Short Term Outcomes of Percutaneous Pulmonary Balloon Valvuloplasty in Adult Patients with Pulmonary Stenosis

Original Article

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Summary:

Background:

Percutaneous Balloon Pulmonary Valvuloplasty (BPV) is now the treatment of choice for pulmonary valve stenosis (PS) Patients and Methods. It is a retrospective study involving 40 consecutive patients with moderate to severe PS underwent BPV in Ibn Albitar Hospital for Cardiac Surgery from Sept. 2003 to Sept. 2004 , were medical records , Electrocardiograms (ECG) , Echo Doppler studies , and Catheterization data were reviewed carefully.

Results:

Mean pressure gradient across pulmonary valve (PV) was reduced from 112 +/- 46 mmHg before intervention to 49 It/- 34.7 after intervention.

Procedure failure occurred in one patient (2.5 %), four patients (10%) developed mild to moderate pulmonary regurgitation , no mortality was detected .

Conclusion:

BPV is effective and safe procedure for patients with valvular PS.

Introduction:

Since first catheter intervention at 1979 (I), BPV evolved to be the treatment of choice for valvular PS (2,3,4) .

The mechanism of balloon dilatation is through valve leaflet commissural disruption by the radial forces of balloon inflation (5) , with excellent short and long term results (6,7,8,9).

The aim of this study is assessment of effectiveness of BPV in patients with valvular PS who underwent this procedure in a single cardiology hospital and evaluation of short term results and complications of this procedure.

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Patients and Methods:

From September 2003 to September 2004, 40 consecutive patients with moderate to severe valvular PS underwent BPV in Ibn Albitar Hospital for Cardiac Surgery.

Moderate PS mean that pressure gradient between right ventricle (RV) and pulmonary artery (PA) is 50-79 mmHg , while 80 mmHg or more is considered as severe PS (10) .

The Medical records of those 40 patients were studied carefully including clinical data, clinical outcome, Electrocardiograms (ECG), Echo Doppler study and Catheterization reports and films.

ECG criteria of RV hypertrophy (RVH) are tall R wave in lead VI, right axis deviation, T wave inversion in leads VI to V3, rS in V6 and right atrial abnormality (11).

BPV were done through percutaneous approach via a femoral vein under local anesthesia, where RV and PA pressures were recorded and pressure gradient between them were calculated right venriculography were performed (12).

Balloon size was selected approximating the diameter of pulmonary annulus and then increasing the size, if necessary, to abolish the gradient (12,13). We usually used single balloon (Mansfield balloon, Boston Scientific Corporation, MA 02172, USA and Owens-lo-profile, balloon dilatation catheter, Scimed, Boston Scientific Corporation), and we used Amplatz super stiff exchange wires (Mansfield, Boston Scientific Corporation, USA).

Successful BPV indicate significant reduction in pressure gradient between RV and PA, while failure was defined as inability to put balloon in its position or failure to reduce pressure gradient significantly.

Statistical analysis: Continuous data were presented as mean value +/- one standard deviation. Comparisons were performed by using Student t test, AVOVA test was used to assess the significance of relationship among the variables. AP value less than 0.05 was accepted as minimal level of significance.

Results

40 patients with valvular PS underwent BPV aged 16 - 32 year, mean age was 22+/- 5.5 year, 18 patient (45%) were females (table 1).

Presenting symptoms were dyspnea in 24 patient (25%) and chest pain in 6 patients (15 %) .

ECG interpretation showed that RVH was seen in 25 patients (62%), right bundle branch block (RBBB) in 10 patient (25%) and in 5 patients ECG was normal (table 1).

There is a linear relationship between the length of R wave in lead VI and the degree of RV pressure measured during catheterization (correlation co efficient = 0.52, P = 0.049), (fig. 1) .

The mean pressure gradient across PV (measured during catheterization) was reduced from 112 +/- 46.28 mmHg before BPV to 49.2 +/- 34.7 mmHg after intervention, P < 0.05, (fig. 2).

There was an increase in systolic PA pressure post BPV in comparison with pre intervention pressure, P = 0.01 (fig. 3).

Post procedural hematoma at the site of skin puncture was seen in 2 patients (5%) which needed no blood transfusion or surgical intervention, both patients were treated conservatively with complete resolution of hematomas.

4 patients (10%) developed mild to moderate pulmonary regurgitation.

Failure of the procedure occurred in one patient (2.5%) because of inability to pass the balloon through PV.

No mortality was recorded.

Table 1: Baseline characteristics of patients with Pulmonary Stenosis who underwent BPV

Variable	Value
Number	40
Mean age (years)	22 +/- 5.5
Weight (kilograms)	45.5 +/- 6.5
Height (cm)	140 +/- 20
Males (%)	22 (55)
Shortness of breath as presenting symptom (%)	24 (60)
Chest pain as presenting symptom (%)	6 (15)
Palpitation as presenting symptom (%)	10 (25)
RVH in the ECG (%)	25 (62)
RBBB in the ECG (%)	10 (25)
Normal ECG (%)	10 (25)
Pressure gradient between RV and PA (mmHg)	112 +/- 46.28
Mean PA pressure (mmHg)	21.35 +/- 5
RV failure (%)	2 (5)
Associated VSD (%)	3 (7.5)
Subvalvular stenosis (%)	2 (5)
Tricuspid regurgitation (%)	32 (80)
RV dilatation (%)	20 (100)

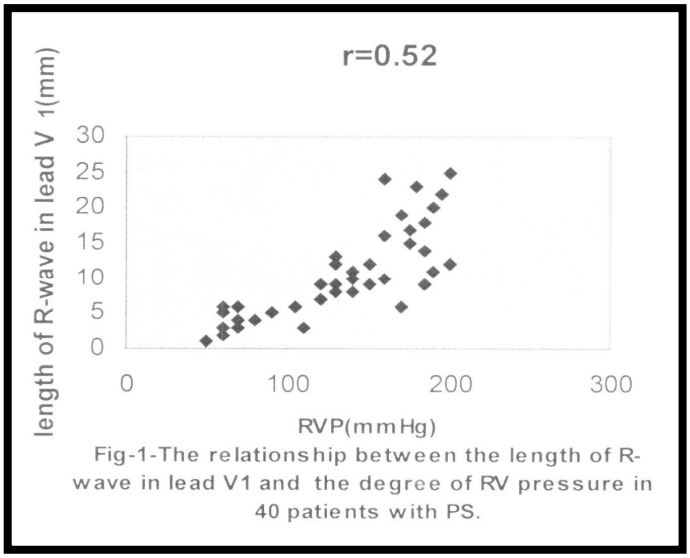

Fig-1-The relationship between the length of R-wave in lead V1 and the degree of RV pressure in 40 patients with PS.

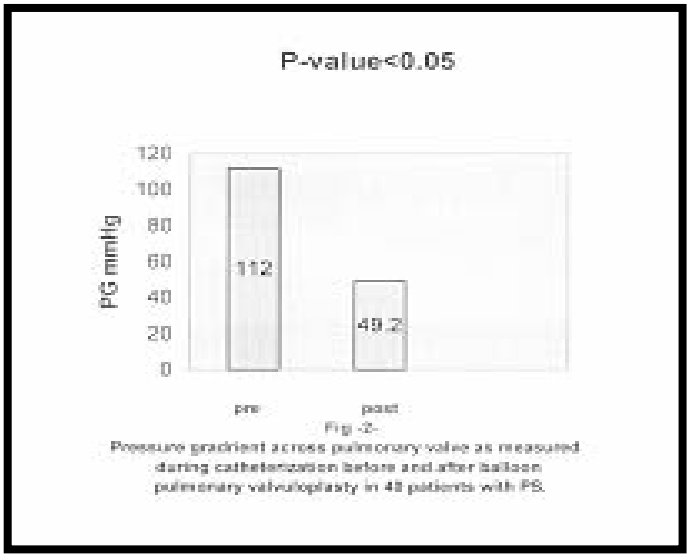

Fig -2-
Pressure gradient across pulmonary valve as measured during catheterization before and after balloon pulmonary valvuloplasty in 40 patients with PS.

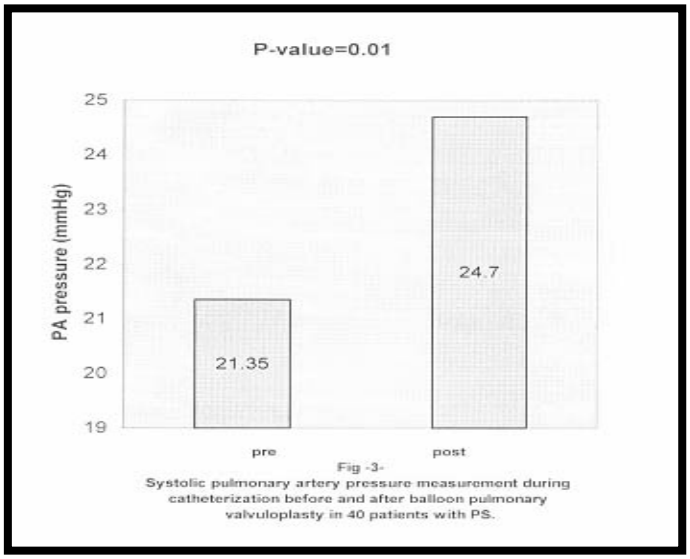

Fig -3-
Systolic pulmonary artery pressure measurement during catheterization before and after balloon pulmonary valvuloplasty in 40 patients with PS.

Discussion:

This study represents the experience of one cardiac hospital in BPV. It involved adolescents and young adults who either escaped detection of PS during their childhood or simply treatment was not available to them during their childhood.

There was a significant correlation between RV pressure and the length of R wave in lead V1, it is reported that the degree of RVH is proportional to the severity of PS (5). Bourdillon stated that in conjunction with clinical data the ECG can be used to predict severity of pulmonary valve stenosis (14).

In this study there was a significant and marked reduction in mean pressure gradient across PV after BPV , from 112 +/- 46.28 mmHg to 49.25 +/- 34.7 mmHg.

Comparable results were achieved by Juarez (6), Fawzy (7), Jarrar (8), Ghannam (15), Lip (16), Hatem (17), and others (9,18,19).

In fact many studies reported that the pressure gradient across PV further decreased after a period of follow up (6, 7, 8, 17, 18).

After BPV the systolic PA pressure increased from 21.35 +/- 5 mmHg before the procedure to 24.7 +/- 8.03 mmHg after the procedure and this explained by increased blood flow to the pulmonary artery in previously stenotic pulmonary valve.

10 % of patients in this study developed pulmonary regurgitation, which caused no hemodynamic disturbance. Gibbs reported that pulmonary regurgitation after BPV is probably no worse than after surgical valvotomy (20). Poon reported that moderate pulmonary regurgitation occurred in 7 % of patients after BPV and this increased to 29 % after one year (21). Rao reported that 70 out of 80 patient underwent BPV developed pulmonary regurgitation however neither RV dilation nor paradoxical interventricular septal motion developed at late follow up 3 -10 years (9).

In two patients, hematoma at puncture site in the femoral region were developed which resolved on conservative treatment without the need for blood transfusion or surgical intervention.

No mortality was reported in this study and this is in accordance with other studies (7,19).

Failure of the procedure occurred in one patient (2.5 %). Other studies reported also high success rate (15, 17).

In conclusion BPV is effective and safe procedure in adolescents and young adults with valvular PS.

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