Case Reports

MitraClip Deployed via Left Femoral Vein

in an 85-Year-Old Woman with Mitral Regurgitation

Mohan Mallikarjuna Rao Edupuganti, MD
Deniz Mutlu, MD
David M. Mego, MD
Kostas Marmagkiolis, MD
Mehmet Cilingiroglu, MD, FACC

The MitraClip system can be used to control regurgitant blood flow in patients with mitral regurgitation who cannot tolerate open surgery to replace the mitral valve. Technical limitations make the right femoral vein the standard access point for placing the MitraClip. However, this route is not always suitable. We present the case of an 85-year-old woman in whom we successfully used a left-sided approach for inserting a MitraClip because her right femoral vein was occluded. This apparently novel left femoral approach merits consideration as an option for device insertion when right femoral vein access is precluded.
(Tex Heart Inst J 2019;46(3):195-8)

Key words: *Aged, 80 and over; balloon valvuloplasty/methods; cardiac catheterization/instrumentation/standards; femoral vein/surgery; heart failure/therapy; heart valve diseases/complications; heart valve prosthesis implantation/methods; mitral valve insufficiency/therapy; punctures/methods; treatment outcome*

From: *Department of Interventional Cardiology (Drs. Cilingiroglu, Edupuganti, Marmagkiolis, Mego, and Mutlu), Arkansas Heart Hospital, Little Rock, Arkansas 72211; and School of Medicine (Dr. Cilingiroglu), Koc University, 34450 Istanbul, Turkey*

Dr. Edupuganti is now at the School of Medicine, University of Arkansas for Medical Sciences, Little Rock, Arkansas. Dr. Marmagkiolis is now at Citizens Memorial Hospital, Bolivar, Missouri. Dr. Mutlu is now at the Cerrahpasa Faculty of Medicine, Istanbul University, Istanbul, Turkey. Dr. Cilingiroglu is now at the School of Medicine, Bahcesehir University, Istanbul, Turkey; and UT Health, San Antonio, Texas.

Address for reprints: *Mehmet Cilingiroglu, MD, Yildiz Mh. Ciragan Caddesi, Osmanpasa Mektebi Sokak 4-6, 34353 Besiktas, Istanbul, Turkey*

E-mail: *Cilingiroglumehmet@gmail.com*

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The MitraClip® (Abbott) is a transcatheter mitral valve repair system that has become an important option for treating mitral regurgitation (MR). Deployment involves a minimally invasive procedure, suitable for patients who have degenerative MR but are poor candidates for mitral valve surgery. The safety profile of the MitraClip appears to be good: data from experienced centers indicate that MitraClip placement reduces MR severity in almost all patients, that it reduces in-hospital complications, and that it substantially improves patients' clinical status.[1-3]

The MitraClip is typically inserted from the right atrium into the left atrium through the fossa ovalis, so the standard access point is the right femoral vein.[3] Several authors have described alternative access sites.[4-6] In this report, we present the case of an elderly patient in whom right femoral access was precluded, necessitating a left-sided approach.

Case Report

In November 2017, an 85-year-old woman was admitted to the hospital with shortness of breath. She had a history of hypertension, dyslipidemia, sick sinus syndrome, paroxysmal atrial fibrillation (a CHA_2DS_2-VASc score[7] of 4 on warfarin), ischemic heart disease with evidence of myocardial infarction, and severe MR with moderate left ventricular systolic dysfunction.

During the preceding months, the patient had been hospitalized repeatedly for management of congestive heart failure and bilateral pleural effusions. Her baseline functional status was New York Heart Association (NYHA) class IV.[8] An episode of congestive heart failure complicated by cardiogenic shock prompted her current admission, and she was placed on vasopressor support. A transthoracic echocardiogram showed moderate left ventricular systolic dysfunction (ejection fraction, 0.40–0.45). The patient had mild-to-moderate generalized hypokinesis, severe biatrial enlargement, and moderate pulmonary artery hypertension. Prolapse of the A2 mitral segment was causing severe, posteriorly directed MR (Fig. 1).

After consulting with cardiac surgeons, the patient's treatment team decided against surgical correction (estimated Society of Thoracic Surgeons risk score,[9,10] 30%). The patient consented to undergo MitraClip implantation.

General anesthesia was induced, and a transesophageal echocardiographic (TEE) probe was introduced. The possibility of a left atrial appendage thrombus was excluded. Right femoral vein puncture was initially performed; however, the guidewire did not advance to enable placement of a 6F sheath. Left femoral vein access enabled unobstructed guidewire advancement. An angiogram obtained through the left femoral sheath showed an occluded right common femoral vein (CFV) (Fig. 2). We therefore decided to proceed with the left-sided approach. We advanced a 0.35-in J-tipped

guidewire into the inferior vena cava (IVC). Using fluoroscopic guidance, we removed the 6F sheath and advanced an 8F Mullins sheath and dilator (Medtronic) over the guidewire into the superior vena cava. We preshaped a Brockenbrough needle (Medtronic) to enable its placement perpendicular to the fossa ovalis. We meticulously advanced the needle into the sheath and positioned the hub of the needle just outside the dilator, to prevent inadvertent perforation of the venous system.

Using TEE guidance, we withdrew the stylet of the needle, then withdrew the entire assembly into the right atrium. We advanced the needle and dilator across the posterosuperior part of the fossa ovalis while constantly monitoring chamber pressures through the needle. The baseline left atrial pressure was 25 mmHg.

When the Mullins sheath and dilator were across the interatrial septum and advanced over the needle, we exchanged the needle for a 260-cm-long, J-tipped Amplatz Extra-Stiff Wire Guide (Cook Medical). We inserted a steerable guide catheter with dilator assembly over the guidewire under TEE guidance, then removed the guidewire and dilator. Next, we advanced the MitraClip delivery system through the guide catheter. Using 2- and 3-dimensional (3D) TEE guidance, we grasped the A2 and P2 leaflets with the MitraClip. The patient's MR decreased immediately, as evaluated semiquantitatively with use of TEE color-flow Doppler and 3D reconstruction images (Fig. 3). The preprocedural transmitral gradient was 3 mmHg, and the final gradient was between 7 and 10 mmHg. The final mitral valve pressure half-time was 108 ms, and the mitral valve area was 2.02 cm^2.

We removed the steerable guide catheter. The patient's groin was closed with a cutaneous purse-string suture that was left in place for 3 hours. The previously severe MR became mild-to-moderate. We prescribed optimal medical therapy for the patient. At her 6-month follow-up examination, her dyspnea was markedly reduced, her systolic pulmonary artery pressure was 50% lower, and she was in NYHA functional class II.

Discussion

The MitraClip is a promising alternative to open surgery. Although the procedure is typically initiated through the right femoral vein, other access routes have proved to be feasible. Two of these are direct right atrial puncture[4] and a pulmonary vein approach through a right minithoracotomy.[5] A transjugular procedure has been performed with use of a novel transseptal system that involves a steerable sheath and radiofrequency wire and a modified steering technique.[6] We are unaware of previous reports on deploying the MitraClip through the left femoral vein.

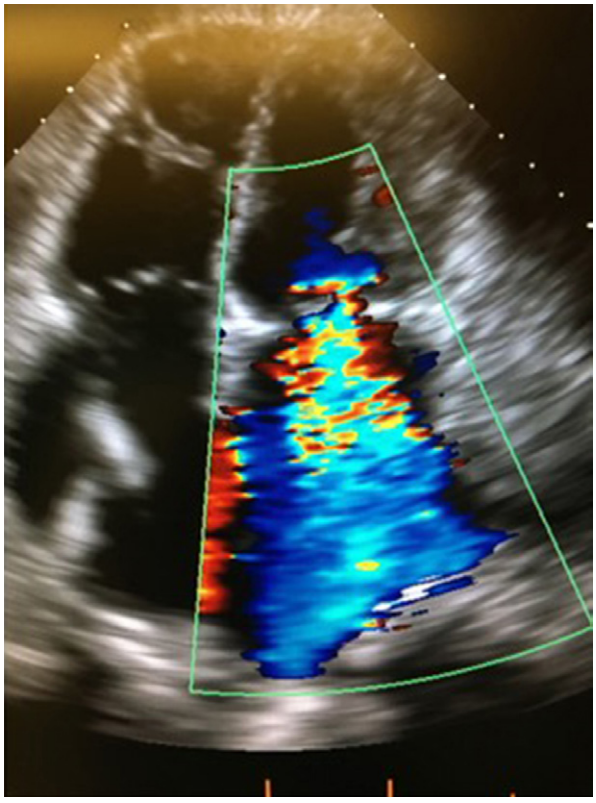


Fig. 1 *Transthoracic echocardiogram (apical 4-chamber view in color-flow Doppler mode) shows severe mitral regurgitation.*



Fig. 2 *Fluoroscopic image shows the occluded right common femoral vein.*

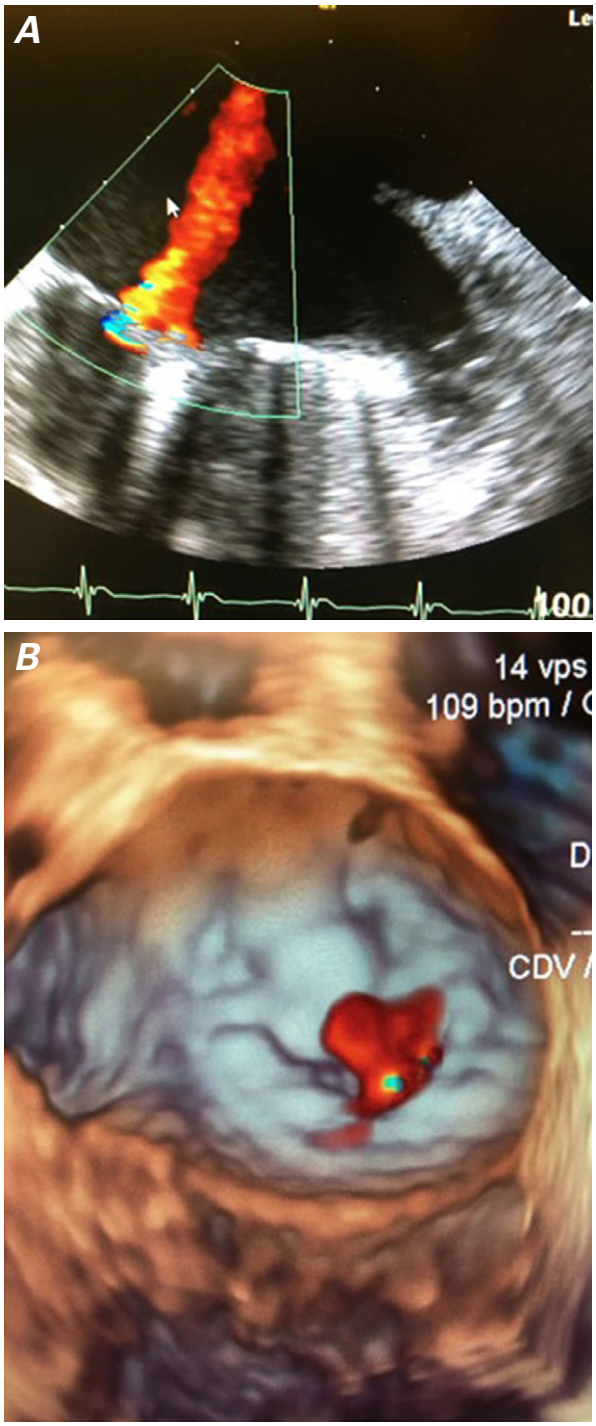


Fig. 3 *Transesophageal echocardiograms in* ***A****) 2-chamber view in color-flow Doppler mode and in* ***B****) 3-dimensional reconstruction of the mitral valve show reduced regurgitation after MitraClip placement. The arrow in A is a cursor.*

Several difficulties are associated with the left CFV route. The course to the right atrium is longer and more tortuous than that of the right CFV, limiting the catheter's reach in taller patients. In addition, the angulation between the left CFV and the IVC is more acute than that between the right CFV and the IVC. The Brockenbrough needle must be advanced to the interatrial septum through the Mullins sheath.[3,11,12] This maneuver is typically straightforward in the right CFV approach; in contrast, access through the left CFV necessitates special techniques.[13,14] The acute angulation between the IVC and the left CFV can produce traction on the IVC, which may cause the Mullins sheath system to perforate. Further difficulties can arise when introducing the needle into the fossa ovalis. The left approach places the needle more parallel than perpendicular to the fossa, leading to the risk of interatrial septal dissection.[13]

These challenges can be overcome by modifying techniques. One method is to bend the patient's trunk to the right, which aligns the left CFV with the IVC.[13] A second method is to increase the distal curvature of the needle by 40° so that it can be navigated through the acute angle between the left CFV and the IVC while keeping the needle perpendicular to the interatrial septum.[13] If neither method works, the operator can use a telescoping technique in which the needle is pushed gently while the Mullins dilator is pulled.[14] Other routes for deploying the MitraClip, such as that for deploying interatrial septal devices through the axillary vein, also warrant consideration.[15]

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