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CASE REPORT

# Percutaneous transluminal mitral valve commissurotomy Via Veno-Arterial loop method

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## Abstract

**Background:** Since its inception in 1984 by Inoue and colleagues, percutaneous trans venous mitral commissurotomy (PTMC) is the first line treatment option for severe mitral stenosis with favorable valve morphology. Critical mitral stenosis can however pose a challenge for balloon crossing to the left ventricle. Various techniques have been demonstrated to overcome this difficulty. We use a novel technique to cross mitral valve.

**Case Presentation:** We describe a case where critical stenosis of rheumatic mitral valve in a young lady which was not amenable to conventional PTMC procedure, was successfully performed via veno-arterial rail method.

**Management & Results:** After crossing the interatrial septum, mitral valve was tried to cross with the standard technique using Inoue balloon, but failed because the stenosis was very tight. So we have crossed mitral valve through exchanged length terumo wire which was snared in descending aorta and externalized through right femoral artery and then we were able to pass the balloon through the tight mitral valve and the procedure was completed without any complication. Post procedure the pressure gradient dropped to 4mmHg and the mitral valve area was recorded as 1.8cm 2 with 2D echo planimetry.

**Conclusion:** In difficult to cross MV during PTMC, the veno-arterial rail method can be used easily for a successful procedure.

## Keywords

Percutaneous Transluminal Mitral Valve, Commissurotomy, Veno-Arterial Loop Method.

## Introduction

Since its inception in 1984 by Inoue and colleagues[1], percutaneous trans venous mitral commissurotomy (PTMC) is the first line treatment option for severe mitral stenosis with favorable valve morphology[2]. Critical mitral stenosis, calcific valve or subvalvular apparatus, interatrial septal bulge, and small left atrium size make the procedure difficult at different steps. Critical mitral stenosis can, however, pose a challenge for balloon crossing to the left ventricle. Various techniques have been demonstrated to overcome this difficulty[3-11]. We describe a case where severe stenosis of the rheumatic mitral valve in a young lady was successfully performed with the veno-arterial rail method.

## Case Report

Our patient was a 22-year-old female with a History of Rheumatic heart disease with severe MS. She was in sinus rhythm, symptomatic with shortness of breath of New York Heart Association class III. Transthoracic and transesophageal echoes were performed, which showed a mitral valve area of 0.6cm$^2$, mean Gradient of 19mmHg across the mitral valve, left atrium diameter of 50mm with heavy contrast, severe tricuspid valve regurgitation, pulmonary artery pressure 70 mmHg, no left atrial (LA) or left atrial appendage (LAA) clot, EF 60%, and only trivial mitral regurgitation. Wilkins's score was 8.

Right Femoral Artery access was used for the 6F pigtail catheter in the aortic root. Right femoral Vein access with 8F Mullin sheath was taken, followed by 12F Inoue Balloon. After crossing the interatrial septum, the mitral valve was tried to cross with the standard technique using the Inoue balloon but failed - *likely due to very tight stenosis.* Septostomy was tried again a bit higher, but that did not help. Supportive Amplatz wire (positioned in the left subclavian artery and then in the descending aorta) was used as an anchor, but that did not help either. An exchange length Terumo wire was taken through the Mullin sheath via JR4 guide catheter to direct it through the mitral valve orifice. After crossing the mitral valve, the wire was then advanced from the left ventricle into the aorta.

The Inoue balloon was then tried to negotiate through the mitral valve, but it did not offer enough support (Figure 1), so the wire was then advanced further into the descending aorta and was snared there with a gooseneck snare via the femoral route (Figure 2). The wire, although snared, was kept lax in order for the Inoue balloon to assume the ideal base to apex position to avoid any entanglement with the chordae or aortic valve damage (Figure 3).

We were then able to pass the balloon through the tight mitral valve, and the procedure was completed without any complication (Figure 4). The total time of the procedure was about 90 minutes, and the total fluoro time was about 40 minutes. Post-procedure, the pressure gradient dropped to 4mmHg, and the mitral valve area was recorded as 1.8cm$^2$ with 2D echo planimetry.

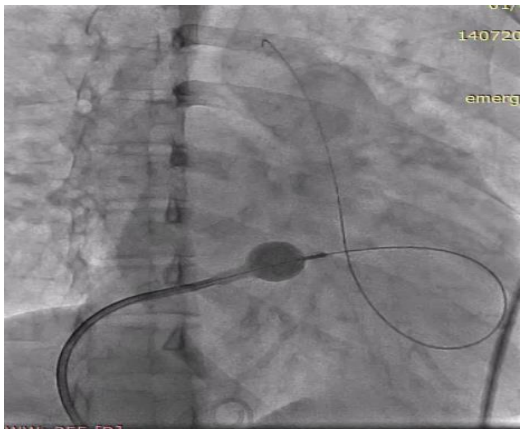

**Figure 1: Wire in ascending aorta.**


**Figure 2: Snaring the wire in the descending aorta.**

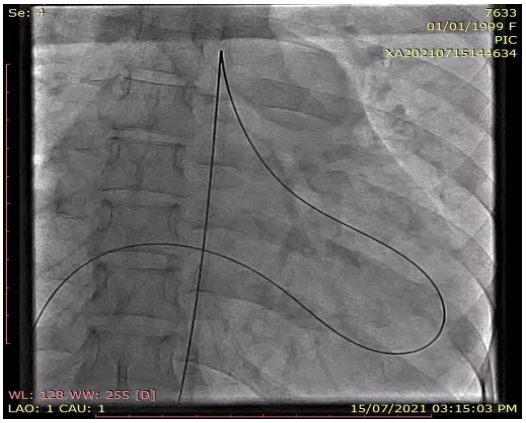


**Figure 3: Final position of the lax wire**

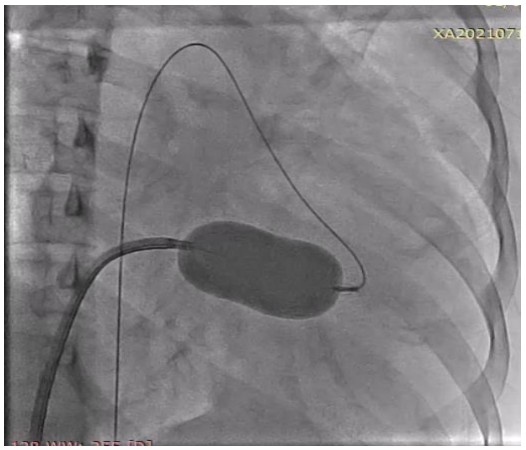

**Figure 4: Final balloon dilatation**

**Table 1: Hemodynamic perimeters before and after the procedure.**

| Hemodynamic Perimeters | Pre-procedure | Post-procedure |
|---|---|---|
| **LA pressure** | 29 mmHg | 10 mmHg |
| **MV gradient** | 19 mmHg | 4 mmHg |
| **MV area** | 0.6 $cm^2$ | 1.8 $cm^2$ |
| **MR** | Trivial | Mild |

*LA: left atrium, MV: mitral valve, MR: mitral regurgitation

## Case Discussion

PTMC is the preferred method of treating severe rheumatic mitral stenosis when the anatomy is deemed suitable for the procedure. Inoue balloon is widely used these days for the procedure which is guided through the mitral valve with the help of pre-shaped stylets. However, some patients have difficult anatomy, which makes the two crucial steps hard to perform: puncturing the interatrial septum and crossing the Inoue balloon through the mitral valve. In our case, we faced difficulty in the later step.

Most operators have reported their experience in such difficult cases using different modified techniques such as double looping the catheter in the left atrium, which can be done by counterclockwise rotation of the Inoue balloon catheter while in LA[4]. In our patient, this method failed because of the small size of the left atrium. Another method described is to use the drop in LV systolic pressure as a guide to cross the mitral valve[5].

A relatively novel method reported is over the wire loop method. In this method, a wire is first crossed into the left ventricle over which the Inoue balloon is railed in difficult to cross mitral valve orifice. Deora et al. (2017) reported using Amplatz super-stiff guidewire passed into the left ventricle with the help of AR-1 catheter over which Inoue balloon was railed[6]. We used a stiff wire, but that did not offer enough support in our case. At the same time, Manjunath et al. (1998) used the pigtail LA wire directly in the left ventricle (LV) in their case series[7]. A balloon flotation (Swanz Ganz) catheter is also used to deliver a soft-tipped backup wire into the left ventricle to serve as a rail[8]. The rapid snare sliding technique is one method of snaring the hydrophilic wire in the LV described by Thakur et al. 9. Crossing the hydrophilic wire further from the left ventricle into the aorta to better anchor the support wire is also reported. Pradhan et al. (2018) placed it in the ascending aorta in their patient[10]. The support wire is even reported to be advanced up to the ulnar artery and bending the patient's elbow for better support for the Inoue balloon to cross the mitral valve[11]. In our case, the hydrophilic exchange length wire was advanced from ascending aorta down into the abdominal aorta, and a gooseneck snare via the femoral artery route was used to anchor the wire. Advancing the wire to such an extent was the result of multiple failed attempts while the wire was kept in the ascending aorta and subclavian artery before this (Fig). To our knowledge, this is the first case in our country ever reported which was successfully performed by the veno-arterial rail method without any complications.

## Conclusion

In difficult to cross MV during PTMC, the veno-arterial rail method can be used easily for a successful procedure.

## Acknowledgment

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