Case report – Arrhythmia

Microwave ablation of atrial fibrillation in conjunction with treatment of early postoperative massive left atrial thrombosis

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Received 6 May 2002; received in revised form 6 October 2002; accepted 11 October 2002

Abstract

Left atrial thrombosis is a rare complication of both atrial fibrillation and mitral valve surgery. A patient with a massive atrial thrombosis associated with symptoms of severe heart failure is presented. Restoration of rhythmical ventricular contraction and, ultimately, atrial contractility is of great benefit for providing relief from symptoms and for preventing thrombus recurrence. We present an approach to surgically treat atrial fibrillation using a new microwave energy source in a patient with left atrial thrombosis who requires a mitral valve prosthesis replacement.

Keywords: Atrial thrombosis; Atrial fibrillation; Ablation; Microwave

1. Introduction

Early thrombosis is a rare complication of mitral valve surgery, and is aggravated by a very high re-operation risk [1]. Atrial fibrillation (AF) is an important complication of mitral valve disease, and is a primary risk factor for left atrial thrombosis [2]. The Maze procedure is considered to be an effective approach for treating chronic AF, but is associated with high operative risk and complications.

2. Case history

A 63-year-old Caucasian male, referred to us from an Eastern-block country, who had undergone a mitral valve replacement 4 months earlier, presented with a massive left atrial (LA) thrombosis. The patient was diagnosed with rheumatic mitral valve dysfunction and had had symptomatic AF for many years. In the former procedure, the patient received a biologic prosthetic mitral valve. On postoperative day 4 he started complaining of shortness of breath and other symptoms of heart failure. Upon admission, the patient reported a 6-year history of AF and dyspnea with any level of activity, and was forced to rest in an orthostatic position. On inspection the patient appeared to be slightly dyspneic, with cold and moist skin. His legs were significantly and symmetrically edematous. Pulse was 122 beats/min, rhythm was irregular. Auscultation indicated no cardiac murmur, but ronchi were audible on all the lung fields, especially at the bases. Chest radiography showed left atrial enlargement and lung congestion. A transesophageal echocardiography indicated a thrombotic formation in the LA, spanning from the prosthetic mitral valve to the dome of the atrium and involving the left atrial appendage. The left pulmonary veins (PV) were largely occluded by the thrombus. The patient had been on anticoagulation therapy since the initial valve operation; however the INR was only 1.15. The procedure was performed through a median sternotomy. To treat his AF, electrical isolation of the PV was attempted using a microwave energy ablation system. After initiating cardiopulmonary bypass, a first set of lesions was produced epicardially on the septal surface of the LA (i.e. on the anterior surface of right inferior and superior PVs) using a 40-mm length probe (FLEX 4, AFx Inc., Fremont, CA) with a power setting of 65 W for 90 s (see Fig. 1 for a scheme of ablation pattern performed). After placement of the epicardial lesion set, the aorta was clamped and the heart was arrested using antegrade and retrograde cold crystalloid cardioplegia. The LA was opened and the thrombus was evacuated. The thrombus (Fig. 2A,B) was a 13 × 7-cm formation, which strongly adhered to the surface of the left atrial wall but not to the valve surface. It clearly obstructed the left PVs. After the LA was completely cleared out, a second set of lesions was placed endocardially: one lesion on the dome of the LA above the level
of the superior PVs, a second lesion just above the level of the mitral annulus, and a third joining the left superior and left inferior PVs. A final lesion was placed from the ostium of the left inferior PV to the left appendage, which was subsequently sutured shut. The prosthetic valve was removed and a new prosthetic mechanical valve (Sorin 27 mm, Sorin Biomedica Cardio S.p.A., Saluggia (VC), Italy) was implanted. Once declamped, the heart recovered spontaneous sinus activity. Weaning from cardiopulmonary bypass was uneventful. In the intensive care unit, the patient suffered respiratory failure which prolonged assisted ventilation. On postoperative day 5 he experienced a recurrence of AF. He was electrically cardioverted and received oral Amiodarone (200 mg) twice a day for 5 days. The patient was discharged home on postoperative day 11 in normal sinus rhythm and in overall good condition. Echocardiography at discharge indicated a slightly compromised (EF = 50%) but normally dimensioned LV.

After 3 months of follow-up, the patient has remained in normal sinus rhythm, as confirmed by periodic cardiological follow up and EKG.

3. Discussion

It is now widely accepted that anticoagulation is required to reduce risk of thrombosis and cerebrovascular accidents in patients with AF [3]; however, restoration of normal sinus rhythm is ideal when possible. In cases with ventricular failure, such as the patient we present here, rhythm abnormalities are likely responsible for a significant portion of a patient’s symptomatology, therefore resolution of AF is of great benefit.

The Maze procedure is an established surgical technique which has been demonstrated to restore normal sinus rhythm in patients with atrial fibrillation. However, despite the high rate of success of the maze procedure, even with all the simplifications that the procedure has gained with experience, it remains a complicated and time-consuming technique and is associated with high risk of complications [4]. These disadvantages limit its application, especially in those patients who may benefit most.

Our patient suffered from an early thrombosis after implantation of a bioprosthetic valve. Thrombosis resulting from a mitral valve prosthesis has been described following replacements with mechanical valves [5], but is considered an extremely rare event with a bioprosthesis. We theorize that a significant precipitating factor for early atrial throm-
bosis in this case was AF, which recurred a few minutes after the initial valve procedure. The patient’s pathology may have been exacerbated by inadequate anticoagulation, along with an extremely enlarged atrium (74 mm AP diameter estimated at the echo).

The atrial ablation was conducted quickly (9 min) and safely, and allowed restoration of normal sinus rhythm. We suggest, according to our previous experience [6], postoperative prophylactic treatment with Amiodarone to avoid recurrence of AF. The patient received a mechanical valve because of his young age and has undergone his second cardiac procedure. However, in other recipients, anti-coagulation therapy could be ceased at the same time as anti-arrhythmic drugs are withdrawn, 12–24 weeks following the operation.

4. Conclusions

We feel that this microwave energy ablation procedure can be safely performed in all classes of patients. Furthermore, most of the ablation procedure can be performed before arresting the heart using an epicardial approach to further reduce the cross-clamp time. In this case, it was advisable to open the atrium before dislocating the heart in order to avoid thrombus fragmentation; however, in most cases the epicardial approach is safe and convenient.

Some authors suggest that surgical atrial size reduction could be added to the procedure to improve the long-term results, both in terms of sinus rhythm restoration and recovery of efficacious atrial contraction [7]. In the literature there are very few data, limited to few sporadically reported cases, and this procedure can be considered more a leap of faith than an established procedure [8,9]. This procedure is not routine at our institution and moreover there is no evidence that atrial size reduction reduces the thromboembolic risks as recently mentioned by Dr. Melo at the Technocollage of ECTS (Monte Carlo, September 21, 2002). Nevertheless, longer-term follow-up is necessary to completely validate this atrial ablation technique.

References


Appendix A. ICVTS on-line discussion

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Date: 20-Dec-2002 08:00

Message: This case report emphasises the need to recognise the presence of a mitral prosthesis (mechanical or tissue), left atrial size, left atrial rhythm and left ventricular size when assessing the patient’s risk of atrial thrombus with or without systemic embolus. It is interesting to speculate whether protracted surgery ([albeit] micro-wave maze plus atrial clot disobliteration plus mechanical valve re-placement) is prudent in containing stroke risk! We know very little about the contractile state of the left atrium after the maze. All of us undertaking this surgery hope to achieve freedom or minimisation of the above noted atrial thrombotic risk factors for our patients. Often we accept that surgically “created” sinus rhythm allows us to withdraw the often described “intrusive and life long anticoagulant therapy”. Arguably, this practice is probably unacceptable in patients with a rheumatic aetiology when reliable anticoagulant control is readily available. We certainly need more information in this area to guide us in the safe handling of such patients. Thank you to the authors for both the opportunity for educational reflection and thoughts on future work in this area.