The Heart Surgery Forum #2013-156
16 (5), 2013 [Epub October 2013]
doi: 10.1532/HSF98.2013156

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Isolation of Outflow Graft of a Clotted Ventricular Assist Device with Recovery of Cardiac Function

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ABSTRACT

Ventricular assist device (VAD) thrombosis, though uncommon, is a well-known complication. A HeartWare VAD implanted 2 years ago in a middle-aged man stopped because of thrombosis in the VAD. Because the patient's left ventricular function was recovered by the time of intervention, only the outflow graft was isolated and cut, leaving the pump in place.

INTRODUCTION

Ventricular assist devices (VADs) have become a routine therapeutic option for patients with end-stage heart failure [British Heart Foundation 2009]. Thrombosis in the VAD is an infrequent but known complication which can be treated with anticoagulation therapy but may require pump replacement [Popov 2012].

CASE REPORT

A 52-year-old man with a diagnosis of ischemic cardiomyopathy, who had received an implanted HeartWare left ventricular assist device (LVAD) 2 years previously, presented with frequent alarms of decreased flow. During the 2 years with the HeartWare VAD (HVAD) support, he had remained active, and serial echocardiography showed some reduction in left ventricular size and only mild improvement in cardiac function. At the time of presentation, LVAD flows were 0.7 L/minute and the controller was alarming every 10 minutes. Unfractionated heparin was started, but after another 12 hours, the flows were suddenly dropped to zero. The patient was stable, with good blood pressure, good upstroke in the arterial waveform, and acceptable levels of blood gases and serum lactate. Echocardiography showed normal-sized ventricles with normal systolic function.

Received May 13, 2013; received in revised form September 16, 2013; accepted October 24, 2013.

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It was evident that the heart had recovered significantly and no longer needed mechanical support. One of the options was explantation of the HVAD, but this option involved the inherent risk of the need for a long- or short-term ventricular assist device. Also, bleeding and the potential of need for cardiopulmonary bypass (CPB) would lead to further deterioration of his right ventricular and renal function. Therefore it was decided to isolate the outflow graft from the ascending aorta because of the potential risk for embolization from the clotted HVAD.

Through a 5-cm incision in the left second intercostal space near the sternum, the outflow graft was dissected for a length of 3 cm from its anastomosis with the ascending aorta. The graft was incised between the 2 vascular clamps, and the clots were cleaned (Figure 1). Brief release of the distal vascular clamp demonstrated brisk bleeding from the ascending aorta. The proximal end was tied with 2 silk sutures, while the distal end was secured with 3-0 polypropylene sutures in 2 layers.

An echocardiogram on the fifth day showed normal-sized ventricles with good systolic function (ejection fraction, 55%). After 6 weeks, the LVAD was explanted through a right anterolateral thoracotomy in the fifth intercostal space, without CPB.

DISCUSSION

The incidence of device thrombosis in axial-flow LVADs is reported to be 0.02 events per patient year but can reach 8% [Slaughter 2009; Wieselthaler 2010]. Device thrombosis is a result of either in situ device thrombogenesis, in which there is gradual reduction of flow with increase in power, or migration of the thrombus into the inflow cannula, in which the changes are dramatic [Kiernan 2011]. There is no consensus about the treatment of device thrombosis; however, thrombolytic therapy is favored as a first line of treatment [Rothenburger 2002]. Some groups have suggested intracavitatory thrombolytic therapy thorough a catheter in the left ventricle in a bid to reduce the systemic side effects [Kiernan 2011]. However, Aissaoui et al disagree about the role of thrombolytic therapy and prefer device exchange, although this procedure is associated with high morbidity and mortality [Pagani 2009; Aissaoui 2012].

In our patient, thrombolysis was not an option, because the device was clotted completely, nor was device exchange,

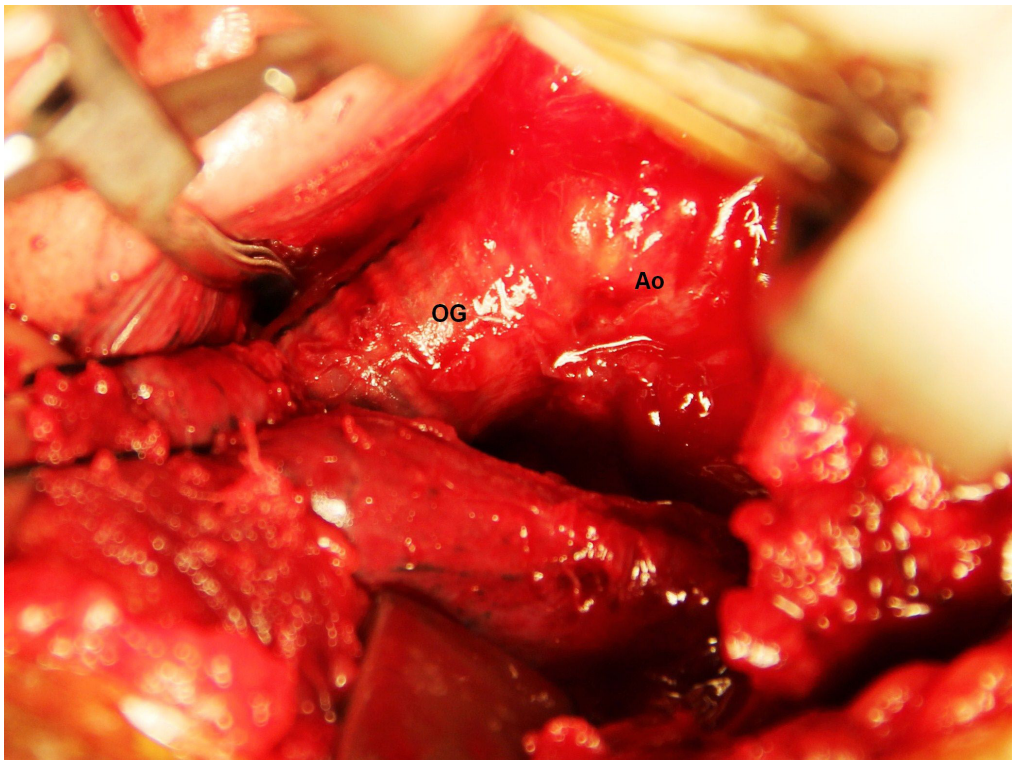

Figure 1. Outflow graft seen through left second intercostal space. OG indicates outflow graft; Ao, aorta.

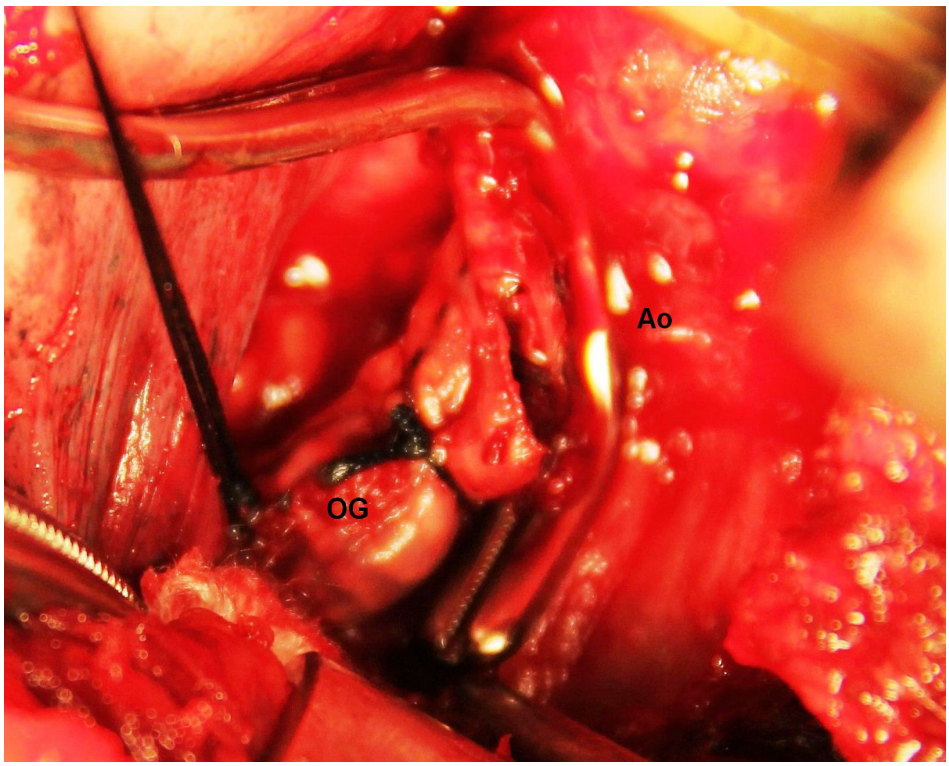

Figure 2. Outflow graft clamped and tied off. OG indicates outflow graft; Ao, aorta.

as myocardial function was recovered. The device was not explanted because of the risk of blood loss and need of CPB, which may not have been tolerated by this freshly recovered heart. Potapov et al have reported 2 cases in which HVAD used to support right ventricle was stopped after recovery of ventricular function and left in place without any regurgitation through the pump or any complication [Potapov 2012]. However, keeping the clotted device would have posed the risk of systemic thromboembolism. So, we tied off the outflow graft, which not only avoided sternotomy and CPB but also gave the heart time to recover.

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