

Will it fit? Leadless pacemaker implantation in a patient on extracorporeal membrane oxygenation

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Introduction

Leadless pacing (LP) has been a major advancement in cardiac pacing. In addition to eliminating pocket- and lead-related issues, the device appears to be more resistant to infection and therefore ideal for patients at high infectious risks with a need for pacing. In this case we report the use of LP for recurrent asystolic episodes in a patient on V-V extracorporeal membrane oxygenation (ECMO).

Case report

The patient is a 54-year-old woman with a history of rapidly progressive interstitial lung disease presenting with worsening dyspnea on exertion. Soon after admission the patient was started on pulse dose steroids along with initiation of tacrolimus in the setting of worsening hypoxic respiratory failure. Plasmapheresis therapy was planned to begin; however, she developed significant hypoxia requiring emergent intubation. Despite plasmapheresis and pulse dose steroids, hypoxemia persisted, and the patient was initiated on V-V ECMO via an 18F catheter in the right internal jugular vein and a 23F catheter in the right femoral vein. She had a prolonged hospital course, which was complicated by episodes of PR prolongation and AV block up to 25 seconds during coughing spells and tracheal suctioning resulting in significant hypotension, consistent with vagally mediated episodes. Given hemodynamic instability associated with the pauses, a decision was made to proceed with implantation of a leadless pacemaker.

The patient was taken to the electrophysiology laboratory. The left femoral groin region was prepped and anesthetized. Using the Seldinger technique a 6F vascular sheath was placed in the left femoral vein. A super stiff Amplatz wire was then advanced under fluoroscopic guidance to the right atrium. A 16F Cook sheath was placed over the wire to

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KEY TEACHING POINTS

- Leadless pacemaker systems have significantly reduced or eliminated many of the complications associated with traditional transvenous systems.
- The presence of large bore femoral venous catheters such as those used in extracorporeal membrane oxygenation (ECMO) cannulation should not preclude implantation of a leadless pacemaker.
- This case demonstrates a safe and effective implantation of a leadless pacemaker in the setting of V-V ECMO cannulation.

ensure it would pass, given the presence of the ECMO cannula. A 27F Micra (Medtronic, Minneapolis, MN) delivery sheath was then positioned over a wire into the mid right atrium (Figure 1). The Micra was advanced through the sheath and across the tricuspid valve and positioned and deployed onto the right ventricular septum. The device was tested and found to have satisfactory pacing and sensing parameters. The device was untethered, and the sheath removed, using a figure-of-8 suture for hemostasis. Postoperatively the patient did well, with no complications related to device implantation.

Discussion

This case demonstrates implantation of a Micra transcatheter pacemaker system in a patient on V-V ECMO.

Permanent cardiac pacing has been used for over 50 years for treatment of symptomatic bradycardia. Until recently these systems have consisted of a device generator surgically implanted into a subcutaneous pocket connected to transvenous leads. Although effective, device implantation could potentially result in a multitude of complications, including those related to the subcutaneous pocket (such as hematoma or infection), pneumothorax related to vascular access for lead insertion, and lead dislodgement or endocarditis. Leadless pacemaker systems have been designed to reduce or even eliminate these complications.¹

Implantation of a Micra transcatheter pacemaker system is a safe and effective procedure associated with very few



Figure 1 Advancing the Micra sheath (Medtronic, Minneapolis, MN) over a wire past the extracorporeal membrane oxygenation cannula into the inferior vena cava.

complications related to device implant. Despite the large sheath through which the device is inserted, vascular complications including arteriovenous fistulas or pseudoaneurysms occur less than 1% of the time.^{1,2} It is unclear how that risk changes in patients with large bore femoral venous catheters such as those used for ECMO cannulation, as there have been no published case reports of leadless pacemaker implantation in this population. The case presented here demonstrates uncomplicated implantation of a leadless pacemaker via femoral approach in a patient on V-V ECMO. Using a 16F Cook sheath to confirm smooth passage of a large sheath past the ECMO cannula was critical to ensuring a safe, uncomplicated procedure in this case.

Implantation of a leadless pacemaker in this case provided several advantages. Infection risk was significantly reduced,

since there was no lead or pocket. Critically ill hospitalized patients have multiple access sites through which infection could enter the bloodstream and infect standard pacemaker leads or pocket. This patient is expected to have a very long hospitalization and will constantly be exposed to infection risk. V-V ECMO requires anticoagulation, increasing risk of pocket hematoma and possibly infection. The leadless pacemaker obviated a pacemaker pocket.

At present, leadless pacemaker systems are single-chamber right sided devices which serve only a minority of patients with pacing indications.³ LP technology continues to improve, including current devices with atrial sensing that allow for atrioventricular synchrony. The future of leadless devices includes cardiac resynchronization therapy and integration with subcutaneous defibrillators, which will greatly increase the number of implantations. If leadless devices prove to be just as effective long-term as traditional transvenous devices, leadless pacemaker use may drastically increase and will broaden the patient population in which these devices are used. Cases like the one discussed here will become more common and understanding the implantation technique will lead to safer implants and lower complication rates.

Conclusion

This case demonstrates that presence of femoral venous ECMO cannulation should not preclude implantation of a leadless transcatheter pacemaker system if clinically indicated, as it can be performed safely and effectively.

References

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