Ultrasound

In the critically ill cardiac arrest patient

Rohit Patel, MD
Shands Hospital at the University of Florida
Gainesville, FL
Pt presents speaking partial sentences 78%, confused
What do you do?
Problem
Order
Tech
Reader
Back to you

Golden hour

Treatmen
### Table 2. Causes of Hemodynamic Collapse That Can Be Potentially Diagnosed Using Echocardiography from the Subcostal Window and Their Expected Findings

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Expected findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypovolemic shock</td>
<td>Significantly reduced end-diastolic chamber size</td>
</tr>
<tr>
<td></td>
<td>“Kissing” ventricular walls during systole</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>Clot in transit (in IVC, RA, RV, and/or main PA)</td>
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<tr>
<td></td>
<td>Signs of RV strain:</td>
</tr>
<tr>
<td></td>
<td>Dilated RV</td>
</tr>
<tr>
<td></td>
<td>RV free wall hypokinesis or akinesis ± apical sparing</td>
</tr>
<tr>
<td></td>
<td>Signs of RV pressure overload:</td>
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<tr>
<td></td>
<td>“D-shaped” LV in short axis during systole</td>
</tr>
<tr>
<td></td>
<td>Dilated, noncollapsible IVC</td>
</tr>
<tr>
<td>Systolic failure</td>
<td>Significantly reduced contraction</td>
</tr>
<tr>
<td></td>
<td>Significantly reduced ejection fraction</td>
</tr>
<tr>
<td>Tamponade</td>
<td>Pericardial effusion</td>
</tr>
<tr>
<td></td>
<td>Right atrial systolic(^a) collapse</td>
</tr>
<tr>
<td></td>
<td>Right ventricular diastolic(^a) collapse</td>
</tr>
<tr>
<td></td>
<td>Left atrial systolic(^a) collapse</td>
</tr>
<tr>
<td></td>
<td>Dilated, noncollapsible IVC</td>
</tr>
</tbody>
</table>

IVC = inferior vena cava; RA = right atrium; RV = right ventricle; PA = pulmonary artery; LV = left ventricle.

\(^a\) Refers to cardiac cycle.

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**ECHO ROUNDS**

### Hand-Held Echocardiography in the Management of Cardiac Arrest

Achikam Oren-Grinberg, MD,* Gaurav Gulati,* Lior Fuchs, MD,* and Duane S. Pinto, MD, MPH†
The heart of the matter: Utility of ultrasound of cardiac activity during traumatic arrest

Elizabeth L. Cureton, MD, Louise Y. Yeung, MD, Rita O. Kwan, MD, MPH, Emily J. Mirafior, MD, Javid Sadjadi, MD, FACS, Daniel D. Price, MD, and Gregory P. Victorino, MD, FACS, Oakland, California

The Journal of International Medical Research
2012; 40: 804 – 809 [first published online as 40(2) 2]

Assessment of Cardiac Ultrasonography in Predicting Outcome in Adult Cardiac Arrest

O Tomruk1, B Erdur2, G Cetin1, A Ergin3, M Avci1 and M Kapci1

1Department of Emergency Medicine, Faculty of Medicine, Süleyman Demirel University, Isparta, Turkey; 2Department of Emergency Medicine, and 3Department of Public Health, Faculty of Medicine, Pamukkale University, Denizli, Turkey

ELSEVIER

doi:10.1016/j.ultrasmedbio.2011.11.015

● Review

CLINICAL INTEGRATED ULTRASOUND OF THE THORAX INCLUDING CAUSES OF SHOCK IN NONTRAUMATIC CRITICALLY ILL PATIENTS. A PRACTICAL APPROACH

Roberto Copetti, * Paolo Copetti,* and Angelika Reissig1

*Emergency Department, Latisana General Hospital, Latisana, Italy; and 1Department of Pneumology and Allergology, Medical University Clinics I, Friedrich-Schiller University, Jena, Germany

(Received 15 June 2011; revised 18 November 2011; in final form 22 November 2011)
Figure 8  Flow diagram demonstrating use of C.A.U.S.E. protocol in patients with cardiac arrest.
The Pump

Pericardial effusion?

Global contractility of left ventricle?

Relative size of right ventricle to left ventricle?

Back to the pump
Effusion around the pump

Pericardial Effusion

RV

LV

LA

Pericardium

Descending Aorta
Effusion around the pump

Grades

Small less than 10 mm

Moderate 10–15 mm

Large greater than 15 mm
Effusion around the pump

Tamponade or not?

Hallmark: RV free wall inversion, best recognized during diastole

Right atrial inversion during systole (more common and early finding)

Increased respiratory variation of mitral or aortic inflow velocities (greater than 25%)

Dilated inferior vena cava with decreased inspiratory collapse

ASE Committee Recommendations. Am Soc Echocardiography.
Effusion around the pump – tamponade
Squeeze of the pump

Determination of **global** left ventricular function

LV walls: **visual calculation** of % change from diastole to systole

Ejection Fraction: Radionuclide imaging and visual determination **roughly equivalent**

Amico AF. Am Heart J.
Squeeze of the pump

**Good contractility:** walls almost come together and almost obliterate ventricular cavity during systole

**Poor contractility:** walls move little and heart may be dilated

*Anterior leaflet of mitral valve:* in normal state will vigorously touch septum during ventricular filling (best in parasternal long view axis)
Squeeze of the pump

Segmental wall motion abnormalities?
Cardiac Arrest

**Presence or absence of cardiac contractions**

**Present:** coordinated movements of mitral and aortic valves? If not....chest compressions needed

**Absent:** cardiac standstill after prolonged ACLS....ROSC low
Strain of the pump

Assessment of right ventricular strain

Normal LV:RV = 1 to 0.6

Optimal views: parasternals and apical... Subxiphoid can be used but need to 'fan' through RV

RV dilation: acute pressure rise in pulmonary circuit (large central pulmonary embolus classic example)

Interventricular septum right to left toward LV signal high pressures within pulmonary artery

Jardin F. Chest. 1997
Jardin F. J Am Coll Card.
Strain of the pump

CLINICAL INTEGRATED ULTRASOUND OF THE THORAX INCLUDING CAUSES OF SHOCK IN NONTRAUMATIC CRITICALLY ILL PATIENTS. A PRACTICAL APPROACH

ROBERTO COPETTI, PAOLO COPETTI, and ANGELICA REISSIG

*Emergency Department, Latisana General Hospital, Latisana, Italy; and †Department of Pneumology and Allergology, Medical University Clinics I, Friedrich-Schiller University, Jena, Germany

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Strain of the pump

Gradual increase?

Dilation of RV and thickening or hypertrophy of RV wall
Strain of the pump

(a) Clot

(b) Clot in IVC

Case Report

Detection of Acute Pulmonary Embolism by Bedside Ultrasound in a Patient Presenting in PEA Arrest: A Case Report

Hangyul Chung-Esaki, Roneesha Knight, Jeanne Noble, Ralph Wang, and Zlatan Coralic

Hindawi Publishing Corporation
Case Reports in Emergency Medicine
Volume 2012, Article ID 794019, 5 pages
doi:10.1155/2012/794019