

Survival following non-operative management of infected coronary artery aneurysm with infected pericardial effusion complicated by multi-organ failure: a case report

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Background

Infected coronary artery aneurysm with infected pericardial effusion is a very rare complication following percutaneous coronary intervention (PCI) and is associated with high mortality. Management options include open cardiothoracic surgery or non-operative management with pericardiocentesis. The best management option is currently unknown.

Case summary

A 76-year-old man with a background of hypertension, type two diabetes mellitus, chronic kidney disease, and a pacemaker presented with worsening shortness of breath 5 weeks following PCI to the right coronary artery (RCA) for a non-ST elevation myocardial infarction. His blood cultures grew methicillin-sensitive *Staphylococcus aureus* and he developed progressive renal failure and shortness of breath despite high-dose antibiotics. Echocardiography showed a pericardial effusion with impending tamponade and the patient proceeded urgently for pericardiocentesis. He subsequently developed severe cardiogenic and vasoplegic shock with multi-organ failure. Computed tomography coronary angiography (CTCA) showed an RCA aneurysm. He was conservatively managed with a pericardial window due to being too high risk for cardiac surgery and subsequently made a full recovery.

Discussion

Non-operative management of infected coronary artery aneurysm and infected pericardial effusion resulted in survival and return to baseline function in our patient despite the development of severe shock with multi-organ failure.

Keywords

Infected coronary artery aneurysm • Mycotic coronary artery aneurysm • Infected pericardial effusion • Pericardial empyema • Infected coronary artery stent • Case report

ESC Curriculum

2.1 Imaging modalities • 2.2 Echocardiography • 2.4 Cardiac computed tomography • 3.4 Coronary angiography • 7.3 Critically ill cardiac patient

Learning points

- Infected coronary artery aneurysm is a rare, life-threatening complication following percutaneous coronary intervention and is often complicated by infected pericardial effusion.
- With appropriate supportive care, non-operative management of infected coronary artery aneurysm with infected pericardial effusion can lead to survival.

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Introduction

Infected (mycotic) coronary artery aneurysm is a rare complication following percutaneous coronary intervention (PCI) and is associated with a high mortality.¹ A systematic review by Baker *et al.*² in 2020 showed found 97 published cases with a short-term mortality of 42.6%. The additional complication of infected pericardial effusion is very rare and discussion is limited to a few case reports.^{3–6}

The clinical presentation and disease progression varies widely in these case reports. Onset of this complication following PCI can range from weeks to years. Severity ranges from moderate illness to multiorgan failure and death.

The appropriate management options of infected coronary artery aneurysm are unclear due to the rarity and variety of this disease and it is uncertain how the additional complication of infected pericardial effusion should change management. Early surgical intervention has been suggested as the gold standard treatment for mycotic coronary artery aneurysm due to the rationale of achieving source control by removing the infected artery aneurysm and stent.⁷ We present a case describing survival in a patient with infected coronary artery aneurysm and infected pericardial effusion managed non-operatively.

Timeline

| Date | Event |
|-------------------|---|
| 17 August 2020 | Presentation with non-ST elevation myocardial infarction. |
| 22 August 2020 | Angiography and stenting of 99% right coronary artery (RCA) stenosis. |
| 25 August 2020 | Discharged home. |
| 28 September 2020 | Represented with progressive shortness of breath. |
| 29 September 2020 | Blood cultures positive, started on antibiotics. Normal transthoracic echocardiography (TTE). |
| 30 September 2020 | Left knee aspirate. |
| 1 October 2020 | Left knee arthroscopic washout. |
| 2 October 2020 | Normal transoesophageal echocardiogram (TOE). |
| 4 October 2020 | Attempted dialysis failed due to hypotension. |
| 5 October 2020 | Admitted to intensive care unit (ICU) for dialysis with vasopressor support. Focused cardiac ultrasound shows moderate pericardial effusion. |
| 6 October 2020 | TTE and TOE showed pericardial effusion with a hypoechoic collection around the RCA. Pericardiocentesis of purulent pericardial fluid. Develops severe shock. |
| 7 October 2020 | Computed tomography coronary angiography shows RCA aneurysm. TTE shows severe biventricular failure and large pericardial effusion. Pericardial drain blocks. |
| 13 October 2020 | Extubated. |
| 15 October 2020 | Successful pericardial window. |
| 19 October 2020 | Discharged from ICU. |
| 10 October 2020 | Discharged from hospital. |

Case presentation

A 76-year-old Caucasian man with a history of hypertension, type two diabetes mellitus, stage four chronic kidney disease, obstructive sleep apnoea, previous pacemaker insertion for symptomatic bradycardia, and previous bilateral total knee joint replacement presented with chest pain and 2 weeks of shortness of breath on exertion. An electrocardiogram showed an old left bundle branch block and serial high-sensitivity troponin levels (hs-TnT) were 55 ng/L, then 71 ng/L after 2 h. His temperature was 35.8°C. Transthoracic echocardiography (TTE) showed normal biventricular size and function.

He proceeded for angiography which showed a 99% stenosis in a dominant right coronary artery (RCA) (*Figure 1, Video 1*). The cardiologist placed four drug-eluting stents in the RCA which was difficult due to angulation and calcification and was complicated by balloon rupture (*Figure 2, Video 2*). There was no deesterilization of the equipment reported. He was discharged home 3 days later.

Five weeks later, the patient represented with progressive shortness of breath. On examination, he had mild bilateral pedal oedema and normal heart and lung sounds. Bloods showed a white cell count of $14.3 \times 10^9/L$ (normal range: $4-11 \times 10^9/L$) and C-reactive protein of 110 mg/L (normal range 0–8 mg/L) with non-dynamic high-sensitivity troponin levels of 85 ng/L, then 82 ng/L (normal range 0–14 ng/L). Transthoracic echocardiography showed normal biventricular function, normal valve function with no evidence of endocarditis and no pericardial effusion. Three sets of blood cultures were taken which were positive within 24 h and grew methicillin-sensitive *Staphylococcus aureus* (MSSA) and he was started on IV flucloxacillin.

The patient reported a mild trauma to his left knee 5 days prior. On examination, the knee was mildly swollen and tender but not erythematous. An aspirate was performed which yielded a white cell count of $100\,800 \times 10^6/L$ with no organisms seen or grown. He proceeded for an arthroscopic washout of the left knee which yielded serous fluid and later grew *Staphylococcus epidermidis*.

A transoesophageal echocardiogram (TOE) showed no evidence of endocarditis, no pacemaker wire infection, and no pericardial effusion.

While in hospital, the patient developed worsening shortness of breath with pleuritic chest pain. He developed a worsening kidney injury with oliguria and had attempted dialysis but developed hypotension with angina and shortness of breath. He was admitted to the intensive care unit (ICU) the following day and successfully had dialysis with inotropic support. A focused cardiac ultrasound showed a moderate sized circumferential pericardial effusion with no evidence of tamponade.

Formal TTE the following day confirmed the presence of a moderate circumferential pericardial effusion with no haemodynamic compromise seen. It also showed a hypoechoic collection around the RCA and stent (*Figure 3, Video 3*). A subsequent TOE confirmed the above findings, with evidence of tamponade.

Based on the echocardiographic findings, the patient proceeded urgently to the cath lab for pericardiocentesis. Purulent fluid was drained which yielded a white cell count of $2540 \times 10^6/L$ and subsequently grew MSSA. He developed severe cardiogenic and vasoplegic shock with hypoxia during the procedure and was intubated in the cath lab. He returned to ICU on escalating vasoactive support which peaked at 120 µg per minute of noradrenaline in addition to adrenaline, vasopressin, and shock dose steroids.

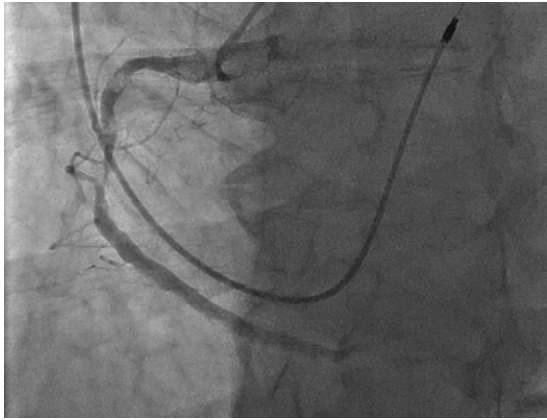


Figure 1 Angiography of right coronary artery before stent insertion showing multiple flow limiting lesions.



Figure 2 Angiography of right coronary artery following insertion of four stents showing good contrast flow.

A computed tomography coronary angiography the following day showed an RCA aneurysm between the first and second stents with contrast extravasation (Figure 4, 5). A TTE showed severe biventricular failure and a large pericardial effusion. The pericardial drain subsequently became blocked and extensive discussions occurred with cardiothoracic surgery to consider operative management. Due to the prohibitive risk of surgical intervention, the patient was conservatively managed.

Antibiotics were escalated to vancomycin plus clindamycin and flucloxacillin was changed to cefazolin due to a new severe liver injury. The patient improved with supportive care in the ICU and was able to be extubated. He then proceeded to the cath lab for a percutaneous balloon pericardial window during which he remained stable.

The patient was discharged from ICU a few days later and subsequently discharged from hospital following a period of rehabilitation on lifelong suppression antibiotics with flucloxacillin. He returned to full time work 3 months following discharge from hospital and

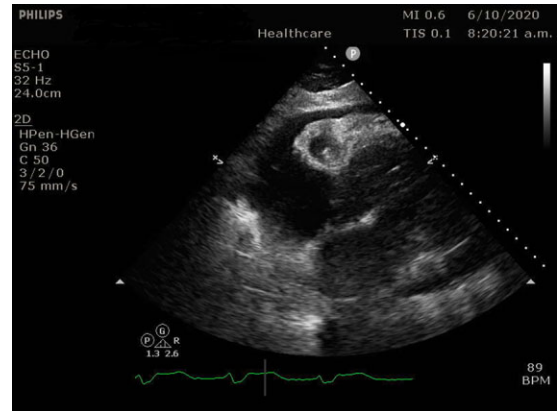


Figure 3 Subcostal four-chamber transthoracic echocardiography view showing pericardial effusion and right coronary artery stent with surrounding hypoechoic collection.



Figure 4 Sagittal computed tomography coronary angiography slice showing right coronary artery with aneurysm between two coronary stents with associated pericardial effusion.

remains well with no functional limitations 1 year post his initial admission. A repeat TTE 1 year following the patient's discharge showed moderate to severely reduced left ventricular function, moderately reduced right ventricular function, and no significant pericardial effusion.

Discussion

The incidence of bacteraemia following PCI is <1% and is usually uncomplicated with the most common pathogens being coagulase negative staphylococcus.^{8,9} The incidence of coronary stent infection

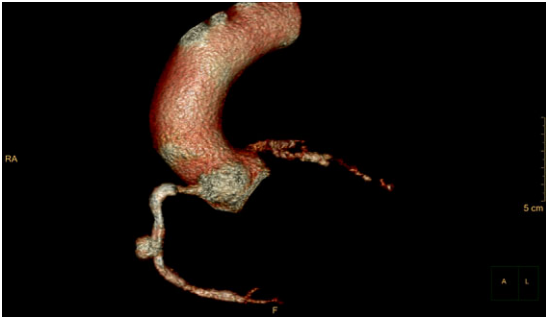
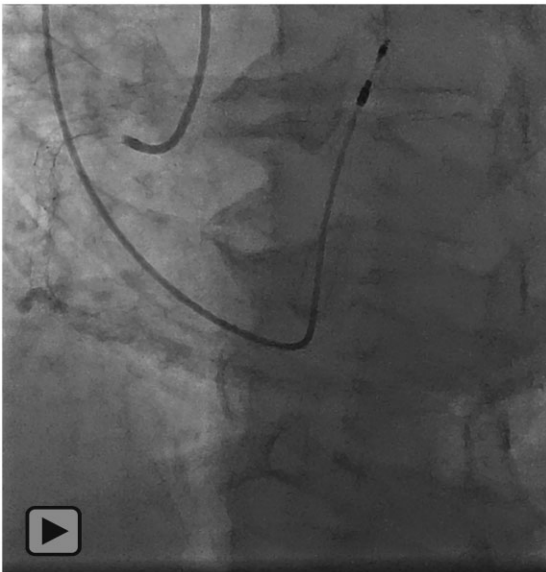
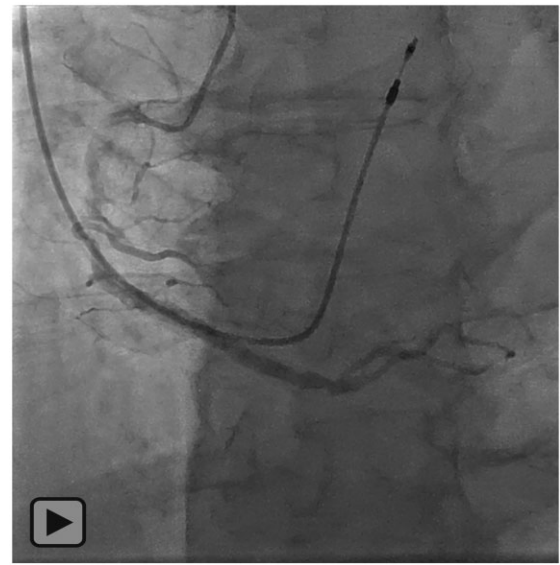


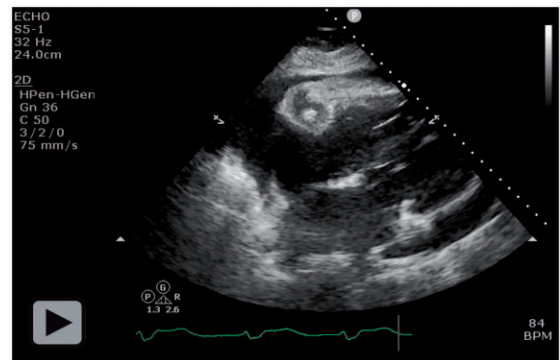
Figure 5 Three-dimensional computed tomography coronary angiography image showing right coronary artery aneurysm between stents.



Video 1 Right coronary artery angiography before stent insertion showing multiple flow limiting lesions.



Video 2 Right coronary artery angiography following insertion of four stents showing good contrast flow.



Video 3 Subcostal four-chamber transthoracic echocardiography view showing pericardial effusion and right coronary artery stent with surrounding hypoechoic collection.

rare and is associated with a high mortality and commonly complicated by pericardial effusion.^{1,2,10}

Infected coronary artery aneurysm can occur spontaneously in immunocompromised individuals but has more often been reported often in patients following PCI. There is a theoretical basis for increased risk of infection following intervention with drug-eluting stents compared to bare metal stents due to their immunomodulatory effects.¹¹ The most common location for infected coronary artery aneurysm is the RCA and the most common pathogen is *Staphylococcus aureus*.¹ It is unclear whether the pathogen is more often introduced at the time of intervention or is already present at the time of intervention.

Our case involved some unique diagnostic and therapeutic difficulties. Initial management was focused on possible septic arthritis of the patient's prosthetic left knee as the source of the MSSA bacteraemia.

Despite source control of the knee, the patient continued to deteriorate and required admission to ICU, at which point the pericardial effusion was noted. It is striking to note that this effusion had developed rapidly following a normal TOE that was performed 3 days prior.

The use of different imaging modalities was crucial in the management of this case. The initial focused cardiac ultrasound was able to identify the pericardial effusion as the likely cause of the patient's shortness of breath and prompted the diagnostic sequence of events. The subsequent formal TTE allowed identification of the hypoechoic collection around the RCA stent associated with the pericardial effusion. The following TOE was able to confirm these findings and combined bedside clinical interpretation by the performing cardiologist, suggested infected coronary artery aneurysm as the cause. Computed tomography coronary angiography imaging was then used

to provide detailed three-dimensional images to confirm the diagnosis of infected coronary aneurysm including the exact location between stents and the presence of extravasation.

The exact sequence of pathophysiological events in our patient remains unclear. It is possible that their bacteraemia was seeded from their septic arthritis. However, given that different pathogens were grown from the knee and from the pericardial fluid, the septic arthritis may have been unrelated.

Our patient was non-operatively managed due to the prohibitive risk of surgical intervention. Due to the patient's severe shock and multi-organ failure, the prognosis initially looked very poor. With appropriate supportive care in the ICU, the patient improved enough to have a pericardial window which allowed the patient to continue to recover to hospital discharge and subsequently made a full recovery.

Conclusion

The appropriate management for infected coronary artery aneurysm with associated pericardial effusion remains unclear and this is likely to continue due to the rarity of these pathologies. This case describes survival with a good functional outcome following conservative management despite severe multi-organ failure. This should be considered as an appropriate management option in patients who are too critically unwell for cardiac surgical intervention.

Lead author biography



Timothy Wareing is a trainee with the College of Intensive Care Medicine and is based in Hamilton, New Zealand. He has an interest in the care of critically unwell cardiology patient and in the use of echocardiography to guide management for these patients.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: None declared.

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