TEE-ing off the Cardiac Arrest Sand-Trap: Shadow-Boxing for CPR Vectors, Missed VF & Pseudo PEA

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Questions to be Addressed

• How might direct visualization of the heart using Transesophageal Echocardiography (TEE) during cardiac arrest address some of the limitations in field assessment and treatment of cardiac arrest?
SLCFD Project

- UTE-CAP
  - Use of Transesophageal Echocardiography in Cardiac Arrest Project

Prepare • Respond • Impact
Study Protocol

- Dispatch alerts sent to mobile phones of 4 TEE trained investigators
- Respond to scene of arrest
- Place TEE in patients after intubation performed
- Imaging used to assist providers with decision-making
Where it’s placed

Catheter

Transducer

Wendolyn Hill
What it Does
TEE during CPR
CAN TEE HELP TO CLASSIFY THE CARDIAC RHYTHM?
The Cardinal Sin in Defibrillation

- Not shocking the shockable rhythm
Rhythm Analysis
• How often do paramedics misclassify VF?
  – Unknown
  – Misclassification of SVT is 31%

(Goebel PJ. Prehosp Emerg Care 2004;8(2): 166-70)
Misclassification of VF

• How often do AEDs misclassify VF?
  – 16% of VF episodes deemed non-shockable

(Calle PA. Resuscitation 2015;88:68-74)
Case Report

- 73 year old obese female arrests in the ED
- Asystole on the monitor
- TEE inserted...

Blaivas M. Resuscitation 2008;78(2):135-140
TEE Images

- VF mechanical activity clearly seen
- Shocked into cardiac standstill → occasional ventricular beats → ROSC
CAN TEE OBVIATE THE NEED FOR PULSE CHECKS AND IMPROVE DETECTION OF ROSC?
PEA is a Dangerous Rhythm

PEA

- Electromechanical Dissociation
- Pseudo-PEA
- Unrecognized ROSC

**Mechanical Activity**
- None
- Poor
- Adequate

**Blood Pressure**
- Absent
- Low
- Adequate
Pulse Checks

- Accuracy as poor as 15% when performed within AHA recommended 10 sec
  (Eberle B. Resuscitation 1996;33(2):107-16)

- Implications:
  - Terminating efforts in patients with pseudo-PEA or even ROSC
  - Continuing asynchronous compressions over a beating heart
‘Miracle’ as Mississippi man wakes up in body bag at funeral home

Published February 28, 2014 • FoxNews.com
TEE during pulse check
TEE During Pulse Check
CAN TEE IMPROVE HAND POSITIONING DURING CPR?
• How do you know that your chest compressions are generating blood flow?
  – ETCO$_2$
Traditional Hand Placement

Chest compressions are performed between the nipples.
Where We Want to Direct Chest Compression Force
Occlusion of the Aortic Outflow Tract

- Location of hand placement may lead to occlusion of aortic outflow tract
  - Occurred in 44% of cases in ED based study
  - Reduces cardiac output during CPR

Occlusion of Ao Outflow Tract
Depth of CPR and Release

- Bad CPR - Depth <3cm
- Complete Release
- Incomplete Release
- Good CPR - Depth >4cm
- Depth of compression

Prepare • Respond • Impact
CAN TEE HELP IDENTIFY THE CAUSE OF ARREST?
Cause of Arrest

• Identified correct cause in 31/48 (65%)
• Incorrect cause identified in 4/48 (8%)
• Changed management in 15 (31%)
• Diagnoses: tamponade (n=6), MI (n=21), PE (n=6), ruptured aorta (n=1), aortic dissection (n=4), papillary muscle rupture (n=1)

Van der Wouw, et al. JACC 1997;30(3):780-783
• TEE has the potential to:
  – Improve Rhythm Analysis
    • Identify masked VF
    • Distinguish PEA from pseudo-PEA and early ROSC
  – Replace the pulse check
  – Tell you to move your hands to a better position during CPR
  – Identify cause of arrest
    • Change management
THANK YOU

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