoring alarms
- Check femoral or carotid pulse for up to 10s
- Check the art line for position and look at the other traces on the monitor
- In a cardiac arrest, art line, CVP, PA pressures and O2 sats will be flat
- If after 10s there is no palpable central pulse and the arterial, CVP, PA and O2 sats waveforms are flat, start cardiac arrest protocol

Call for help

Identification of Arrest & Initiation of BLS in ICU

Recommendations:

If the ECG shows VF or asystole, call cardiac arrest immediately.

If the ECG is compatible with a cardiac output, feel for a central pulse for 10 s and look at the pressure traces. If arterial and other pressure waveforms are pulseless then call cardiac arrest immediately.

Doubtful Diagnosis of Cardiac Arrest

- Feel for a central pulse for 10s, look at monitor traces
- If VF or asystole initiate arrest protocol without feeling for a pulse
- If viable ECG and monitor traces amplitudes are also diminishing
ask for help, do not start protocol

BLS: External Cardiac Massage

- Witnessed VF or pulseless VT, 3 shocks if defibrillator is available within 1 min
- ECM: Middle of the sternum, 4 –5 cm in depth
- Chest compressions: 100 beats/min
- Look arterial trace for effectiveness
- Aim for the 'systolic' impulse over 60 mmHg.
- ECM ineffective → Emergency resternotomy

BLS: Airway

Recommendations:

Airway and breathing.

Immediately turn the oxygen up to 100%.

For ventilated patients, PEEP should be removed, and if you are happy to do so, the ventilator should be disconnected and a bag/valve used. Listen for breath sounds both sides and equal chest movement to identify a pneumothorax or a haemothorax if present.

If you suspect a tension pneumothorax, place a large bore needle into the 2nd intercostal space, anterior mid-clavicular line, followed either by a chest drain or opening of the pleura at resternotomy.

If you are happy with the airway and breathing, the patient may be reconnected to the ventilator.

Infusions & Syringe Drivers

Recommendations:

In an established cardiac arrest all infusions and syringe drivers should be stopped.

If there is concern about awareness then it is acceptable to continue the sedative infusions.

Other infusions can be restarted as required by the clinical situation.

Epinephrine

- Reports are not consistent
- 1 mg epinephrine in PEA/asystole or after the 2nd. failed shock in VF/VT
-weak evidence-
- Arrest after cardiac surgery, may led in rapidly restoring CO
- Epinephrine may result in dangerous hypertension
- Delay epinephrine until reversible causes are excluded
- Useful in impending arrest or peri-arrest situation
- Dose: 100 - 300 mcg IV bolus

Cardiac Arrest in Patients with an IABP

Recommendation:

In cardiac arrest with an IABP in place, it should be set to pressure trigger.

If there is a significant period without massage, triggering should be changed to internal at a rate of 100 bpm until massage is recommenced.

Management of the Cardiac Arrest

Six key roles in the cardiac arrest:

1. ECM

- √ 100 beats/min, look at the arterial trace to assess effectiveness

- exception: immediate defibrillation or pacing is appropriate prior to ECM-

2. Airway and breathing

- √ O₂ at 100%

- √ Check airway and breathing

- exclude pneumothorax, hemothorax or ETT problem-

3. Defibrillation

- √ Connect defibrillator and administer shocks if required

- √ Check the pacing

- √ If emergency resternotomy, internal defibrillators should be available and connected

ctd

Management of the Cardiac Arrest

Six key roles in the cardiac arrest:

4. Team leader

- √ Conduct the arrest management
- √ Ensures that protocol is being followed and that there is a person allocated to each role

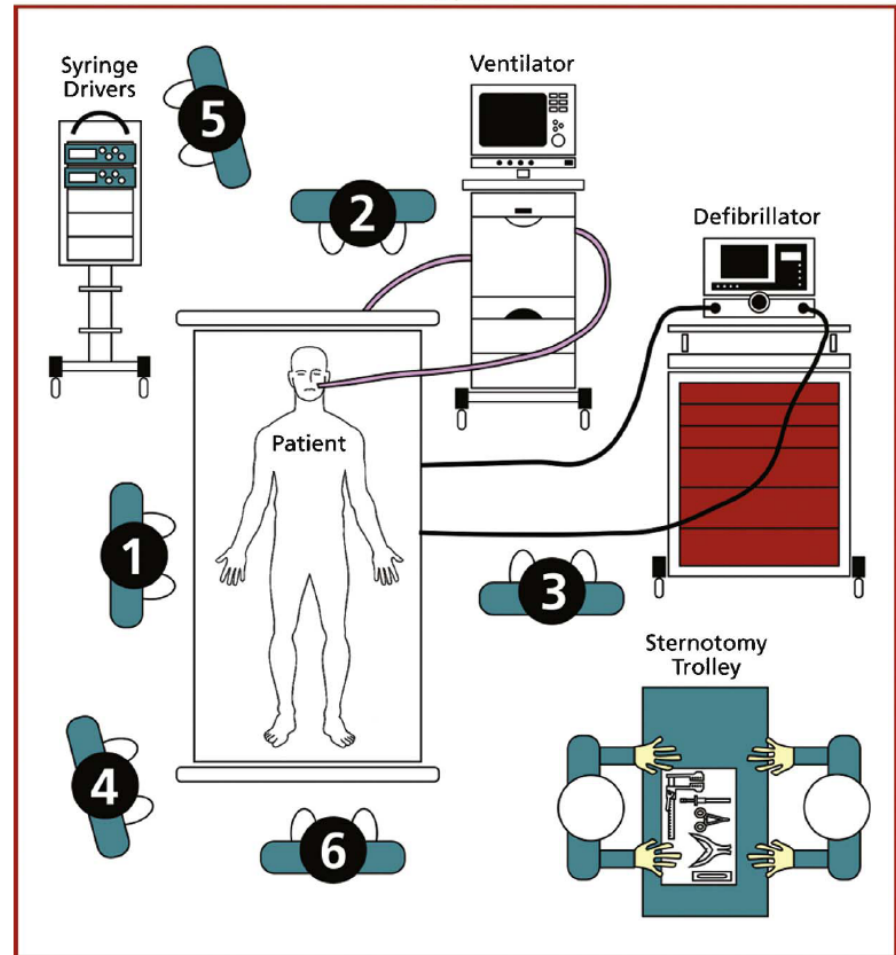
5. Drug

- √ Stops all infusions and syringe drivers
- √ Administers drugs

6. ICU co-ordinator

- √ Coordinates activity peripheral to the bedside:
 - Prepares for potential re-sternotomy
 - Manages available personnel and call for expert assistance

Figure 2. Six key roles in the cardiac arrest



Six Key Roles in the Cardiac Arrest

Six key roles in the cardiac arrest:

1. External cardiac massage
2. Airway and breathing
3. Defibrillation
4. Team leader
5. Drugs and syringe drivers
6. ICU co-ordinator

Fig. 2. Six key roles in the cardiac arrest.

VF or Pulseless VT

Precordial thump

Recommendations:

A precordial thump may be performed if within 10 s of the onset of VF or pulseless VT.

This should not delay cardioversion by defibrillation.

VF or Pulseless VT

Immediate ECM vs. immediate defibrillation or pacing

Recommendation:

In an arrest after cardiac surgery, external cardiac massage can be deferred until initial defibrillation or pacing (as appropriate) have been attempted, provided this can be done in less than 1 min.

VF or Pulseless VT

Number of attempts at defibrillation before resternotomy

Recommendations:

In ventricular fibrillation or pulseless ventricular tachycardia 3 sequential shocks should be given without intervening CPR.

In VF or pulseless VT, emergency resternotomy should be performed after 3 failed attempts at defibrillation.

VF or Pulseless VT

Amiodarone

Recommendation:

After 3 failed attempts at cardioversion for ventricular fibrillation/pulseless VT, a bolus of 300 mg of intravenous amiodarone should be given via the central line.

VF or Pulseless VT

Automated external defibrillators (AEDs)

- Not recommend, it may delay the decision to perform resternotomy

VF or Pulseless VT

Pads vs. paddles

- Acceptable, but only one or the other with staff trained in its use
- Interchanging between paddles and pads may introduce delays

Deakin C. W71, Circulation 2005;112(Suppl. I):b1—4.

Automatic external compression devices

- Not tested on patients after a sternotomy
- Not recommended until safety is demonstrated

Cardiac Arrest with 'Non-Shockable' Rhythm

Pacing

Recommendations:

For asystole or severe bradycardia, connect the epicardial pacing wires and set to DDD at 90 bpm at the maximum atrial and ventricular output voltages.

If the rhythm is pulseless electrical activity and a pacemaker is connected and functioning, then briefly turn the pacemaker off to exclude underlying ventricular fibrillation.

Cardiac Arrest with 'Non-Shockable' Rhythm

Atropine

Recommendations:

For patients with asystole or extreme bradycardia atropine should be given via the central line at a dose of 3 mg.

Cardiac Arrest with 'Non-Shockable' Rhythm

Emergency re sternotomy after non-VF/VT arrest

Recommendation:

In non-shockable cardiac arrest which does not resolve after atropine and pacing, emergency re sternotomy should be immediately performed.

Conduct of Emergency Resternotomy

Internal vs. external cardiac massage

Recommendations:

Internal cardiac massage is superior to external cardiac massage. In patients with a recent sternotomy in whom resuscitative efforts are likely to last more than 5–10 min, emergency resternotomy is indicated in order to perform internal cardiac massage even if a reversible cause from resternotomy seems unlikely.

Conduct of Emergency Resternotomy

Abdominal compression to achieve ECM

- Produces sufficient systemic perfusion pressures
- No reports on visceral organ damage
- Provide systemic perfusion while an emergency resternotomy is performed
- Needs further evidence to be recommended

Conduct of Emergency Resternotomy

Emergency resternotomy set

-ICU Staff must be trained-

- Essential five items: (all-in-one)
 - Sterile thoracic drape
 - Scalpel
 - Wire cutter
 - Heavy needle holder
 - Sternal retractor
- Useful items:
 - Jankauer sucker
 - Larger sets to be available for OR team
 - Small emergency resternotomy set with the disposable scalpel taped to the top
 - Once the chest has been opened, this set can be discarded and a full set opened

Conduct of Emergency Resternotomy



Fig. 3. Small resternotomy set packed with scalpel on top (above) and opened (below).

Conduct of Emergency Resternotomy

Preparation for emergency resternotomy

Recommendations:

Two to three staff members should put on a gown and gloves as soon as a cardiac arrest is called, and prepare the emergency resternotomy set.

Hand washing is not necessary prior to closed-sleeve donning of gloves.

Conduct of Emergency Resternotomy

Personnel performing emergency resternotomy

- Cardiac surgeon
 - If unavailable
- All personnel should be skilled

Conduct of Emergency Resternotomy

Emergency resternotomy

- Sterile gown and gloves
- Continue ECM until ready to apply the all-in-one sterile thoracic drape
- Apply the thoracic drape, whole bed covered
- Recommence ECM
 - changeover from non-sterile ECM to sterile ECM should take no more than 10s
- When equipment is ready, cease ECM and perform sternotomy

ctd

Conduct of Emergency Resternotomy

Emergency resternotomy

- Cut and pull out the sternal wires
- The sternal edges will separate a little and tamponade, if present, may be relieved
- Use suction to clear excessive blood or clots
- Place the retractor between the sternal edges and open the sternum
- If CO is restored, wait for expert assistance
- If there is no CO, identify the position of any grafts and then perform internal cardiac massage and internal defibrillation if required

Conduct of Emergency Resternotomy

Method of internal cardiac massage

If inexperienced don't rush

- Remove clots, locate the internal mammary and grafts
- Two-hand technique:
 - Right hand round the apex to the back of the heart, palm up and hand flat
 - Left hand flat onto the anterior surface of the heart and squeeze hands together
 - Squeeze hands at rate of 100 per min, look at the arterial trace
 - Obtain a systolic impulse of more than 60 mmHg

Conduct of Emergency Resternotomy

How long after cardiac surgery is emergency resternotomy no longer indicated?

Recommendations:

Emergency resternotomy should form an integral part of the cardiac arrest protocol up to the 10th postoperative day.

Beyond the 10th postoperative day, a senior clinician should decide whether emergency resternotomy should still be performed.

Emergency resternotomy for internal cardiac massage should still be considered in preference to prolonged external cardiac massage even if a surgically reversible cause for the arrest is not suspected.

Conduct of Emergency Resternotomy

Sterility during emergency resternotomy

- Attempt complete aseptic technique
 - Low rate of mediastinitis
- Wear sterile gown and gloves
- Facemasks or surgical caps are not essential
- Use disposable all-in-one thoracic drape with a clear window that covers the skin
 - Obviates the need for skin preparation

Conduct of Emergency Resternotomy

CPB after emergency resternotomy

- Indications: No spontaneous CO
- 30,000 IU of heparin IV
- Additional 10,000 IU of heparin to be added to CPB machine reservoir
- Not need to check an ACT before commencing CPB
- Cannulae to Ao and RA

Conduct of Emergency Resternotomy

Antibiotics after emergency resternotomy?

Recommendations:

It is common practice to perform an antiseptic washout after emergency resternotomy and to give additional intravenous antibiotics.

This is not unreasonable and is indicated if the resternotomy has not been performed using full aseptic techniques.

Conduct of Emergency Resternotomy

Permissive hypothermia after resuscitation from prolonged cardiac arrest

- Cooling to 32–34°C for 12–24 h, if significant period of poor cerebral perfusion

Special Considerations

'Open chest' patients

- ECM at the midpoint of the chest, over the gauze packs
- Observe arterial pressure trace to assess the effectiveness of ECM
- If emergency resternotomy, full aseptic technique
- Remove carefully the packs

Special Considerations

Transplant patients

- Atropine will be ineffective

Pediatric patients

- 11% suffered a respiratory arrest
- Drugs dosages to be corrected by weight or surface area

Special Considerations

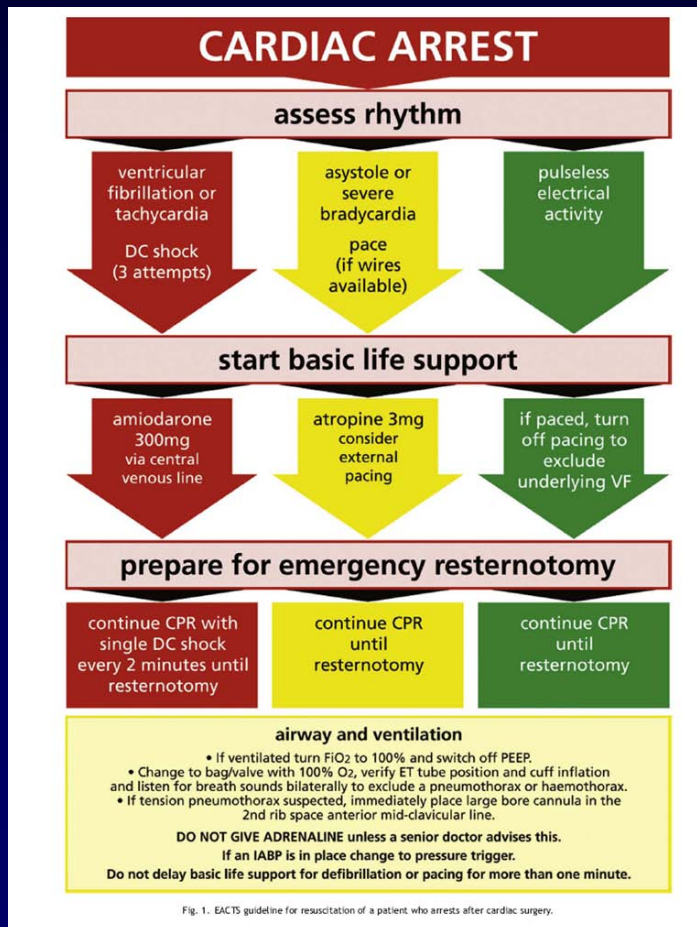
Patients with a cardiac assist device

- This guidelines do not apply
- Be trained for equipment failure and the 'cardiac arrest'
- 'Arrest' may be due to mechanical failure and in this situation ECM is not appropriate

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Cardiac Arrest after Cardiac Surgery

Is it different from ACLS?



I think so.....

Guideline for *Resuscitation in Cardiac Arrest after Cardiac Surgery*

Thank You

