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Authors: Santosh Kumar Sinha, Puneet Aggarwal, Kumar Himanshu, Siddarth Samrat

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Percutaneous Trans Mitral commissurotomy (PTMC) in the background of *giant left atrium* using *Reverse Loop Entry* technique

Santosh Kumar Sinha, Puneet Aggarwal, Kumar Himanshu, Siddarth Samrat

Department of Cardiology, LPS Institute of Cardiology, G.S.V.M. Medical College, Kanpur, India

Abstract

Percutaneous trans-mitral commissurotomy (PTMC) using Accura balloon is an effective procedure for management of patients with rheumatic mitral stenosis. It is not uncommon to come across giant left atrium (LA) especially in the developing world as patient often present late in the course of the disease. This is a technically challenging situation as usual landmark changes which make the procedure difficult beginning from septal puncture to negotiation of balloon into left ventricle across the mitral valve. Here we report a case of 16-year old girl suffering from rheumatic mitral stenosis in which left atrium was giant (13cm x 11cm) where the mitral valve could not be negotiated with standard technique. Valvotomy was successfully executed by *reverse loop entry* technique.

Key words: Giant left atrium; Reverse Loop Entry Technique; Percutaneous Trans Mitral commissurotomy

Introduction

Percutaneous trans-mitral commissurotomy (PTMC) is the gold standard treatment for suitable isolated rheumatic mitral stenosis [1]. In patients with giant left atrium (LA) the inter-atrial septum assumes flatter position as a result of horizontal orientation, and used to bulge into right atrium as a result of increased LA pressure. All these factors make atrial septostomy challenging. Furthermore, left ventricle (LV) entry across the mitral valve, a key step following a successful atrial septal puncture, becomes difficult as balloon usually floats into LA. The standard technique of placing Accura balloon in the left atrium (LA) and advancing it into left ventricle (LV) often becomes challenging in as a result of low or medial position of septal puncture, altered left atrial geometry, and severe sub-valvular disease or tight mitral stenosis. The usual technique requires modifications in these atypical scenarios.

Case report

A 16-year-old girl presented with exertional dyspnoea- New York Heart Association (NYHA) class II for past one and half years. Trans-thoracic echocardiogram revealed pure severe mitral stenosis (Mitral valve area by planimetry — 0.9 cm²; and 0.8 cm² by pressure half time). Her Wilkin's score was 8/16 (M₂C₁T₂S₃), left atrial was giant (13cm x 11cm), and mean gradient across the mitral valve was 32 mmHg. Transesophageal echocardiography was done to look for feasibility of PTMC. Her height was 156 cm. PTMC was planned after obtaining informed consent. Femoral artery and vein were accessed with 6F and 9F sheath. After performing septostomy by utilizing *fossa ovalis probing* technique as described by Krishnamoorthy et al [2], and dilating the septum in usual fashion, looped LA wire was placed into left atrium. 26 mm Accura balloon (Vascular Concepts, Essex, UK) was chosen based on Hung's formula. Preprocedure LA pressure was 46/24 mmHg (mean = 35mmHg). Accura balloon could not be negotiated across the mitral valve by usual sliding or direct method. It was withdrawn, and mullin sheath was reintroduced. LA wire was repositioned making a counter-clockwise turn this time as we intended to go for *reverse loop entry technique* (Fig. 1, 2A). Balloon was gradually pushed over the looped wire (Fig. 2B, 3A). Wire was removed and metallic stylet was introduced into the balloon too short to its tip while it was partially inflated (Fig. 2B, 3A). It was pulled little till the bobbing movement was observed. It was deflated and suddenly pushed into left ventricle (Fig. 3B, C). Once into LV as confirmed by premature beats on electrocardiogram, it was partially inflated and gradually pulled down to straighten the redundant loop (Fig. 4, 5A). Once balloon was straightened, it was deflated and pushed down further into LV (Fig. 5B). The balloon was inflated in its distal part and pulled back to anchor it at the mitral valve and inflated further to achieve its full dilatation (Fig. 6). Successful valvulotomy was performed as hemodynamic measurement revealed mean LA pressure coming down to 9 mmHg. Mitral valve area was 1.9 cm² with mild mitral regurgitation on subsequent echocardiography. Total procedural time was 49 minutes because of the complexities of the procedure. She was discharged next day with low dose oral loop diuretics, oral beta blocker and intramuscular penicillin prophylaxis every three weeks.

Discussion

In country like India where patients with rheumatic mitral stenosis often present very late, it is not unusual to find giant left atrium where anatomy of interatrial septum is often distorted. Due to the high left atrial pressure, atrial septum usually bulges into right atrium, becomes flatter thus taking a more horizontal orientation, and therefore fossa ovalis lies lower down

[3]. These factors combined together makes septal puncture challenging as needle tends to dissect the septum rather than puncturing because of tangential tracking. Also, if it punctures the muscular part of the septum, sometimes septal catch is encountered which makes the balloon negotiation across the mitral valve difficult. Septal puncture and balloon delivery across the mitral valve into left ventricle are the potential problem in such case.

Other improvisation may be non-ideal puncture sites such as more cephalad, leftward (closer to mitral valve), and very low punctures, changing the shape of stylet and different techniques of balloon entry such as over the wire technique, [4, 5] and floating swan ganz catheter into left ventricle [6]. With the help of preshaped stylet, Accura balloon can be delivered into left ventricle by direct or sliding method in most of the cases. The challenging substrates are low or medial septostomy site, severe subvalvular disease (score ≥ 3) with eccentric mitral orifice and giant LA as usual geometry is altered. In our case, giant LA and severe subvalvular disease were responsible for failure of conventional technique. These challenges can be circumvented by modifications of the standard technique like reverse loop technique, double loop technique, over the wire double-balloon technique vertical approach using left ventricular pressure as a guide for LV entry [7, 8]. One can make a veno-arterial loop or else place the wire tip in the descending aorta across the aortic valve to deliver the balloon [8]. The potential problem with this technique is lack of proper support for the bulky balloon, injury to the mitral chordal apparatus, the risk of ventricular arrhythmia, ventricular perforation, and multiple exchanges of hardwares which is time consuming.

In our technique, no exchange of hardwares was made. What needed was to make a counter-clockwise loop of LA wire to give a better support to the balloon. It should be pushed as deep as possible into LA and kept partially inflated while pulling it. The partially inflated balloon directs itself towards the mitral valve orifice because of the blood flow. This maneuver helps in its negotiations across the mitral valve. Secondly, once it reaches into LV, it should be partially re-inflated so that it could not come out of LV while redundant loop into LA is abolished by further pulling it back. Another point to note that in case of severe subvalvular disease (score ≥ 3); one may opt for stepwise dilatation to prevent mitral regurgitation. If gradient fairly comes down in first dilatation, one may leave even if results are little sub-optimal as it is always better not to create more than moderate.

Conflict of interest

None

References

1. Fawzy ME. Percutaneous mitral balloon valvotomy. *Catheter Cardiovasc Interv.* 2007; 69(2): 313–321, doi: [10.1002/ccd.21008](https://doi.org/10.1002/ccd.21008), indexed in Pubmed: [17253604](https://pubmed.ncbi.nlm.nih.gov/17253604/).
2. Krishnamoorthy KM, Dash PK. Transseptal catheterization without needle puncture. *Scand Cardiovasc J.* 2001; 35(3): 199–200, indexed in Pubmed: [11515693](https://pubmed.ncbi.nlm.nih.gov/11515693/).
3. Clugston R, Lau FY, Ruiz C. Transseptal catheterization update 1992. *Cathet Cardiovasc Diagn.* 1992; 26(4): 266–274, indexed in Pubmed: [1394413](https://pubmed.ncbi.nlm.nih.gov/1394413/).
4. Dani SI, Patel TM, Chag MC, et al. Difficult mitral valvuloplasty: an "over the wire" modification of Inoue technique. *J Invasive Cardiol.* 1995; 7(5): 148–151, indexed in Pubmed: [10155098](https://pubmed.ncbi.nlm.nih.gov/10155098/).
5. Manjunath CN, Srinivasa KH, Patil CB, et al. Balloon mitral valvuloplasty: our experience with a modified technique of crossing the mitral valve in difficult cases. *Cathet Cardiovasc Diagn.* 1998; 44(1): 23–26, indexed in Pubmed: [9600517](https://pubmed.ncbi.nlm.nih.gov/9600517/).
6. Mehan VK, Meier B. Impossibility to cross a stenotic mitral valve with the Inoue balloon: success with a modified technique. *Indian Heart J.* 1994; 46(1): 51–52, indexed in Pubmed: [7646606](https://pubmed.ncbi.nlm.nih.gov/7646606/).
7. Safi AM, Kwan T, Clark LT. Successful percutaneous balloon mitral valvuloplasty using left ventricular pressure as a guide to cross the mitral valve--a case report. *Angiology.* 2000; 51(1): 83–86, doi: [10.1177/000331970005100113](https://doi.org/10.1177/000331970005100113), indexed in Pubmed: [10667647](https://pubmed.ncbi.nlm.nih.gov/10667647/).
8. Deora S, Vyas C, Shah S. Percutaneous transvenous mitral commissurotomy: a modified over-the-wire technique for difficult left ventricle entry. *J Invasive Cardiol.* 2013; 25(9): 471–473, indexed in Pubmed: [23995723](https://pubmed.ncbi.nlm.nih.gov/23995723/).

Figure legends

Figure 1. Reverse loop of LA wire into left atrium showing its giant size (13cm x 11 cm)

Figure 2. Accura Balloon being tracked over the left atrial wire

Figure 3. Balloon being partially inflated (A) while being gradually pulled. Once near the mitral valve orifice, it was deflated and pushed into left ventricle (B; C)

Figure 4. Once into left ventricle, it was partially re-inflated and pulled further to abolish the redundant loop in left atrium (A; B)

Figure 5. Once balloon was straightened (A); it was deflated and further pushed into left ventricle (B)

Figure 6. The balloon was inflated in its distal part and pulled back to anchor it at the mitral valve and inflated further to achieve its full dilatation











