CARDIOPULMONARY RESUSCITATION- FROM THE PAST INTO THE FUTURE.

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Disclosure

No conflict of interest to disclose
1. The following medication category decreases myocardial oxygen demand
   a. Beta-adrenergic blocking (beta-blockers) agents
   b. Beta-adrenergic agonist agents
   c. Vasopressin
   d. Alpha-adrenergic agonist agents
2. In adult patients, mouth-to-mouth resuscitation by untrained provider is absolutely imperative during CPR to improve patients’ survival

a. True
b. False
3. There is ample evidence that beta-blockers alone could be used in VF/VT arrest
   a. True
   b. False
4. DSD does not work in refractory VF arrest, and should not be used, ever.

a. True

b. False
5. Left Stellate Ganglion block could be used to control electric storm.

a. True

b. False
Objectives

• Review
  – Resuscitation History
  – Current Resuscitative Guidelines

• Discuss therapies that will likely improve patient’s survival
HISTORY

• 5000-3000 BC- first mouth to mouth ventilation

• 1740- Paris Academy of Science
  ➢ Use for drowning victims

• 1780- first attempt of Newborn resuscitation by blowing

• 1874- first experimental direct cardiac massage

• 1901- first successful direct cardiac massage in man

• 1946- first experimental indirect cardiac massage
HISTORY

- 1957: U.S. military use
  - Revive unresponsive victims

- 1960: CPR developed
  - American Heart Association CPR committee
1972: Leonard Cobb

- First mass citizen training in CPR
- Trained over 100,000 people in 2 years
• 1980's

- **1981** A program to provide telephone instructions in CPR began in King County, Washington.

- **1983** AHA convened a national conference on pediatric resuscitation to develop CPR and ECC Guidelines for pediatric and neonatal patients.

- **1985** Fourth National Conference on CPR and ECC.

- **1988** AHA introduces first pediatric courses, pediatric BLS, pediatric ALS and neonatal resuscitation, cosponsored with The American Academy of Pediatrics (AAP).
HISTORY

• 1990's

➢ Early Public Access Defibrillation (PAD) programs are developed with the goal in mind to provide training and resources to the public so they are able to aid in the successful resuscitation of cardiac arrest victims.

➢ 1992  Fifth National Conference on CPR and ECC.

➢ 1992  International Committee on Resuscitation (ILCOR) founded

➢ 1999  First task force on first aid was appointed. First International Conference on Guidelines for CPR and ECC
• **2004** AHA and ILCOR releases a statement regarding the use of AEDs on children

• **2005** AHA developed the Family & Friends® CPR Anytime® kit

• **2005** The 2005 International Consensus on ECC and CPR Science with Treatment Recommendations (CoSTR)
2008  The AHA releases a statement about Hands-Only™ CPR

2010  The 2010 International Consensus on ECC and CPR

2015  The Institute of Medicine releases its report titled Strategies to Improve Cardiac Arrest Survival: A Time to Act (2015)
2015 Updates

Figure 5

BLS Healthcare Provider Adult Cardiac Arrest Algorithm – 2015 Update

1. Vary scene safety.
2. Victim is unresponsive. Shout for nearby help. Activate emergency response system via mobile device (if appropriate). Get AED and emergency equipment (or send someone to do so).
3. If no normal breathing, has pulse:
   - Monitor until emergency responders arrive.
   - Look for no breathing or only gasping and check pulse (simultaneously). Is pulse definitely felt within 10 seconds?
4. If no breathing or only gasping, no pulse:
   - Provide rescue breathing: 1 breath every 5-6 seconds, or about 10-12 breaths/min.
   - Activate emergency response system (if not already done after 2 minutes).
   - Continue rescue breathing: check pulse about every 2 minutes. If no pulse, begin CPR (go to “CPR” box). If possible opioid overdose, administer naloxone if available per protocol.
5. CPR
   - Begin cycles of 30 compressions and 2 breathes. Use AED as soon as it is available.
6. AED arrives.
7. Check rhythm, Shockable rhythm?
   - Yes, shockable: Give 1 shock. Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.
   - No, nonshockable: Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.

By this time in all scenarios, emergency response system or backup is activated, and AED and emergency equipment are retrieved or someone is retrieving them.
Adult Cardiac Arrest Circular Algorithm—2015 Update

CPR Quality
- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If P<sub>ETCO</sub> < 10 mm Hg, attempt to improve CPR quality
  - Intra-arterial pressure
    - If relaxation phase (diastolic) pressure < 20 mm Hg, attempt to improve CPR quality.

Shock Energy for Defibrillation
- Biphasic: Manufacturer recommendation (eg, initial dose of 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
- **Amiodarone IV/IO dose**: First dose: 300 mg bolus. Second dose: 150 mg.

Advanced Airway
- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)
- Pulse and blood pressure
- Abrupt sustained increase in P<sub>ETCO</sub> (typically >40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

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

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Pivot to “not in ACLS”
Your first patient of the day
Doctor I need you!
WELL ...

WE'RE WAITING
Seriously?
Yes, I am superhuman, but, even I should only do chest compressions for 2 minutes.
Now what?
Electrical Storm
Who?
13-Blockers for the treatment of cardiac arrest from ventricular fibrillation?*
Daniel Bourque a,*, Raoul Daoust a,b, V´erilibe Huard a,b, Marco Charneux a,b,c

a Department of Emergency Medicine, Sacre´-Coeur Hospital, 5400 Gouin Ouest, Montreal, Quebec, Canada H4J 1C5
b Faculty of Medicine, University of Montreal, Montreal, Quebec, Canada
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Review article

Use of beta-blockers for the treatment of cardiac arrest due to ventricular fibrillation/pulseless ventricular tachycardia: A systematic review

Felipe Carvalho de Oliveira\textsuperscript{a,b}, Gilson Soares Feitosa-Filho\textsuperscript{a,b,*}, Luiz Eduardo Fonteles Ritt\textsuperscript{b,c}

Resuscitation 83 (2012) 674–683
<table>
<thead>
<tr>
<th>Author</th>
<th>Population</th>
<th>Groups</th>
<th>j3-Blockade Strategy</th>
<th>Results</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>Nademane34</td>
<td>49 post-MI patients</td>
<td>(1) ACLS-guided</td>
<td>LSGB (n = 6)</td>
<td>Significant reduction in VF episodes</td>
<td>Patients were assigned to each treatment arm</td>
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<tr>
<td></td>
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<td>therapy (n = 22)</td>
<td>Esmolol (n = 7)</td>
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<tr>
<td></td>
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<td>(2) Adrenergic Blockade (n = 27)</td>
<td>Propranolol (n = 14)</td>
<td>Better short term (82% vs. 22%) and long term survival (66% vs. 4%)</td>
<td>according to physician preference, rather than randomly assigned</td>
</tr>
<tr>
<td>Miwa35</td>
<td>42 consecutive ES patients</td>
<td>All patients received j3-blockade after failure of ACLS-guided therapy</td>
<td>Landiolol in increasing doses (up to 60%)</td>
<td>Overall survival was 60%</td>
<td>Both responders and survivors had lower age and APACHE II scores compared to non-responders and non-survivors</td>
</tr>
</tbody>
</table>
Use of esmolol after failure of standard cardiopulmonary resuscitation to treat patients with refractory ventricular fibrillation.

Driver VE, Debaty G, Plummer DW, Smith SW

What can you do?
Beyond ACLS
Double Simultaneous External Defibrillation
www.rebelem.com
Double Defibrillation

http://coreem.net/procedures/defib-pads/
Double Sequential Defibrillation for Refractory Ventricular Fibrillation and Pulseless Ventricular Tachycardia

The authors discuss the potential benefits of double sequential defibrillation for patients with refractory ventricular fibrillation/pulseless ventricular tachycardia, underscoring the need for further research.

*Emergency Medicine.* 2017 November;49(11):499-504

Author(s): Leyda Hu, DO, Winny Liang, Pa-C, Richard Cousino, DO, Jason Cheng, DO, Samuel E Perry,
• Cabañas et al, 2014
  • retrospective case series of 10 patients
  • DSD between 2008 and 2010
  • 70% of the patients were successfully converted by DSD out of refractory V-fib
  • 0 survived to discharge

• Cortez et al, 2016
  • 12 patients with refractory V-fib treated with DSD found that
  • nine patients (75%) converted out of V-fib
  • three survived to hospital discharge, with two patients (16.7%) discharged with a CPC of 1

• Merlin et al, 2016
  • retrospective case series, EMTs delivering DSD in the field
  • seven patients
  • five of whom (71%) were successfully converted out of V-fib
  • four (57%) surviving to hospital admission.
DSD MAY BENEFIT in REFRECTORVY VF

Treating electrical storm: sympathetic blockade versus advanced cardiac life support-guided therapy.

Nademane K, Taylor R, Bailey WE, Reiders DE, Kosar EM.
Left stellate ganglion block
Summary

• CPR only for non-trained personal for cardiac arrest is sufficient.
• BB blockers could be used in refractory VF arrest to decreased myocardial oxygen demand.
• Double Sequential Fibrillation may improve patients’ chances for ROSC.
• Left Stellate Ganglion Block could be the treatment of choice in Electrical Storm to block sympathetic stimulation.
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Post-test

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