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CASE REPORT

ADVANCED

CLINICAL CASE: IMAGING AND GENERAL CARDIOLOGY

Embolized Hydrophilic Coating Polymers Found in Left Ventricular Assist Device Apical Core Specimen

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ABSTRACT

Left ventricular assist devices are increasingly used in patients with advanced heart failure. Gross and histologic evaluation of myocardial apical core specimens, extracted during device placement, can provide important insights. Herein, we describe a case of hydrophilic polymer embolization with associated foreign-body giant cell reaction discovered during apical core evaluation. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2022;4:819–821)

HISTORY OF PRESENTATION

A 59-year-old woman with ischemic cardiomyopathy and left ventricular ejection fraction of 30% was admitted to the cardiology department to evaluate for left ventricular assist device (LVAD) implantation in the setting of worsening heart failure. On admission, her vital signs were normal and her physical examination revealed elevated jugular venous pressure and mild bibasilar crackles. After a comprehensive assessment, the patient underwent LVAD (HeartMate 3, Abbott Laboratories) implantation surgery with an uneventful course. Routine histopathologic examination of the apical core specimen, extracted during device placement, was performed and revealed multifocal nonnecrotizing granulomas.

LEARNING OBJECTIVES

- To understand the importance of examining apical core specimens in patients undergoing LVAD implantation.
- To recognize the possible complication of embolization of hydrophilic polymer coating during catheter-based coronary interventions causing a foreign-body giant cell reaction.

PAST MEDICAL HISTORY

Past medical history included type 2 diabetes mellitus and ischemic heart disease (IHD). Six years before the current admission she presented with ST-segment elevation myocardial infarction causing cardiogenic shock and she underwent percutaneous coronary intervention (PCI) with drug-eluting stents (DES) deployed in a wraparound left anterior descending (LAD) and left circumflex arteries. Because of recurrent

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ABBREVIATIONS AND ACRONYMS

DES = drug-eluting stent(s)

IHD = ischemic heart disease

LAD = left anterior descending artery

LVAD = left ventricular assist device

PCI = percutaneous coronary intervention

chest pain, 2 additional PCIs with DESs to the LAD and diagonal branch were performed.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of granulomas in myocardial biopsy includes giant cell myocarditis, sarcoidosis, infectious diseases, and foreign-body giant cell reaction.[1]

INVESTIGATIONS

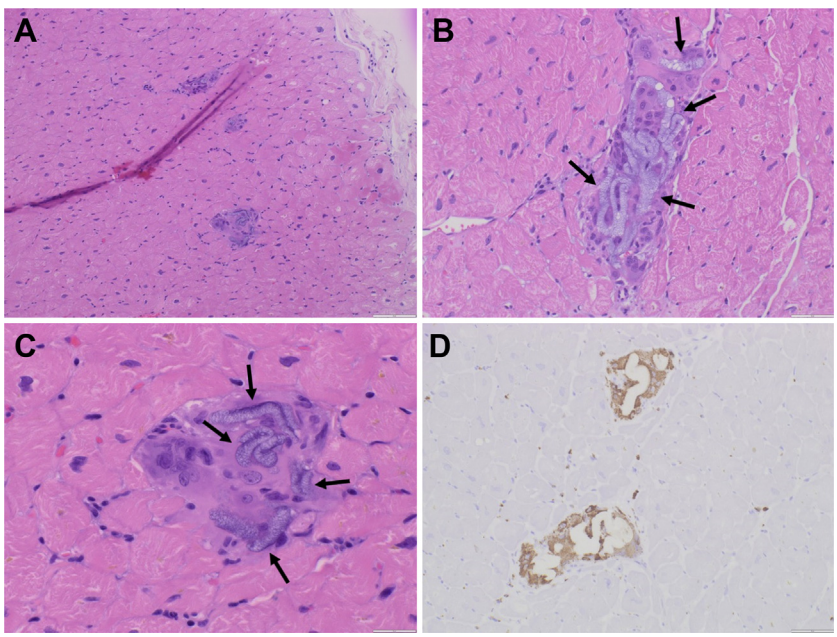
Histopathologic examination disclosed numerous granulomas surrounding a nonpolarizable basophilic foreign material (Figure 1). The granulomas contained CD68-reactive giant cells and were negative for periodic acid-Schiff and Ziehl-Neelsen stains. A Masson trichrome stain exhibited marked interstitial fibrosis and perivascular fibrosis. The morphology of the foreign material was diagnostic of hydrophilic polymer, thought to be a result of an earlier PCI (eg, coronary guidewires, introducer, or delivery sheaths).

DISCUSSION

Apical tissue, extracted during LVAD implantation, can reveal undiagnosed cardiac pathologies and can provide important insights into pathophysiology and prognosis, and may even help to dictate therapy. For instance, Schultz et al[2] showed that in apical core samples obtained during LVAD implantation, patients with IHD had more myocardial fibrosis than patients with nonischemic cardiomyopathy, and that myocardial fibrosis was more common in older patients and those with an implantable cardiac defibrillator. In another study, interstitial fibrosis was shown to be inversely related to survival and functional improvement, suggesting that quantification of myocardial fibrosis is a possible marker for prognosis in this group of patients.[3] In addition, uncommon histopathologic findings in apical core samples have been reported[4,5]; however, to the best of our knowledge, this is the first report to demonstrate hydrophilic polymer embolization in this specimen type.

Embolization of hydrophilic coating polymers is an increasingly recognized complication of endovascular catheter-based procedures. This complication was previously described in multiple procedures and tissues, most commonly in the brain in patients who underwent neurointerventional procedures, but also in the lungs, kidneys, and lower extremities, and even as a cause of valve thrombosis after

FIGURE 1 Histology From Left Ventricular Assist Device Apical Core Specimen



Photomicrograph of the apical core specimen showing scattered nonnecrotizing granulomas with foreign-body giant cells surrounding embolized hydrophilic polymer **(arrows)** (hematoxylin and eosin staining; **A**, ×40; **B and C**, ×400). **(D)** Immunohistochemical staining of giant cells with CD68-reactive macrophages (×100).

transcatheter aortic valve replacement.[6,7] This phenomenon was previously described also as a rare complication of cardiac catheterizations and PCI where shearing and embolization of hydrophilic polymer coating from coronary guidewires, introducer, or delivery sheaths were demonstrated. Although the true incidence of this complication is unknown, it is thought to be highly underestimated, possibly because of the need of histopathologic tissue examination for diagnosis confirmation. In a study by Grundeken et al,[8] hydrophilic coating polymers were demonstrated in almost one-half of coronary thrombus aspirates and in 10% of autopsies of patients who underwent PCI, with variability that depends on the guidewire used. The embolization of hydrophilic polymers during endovascular coronary interventions might result in a tissue reaction, characterized by foreign-body granulomas; however, tissue reaction is time dependent as granulomas and fibrosis develop on the long term and short term observations showed only minimal inflammatory response with no giant cell reaction.[8,9] The embolization of hydrophilic polymers has been reported to be associated with different cardiac (eg, stent thrombosis, aortic valve thrombosis, and myocardial ischemia) and noncardiac (eg, stroke, cerebral edema, glomerular ischemia, pulmonary infarction, and livedo reticularis) clinical sequelae.[6-9] Therefore, in November 2015 the U.S. Food and Drug Administration issued a safety communication to inform health care providers about the risk of hydrophilic coating embolization and the potential of adverse events.[10] Currently, there are no studies to evaluate the clinical significance or prognostic implications of this phenomenon, and they are yet to be assessed in future studies. Moreover, it is not yet clear if this finding portends prognostic significance in the setting of LVAD placement.

FOLLOW-UP

The patient significantly improved her functional status while on LVAD support, suggesting that this finding may be incidental.

CONCLUSIONS

This case highlights the importance of histopathologic examination of the apical core samples extracted during LVAD implantations. Such evaluation can demonstrate surprising findings and provide invaluable insights. In addition, it emphasizes the importance of clinicopathologic correlation and brings to attention the possibility of embolization of hydrophilic coating polymers to the myocardium, causing a foreign-body giant cell reaction, a potentially underrecognized complication of cardiac catheterizations and PCI.

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS giant cell, ischemic heart disease, left ventricular assist device, percutaneous coronary intervention