



Percutaneous transvenous mitral commissurotomy in mitral stenosis and left atrial appendage clot patients in special conditions: Hospital-based study



Rajib Rajbhandari^{a,*}, Rabi Malla^a, Arun Maskey^a, Yadav Bhatta^a, Yubraj Limbu^a,
Ranjit Sharma^a, Satish Singh^a, Chandramani Adhikari^a, Sundeep Mishra^b

^a Shahid Gangalal National Heart Centre, Kathmandu, Nepal

^b AIIMS, New Delhi, India

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ABSTRACT

Background: The percutaneous transvenous mitral commissurotomy is an important procedure for the treatment of mitral stenosis. A lot of mitral stenosis cases have left atrial appendage clot which precludes the patient from the benefit of this procedure.

The aim of the study was to study the feasibility and safety of the procedure in a patient with appendage clot in the setup of certain urgent conditions.

Method: All cases of mitral stenosis with significant dyspnea and mitral valve area $<1.5 \text{ cm}^2$ with left atrial appendage clot and a condition which would preclude the patient from continuing on anticoagulation and needed urgent intervention were included in the study. From January 2011 to December 2013, twenty patients coming to Shahid Gangalal National Heart Centre, Kathmandu were selected for the procedure with conventional sampling technique. Informed written consent was obtained from the patients explaining all possible complications. The approval of the study was taken from the ethical committee of the hospital.

Result: Mean mitral valve area increased from 0.90 cm^2 ($SD \pm 0.14$) to 1.5 cm^2 ($SD \pm 0.21$) ($p = 0.02$). Left atrial mean pressure decreased from mean of 20 to 10 mmHg. Subjective improvement was reported in all. All of the patients had fulfilled criteria for successful PTMC. There was no mortality during hospital stay or in one-week follow-up period. There were no neurological complications or any need for emergency surgery.

Conclusion: The immediate result of percutaneous transvenous mitral commissurotomy in selected cases of mitral stenosis with left atrial appendage clot is safe and acceptable in certain urgent situations in experienced hands.

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1. Introduction

The incidence of rheumatic heart disease has not declined in our region. About one-third of admissions to our hospital is due to rheumatic heart disease; among them, one-third consist of isolated mitral stenosis. The treatment of choice in this situation is percutaneous transvenous mitral commissurotomy (PTMC).^{1–3} Since the beginning of interventional program in our hospital about 15 years back, all suitable cases of mitral stenosis without

left atrial clot are taken for PTMC. But left atrial (LA) clot is present in nearly 15% of severe mitral stenosis according to hospital registry; 90% of them are inside LA appendage and only 10% are placed in the left atrial body. Medical literature consider PTMC to be risky in the presence of the clot, and this precludes many patients from the benefit of this procedure. Thus LA appendage clot is considered as contra-indication to PTMC in standard practice and usually treated medically with anticoagulation or referred for surgery. But in some conditions, either mode of treatment may not be appropriate. The present study aimed to evaluate the feasibility and safety of PTMC procedure in a patient with LA appendage clot in emergency situation or when no other reasonable option is available. This is a first study of this kind in our region.

* Corresponding author. Tel.: +977 9851052350; fax: +977 14371123.
E-mail address: rajibrbhandari@yahoo.com (R. Rajbhandari).

2. Methods

All cases of mitral stenosis attending our hospital with significant symptoms of dyspnea, NYHA class II or more and mitral valve area (MVA) $< 1.5 \text{ cm}^2$ with left atrial (LA) appendage clot (Type Ia) - mitral stenosis patients with LA appendage clot not protruding out of LA appendage and any of the following: pregnancy, or patient in pulmonary edema, or patients who recently had bleeding disorder or patient with stroke, or patients whose clot did not get dissolved despite adequate anticoagulation with warfarin for more than nine months and still had significant symptoms or those who were unable to go for surgery.

Exclusion criteria were left atrial body thrombus, LA appendage clot extending into LA, mitral regurgitation with >3 grade, bicommissural calcification or severe grade 4 calcification, and severe aortic valve disease. From January 2011 to December 2013, twenty patients were selected for the procedure. Echo was done to diagnose and classify the mitral valve according to Wilkins scoring system. Routine investigations were performed which included total leukocyte count, differential count, hemoglobin, X-ray chest, ECG, and serum urea, creatinine, sodium and potassium. Trans-thoracic and trans-esophageal echocardiography was performed to observe for LA and LA appendage clot. GE Vivid S6 pediatric (TEE) and adult (TTE) probe was used for the purpose. Right femoral artery and right femoral vein was accessed with 5 and 8 French sheath. Pigtail catheters in non-coronary cusp of ascending aorta served as land mark.^{4–7} Puncturing of inter-atrial septum was done through right femoral vein by Mullins sheath and Brokenborough needle.

Once the inter-atrial septum was punctured and Mullins sheath entered, the LA appendage was outlined with injection of contrast material. This gave a good idea of the appendage area which was to be avoided during balloon manipulation. Special precaution was taken not to bring the coiled wire and balloon tip above the level of LA appendage. While entering the balloon into the LA through the coiled wire, the wire was kept low inside LA and the balloon was pushed slowly into LA to make a complete circle. This kept the balloon tip away from disturbing LA appendage. The reverse loop technique (balloon encircling the whole of LA in anticlockwise direction) was avoided to keep the balloon tip away from the LA appendage. Firm J wire was used instead of flexible J wire. This avoided unnecessary movement of the balloon tip. Mitral valve was dilated only once with the maximum permissible size (that is height in cm divided by ten plus ten), instead of stepwise repeated dilatation. Inoue balloon was used for the purpose. Three thousand units of un-fractionated heparin was administered during the procedure.

In pregnant ladies, the fetus was protected from radiation with pelvic and abdominal shields. The lead gown was put beneath the back extending from lower part of thorax to the buttock. Neck-guard shields were put on their abdomen. Check echocardiogram was done the next day. Successful PTMC were considered as those with final MVA $\geq 1.5 \text{ cm}^2$ or who had doubling of MVA after the procedure.^{8,9} Most patients were discharged the next day except those who had presented with pulmonary edema. Discharged patients were followed up in clinic after a week.

Fig. 1, shows a typical case with a small clot inside LA appendage.

3. Results

Age of the patients ranged from 20 years to 58 years. Mean age of the patient was 31.4 ± 9.3 years, mean height was 157.5 ± 4.3 cm, and mean weight was 54.6 ± 3.9 kg. Male to female ratio was 0.35 : 1. Patients were of different clinical background. Out of 20 patients, (a)

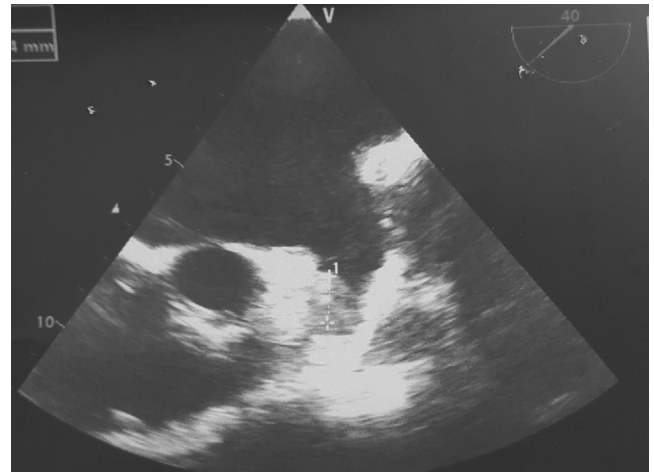


Fig. 1. Transesophageal echo showing a clot lying well inside the LA appendage.

3 ladies were pregnant and were not on anticoagulants because of the risk to the fetus, (b) 2 patients were in frank pulmonary edema; TEE could not be done on them; instead left atrial appendage clots were detected on transthoracic echo, these patients had to undergo the procedure as a rescue procedure, (c) 9 patients had received warfarin therapy for more than 12 months with adequate INR levels and had class III symptoms, (d) 2 had attended hospital ER with supratherapeutic INR and still had clot despite prolonged warfarin therapy for more than 12 months, (e) 3 were in NYHA class III-IV despite medication and were attending ER in heart failure frequently, and (f) one had recent history of embolic stroke with hemorrhagic complication and NYHA class III symptoms (Table 1).

Forty percent of the study patients were in atrial fibrillation. Mean MVA increased from 0.90 cm^2 (SD + 0.14) to 1.5 cm^2 (SD + 0.21) ($p = 0.02$). Minimum pre-procedure and maximum post-procedure MVA was 0.5 cm^2 and 2.0 cm^2 respectively. Repeat echo at 3 months could not be done in majority of the patients because of poor follow-up. Left atrial mean pressure decreased from mean of 20 to 10 mmHg. Subjective improvement was reported in all 20 patients. All had fulfilled criteria for successful PTMC. There was no mortality during hospital stay and in one-week follow-up. Five patients had mild MR and one had moderate MR. No one had cardiac tamponade or severe mitral regurgitation unlike other major studies.^{10,11} None died during the procedure or due to complication from the procedure. None had any neurological complications or stroke. There was no need for emergency surgery in any of the cases. One of these patients developed atrial fibrillation with fast ventricular response with hemodynamic compromise which settled on its own (Fig. 2).

4. Discussion

PTMC procedure is provided free of cost in our government hospitals while mitral valve replacement is a costly procedure.

Table 1

Few important echo parameters of patients.

LA size in mm	43 (± 3.3)
LA pressure mmHg pre procedure	20 (± 2.7)
LA pressure mmHg Post procedure	10 (± 1.2)
MVA pre procedure cm^2	0.9 (± 0.14)
MVA post procedure cm^2	1.5 (± 0.21)
LV ejection fraction %	53 (± 4)

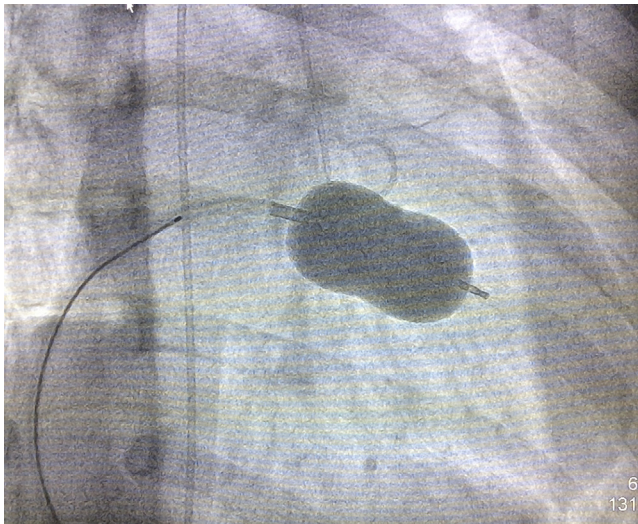


Fig. 2. Inoue balloon being dilated in mitral valve.

Furthermore, it is not always easy for these patients to monitor and maintain INR after the valve replacement, especially those living in remote hilly areas. Many of them fail to take medication and many land up in ER with supratherapeutic INR and/or bleeding complications. Thus whenever feasible PTMC is always a superior option.

PTMC procedure can be sometimes difficult and time consuming in patients with dilated LA. Few injections of contrast in LA and aorta to identify different landmarks make the septal puncture safe and easy. This is helpful especially for the operators who are not so experienced. Entry through patent foramen ovale may not be the best site for puncture. This approach makes left ventricle (LV) entry difficult. Even otherwise complex anatomy with large LA may make left ventricle entry difficult and time consuming. Consequently, with prolonged manipulations chances of thrombo-embolism increase. Simple anatomy with relatively small LA and RA in our patients in the study enabled the procedure to be performed smoothly without thromboembolic complications. Using stiffer J-wire, expert operators can maneuver balloon straight into LA without disturbing the LA appendage area. In this study, the results in terms of mitral valve area are less than optimal probably because only one single dilatation of the balloon during the procedure; no repeat dilatation was performed. Restriction to single dilatation avoided unnecessary manipulation of the LA appendage clot. If the landmarks are well delineated by contrast injection into LA then one can easily avoid the areas of LA appendage and hence not disturb the clot. A notable point IN OUR STUDY was the fact that the most of the LA appendage clot were probably organized since many patients had already taken anticoagulation for a good period of time. Another notable point among the patients in the study was 45% of the cases were in atrial fibrillation which is relatively high in comparison to another study.¹² This could be because of the fact that the patient population was somewhat older than in other studies.^{13–15} The patient population in the study was special because there was urgent need for relief of symptoms in these sick patients. Although LA appendage clot is a relative contra-indication for performance of PTMC there are no clear-cut guidelines in these sick patients with LA appendage clot. Furthermore, this procedure has been described being done safely with or

without carotid protection devices,¹⁶ but still it is not feasible in many setups because of technical reasons and financial constraints of the patients. Despite the possibility of neurological complications, the procedure has to be performed in high risk.¹⁷ Our center by now has good experience of more than 6000 PTMC procedures with very minimal complication, low mortality and negligible neurological complications. Refusing to do PTMC sometimes means refusing any treatment for the patient because there may be no other feasible or safe alternative treatment for these patients. As described in our study, few patients had been treated with anticoagulation for more than one year but they had worsening of symptoms and urgent treatment was the only alternative for their survival. The patients with pulmonary edema had associated pneumonia as well and were treated with antibiotics. The 3 pregnant cases were on 7 months of conception and presented for the first time. The fluoro exposure time among pregnant patients was less than five minutes. In few other cases, the intervention could not be delayed further because they were having symptoms. Urgent mitral valve replacement is not technically easy in these sicker patients and in addition there was a financial constraint. Thus, PTMC may be considered as a rescue procedure in conditions like this where surgery is not feasible. Small patient numbers is the major limitation of this study.

5. Conclusion

The immediate result of PTMC in selected cases of mitral stenosis with LA appendage clot is acceptable in certain urgent situations in experienced hands.^{18–20}

Conflicts of interest

The authors have none to declare.

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