Use of Echocardiography in Cardiac Arrest

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Faculty Disclosures

None for this talk
Objectives

• Knowledge of Echocardiography in cardiac arrest

• Outline on Image acquisition and Interpretation

• Operational and Technical Challenges & Solutions

• Clinical Cases
How to best utilize echo during Codes

- Differentiate between true PEA and Pseudo PEA
- Care during code and post code
- Evaluate adequacy and optimize position of CPR
- Help during pulse check assessment
Assess during Code

**PEA**
- Electromechanical Dissociation
- 5H’s and 5 T’s

**Pseudo PEA**
- Cardiac activity present but without palpable pulse
- Cardiac tamponade
- Severe hypovolemic
- Pulmonary embolism
- Severe cardiomyopathy
Rapid cardiac ultrasound of inpatients suffering PEA arrest performed by nonexpert sonographers

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Arrest with initial rhythm of PEA

Emergency Sonographer places ultrasound in sub-xiphoid region while CPR continues
1) Subcostal long axis view of the heart obtained.
2) ACLS leader informed to give notice 5 seconds before next pulse check.

At pulse check, emergency sonographer records a 10 second video loop of ultrasound motion. Sonographer then moves away from the patient and evaluates the loop.

Cardiac Motion?

Adequate images

Yes

No

Pericardial Effusion

Yes

No

Right Ventricle larger then Left Ventricle in the Presence of a small dynamic Left Ventricle

Yes

No

Under filled Right Ventricle in the presence of a small dynamic Left Ventricle

Yes

No

“A pericardial effusion is seen, tamponade is a possible cause of PEA”

“The findings of right heart strain are seen, Pulmonary Embolus is a possible cause of PEA”

“The findings of hypovolemia are seen, hypovolemia is a possible cause of PEA”

“No suggestive findings are seen”

“This is a limited screening examination”

Inadequate for interpretation

Repeat loop x 2 if needed
(One of these attempts may be made during a requested 10-second pause)
The Cardiac Arrest Sonographic Assessment (CASA) exam – A standardized approach to the use of ultrasound in PEA

Kevin F. Gardner MD, Eben J. Clattenburg MD, MPH, Peter Wroe MD, Amandeep Singh MD, Daniel Mantuani MD, Arun Nagdev MD

The CASA Exam (Cardiac Arrest Sonographic Assessment)

1. Cardiac Tamponade? ≤10 seconds
   - 2 min ACLS

2. Right heart strain? ≤10 seconds
   - 2 min ACLS

3. Cardiac activity? ≤10 seconds
   - PNX/FAST (As indicated)
C.A.U.S.E.: Cardiac arrest ultra-sound e
A better approach to managing patients
non-arrhythmogenic cardiac arrest☆

Caleb Hernandeza, Klaus Shulera, Hashibul Hanmana, Chi
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Bedside Focused Echocardiography as Predictor of Survival in Cardiac Arrest Patients: A Systematic Review

Lacey Blyth, Paul Atkinson MB, BCh, BAO, BSc(Hons), MA(Cantab), MRCP, FCEM, Kathleen Gadd, MLIS, and Eddy Lang, MD, CCFP(EM)

Table 3
Two-by-Two Table Showing Summary of Pooled Results

<table>
<thead>
<tr>
<th></th>
<th>ROSC (Positive Outcome)</th>
<th>No ROSC (Negative Outcome)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac contractility seen on echo (positive test)</td>
<td>98</td>
<td>92</td>
</tr>
<tr>
<td>No cardiac contractility seen on echo (negative test)</td>
<td>9</td>
<td>369</td>
</tr>
</tbody>
</table>

Symmetric SROC
AUC = 0.9251
SE(AUC) = 0.0497
Q^2 = 0.8693
SE(Q^2) = 0.0563
2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

1. Start CPR
   - Give oxygen
   - Attach monitor/defibrillator

2. Rhythm shockable?
   Yes: VF/pVT
   No: Asystole/PEA

3. Shock

4. CPR 2 min
   - IV/IO access

5. Rhythm shockable?
   Yes: Shock
   No:

6. CPR 2 min
   - Epinephrine every 3-5 min
   - Consider advanced airway, capnography

7. Shock

8. CPR 2 min
   - Amiodarone
   - Treat reversible causes

9. Asystole/PEA

10. CPR 2 min
    - IV/IO access
    - Epinephrine every 3-5 min
    - Consider advanced airway, capnography

11. Rhythm shockable?
    Yes: CPR 2 min
        - Treat reversible causes
    No:

12. If no signs of return of spontaneous circulation (ROSC), go to 10 or 11
    If ROSC, go to Post-Cardiac Arrest Care
Short Axis views of the RV and LV

(a).

(b. (i)).

Coronary perfusion pressure + \( O_2 \) demand = RV ischemia

RV hypertrophy

Wall stress

(ii).

RV pressure + LV filling = Cardiac Output
Thank You
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