Imminent Cardiac Collapse: The Catastrophy You Cannot Afford To Miss

Presenting Authors

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Introduction

- Cardiac arrest is not rare in clinical practice and is often reversible in most cases if treated at the earliest.

- Imaging a patient having a cardiac arrest on the CT examination table is not common and limited radiology literature is available.

- Altered hemodynamics resulting from cardiac failure causes stasis of blood in dependent organs of the body and injected intravenous contrast material, being heavier than blood, tends to accumulate in the dependent portions of the venous system seen as dependent contrast pooling and layering.

- This inappropriate clinical scenario is a marker of the worsening clinical condition.

- It is therefore very important to identify pertinent findings & act quickly.
Teaching points:

1. To discuss taxonomy and etiopathogenesis of cardiac collapse
2. To review characteristic imaging findings

In this exhibit, we discuss the pertinent CT imaging findings of on table cardiac arrest. Increased awareness of such entities will contribute to optimized care of patients.
Cardiac arrest: Case 1

- 73-years-old male
- Status post fall
- Severe head injury
- Asystole during chest CT
MDCT showing dense contrast pooling (arrows) in the SVC, coronary sinus as well as in the right heart chambers with no contrast in the left heart chambers.
Also seen is contrast pooling (yellow arrows) in the dependent IVC, hepatic veins, hepatic parenchyma, and in the renal veins with the formation of a blood-contrast level (red arrows)
Cardiac arrest: Case 2

- 54-years-old male
- Found down
- Acute hemopericardium and cardiac tamponade
- Autopsy: Rupture Acute Myocardial Infarction
MDCT showing dense contrast pooling (yellow arrows) in the SVC, pulmonary arteries, in the dependent IVC, hepatic veins, as well as in the right heart chambers with the formation of a blood-contrast level (red arrow). No contrast in the left heart chambers. Also seen is hemopericardium (blue arrows) and mediastinal stranding.
Contrast pooling (yellow arrows) is noted in the dependent IVC, hepatic veins, hepatic parenchyma, and the right renal vein with the formation of a blood-contrast level (red arrows)
Sagittal and coronal images showing dense contrast pooling (red arrows) in the dependent SVC-IVC, hepatic veins, and hepatic parenchyma.
Delayed images showing hemopericardium (yellow arrows) and mass effect on right cardiac chambers (red arrows) suggesting tamponade. Also seen is thinning and irregularity of apex and lateral wall of left ventricle probably suggesting acute myocardial infarction and rupture (blue arrows)
Cardiac arrest: Case 3

• 17 year-old female
• Status post MVC
• Severe head injury
• Severe chest injury
• Patient died in scanner
MDCT showing dense contrast pooling (yellow arrows) in the SVC, in the dependent IVC, hepatic veins, hepatic parenchyma as well as in the right heart chambers with the formation of a blood-contrast level (red arrows). No contrast in the left heart chambers. Pulmonary contusions and small hemothoraces (blue arrows) are also noted.
Also seen is contrast pooling (yellow arrows) in the dependent IVC, hepatic veins, hepatic parenchyma, and the renal veins with the formation of a blood-contrast level (red arrows)
Coronal images showing contrast pooling (yellow arrows) in the dependent SVC-IVC, hepatic veins, hepatic parenchyma, and the renal veins with the formation of a blood-contrast level (red arrow). Pulmonary contusions are also seen (blue arrows).
Cardiac arrest: Case 4

- 59-years-old female
- Coded before and after CT
- Central line placement prior to CT
- Diffuse pulmonary opacities either edema or pneumonia
- Air embolism likely during line placement since air is seen in the non-contrast images (Aortic dissection protocol)
- Patient coded and died after the CT was performed
- CT shows the air embolism and extensive contrast opacification of the spinal veins
MDCT showing contrast pooling (yellow arrows) in the SVC, azygous vein, and dependent IVC with the formation of a blood-contrast level (red arrows). Pulmonary opacities (blue arrows) are also noted.
Sagittal images showing contrast pooling (red arrows) and dense opacification in the paravertebral and spinal veins.
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Sagittal images showing contrast pooling (red arrows) and dense opacification in the paravertebral and spinal veins. Pulmonary opacities (blue arrows) are also noted.
• 38-year-old male patient came in to have the dialysis catheter exchanged
• The exchange did not go well and the patient arrested
• CT scan was performed
Chest radiograph showing right dialysis catheter

Follow up radiograph showing altered course of right dialysis catheter and patient developed chest pain and hypotension
CEPT showing hemopericardium (yellow arrows) and mass effect on right cardiac chambers (red arrows) suggesting tamponade. Also seen is high density contrast in the pericardium (blue arrows) suggesting SVC perforation during a catheter exchange. The site of perforation occurred in the extrapericardial portion of the SVC.
CECT at different level showing hemopericardium (yellow arrows) and mass effect on right cardiac chambers (red arrows) suggesting tamponade. Also seen is high density contrast in the pericardium (blue arrows) suggesting extrapericardial SVC perforation during a catheter exchange.
Conclusion

• Cardiac arrest results in abrupt cessation of cardiac pump function that may be reversible by prompt intervention but can lead to death in its absence

• Imaging findings of sudden cardiac arrest are quite characteristic

• Altered hemodynamics leads to dependent venous pooling of contrast giving contrast–blood levels on contrast-enhanced CT, which is a marker of worsening clinical condition and carries grave prognosis for the patient

• The radiologist should be aware of the imaging findings so that proper resuscitative measures can be taken immediately

• The treating physician should be informed immediately as these findings imply imminent cardiogenic shock
Summary

- Recognizing the typical imaging manifestations of imminent cardiac failure with adequate clinical correlation is thus extremely critical not only for timely and accurate diagnosis but also for guiding treatment.
- Imaging thus plays a critical role in the patient management.
References

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