Percutaneous Transvenous Mitral Commissurotomy In A Pregnant Adolescent At AFIC/NIHD

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A seventeen and a half year old, expectant mother, primigravida, at eighteen weeks gestation, was brought to AFIC/NIHD, with complaints of acute shortness of breath, NYHA Class IV.

She was a thin built young girl, with a pulse 120/min, BP 110/70 mmHg and signs of severe mitral stenosis and frank pulmonary oedema. She had been admitted in our hospital in atrial fibrillation and frank pulmonary oedema six weeks earlier as well, and had been stabilised on medical treatment. Her EKG then showed sinus rhythm, P mitrale, tall R wave in lead V1, ST depression across the chest leads and her Transthoracic 2D echocardiogram showed a severe, noncalcific, Mitral Stenosis with pliable valves and mildly thickened subvalver apparatus with no mitral regurgitation. A Transoesophageal echocardiogram had excluded any left atrial clot. She had been given an appointment for surgery but later, it was decided to let the pregnancy proceed and to keep the patient under observation. She was admitted, nursed propped up in bed, 0_2 8L/min was given by nasal prongs, IV line was set up, frusemide 60mg iv stat (repeated after half an hour) and Digoxin 0.25 mg IV were given. Oxygen saturation, cardiac rate and rhythm and BP were monitored. The 'On call' gynaecologist was requested for an obstetrical assessment, which in brief, was LMP: 7.4.97, EDD: 7.1.98, placenta grade:1, foetal cardiac activity: normal, foetal movements: normal.

We took her to the cardiac cath lab and did a PTMC, using a 26 mm Inoue Balloon, shielding the pelvis and the abdomen circumfrentially with a lead apron. The procedure time was 15 min.

Preparation:

- The cath lab staff got ready before the patient was shifted.
- Stacked three pillows on the cath table.
- The scrub nurse ready, along with the trolleys and a prepped 26 mm Inoue Balloon.
- The electromedical assistant got the patient's name and ID printed, the transducers zeroed, and lines attached and flushed, before the patient was shifted.
- A lead apron was placed on the cath table to lie under the abdomen and the pelvis of the patient.
- Oxygen source was checked and mask kept ready at hand.
- The patient was brought to the cath lab sitting up on a wheel chair.
- She was shifted on to the table, on to the lead apron and made to recline semirecumbent.
- She was quickly draped and the right femoral vessels cannulated under Local anaesthesia. 6Fr arterial, 7Fr venous sheaths were used.
- The lead apron was rolled on to the front of the patient's pelvis and abdomen and a sterile drape was put on it to cover it on the front.

- A 6 Fr Pigtail catheter was passed up the descending aorta and down the ascending aorta right up to the aortic valve.

Procedure

- The 7Fr GL was advanced up to the Rt internal jugular vein. For these steps the fluoroscope was flashed only for a split second, twice (two fluoroflashes), doing most of the repositioning from the acquired memory.

- The GL was withdrawn leaving the 032 heavy duty exchange wire in the Rt jugular vein. And then the 8F Mullens sheath was gently guided up the wire with one 'fluoroflash' when its tip reached its approximate destination. At this stage the C arm was moved to give image in the RAO 40° angulation. The Brockenbrough needle was inserted into the Mullens sheath without fluoroscopic guidance and very gently advanced.

- The Mullens sheath (along with the needle) was withdrawn into the Right atrium. Using the pigtail catheter as a guide, the puncture site was defined and satisfactorily targeted. The interatrial septum was punctured without resorting to any contrast injection and the sheath pushed into Left Atrium. Only at this stage we injected ha a cc of dilute contrast to confirm how far the tip had gone into the Left Atrium. We did not do an LV cineangiogram.

- Total contrast used was 1/2 cc.

- Inj Velosef 500mg iv and a low dose of Heparin 2000 units I/V was given.

- The guide wire was passed and the sheath withdrawn, leaving the guide wire in the left atrium.

- The 14 Fr dilator was used to dilate the puncture site (two fluoroflashes only). The balloon was easily passed up the wire and crossed into the LA (1 Fluoroflash). The 26 size Inoue balloon crossed the mitral valve with the help of the J wire and we very quickly ballooned it. No residual gradient was observed. The patient felt instantaneous relief in symptoms. A check ultrasound examination of the foetus showed no instability. A check Transthoracic Echocardiogram was done which showed Mitral valve area of 2.5 cm^2. The patient was sent home fully ambulant and asymptomatic two days later.

Post Script:

The patient proceeded with her pregnancy and delivered a perfectly healthy baby girl at term, of a normal spontaneous vaginal delivery.

Discussion:

Mitral stenosis is the most common rheumatic heart disease in pregnancy[1]. Pregnancy is associated with a 40% increase in circulating blood volume, an increased sympathetic activity and an increase in heart rate[2]. When mitral stenosis complicates pregnancy, the pressure gradient across the narrow mitral valve increases greatly as left ventricular diastolic filling time decreases secondary to the physiological increase in heart rate and increased cardiac output of pregnancy[3]. An increased LA pressure and arrhythmogenic effect of pregnancy may result in atrial flutter or fibrillation, substantially accelerating the ventricular rate and further elevating the LA pressure thus predisposing to pulmonary oedema[4]. These patients usually suffer from various NYHA classes of congestive failure.

Patients with critical mitral stenosis (MVA<1cm^2) can usually proceed to successful completion of pregnancy with careful medical treatment provided special emphasis is laid on control of heart rate[5]. We treat these patients first medically with bed rest, oral diuretics and beta blockers (or digoxin if the patient is in Atrial Fibrillation[5]).

If patients become severely symptomatic we have to relieve the mitral valve obstruction. This we do surgically or by ballooning the valve. Surgery is done by Closed Mitral Valvotomy (CMV) or Open Mitral Valvotomy (OMV) or valve replacement where so indicated. The first CMV in a pregnant woman was described in 1952.

Foetal mortality as high as 5-10% has been described with CMV in pregnancy[8]. This modality of therapy has the added advantage of avoiding the transient fall in the blood pressure from uterine

compression of the IVC. On the other hand Mitral valve surgery under extracorporeal circulation has been associated with considerable foetal and maternal mortality. One reference[6] shows maternal mortality of 13.3% and foetal mortality of 33.3%. In addition, there are problems of hypothermia to the foetus and we still do not know the long term side effects of hypothermia and cardiopulmonary bypass on the newborn. Another reference[7] gives foetal mortality ranging from 20-30%[7]. The third option is opening the valve by means of a balloon; i.e., percutaneous transluminal mitral commissurotomy (PTMC). There are limited published reports on use of PTMC in pregnant patients despite the fact that ever since the description of this procedure in 1984[9] it has become the most popular method of opening the mitral valve world wide and that more than fifteen thousand PTMCs for opening stenosed mitral valves have been done around the world done both by means of cylindrical balloons, like the Mansfield balloons, single or double, and the Inoue Balloons. Understandably so, while attempting PTMC, we have to be cautious of potential procedural complications such as haemopericardium or mitral regurgitation which may warrant open heart surgery in emergency. Transient hypotension has also been described in some studies[10]. One other concern while planing PTMCs in pregnancy has been the risk of ionising radiation to the foetus and the risk of iodine exposure from the contrast medium used. Both these matters have been addressed to in studies: it has been seen that radiation exposure has been measured to be very low between 0.1 mSv to 0.5 mSv[11] (far lower than legally permissible for pregnant women exposed to radiation). And radiation hazard can be minimised by limiting fluoroscopy time and by wrapping a lead apron around the abdomen and pelvis[11].

PTMC has been found to effective in improving mother's haemodynamic status, allowing thus the completion of pregnancy and has been well tolerated and safe from foetal health point of view[11].

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