Nonsurgical Treatment of Tight Mitral Stenosis Using Inoue Balloon Technique

N H MALLICK M BAKHTIARI S KARIM S HUSSAIN M AZHAR A DAR M ASHFAQ T MALIK
Department of Cardiology Mayo Hospital Lahore
Correspondence to Dr. Nadeem H. Mallick

Mitral Stenosis is one of the commonest long-term complications of rheumatic fever and afflicts many females at a relatively young age, with implications for treatment strategies. We present a study of one hundred and fifty seven consecutive cases of significant mitral stenosis treated with Inoue Balloon technique at Mayo Hospital with hemodynamic and clinical improvement. The age range was 12-60 years. Percutaneous Transvenous Mitral Commissurotomy (PTMC) was successful in 90% of patients, as measured by immediate hemodynamic parameters, including reduction in Left Atrial pressure[1]. The advantages of the procedure were shorter hospital stay, absence of significant scar marks, better patient acceptability and sustained clinical improvement during follow up.
Key words: Inoue Balloon, tight mitral stenosis, left atrial pressure.

Rheumatic fever continues to afflict young people, especially those between 5-15 years of age. The most dreaded complication of this ailment is chronic valvular heart disease which causes much disability. Mitral stenosis is commonest in young females, in whom it leads to serious complications if not managed properly. Surgical mitral valvotomy through left thoracotomy has been replaced by Balloon commissurotomy through trans-septal puncture, using Inoue technique. The objective of this study was to analyse the results of one hundred and fifty seven balloon mitral procedures carried out between January 1996 and January 1998, in order to determine the success as well as complications of this extremely useful treatment modality.

Materials and Methods

All patients included in this retrospective study were admitted in Cardiology Ward after assessment of their clinical status and appropriate investigations were carried out including routine hematology and biochemical profile. The severity of mitral stenosis was determined clinically as well as by non-invasive means including electrocardiograms, chest roentgenograms and transthoracic echocardiograms with doppler study. Transesophageal echocardiography was only performed if clinically indicated especially in patients with atrial fibrillation, history of embolism or assessment of valve morphology. Right femoral approach using Seldinger technique was used to introduce diagnostic and therapeutic catheters. The interatrial septum was punctured with Brockenbrough needle and appropriate sized Inoue balloon catheter was positioned across the mitral valve. Heparin was given systemically in a dose of 100 units per kilogram of body weight and balloon sizing was done according to the height-adjusted formula. Serial dilatations of the stenosed valve were carried out with hemodynamic monitoring of various parameters in order to assess the success of the procedure as well as to detect any untoward complications. The majority of patients were discharged after twenty-four hours after having been assessed clinically and by transthoracic echocardiography.

Results

Majority of the patients were females (72%); youngest age at procedure was 12 years and the oldest patient was 60. Almost all patients had a mean mitral valve area of less than 1.0 cm^2 with symptoms suggestive of severe mitral stenosis. Pulmonary artery pressure was above normal in most patients, the highest recorded pressure being 130 mm. Hg. Similarly the Left atrial pressures before PTMC were abnormally raised in most patients (the maximum recorded being 70/38), which fell considerably with successful procedures as an indirect measure of increase in mitral valve area. Of the total 157 patients included in the study, the interatrial septum could not be punctured in 3 patients and thus the procedure was aborted without any problems. PTMC was abandoned in another 12 patients owing to various reasons, as outlined below:

Table no 1: Reasons for abandoning procedure

Reasons	No. of patients
Fast atrial fibrillation	1
Supraventricular tachycardia	1
Difficulty in groin access	1
Extreme restlessness	1
Heavily cacified valve	1
Anticoagulation	1
Significant mitral regurgitation	1
Failure to cross mitral orifice	1
Mitral stenosis not significant	1
Thromboembolism	1
Cardiac tamponade	2

One of the patients with cardiac tamponade had to be transferred to the Cardiac Suugical unit for operative intervention.

These results indicate that percutaneous intervention was successful in 90% of patients while the incidence of serious complications was extremely low in this random patient population.

Discussion

PTMC has emerged as a very successful balloon procedure for treating tight mitral stenosis and the majority of centers are now using Inoue technique which has a very low incidence of complications in expert hands. The procedure time is considerably shorter than the double

balloon technique and the expense of the procedure can be reduced by appropriate sterilization and reuse of the Inoue balloon. With successful commissurotomy, the left atrial as well as pulmonary artery pressures reduce immediately[2], while clinical improvement occurs over a longer period of time. The results are comparable to those of Closed Mitral Valvotomy with the notable exception that surgical scar is absent which makes this procedure cosmetically acceptable to most patients, especially young females .

Echocardiography is the most informative non-invasive diagnostic tool for assessment of the severity of mitral stenosis, including suitability for PTMC and various scoring systems including Wilkins score[3] have been devised, based on valve rigidity, degree of thickening, calcification and involvement of infravalvular apparatus by the rheumatic process. Transthoracic studies also adequately determine involvement of other valves as well as ventricular size and function, while Doppler flow studies help to calculate mitral orifice area, pulmonary artery pressures and degree of regurgitation. The two absolute contraindications to the procedure remain significant mitral regurgitation and the presence of left atrial thrombus, the latter sometimes requiring transesophageal echocardiography for detection.

Major complications of the procedure include cardiac perforation with tamponade, systemic embolism, severe mitral regurgitation and left to right atrial shunting; occasionally emergency surgery may be needed while the incidence if in-hospital mortality is extremely low.

The results of our study demonstrate that PTMC is a very safe procedure. The risks as well as benefits are quite comparable to those of surgical commissurotomy[4], with minimal procedure-related complications. Local anaesthesia is used and thoracotomy is avoided. The hospital costs are low and the hospital stay and convalescent periods are shorter, making it the procedure of choice for the treatment of severe mitral stenosis, as long as the valve morphology is suitable and there are no major contraindications.

References

1. Ishikura F Nagata S Hirata Y Kimura K. et al .: Rapid reduction of plasma ANP levels during PTMC in patients with Mitral Stenosis. Circulation 1989; 79: 47-50.
2. Hung J Fu M Yeh S Lin F et al. : Hemodynamic and clinical efficacies of catheter balloon PTMC. J Formosan Med Assoc 1990; 89: 182-9.
3. Wilkins G T Weyman A E Abascal V M ,et al.: Percutaneous mitral valvotomy: An analysis of echocardiographic variables related to outcome and the mechanism of dilatation. Br. Heart J. 60:299, 1988.
4. Reyes V P Raju B.S. Wynne J ., et al.: Percutaneous balloon valvuloplasty compared with open surgical commissurotomy for mitral stenosis. N. Engl. J. Med. 331: 961, 1994.