The Changing Landscape of Percutaneous Technology Leading to Surgical Complications

Amy Fiedler[1]

[1]University of Wisconsin

October 27, 2020

Abstract

With new technology comes new complications. We discuss the interesting case presented by Bjelic and colleagues regarding a missplaced TAVR valve into the inflow cannula of an LVAD, leading to hemodynamic collapse. The authors describe the pitfalls of the new technology and interesting surgical maneuvers to address these complications.

The Changing Landscape of Percutaneous Technology Leading to Surgical Complications

Amy G. Fiedler, MD

University of Wisconsin, Division of Cardiothoracic Surgery

Running Head: Technology leading to surgical complications

Disclosures: None

Conflict of Interest: None

Word Count: 747

Keywords: LVAD, TAVR

Corresponding Author:

Amy G. Fiedler, MD

Assistant Professor of Cardiac Surgery

University of Wisconsin, Madison

H4/320 CSC

600 Highland Ave.

Madison, WI 53792

Phone: 608.262.3858

Fax: 608.263.0547

Email: fiedler@surgery.wisc.edu

Abstract:

With new technology comes new complications. We discuss the interesting case presented by Bjelic and colleagues regarding a misplaced TAVR valve into the inflow cannula of an LVAD, leading to hemodynamic

collapse. The author describe the pitfalls of the new technology and interesting surgical maneuvers to address these complications.

Commentary:

An Achilles heel of LVAD support is the progressive development of de novo aortic insufficiency. With rapidly improving technology, increased numbers of patients' worldwide suffering from heart failure, and a relatively stable number of donors, we will continue to see and manage patients who are living longer due to the advent of durable mechanical support.

Although, with new technology comes new complications. The compelling case report "Transcatheter aortic valve replacement in left ventricular assist device patient – Overcoming the complications with transapical approach and circulatory arrest" by Bjelic and colleagues from the University of Rochester highlights this clearly. The authors describe a patient who has lived with an LVAD for five years as a bridge to transplant. While waiting, he developed severe aortic insufficiency. The patient, deemed a high risk surgical candidate, initially was treated with an attempt at percutaneous closure with an Amplatzer occluder which failed, and unfortunately worsened his hemodynamics leading to cardiogenic shock. Recognizing the challenging situation this places the patient in from the standpoint of escalating mechanical circulatory support options, the decision was then made to attempt off-label utilization of TAVR. TAVR was attempted, with subsequent PVL, leading to valve dislodgement into a stationary, sub-mitral position. An additional TAVR valve was then deployed with moderate PVL but a reasonable result. Unfortunately, in the overnight hours, the "stationary" TAVR valve dislodged, completely occluding the LVAD inflow cannula leading to profound hemodynamic collapse. VA-ECMO was initiated and the patient brought to the OR. Cardiopulmonary bypass was established, and the inflow cannula was surgically approached through a left anterior thoracotomy. The LV inflow cannula was removed from the apex and the migrated TAVR was subsequently removed through the apical cuff. Due to moderate PVL of the implanted TAVR, a valve-in-valve TAVR was deployed through the apical cuff in antegrade fashion with resolution of PVL. The patient was weaned and decannulated from VA-ECMO the following day, ultimately discharging to home in good condition. Most certainly, the authors should be commended for a great save.

This is an extraordinary case which highlights a number of different and important topics. The first being the challenge we face in the setting of the "high surgical risk patient" who subsequently undergoes application of an off-label new(ish) technology. These situations, while on one-hand should be applauded for pushing the envelope and moving the field forward, present unique challenges should an unusual complication such as what is reported here occurs. Now, in the best of situations, what was once a "high risk" surgical patient is now nearly "prohibitively high risk" while in cardiogenic shock maintained on VA-ECMO, requiring an operation for a problem not typically described in the literature. While the result of this patient was a life saved, the outcome may be different for others. How do we as a specialty weigh these risks and benefits? In addition, this patient had the LVAD placed as a bridge to transplant. Instead of placing the patient in a potentially harmful situation with the use of various percutaneous technologies to remedy his aortic insufficiency, could his UNOS Status have been adjusted so the likelihood of him receiving a transplant be expedited? These questions are the core and crux of the heart team approach to these complicated cases.

Next, the importance of the cardiac surgeon remaining involved, engaged, and able to perform the technical aspects of deploying percutaneous technology cannot be discounted. As the landscape continues to change with interventional cardiologists expanding their reach in structural heart disease, we as surgeons must remain vigilant in remaining valuable members of this team. This is critically important as we move forward in order to manage unanticipated complications which result in the need for emergency surgery, as well as the necessity to be able to employ the technology in off hour, off label situations as described in this case as a life-saving maneuver.

Finally, this case clearly illustrates the skill and forward thinking nature of the surgical team at University of Rochester. From the use of percutaneous devices, to a non-sternotomy approach and subsequent retrieval and deployment of TAVR through the apical cuff, the management of this patient highlights truly how

far we as a specialty have evolved in the field of durable mechanical circulatory support and heart failure management.

With new technology comes new and more challenging surgical complications. As surgeons we must continue to be an integral part of the team; innovating and pivoting as new situations arise.