

Percutaneous Biventricular Cardiac Assist Device in Cardiogenic Shock and Refractory Cardiac Arrest

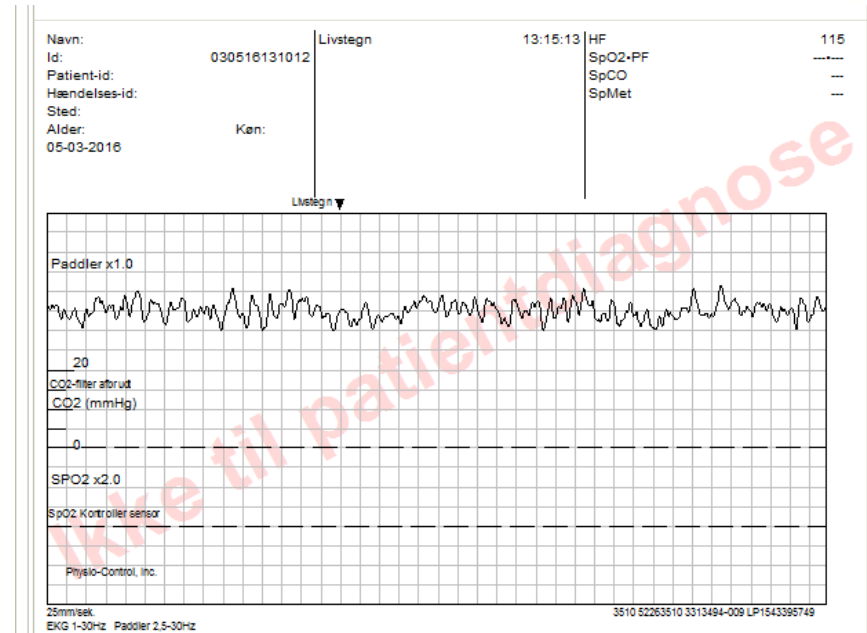
***Case Presentation
Julia Ellert MD PhD***



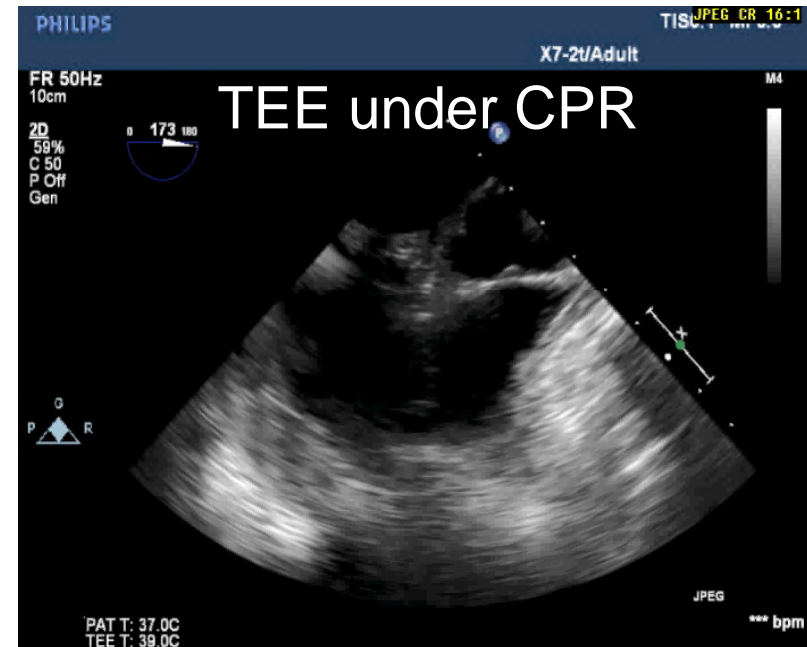
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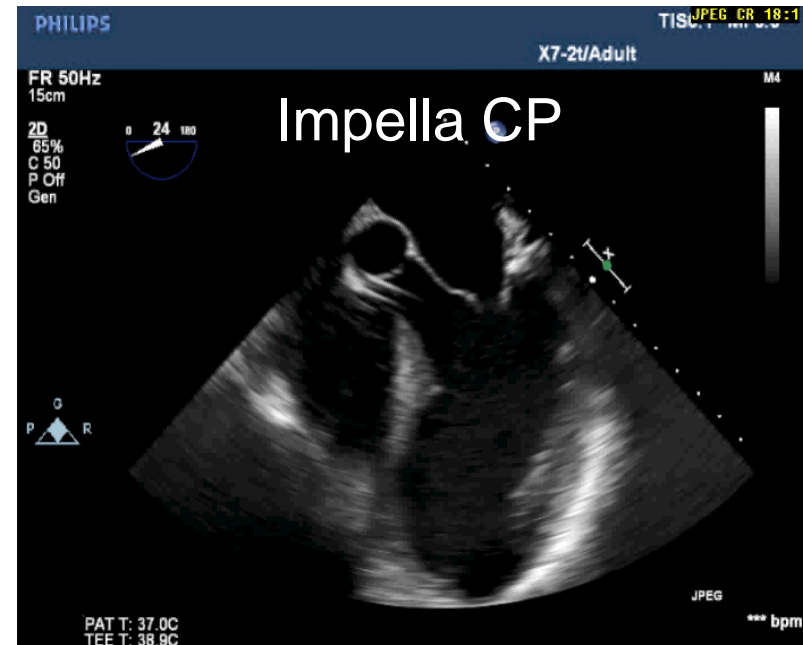
- A 65-year-old man with witnessed cardiac arrest and initial rhythm VF which after defibrillation converted to PEA
- The patient was transferred with a mechanical chest compression device (LUCAS) to our institution
- At the arrival ongoing CPR was 55 minutes
- Upon arrival he was severely metabolic deranged: pH 7.08, lactate 12 mmol/l and end-tidal CO₂ of 2.4 mmHg



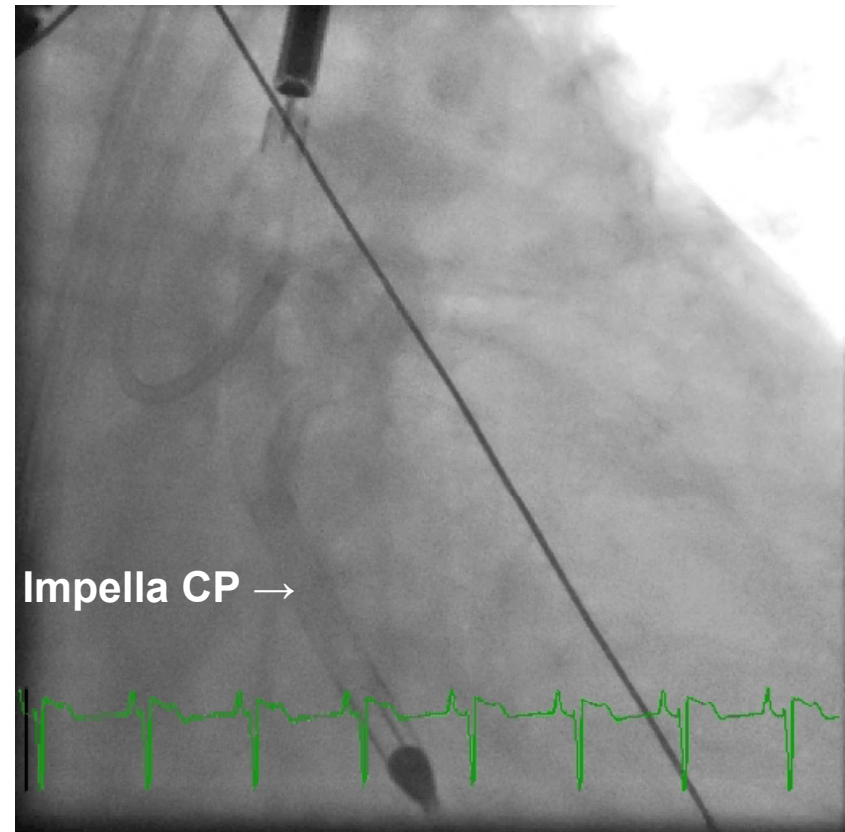
- There was no history of cardiac disease
- The patient was known with claudicatio symptoms
- The heart-team consisting of an anesthesiologist, two cardiologists and a thoracic surgeon decided that VA-ECMO was not an option



- Immediate at arrival an Impella CP was implanted under continued mechanical compression by the LUCAS device
- After insertion of Impella CP into the LV the device was gradually increased in flow during continuous chest compression and it was managed to restore circulation.
- The circulation was restored after total low-flow time of 70min



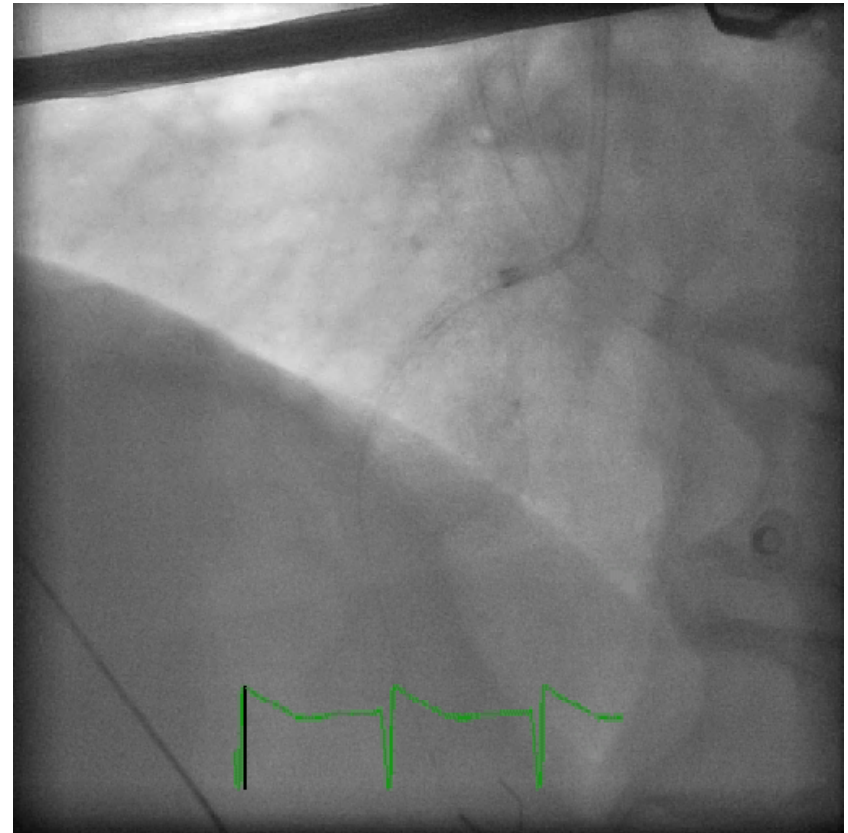
- The subsequent coronary angiogram showed:
- Left dominant circulation
- Chronic occlusion of the proximal LAD with collaterals from LCX



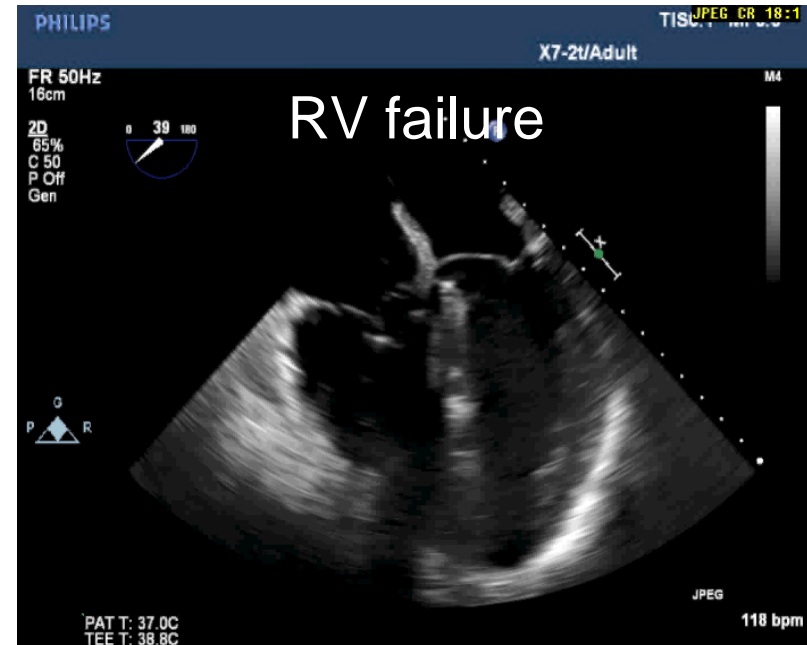
- Furthermore there was an acute occlusion of the proximale RCA
- Successful implantation of a 2.5 x 38 mm Xience stent in the proximale RCA was performed



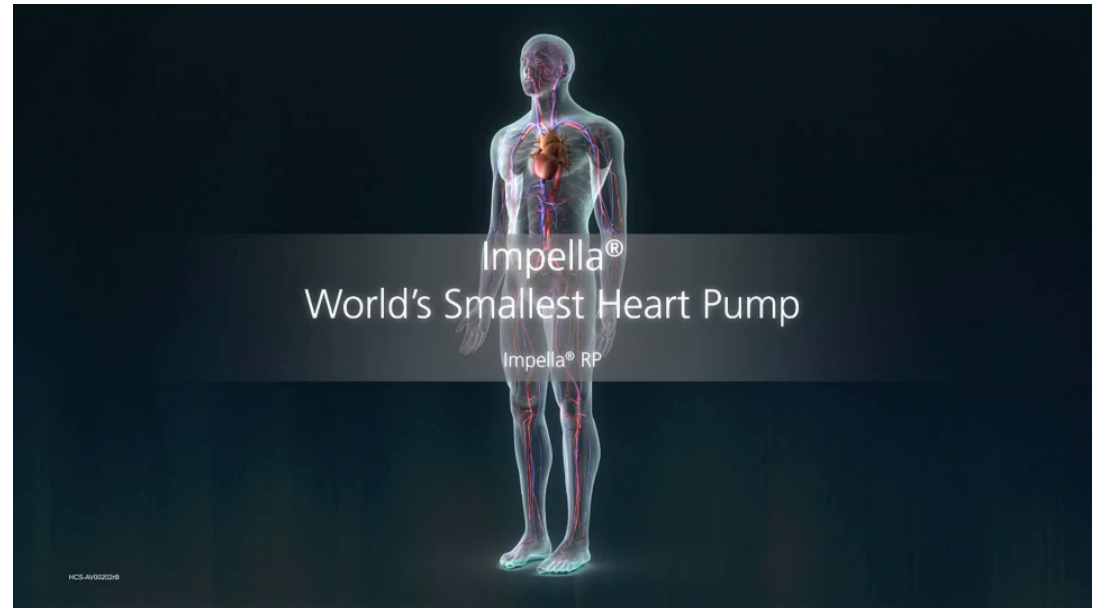
- The final result showed a well expanded stent and a good flow in the not-dominant RCA



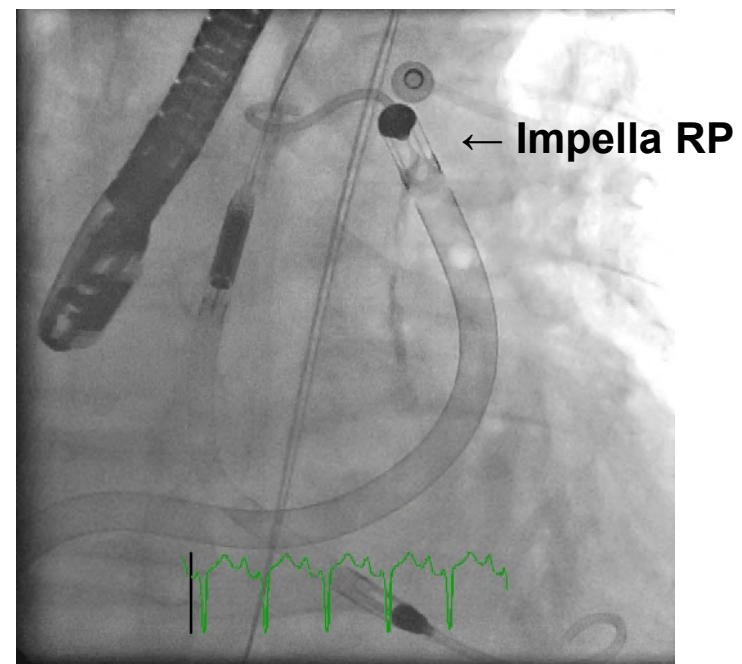
- Despite initial stabilization patient developed severe right heart failure
- There was no response for intravascular volume optimization, high-dose inotropes, vasopressor and RV pacing



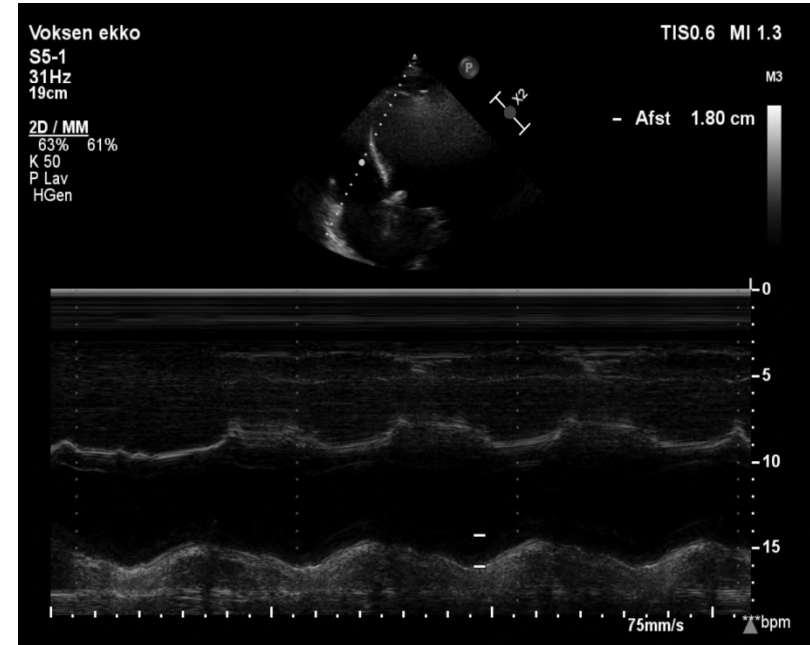
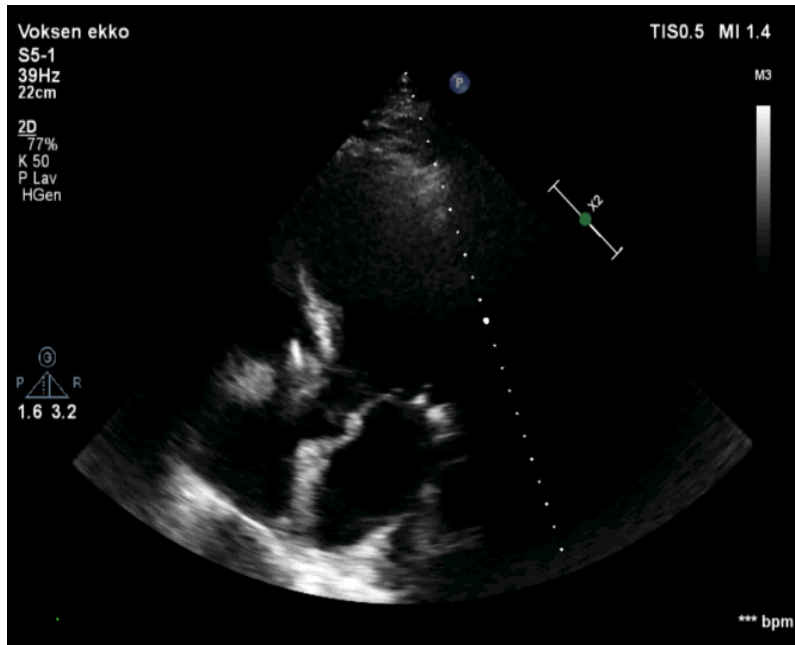
- Impella RP was implanted via femoral vein into the pulmonary artery as the right heart support
- The inflow portion of the catheter resides in the inferior vena cava, and the flexible outflow cannula resides in the main pulmonary artery
- The device can provide up to 4,6 L/min of flow for up to 14 days



- After implantation of Impella RP with 3.9 l/min of flow and Impella CP with flow of 3.3 l/min circulatory stabilization was achieved and the patient was transferred to the ICU
- Postoperative echocardiography and chest x-ray confirmed the both Impellas to be in the appropriate position

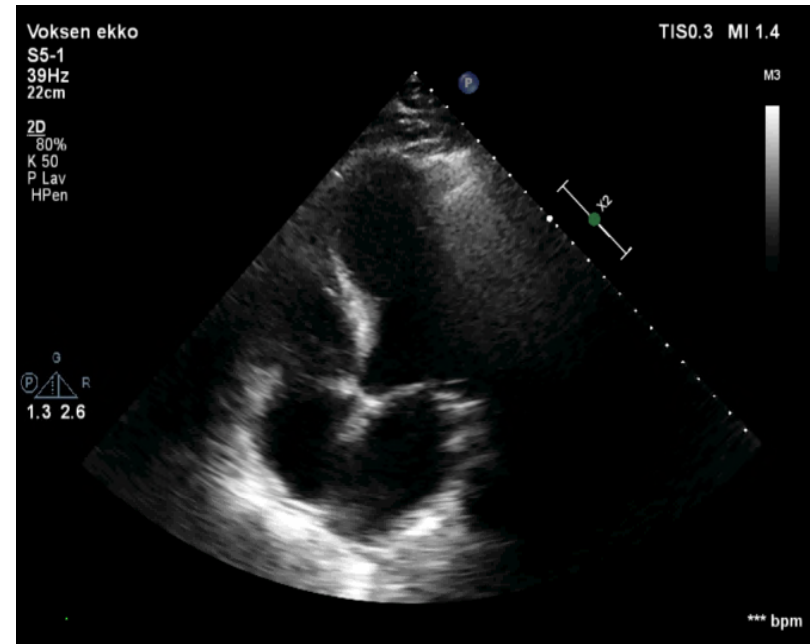


- Along with the improvement in hemodynamics, there was a significant reduction in the required doses of inotropes and vasopressors
- Lactate was 9.6 mmol/l at arrival at ICU and was normalized (1.6 mmol/l) after 12 hours
- Initial 8 hours the pulsatility was low but not absent and normalized thereafter
- The activated coagulation time (ACT) was kept between 150 and 180 seconds
- The patient developed acute kidney injury with need of dialysis

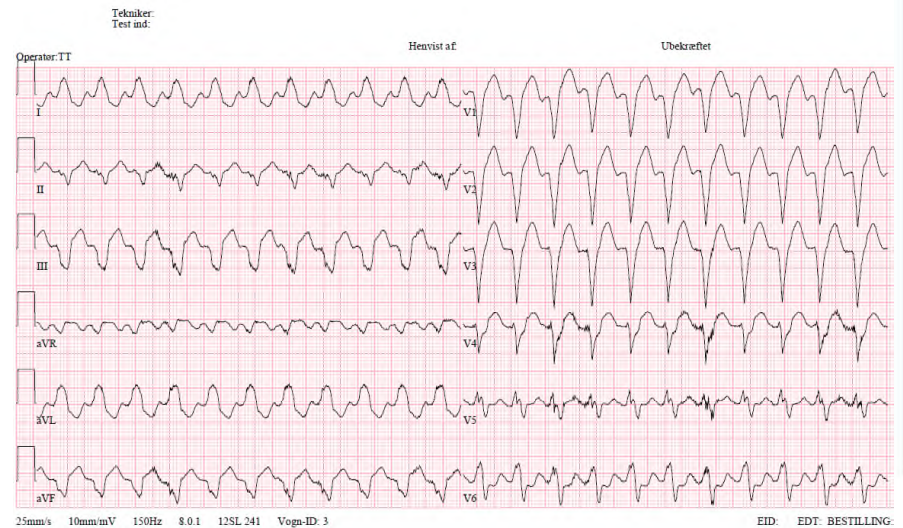


- Echocardiography on day 6 showed improvement of the right ventricular function

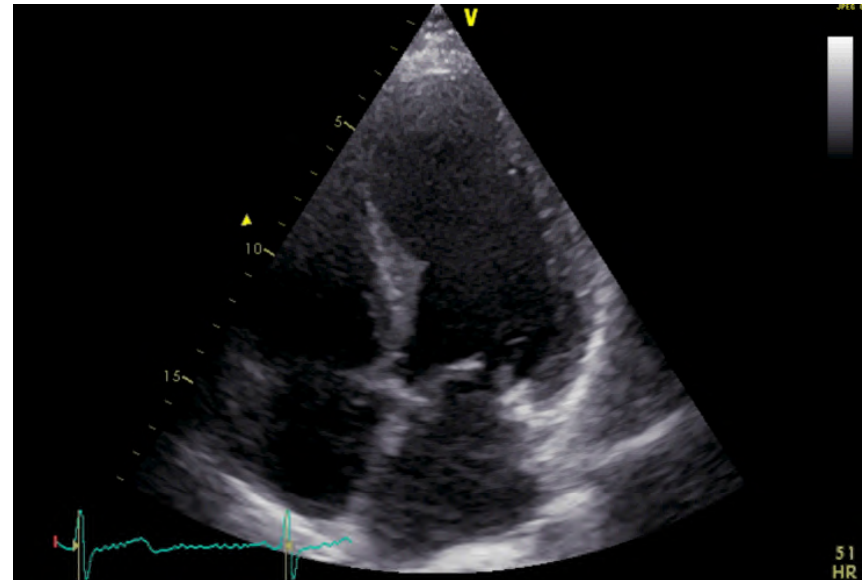
- After successful device weaning Impella RP was removed on day 7 and Impella CP was removed on day 8
- There were no device-related complications with the Impella CP and Impella RP
- The patient could be extubated on day 12, no neurological deficits could be observed
- Discharging from ICU after 25 days



- Due to non-sustained VT, a secondary prophylactic ICD was implanted
- The patient recovered slowly and was discharged home on day 41
- Cardiac and physical rehabilitation and anti-congestive medications were initiated
- Dialysis was required for a period of 46 days



- The patient was followed in the heart failure clinic
- 7 month later the Echocardiography showed normal RV function, the LV function was still reduced (EF: 20%).
- Clinically, the patient was in a good condition (NYHA class II) with normalized kidney function and no cerebral deficit.



Conclusion

- In the setting of cardiac arrest implantation of an Impella CP to facilitate ROSC is feasible for patients which are not found to be a candidate for VA-ECMO or where some residual RV function is seen
- Supporting alone the LV can however worsen the RV hemodynamics in the biventricular failure
- Simultaneous biventricular support with Impella CP and RP provides hemodynamic stability
- Furthermore, use of the Impella RP allows RV recovery