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Treatment options for patients with mobile left ventricular thrombus and ventricular dysfunction: a case series

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ABSTRACT

Introduction: Little is known about the optimal management of large, mobile, pedunculated left ventricular clots. The management is particularly challenging in patients with advanced heart failure considered for left ventricular assist device implantation, because the clot may cause pump thrombosis.
Methods: We retrospectively reviewed the records of patients with left ventricular thrombi identified by echocardiography, and found three cases with large protruding mobile clots.
Results: In this paper, we are presenting three challenging cases where the clots were successfully treated surgically. In two cases, the removal of clot was performed simultaneously with the implantation of ventricular assist devices. In the third case, the patient underwent only thrombectomy. Overall, the early outcomes were good in all three patients, but one subsequently died from unrelated causes.
Conclusions: These clinical cases give evidence for surgical treatment of large mobile clots without systemic embolism, even if ventricular assist device is implanted during the same operation.

Keywords: *ventricular assist device, left ventricular clot, heart failure.*

INTRODUCTION

Left ventricular (LV) clots were, formerly, a common occurrence, especially after anterior myocardial infarction in patients with decreased left ventricular ejection fraction (LVEF). Embolic events in these patients are common without anticoagulation occurring in 10- 40 % of patients (1, 2). Although anticoagulation therapy reduces the risk, it does not prevent embolization completely (3). Protrusion and mobility of thrombus are the most important predictors of embolic events (2). Since large and mobile thrombi are relatively rare, no studies address the risk of embolization of such clots. Moreover, the literature provides little guidance on best approaches to management of such patients, especially those with low LVEF. In this paper, we are presenting a series of patients with very large and mobile LV thrombi in the setting of decreased LVEF, and explore surgical removal of apical LV thrombus with subsequent left ventricular assist device (LVAD) implant as a viable option of treatment.

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METHODS

We describe the management of three patients with large mobile protruding LV

thrombi, all treated surgically. All patients provided written informed consent for the procedure and data collection. Ethical approval was waived given the retrospective observational design. Patients were operated in the period between January 1 and July 31, 2013.

RESULTS

Case 1. A 63-year-old male recently diagnosed with non-ischemic dilated cardiomyopathy was admitted to the hospital with cardiogenic shock, hypotension, severely decreased LV function and a large apical thrombus. An echocardiogram revealed a moderately dilated LV with global hypokinesis and LVEF 5-10%, preserved right ventricular function with mildly elevated right ventricular systolic pressures, and a large protruding apical thrombus measuring 3.3 cm x 2.5 cm. Because of relatively intact right ventricular function, thephysicians proceeded with thrombectomy coupled with LVAD implantation.

The ventriculotomy was performed on the apex to achieve the best possible site for good visualization of the LV chamber for clot removal, as well as ideal position for the LVAD inflow cannula Implantation. The thrombus was removed, and a significant amount of time was spent cleaning the ventricular cavity between trabeculae.

The LVAD was then successfully implanted (HeartMate II). The patient was subsequently discharged home and is currently (April 2014) being considered for heart transplant.

Case 2. A 50-year-old male presented to an outside hospital with dyspnea and bilateral leg edema. He was found to have right popliteal and left posterior tibial vein deep vein thrombosis. Other pathological conditions arose: pneumonia, elevated liver enzymes, coagulopathy, acute kidney injury, and left lower extremity wound infection.

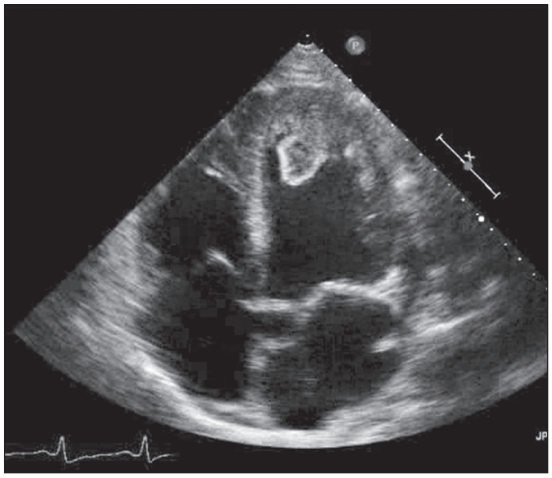

Figure 1 - *Transthoracic echocardiogram of patient 2 (apical four chamber view) showing protruding, pedunculated thrombus attached at the left ventricular apex.*

He was treated with antibiotics, but progressively worsened developing severe LV dysfunction in the setting of septic shock, requiring intubation and emergent transfer to our hospital.

Echocardiography on admission revealed an LVEF of 15-20%, global hypokinesis with apical akinesis, a large apical thrombus measuring 42 mm x 35 mm (*Figure 1*), dilated right ventricle, and a possible right ventricular thrombus. Additionally, Doppler ultrasound confirmed showed the presence of occlusive thrombus within the right popliteal and peroneal veins.

The patient was treated with warfarin in the outside hospital, but he developed supratherapeutic INR, and the anticoagulant was discontinued. Given the patient's biventricular dysfunction, and likelihood future heart transplant, a BiVAD (Thoratec) was implanted. In the operating room, the LV apex was cored, which revealed the presence of a large amount of organized thrombus on the apex, septum, and anterior wall that was carefully removed.

The BiVAD was successfully i mplanted, and

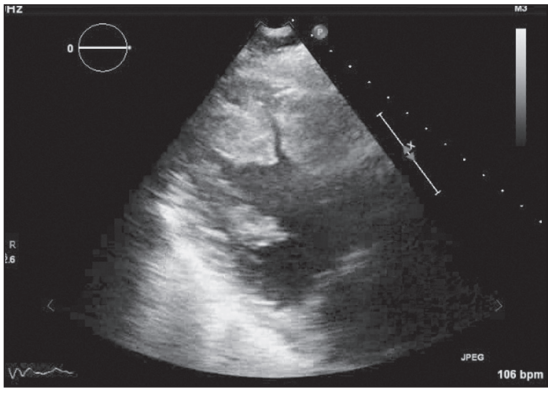

Figure 2 - *Transthoracic echocardiogram of patient 3 showing the LV filled with thrombus.*
LV = Left ventricular.

the patient was discharged home. Six months later he underwent uneventful BiVAD explant and orthotopic heart transplant.

Case 3. A 64 year old male had a past medical history significant for coronary artery disease, chronic lymphocytic leukemia, and acute promyelocytic leukemia that was treated with arsenic five weeks prior to presentation at an outside hospital. A 2D echocardiogram revealed moderate global hypokinesis, severe hypokinesis of the inferior and inferioseptal myocardium, and a large apical thrombus measuring 25 mm x 17 mm (*Figure 2*).

Due to the increased risk of stroke and contraindication to full anticoagulation (he developed a large hemathoma of the thigh shortly after initiation of heparin and warfarin)surgical removal of the LV apical thrombus was performed. During surgery, a ventriculotomy on a beating heart was performed at the apex going towards the inferior wall. A large thrombus was visualized in the apex and removed.

There was also a visible area of scarring on the inferoseptal region and the apex inferiorly that was plicated prior to closing the ventriculotomy. The patient was discharged home 2 weeks after surgery. At the 6-month follow up, a routine echocardiogram revealed a recurrent LV apical thrombus. The patient died three months later due to sepsis in the setting of pancytopenia.

DISCUSSION

In this case series, we presented three patients with large mobile protruding LV thrombi treated surgically. The outcome of the intervention was good in all patients. Only one patient (Case 3) died, but from reasons unrelated to the thrombus as his course was complicated by hematologic malignancy, hypercoagulable state, and recurrence of LV thrombus.

All patients had a mobile LV thrombus found by echocardiogram that we felt required urgent surgical thrombectomy. None of these three patients experienced an embolic neurologic event or sequela of thromboembolism after treatment. Compared to mural non-pedunculated LV thrombi, pedunculated mobile thrombi are associated with the highest risk of systemic embolization, as well as recurrent embolism following anticoagulation treatment alone (4). Currently, no studies are available to choose the best strategy in such cases. In a study measuring the long-term outcomes of treatment strategies, the overall risk of systemic thromboembolism tended to be higher in those treated with anticoagulation versus those that underwent surgical resection (17.7% versus 0%) (4).

However, this study included all LV clots, without any consideration of size and mobility. According to the literature, large and mobile thrombi are often treated with surgical approach (thrombectomy) (5-9). However, there are limited data on the outcomes. The situation with the two patients who had advanced HF and the patients with advanced HF had the need of urgent mechanical assisted circulation; this situa-

tion was particularly challenging because the large clot should be completely removed to prevent pump thrombosis and subsequent systemic embolism. One of them had preserved right ventricular function and one did not, an LVAD and Bi-VAD was implanted, respectively. Neither patient had pump thrombosis, and one underwent successful heart transplantation. So far, only few case reports can be found in the literature combining the two treatment options. Engin et al. described 6 patients with LV clots who underwent LVAD implantation (10). Although they did not specify the size and characteristics of the clots, two of their LV thrombi were not even seen on echocardiography and were discovered only after the ventricles were surgically opened.

In the third case, the LV clot recurred, and thinking retrospectively, the surgery was unnecessary. However, before the operation, hematologists thought that overall prognosis may be good, and the risk of systemic embolization appeared real. We could have tried more conservative approach, but the patient's inability to tolerate anticoagulants did not leave us many choices.

CONCLUSION

We presented a case series suggesting that even large, mobile, and protruding LV clots can be successfully managed surgically, including during LVAD implantation.

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