

Pulmonary Balloon Valvuloplasty In High Risk Patients

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ABSTRACT:

BACKGROUND:

Transcutaneous pulmonary balloon valvuloplasty is the treatment of choice to relieve moderate to severe pulmonary valvular stenosis, the aim of our study is to propose a clinical classification for a group of patients with severe pulmonary valvular stenosis who present with particular signs and symptoms and who carry particular risks and difficulties during cardiac catheterization and pulmonary valvular angioplasty.

METHODS:

From Aug 1993 to Sept. 2001, Pulmonary balloon valvuloplasty (PBV) was attempted in 248 patients with pulmonary valvular stenosis (moderate to severe) from early neonatal days and beyond. Among those we selected 47 patients with severe pulmonary valvular stenosis. They were divided into four groups according to their particular clinical manifestations:

Group A: Those with pure cyanosis.

Group B: Those with Rt sided heart failure without cyanosis

Group C: Those with Rt sided failure and cyanosis.

Group D: Those with biventricular failure.

RESULTS:

We recognized specific risks, complications and technical difficulties in those different groups (will be mentioned in details).

CONCLUSION:

Pulmonary balloon angioplasty is still the standard solution to relieve moderate to severe pulmonary valvular stenosis in all ages, but still there is a group of patients who carries technical difficulties, risks and even death with this procedure.

KEYWORD : classification, Pulmonary stenosis, management.

INTRODUCTION:

Because most of our patients come to medical attention at later age after the onset of severe symptoms, the majority of them (75%) have severe transvalvular gradient, and an appreciable number of them present with grave clinical problems like severe cyanosis, clubbing and spells even in old age. Others may present with full blown picture of Rt side failure and others may present with both cyanosis and failure.

BACKGROUND:

Transcutaneous pulmonary balloon valvuloplasty is considered as the procedure of choice to relieve moderate to severe pulmonary valvular stenosis and the aim of our study is to propose a clinical classification for that particular group of patients with severe pulmonary valvular stenosis who have specific risks and difficulties during and after cardiac catheterization and pulmonary balloon valvuloplasty, and immediate results of that procedure and difficulties encountered.

MATERIALS AND METHODS:

Between Aug. 1993 and Oct. 2001, Pulmonary balloon valvuloplasty (PBV) was attempted in 248 patients with moderate to severe pulmonary valvular stenosis above seven days of life who had been admitted to Ibn AL Bitar center for cardiac surgery.

From those we chose 47 patients with severe stenosis (21 male and 26 female), age at PBV ranged from 8 days to 45 years with a median of 12.5 years, none of them underwent previous surgical or percutaneous valvuloplasty. History elicited included poor exercise tolerance, cyanosis, hypoxic spells and symptoms of Rt side failure.

Echocardiography was used to confirm the clinical diagnosis and to assess anatomic valve characteristics. Particular attention was given to the: pulmonary ring diameter, pressure gradient across RVOT, tricuspid incompetence, existence of interatrial shunt through PFO or patency of PDA, and LV function with ejection fraction.

Those 47 patients had been divided into four groups:

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Group A: Patients with pure cyanosis and no failure, Group B: Patients with Rt ventricular failure and no cyanosis, Group C: Patients with both cyanosis and RV failure, Group D: Patients with biventricular failure.

RESULTS:

Mean gradient in the whole group was 156mmHg declined to a mean of 46mmHg after procedure (maximum gradient was 305 mmHg), favourable results as an acute effectiveness were obtained in 38/47 patients (80%), those patients in whom acute results were unsatisfactory (in term of gradient reduction) 8/9 of them had infundibular reaction and all of them had been considered successful results on intermediate and long term follow up after resolution of that reaction, 1/9 patient had dysplastic valve and sent for surgery.

From the results of the cases considered successful the mortality was four patients (11%): 8 days neonate died 3 days after because of sepsis (G C), 18 years old male died the day after because of arrhythmias and biventricular decompensation (G D), 8 years old girl died two hours later because of intractable pulmonary oedema (G D), 16 years old cyanotic male died the day after because of massive cerebral infarction (G A).

GROUP A:

17 patients, mean age of 17 years, this group presented with normal cardiac size on X ray, mean pressure gradient declined from 161mmHg to 52mmHg immediately after procedure, O₂ saturation dramatically increased directly after procedure in 13/17.

Complications: cyanotic spells (2/17), cerebral infarction and death (1/17), all after 6/12 months: O₂% sat were normal and mean gradient was 25mmHg.

GROUP B:

15 patients, mean age of 15 years, they present with enlarged cardiac shadow on X ray, mean transvalvular gradient reduced from 156mmHg to 48mmHg, main events were severe bradycardia, or asystole during introduction of the catheter or even the guide wire, so the operator should be very quick, one patient was referred for surgery because of dysplastic valve.

GROUP C:

12 patients, severely ill, they present with gross enlargement of cardiac shadow X ray, have the lowest gradient before dilation (mean of 148mmHg) declined after to a mean of 23mmHg, the youngest mean age group, the catheterization needed a relatively long time, and difficulty with the performance of cardiopulmonary resuscitation in four patients, only six patients got

normal systemic saturation immediately after the procedure and all of them after one year of follow up, as well as getting dramatic improvement of their symptoms and signs with gradual regression of cardiac shadow on X ray.

GROUP D:

3 patients, Dilemma group, mean age of 16 years, mean transvalvular gradient of 90mmHg, presented with biventricular failure, mean LVEDP was 25mmHg and mean RVEDP was 20mmHg, they had the worst outcome: an 18 years old male died 24 hours from dilation because of pulmonary odema and resistant arrhythmias, another 12 years old female died one hour after partial dilation because of intractable uncontrolled pulmonary odema, the third patient survived in spite of developing pulmonary odema, because he had lower LVEDP than others (18mmHg).

DISCUSSION:

The physiological consequences and clinical presentation of severe pulmonary valvular stenosis depends chiefly on the degree of obstruction, the distensibility characteristics of the hypertrophied Rt ventricle and the presence of interatrial communication. In pulmonary valvular stenosis with intact ventricular septum, a coexisting Rt to Lt shunt is usually via a patent foramen ovale rather than a true atrial septal defect⁽¹⁻²⁾.

In patients group A, there is PFO and RT to LT shunt.

In patients group B, interatrial septum is intact but with severe tricuspid incompetence and elevated RT atrial pressure, that is why they are pink but with increased central venous pressure symptoms⁽³⁾. In patient group C, they have PFO with severe tricuspid incompetence leading to cyanosis and RT sided failure⁽⁴⁾.

In group D the patients have RV failure with associated unexplained Lt ventricular dysfunction⁽⁵⁾.

The events and difficulties seen during catheterization and the balloon valvuloplasty were different in the four groups.

Rapid catheter manipulation was mandatory in the first three groups. In one fourth of cases predilation with a balloon of smaller size was carried out in order to facilitate the passage of adequate balloon through the pulmonary valve⁽⁶⁾.

Low blood oxygen saturation and elevated hematocrite was the predominant problem in group A, cyanotic spells occurred in 2/17 (11.7%) during and after procedure, adequate hydration prior to and during procedure, as well as reduction of hematocrite just before the procedure are important measures to avoid thrombotic events⁽⁷⁾.

In groups A & C cyanosis may persist after dilation because of the development of infundibular

reaction which will resolve with time with subsequent gradual disappearance of cyanosis⁽⁸⁻⁹⁾.

Low cardiac output, bradycardia and even asystole was common in groups B & C particularly when the catheter or the guide wire just crosses the pulmonary valve⁽¹⁰⁻¹¹⁾.

Group C usually is severely ill due to cardiopulmonary instability and hypoxic spells. They have usually marked enlargement of cardiac silhouette on X-ray. During their follow up, we observed an improvement of the NYHA class, of the ventricular function on echocardiogram, and the cardiac shadow on X-ray will decrease to normal with time.

Group D were the most troublesome. It is better not to dilate because even with partial dilation severe pulmonary oedema will supervene.

We did not compare our study with others because that is a new idea to propose that classification for the high risk patients in severe pulmonary valvular stenosis.

CONCLUSION:

Pulmonary balloon valvuloplasty is the technique of choice for moderate to severe pulmonary valvular stenosis in all age groups, but it is not always an easy procedure. There is a certain group of patients with specific technical difficulties and risks.

RECOMMENDATIONS:

- In groups A,B and C rapid catheter manipulation is mandatory.
- It is preferable to start dilation with small balloons and then proceed to bigger ones, because bradycardia and asystole during inflation is very difficult to manage before achieving complete valve opening.
- Adequate hydration and reducing the hematocrite before the procedure in cyanotic patients are important measures to avoid thrombotic accidents.
- If we try to dilate with failure and the patient developed spells after, consider urgent surgery. TRY to dilate with high caution or avoid dilating pulmonary stenosis with LV dysfunction.

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