

EDUCATIONAL FORUM

New Advances in Emergency Ultrasound Protocols for Shock

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Shock is a major morbidity in emergency and critical care and is also one of the important prognostic factors affecting in-hospital mortality [1]. Timely diagnosis and treatment of shock reduce the length of stay (LOS) and mortality rate at the emergency department (ED). The early use of the point of care ultrasound (POCUS) can reduce the diagnostic time as well as increase the accuracy of diagnosis [2]. The first protocol Undifferentiated hypotension protocol (UHP) was release on 2001, [3]; and more than 15 subsequent protocols were developed [4]. Most protocols include followings:

Heart

Evaluate the common causes of shock and heart function. During POCUS exam, we emphasize on “eye balling”, instead of conventional measurements.

Obstructive shock

Pericardial effusion with cardiac tamponade

Use subcostal view as first screen view. Effusion in the pericardial cavity is usually visible (Fig. 1). Moreover, Right



PERICARDIAL EFFUSION IN SUBCOSTAL VIEW

Figure 1 Pericardial effusion.

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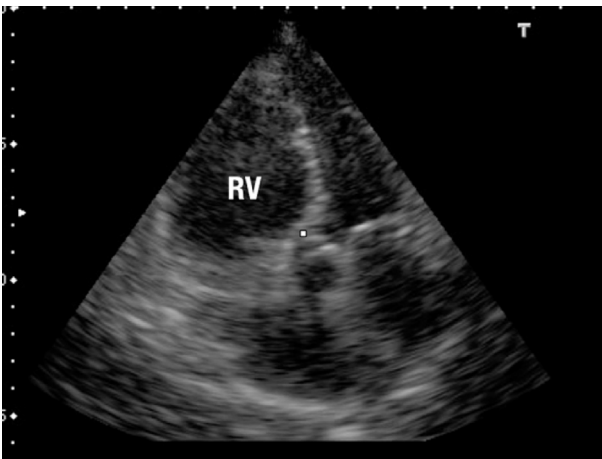
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From Practical guide to Emergency ultrasound, chapter 5

Figure 2 RA collapse sign.



DISTENDED RV IN APICAL 4 CHAMBER VIEW

Figure 3 Pulmonary embolism.

atrium or Right ventricle (RV) collapse sign is specific for cardiac tamponade (Fig. 2). As we mention earlier, conventional measurement is not necessary in POCUS, if patient develops clinical shock status with pericardial effusion, cardiac tamponade should be considered.

Pulmonary embolism

Apical four chamber view is much more accurate for the diagnosis of pulmonary embolism; it provides better visualization of both heart ventricles; in pulmonary embolism, RV is obviously larger than left ventricle (LV) (normal ratio is $RV:LV = 1:1.5$) (Fig. 3). In parasternal short axis view, a D-shape LV (Septal wall shifts toward LV second to pulmonary hypertension) can be found. RV wall thickness is usually <0.5 cm in acute condition; if not, it is usually caused by other chronic condition, such as primary pulmonary hypertension. The presentation of McConnell's sign demonstrates the akinesia of mid RV free wall, but good motion of RV apex.

Cardiogenic shock

Parasternal short axis view is used for LV contractility and coronary artery supply in different territory. The LV will move inward about 30% to 1/3 during contraction (Fig. 4). The presentation of limited LV contraction could be cardiogenic shock, meanwhile, the occurrence of abnormal motion of regional wall reflects the abnormality of coronary arterial territory.

Hypovolemic shock

Kissing sign (the different walls contact each other during contraction) occurs in hypovolemic shock. It is important to evaluate RV condition and end diastolic volume whenever Kissing sign in hypovolemic shock occurs. For example, pulmonary embolism can cause low volume to LV. In hypovolemic shock, both end diastolic and systolic volume are reduced, but in distributive shock, only end systolic volume is reduced.

Blood vessels

Inferior vena cava (IVC)

The normal diameter at the end expiratory phase (IVCe) should be 1–2.5 cm, and diameter is reduced during end inspiratory phase (IVCi). The changing diameter of IVC

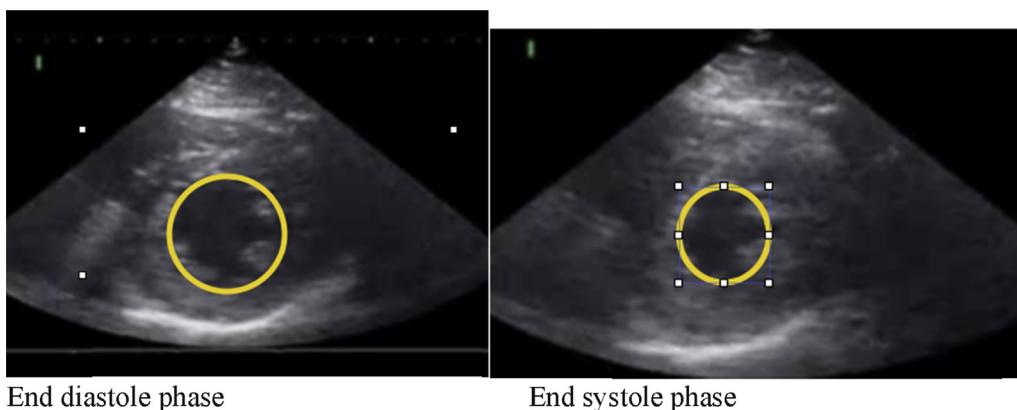


Figure 4 Normal LV contraction.

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