March 2016 Critical Care Case of the Month

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History of Present Illness

A 58-year-old man was admitted to the ICU in stable condition after an aortic valve replacement with a mechanical valve.

Past Medical History

He had with past medical history significant for endocarditis, severe aortic regurgitation related to aortic valve perforation, mild to moderate mitral valve regurgitation, atrial fibrillation, depression, hypertension, hyperlipidemia, obesity, and previous cervical spine surgery. As part of his preop workup, he had a cardiac catheterization performed which showed no significant coronary artery disease. Pulmonary function tests showed an FEV1 of 55% predicted and a FEV1/FVC ratio of 65% consistent with moderate obstruction.

Medications

Amiodarone 400 mg bid, digoxin 250 mcg, furosemide 20 mg IV bid, metoprolol 12.5 mg bid. Heparin nomogram since arrival in the ICU.

Physical Examination

He was extubated shortly after arrival in the ICU. Vitals signs were stable. His weight had increased 3 Kg compared to admission. He was awake and alert. Cardiac rhythm was irregular. Lungs had decreased breath sounds. Abdomen was unremarkable.

Laboratory

His admission laboratory is unremarkable and include a creatinine of 1.0 mg/dL, blood urea nitrogen (BUN) of 18 mg/dL, white blood count (WBC) of 7.3×10^9 cells/L, and electrolytes with normal limits.

Radiography

His portable chest x-ray is shown in Figure 1.

Figure 1. Portable chest x-ray taken on admission to the ICU.

What should be **done next?**

1. Bedside echocardiogram
2. Diuresis with a furosemide drip because of his weight gain and cardiomegaly
3. Observation
4. 1 and 3
5. All of the above

Correct !
4. 1 and 3

The patient is doing clinically well. He does have some weight gain post-operatively but this is not unusual after a major operation and aggressive diuresis is not indicated. He does have cardiomegaly but this is probably due to his valvular insufficiency since it has not changed compared to his admission radiograph. Performance of a baseline bedside echocardiogram is common post-operatively and will help to identify any impending or potential complications.

A 4-chamber view from the bedside echocardiogram is shown in Figure 2.

Figure 2. Bedside echocardiogram in the ICU.

The echocardiogram was interpreted as showing:

- Status post 27/29 mm mechanical bileaflet aortic valve prosthesis; Normal prosthesis. Systolic mean Doppler gradient; 14 mmHg. Trivial prosthetic regurgitation (closing volume).
- Normal left ventricular chamber size. Calculated ejection fraction; 60 %.
- Abnormal ventricular septal motion with respirophasic shift. No other findings for constriction or regional wall motion abnormalities.
- Moderate decrease in right ventricular systolic function.
- Estimated right ventricular systolic pressure; 23 mmHg.
- Mild ascending aorta dilatation (diameter 41 mm at mid level).
- Tiny, insignificant apical pericardial effusion.

On the fifth post-operative day he was sitting in the chair and pleasantly conversant. His urine output the previous day was around 2 L; however, since midnight, it has decreased dramatically. His creatinine yesterday was normal but has increased to 2.6 mg/dL with an accompanying increase in BUN. His WBC has increased to 10.8×10^9 cells/L and his K^+ to 5.5 mEq/L with a mild metabolic acidosis.

Which of the following should be **performed at this time?**

1. Bladder scan
2. Ensure the patency of the bladder catheter
3. Renal ultrasound
4. Urinalysis and culture
5. All of the above

Correct!
5. All of the above

Decreased urine output and acute kidney injury are extremely common in the ICU. The treatment depends on the underlying cause. In general, there are three major causes: obstruction, kidney injury or inadequate perfusion. It is very important to ensure that the mechanical devices such as the urinary catheter are functioning since correction is relatively easy this patient is at a higher risk because of the anticoagulation which can cause obstruction from a clot. His urinary catheter could be easily irrigated and there was no retained urine on bladder scan. An ultrasound of the right kidney is shown in Figure 3.

Figure 3. Ultrasound of the right kidney.

His pulse tracing is shown in figure 4.

Figure 4. Pulse tracing.

Which of the following should be **done next**?

1. Begin counterpulsation intra-aortic balloon pump
2. Begin vasopressors
3. Consult nephrology for dialysis
4. Consult urology for a renal pelvis stent
5. Repeat the bedside echocardiogram

Correct!

5. Repeat the beside echocardiogram

The renal ultrasound shown in figure 3 is normal. The normal renal size is about 4-5 in. or about 10-12 cm. The left kidney also appeared normal. The pulse tracing is not normal. It shows a marked drop with inspiration. A drop of > 10 mm Hg is abnormal and consistent with pulsus paradoxus. The repeat echocardiogram is shown in Figure 5.

Figure 5. Repeat beside ultrasound (4 chamber view).

Which of the following should be **done next**?

1. Continue anticoagulation for the atrial clot
2. Needle pericardiocentesis
3. Thoracentesis
4. Thoracic surgery consult for pericardotomy
5. Thoracic surgery consult to remove the migrated aortic valve

Correct!

4. Thoracic surgery consult for pericardotomy

The repeat echocardiogram explains the pulsus paradoxus and the decreased urine output. There is a large pericardial effusion (Figure 5).

Figure 6. Beside echocardiogram with 5 cm accumulation of pericardial fluid shown at the cardiac apex (1 cm dots).

This was also shown by a thoracic CT scan (Figure 7).

Figure 7. Thoracic and abdominal CT scans. Panel A: thoracic axial view. Panel B: abdominal CT scan coronal view. In each panel the pericardial fluid is indicated by the arrows.

Since the patient is not hypotensive but is anticoagulated, the safest treatment is an operative intervention to remove the clot. Pericardiocentesis carries some risk especially for patients on anticoagulation.

The patient was taken to the operating room for a mediastinal exploration. He became hypotensive just prior to operation and required fluids and vasopressors. A clot was evacuated from the pericardial wall. Post-operatively the patient did well regaining his urinary function and was discharged after 13 days.

Bleeding into the pericardium can occur, especially when the patient is on anticoagulants as this patient was for his mechanical valve. This can present with hypotension or subacutely with decreased organ perfusion as in this case.

References

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