EMERGENCY SURGICAL REFERRAL FOR COMPLICATIONS ARISING FROM PERCUTANEOUS TRANSVENOUS MITRAL COMMISSUROTOMY

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INTRODUCTION

Until the first publication by Inoue and coworkers on Percutaneous Transvenous Mitral Commisorotomy (PTMC) (1) in 1984, surgery was the only treatment available for patients with Mitral Stenosis. Numerous reports concerning PTMC have been published since. A considerable number of patients with MS have now been treated with PTMC, enabling efficacy and risk factors to be assessed. Long-term results are now being published that are enabling us to select the most appropriate candidates for treatment by this method. This study was planned to evaluate the efficacy of PTMC in our set up with a special reference to assess the incidence and outcome of emergency referral for surgery for complications of PTMC.

MATERIAL AND METHODS

From January 2001 to December 2002, 181 cases of Mitral Stenosis underwent PTMC at our institute. The techniques employed the Cribier metallic dilator, Inoue balloon or double balloon. Out of these, 7 (3.8%) patients were referred for emergency surgery directly from the cardiac catheterization laboratory. These included 4 patients with decompensated severe Mitral Regurgitation, 2 patient with cardiac tamponade, and 2 patient with the metallic device stuck in the open position.

RESULTS

In 6 patients surgery was carried out under cardio-pulmonary bypass. One patient who had a perforation resulting in pericardial tamponade, was done without bypass. The mean waiting time for surgery was 2 hours (range 1-4 hours). There were 5 female and 2 male patients. The mean age of these patients was 21 years (range 18-26 years).

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Mitral Valve replacement was carried out in four patients who had developed severe MR after PTMC. In the other three patients, the mitral valve was found to be successfully dilated and surgery was directed towards removal of the device and closure of the perforations producing the tamponade. There was no mortality. All patients were followed up in the out-patients department with an echocardiogram at 1,3 and 6 months. They were all found to be clinically and echocardiographically satisfactory.

DISCUSSION

The first patient was referred directly from the catheterization lab with a device that would not close after dilatation of the mitral valve. The mitral valve had been successfully dilated after which the device remained stuck in the open position. An echocardiogram was done in the lab which showed that the valve had been satisfactorily dilated with minimal mitral regurgitation. The patient was shifted to theatre where after establishment of cardiopulmonary bypass, the left atrium was opened. The device was found lying in the left atrium in the open position and would not close even on direct manipulation. The terminal portion was therefore cut out and the wire withdrawn proximally. The valve was checked under direct vision and found to be competent. The left atrium was then closed without further surgical intervention after which bypass was discontinued uneventfully.

The second patient was referred again from the lab after balloon dilatation of the mitral valve. The patient became haemodynamically unstable post procedure. An urgent echocardiogram was done which revealed cardiac tamponade. A needle was inserted into the pericardium to relieve the tamponade as the patient was referred for urgent surgery. At operation, three perforations were discovered, one in the IVC and two in the RA free wall. As the mitral valve had appeared

satisfactorily dilated on the pre operative echocardiogram, CPB was not established and the mitral valve was not inspected under direct vision.

The third patient developed severe mitral regurgitation post procedure, which resulted in haemodynamic instability. She underwent emergency surgery for replacement of the mitral valve under CPB.

The fourth patient was again referred from the lab in an emergency. She had become haemodynamically unstable after PTMC. An urgent echocardiogram revealed pericardial tamponade. The echo could not properly assess the state of the mitral valve because of low pressures. She was shifted to theatre in a rush, the pericardium was opened and fresh clot was found all around the heart. The clot was evacuated and CPB instituted. A single perforation was found pumping away at the LV apex, which was repaired. The LA was opened up next. The mitral valve was inspected and found to be satisfactorily opened up with minimal regurgitation. The operation was completed and the patient taken off bypass uneventfully.

The fifth patient was brought pulseless and without blood pressure to cardiac theaters. External CPR and resuscitative measures had already been instituted in the cardiac lab. He was rushed on to bypass with the surgical assistant carrying out internal cardiac massage. In this case, the valvotome was found stuck in the mitral valve in the open position. The mitral valve was totally disrupted and there was a rent in the LV. Since the mitral valve was irreparable, mitral valve replacement was carried out. The LV rent and atrial septal perforations were repaired and the patient taken off CPB initially with moderately high inotropic support, but this was weaned off satisfactorily over the next 12 hours.

The sixth patient was a twenty years old woman referred to the surgical unit after balloon valvotomy with severe mitral regurgitation and pulmonary oedema. She was immediately shifted to operation room. On opening the left atrium, the anterior mitral leaflet was found to be completely disrupted. She underwent mitral valve replacement after which she recovered quite smoothly.

The seventh patient was a 27 years old male with severe mitral stenosis, who was found to have torn chordae and ruptured AML at operation. After mitral valve replacement he made an uncomplicated recovery.

MECHANISM OF PERCUTANEOUS COMMISSUROTOMY

The mechanism of performing the commissurotomy whether surgical or percutaneous is essentially the same, ie: opening the fused commissures[2]. Balloons are also capable of enlarging the valve area by fracturing nodular deposits in patients with calcified valves[3].

TWO APPROACHES FOR PTMC ARE CURRENTLY IN VOGUE.

TRANSVENOUS OR ANTEGRADE APPROACH: This is the most widely practiced method universally. An antegade approach to the right atrium is gained through the femoral vein and less commonly the internal jugular vein[4]. The mitral valve is then reached by puncturing the inter-atrial septum.

TRANSARTERIAL OR RETROGRADE APPROACH: In this technique, the mitral valve is approached retrogradely by puncturing the femoral or brachial artery. No inter-atrial septal perforation is warranted. Though employed less frequently, this approach has shown to be effective in selected cases[5].

Two main techniques are used presently which include balloon commissurotomy and metallic commissurotomy.

BALLOON COMMISSUROTOMY: Two types of balloon are used for performing PTMC.

1. SINGLE/INOUE BALLOON: The Inoue balloon is a self positioning, pressure distensible balloon that allows progressive dilatation of the stenotic valve by increasing the inflation pressure. Having a comparable success rate as the double balloon, a shorter procedure time and higher dispensable costs makes Inoue balloon the one most commonly used[6].

2. DOUBLE BALLOON: In the double balloon method, a trans-septal puncture is performed and a balloon catheter is advanced across the mitral valve into the left ventricle[7]. Two long exchange wires are than positioned in the left ventricle and inter-atrial septum is dilated with 6-8 mm dilatation balloon. A com-

bination of two mitral valvuloplasty balloons are advanced across the mitral valve and inflated.

METALLIC COMMISSUROTOMY: Cribier introduced metallic commissurotomy in the late 1990's. This employs an instrument similar to the Tubb's dilator used in closed mitral commissurotomy. The potential advantage of the metallic dilator is that it is reusable reducing the cost of procedure.

INDICATIONS:

The main indication for PTMC is moderate to severe mitral stenosis with minimal calcification. The other prerequisites for PTMC include absence of left atrial clot, no moderate to severe MR and a septal thickness more than 4mm.

COMPLICATION:

Mortality: The mortality rate in PTMC ranges from 0.1% - 3% in most series[8,9,10]. The main causes of death are left ventricular perforation and poor general condition of the patients. Mortality is higher in the multicentre studies than in those from single large volume centers which reflects the importance of training.

HEMOPERICARDIUM: The incidence of hemopericardium after PTMC varies from 0.5% - 12%. It is usually related to chamber perforation. If it happens, pericardiocentesis usually allows stabilization of patient's condition and transfer for emergency surgery[11].

EMBOLIZATION: Embolization after PTMC occurs in 0.5% - 5% of the patient population[12]. This may lead to stroke, myocardial infarction or uncommonly, ischemia of other organs. Although the incidence is relatively low, its potential consequences are severe and all possible precautions must be observed to prevent this from happening.

MITRAL REGURGITATION: Some degree of stable regurgitation is common after PTMC. Severe mitral regurgitation necessitating surgical intervention is uncommon and ranges from 2% - 19%[13,14].

ATRIAL SEPTAL DEFECT: This is reported to be prevalent in 10% -90% of patients after antegrade PTMC. However, the magnitude of the left to right shunt is generally insignificant.

URGENT SURGERY: Urgent surgical intervention (within 24 hours) after PTMC is uncommon[15]. It is usually required for massive haemopericardium for perforation or severe refractory mitral regurgitation[16].

HEART BLOCK: Transient heart block occurs in about 1.5% of patients and seldom requires permanent pacemaker[17].

OTHER RARE COMPLICATIONS: Numerous other complications have been quoted in the literature but without any significant morbidity or mortality. These include tachyarrhythmias, prolonged hypotension, vasovagal reaction, balloon rupture, angina pectoris, pneumothorax, acute tubular necrosis (ATN) and CPR[18].

CONCLUSION

PTMC is a safe procedure with relatively good results. The 3.8% incidence of complications necessitating emergency surgery at our institute is comparable to results from other centres. Facilities for emergency cardiac surgery, however, should preferably be available at centres where PTMC is being undertaken to reduce morbidity and mortality.

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