CASE REPORT

Circular mapping catheter entrapment in mitral valve apparatus requiring emergency surgery: a rarely reported complication of pulmonary vein isolation procedure for atrial fibrillation

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SUMMARY

Lasso catheter (Biosense Webster) is one of the most commonly employed circular mapping catheters during pulmonary vein isolation (PVI) procedure for atrial fibrillation (AF). Although this catheter has greatly facilitated arrhythmia mapping, it can be associated with serious complications. We report a case of a 59-year-old man who underwent PVI procedure for persistent AF. During the procedure, the Lasso catheter inadvertently slipped into the left ventricular cavity and entangled in the mitral valve apparatus. Various percutaneous manoeuvres to release the catheter were unsuccessful and the patient ultimately required emergency open heart surgery to remove the catheter and repair the valve. To the best of our knowledge, such a case has not previously been reported in the UK necessitating an immediate open heart surgery, avoiding replacement of the valve.

structural or functional valvular abnormalities. In particular, the MV was functioning normally and the left atrium was marginally enlarged at 4.1 cm (normal <4.0 cm).

TREATMENT

The case was considered and deemed suitable for our hybrid ablation AF programme. After informed consent, our patient underwent initial laparoscopic ablation by the cardiothoracic surgeon, followed 8 weeks later by the percutaneous catheter ablation. This was performed in the form of wide area circumferential lesions around ipsilateral pulmonary veins under general anaesthesia with transoesophageal echocardiogram guidance. The Lasso catheter was introduced into the left atrium via a trans-septal approach. While manoeuvring the ablation catheter, the Lasso catheter inadvertently slipped into the left ventricle (LV) and became entangled in the MV apparatus (figure 1). Various manoeuvres including catheter retraction, catheter rotation and advancement of sheath were unsuccessful in releasing the entrapped catheter. Owing to the risk of myocardial perforation and severe MV injury, further attempts were abandoned and cardiac surgeons were urgently consulted for operative removal of the catheter. Patient was transferred immediately to the cardiac surgery theatre for emergency open heart surgery. During surgery, the catheter was found entrapped in the MV papillary muscles, gently released and the valvular apparatus was carefully preserved to permit repair and to avoid valve replacement.

OUTCOME AND FOLLOW-UP

The Lasso catheter was recovered successfully through an uncomplicated open heart surgery followed by an uneventful recovery of our patient. A transthoracic echocardiogram 2 weeks postsurgery demonstrated normal LV function with no evidence of MV dysfunction.

DISCUSSION

Lasso catheter entrapment in the MV apparatus is a known, although rarely reported, complication of PVI procedure for AF. The exact incidence of this complication is not established, but it is likely to be underestimated. A worldwide survey by Cappato *et*

BACKGROUND

Pulmonary vein isolation (PVI) is an established intervention procedure for the treatment of atrial fibrillation (AF). Although extremely rare, entrapment of the circular mapping catheter in the mitral valve (MV) apparatus during the ablation procedure can be associated with severe damage to the MV apparatus with subsequent valve dysfunction. Percutaneous manoeuvres can be helpful in releasing the catheter but urgent surgical intervention can help to minimise damage to the MV, permitting valve repair and thereby avoiding the need for complete valve replacement. This case highlights the importance of immediate opinion from cardiothoracic surgeons with prompt open heart surgery, resulting in successful recovery of the catheter with normal MV function postoperatively.

CASE PRESENTATION

A very fit 59-year-old man with a recent diagnosis of symptomatic, persistent AF was referred by the general practitioner to St George's University Hospital for further management. There was no significant medical history of note.

INVESTIGATIONS

A baseline transthoracic echocardiogram revealed structurally normal heart with no evidence of

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Figure 1 Displaced Lasso catheter from its original position in the left atrium into the left ventricle (LV) and entrapment in the mitral valve (MV) apparatus. Red dotted circle indicates the approximate desired position, whereas the white line indicates displacement into the LV. ((A) transoesophageal echocardiogram probe, (B) Lasso catheter entrapped in MV apparatus, (C) ablation catheter, (D) diagnostic decapolar catheter).

al reported unspecified valve damage in approximately 0.07% of all the cases undergoing ablation for AF.¹ However, a retrospective review of 348 patients by Kesek *et al* reported significantly higher incidence (0.9%) of catheter entrapment in the MV apparatus causing significant MV damage.²

In the unlikely case of catheter entrapment in the MV apparatus, various manoeuvres including advancement of sheaths, retraction and catheter rotation can facilitate release of the catheter. Cases of successful removal of the catheter with percutaneous manoeuvres and by using snare devices have been reported in the literature.^{3–4} Bowers *et al* reported a case of successful catheter recovery percutaneously without damage to the MV by the multidisciplinary team comprising electrophysiologists and an interventional radiologist.⁴ However, in the majority of cases, recovery of the catheter with percutaneous manoeuvres had been associated with severe damage to the MV apparatus and subsequent valve dysfunction, ultimately requiring surgical valve repair.

It is important to perform echocardiography once entrapment of the MV has occurred. If echocardiography demonstrates new, or increased, mitral regurgitation, then forceful or prolonged attempts at catheter retraction should be avoided; since under these circumstances, potential further damage to the MV apparatus may occur.^{5–8} Zeljko *et al* reported two cases of Lasso catheter entrapment during AF ablation followed by successful release with percutaneous manoeuvres.⁵ Unfortunately, there was significant damage to the MV apparatus in both patients, with ruptured anterior papillary muscle, leading to the prolapse of the posterior MV leaflet and severe MV dysfunction, necessitating elective surgical mitral valve repair. Aggressive percutaneous attempts had also led to fracture of catheter tip and severe damage to the mitral valve.^{6,7} Rarely, the extent of damage to the MV had been beyond the limits of repair, requiring replacement with mechanical prosthesis.⁸

The 2012 HRS/EHRA/ECAS Expert Consensus Statement on Catheter Ablation of Atrial Fibrillation emphasises the importance of awareness of this serious complication for all electrophysiologists performing PVI procedure for AF.⁹

It can be speculated that a relatively smaller LA may be associated with an increased risk of catheter displacement into the LV, thus increasing the chances of entrapment in the MV

apparatus. Indeed, our patient had a marginally increased LA diameter of 4.1 cm (normal <4.0 cm) only. This is unlike many other patients with persistent AF who undergo catheter ablation that often have larger left atria, for example, >4.5 cm.

Message

Avoid prolonged aggressive attempts to retrieve the catheter percutaneously, especially if there is echocardiographic evidence of new or increased mitral regurgitation, and obtain early support from cardiac surgeons to permit MV repair in order to minimise risk of MV replacement.

Learning points

- ▶ To the best of our knowledge, this is the first reported case in the UK requiring emergency surgery.
- ▶ Extreme care is recommended while advancing the Lasso catheter, as modest movements can displace the catheter into the left ventricle, resulting in entrapment in the mitral valve (MV) apparatus.
- ▶ Immediate assessment by echocardiography is highly recommended to ascertain any new, or increase in, MV insufficiency.
- ▶ Only gentle manoeuvres should be attempted to release the entangled catheter as prolonged aggressive movements can be associated with serious damage to the MV apparatus.
- ▶ Urgent surgical opinion and intervention can help to minimise the damage to the MV apparatus, if simple manoeuvres do not suffice.

Contributors MIS contributed to the writing of this article, reviewed the patient post procedure in the outpatient arrhythmia clinic and obtained consent for publishing of the case report in the BMJ. AB performed the endocardial catheter ablation. AM was involved in the clinical care of the patient and performed the initial epicardial surgical ablation procedure as part of the hybrid AF program. AM was also involved in the surgical release of the entrapped circular mapping catheter and repair of the mitral valve. RAK is the responsible clinician for the patient. In addition to this, RAK was responsible for the entire process of writing the case report. All authors have reviewed the contents of this article.

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