PREDICTORS OF MITRAL VALVE REPLACEMENT AFTER PERCUTANEOUS MITRAL VALVULOPLASTY

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Summary

Percutaneous mitral valvuloplasty (PVM) is an effective therapy for mitral stenosis in selected patients. Nonetheless, mitral valve replacement (MVR) may be still required after PVM in some cases. The aim of this analysis is to assess predictors of MVR after PVM. Our retrospective study includes 354 patients enrolled in our department (1996-2002). Thirty seven (10, 34%) of 354 patients underwent MVR at a mean interval of 13, 6±9,3 months after PVM. No major differences were apparent in the demographic features of patients who did or did not undergo surgery. Five patients (13%) underwent surgery within the first month after PVM while 32 patients (87%) were operated later. On univariate analysis several predictors were brought out: rheumatic antecedents, commissurotomy history, atrial fibrillation, severe mitral regurgitation before PVM or its aggravation after PVM, high echocardiography score, calcification, small mitral area, mitral gradient, diastolic and systolic arterial pulmonary pressure before PVM. However, on multivariate analysis only mitral area, diastolic and systolic arterial pulmonary pressure could be predictors for surgery. Certainly, PVM is an excellent treatment option in mitral stenosis. It is minimally invasive, well-tolerated and has a high success rate. But the need of surgery after PVM is not uncommon, so if a mitral valve restenosis occurred in patients with predictors of surgery, do we repeat PVM or directly perform RMV?

Key words : Percutaneous mitral valvuloplasty, mitral stenosis, mitral valve replacement

INTRODUCTION

Percutaneous mitral valvuloplasty (PVM) is an effective therapy for mitral stenosis in selected patients. In generally the procedure is well tolerated with a high success rate Nonetheless, mitral valve replacement (MVR) may be still required after PVM either for procedural complications such as acute mitral regurgitation [1] or for postprocedural indication such as a restenosis of the mitral orifice or increasing severity of mitral regurgitation [2]. Accordingly, the purpose of this analysis was to perform an analysis of patients undergoing PVM at a single department in order to assess predictors of MVR after PVM.

MATERIAL AND METHODS

Patients

Our retrospective study included 354 patients undergoing PVM for the first time, between January 1996 and December 2002 in the Cardiology Department of Sfax .There wasn't exclusion criteria. Baseline demographic and clinical data were obtained from medical file.

Echocardiography

Patients underwent M-mode, two dimensional, and Doppler transthoracic echocardiography short time before the procedure to evaluate mitral valvular and subvalvular morphology, and especially to define the transmitral pressure gradient, arterial pulmonary pressure and mitral area. Mitral valve morphology was quantitated using the "echo score" of Wilkins and colleagues[3], derived by grading valve calcification, subvalvular morphology ,valve thickness, and valve mobility on a scale from 0 (normal) to 4 (severely abnormal).

Patients underwent also a stomatologic check up and transoesophageal echocardiography prior to PVM to exclude the presence of left atrial thrombus, one of contraindication of PMV. Transthoracic echocardiographic measurement of valve area and transmitral pressure gradient was repeated one or two days after PMV.

We had usually used in our department during the procedure, the Inoue technique [4]**.** After atrial transeptal puncture, a transeptal catheter was advanced into the left atrium and the mean gradient across the mitral valve was obtained by simultaneous recordings of the left atrial and left

ventricular pressures. The mitral valve was subsequently dilated using an Inoue balloon catheter. Valve dilatations were repeated until there was a satisfactory increase in mitral valve area, a reduction in the left atrial pressure or transmitral pressure gradient, or an increase in the severity of mitral regurgitation. The design of the Inoue balloon allows safe and fast positioning across the valve. In addition, it is pressure extensible, allowing for the performance of a stepwise dilatation.

Statistical analysis

Statistical analyses were performed using Statistical Package for the Social Sciences version 13.0 for windows (SPSS). Independent predictors of cardiac surgery were identified by multivariate analysis with stepwise Cox proportional hazards regression, using entry variables with a p value 0.05 or less on a univariate Cox analysis. Data are presented as mean _ SD and were considered statistically significant at p less than 0.05.

RESULTS

Thirty seven (10,34%) of 354 patients including 8 men and 29 women underwent MVR at a mean interval of 13,6±9,3 months after PVM. The mean age was 34,6±13,4 years. No major differences were apparent in the demographic features of patients who did or did not undergo surgery (baseline clinical data are shown in table I). Five patients (13%) underwent surgery within the first month after PVM while 32 patients (87%) were operated later.

UNIVARIATE ANALYSIS

On univariate analysis several predictors were brought out : rheumatic antecedents, commissurotomy history, atrial fibrillation, severe mitral regurgitation before PVM or its aggravation after PVM, high echocardiography score defined by a score >=8, calcifications, small mitral area defined by an area, mitral gradient, diastolic and systolic arterial pulmonary pressure before PVM (tableII).

MULTIVARIATE ANALYSIS

However, when multivariate analysis was confined to predictors defined on univariate analysis; only mitral area, diastolic and systolic arterial pulmonary pressure were independent predictors for surgery after PVM (table III).

Table I : patient demographics characteristics

	Non surgical(n=317)	Surgical(n=37)	p VALUE
Age(years)	33,8 ±1 3,32	34,68±13,4	0,69
Female sex	259 (81, 7%)	28(76%)	0,37
Palpitation	107 (33, 76%)	14(36%)	0,62
PRE PVM NYHA CLASSIII	278 (88%)	34 (93%)	0,35
ATRIAL FIBRILLATION	66 (21, 7%)	15 (40,5%)	0,01
TRICUSPID VALVE DISEASE	117(36, 9%)	20(54%)	0,043
AORTIC VALVE DISEASE	126(39, 74%)	12(32%)	0,504

TableII : Univariate analysis: predictors of MVR after PVM.

	Non surgical (N=317)	Surgical (N=37)	P Value
Rheumatic antecedents	62,77 %	83,78 %	0,01
Commissurotomy history	9,4%	32,43%	0,01
Tricuspid valve disease	36,9 %	54,05 %	0,043
Atrial fibrillation	21,7 %	40,5 %	0,01
Calcification	0,3 %	16,21 %	0,001
Severe mitral regurgitation before PVM	0,12 %	24,32 %	0,0001
Aggravation after PVM	9,4 %	23,07 %	0,032
Résiduel stenosis	6,4%	24,32%	0,001
echocardiography score>8 (wilkins)	20,50%	59,45%	0,01
Mitral area after PVM(on 2D)	1,9±0,36	1,67±0,33	0,001
Mitral gradient	8,1±3,73	13,44±3,77	0,002
Systolic arterial pulmonary pressure	49,43±16,74	54,8±23,19	0,03
Diastolic arterial pulmonary pressure	44,29±13,6	51,09±15,55	0,02

Table III : Multivariate analysis: predictors of MVR after PVM.

	p VALUE	Hazard ratio with 95% confidence intervals
mitral area	0,015	2,52(1,01;3,46)
diastolic arterial pulmonary pressure	0,016	1,92 (1,26;2,24)
systolic arterial pulmonary pressure	0,003	2,23(1,34;3,58)

SURGICAL DATA

The main clinical indications for surgery after PMV were an acute or an aggravation of mitral regurgitation (~21%), a recurrent mitral stenosis (~27%) or others valve diseases associated (~53%). Morover a septal defect occurred in one patient, requiring surgery on emergency. In all patients we used mechanical leaflets valves.

Comment

Percutaneous mitral balloon valvulotomy (PMV) was introduced in 1984 by Inoue et al [4] and has since evolved as a safe and effective procedure in the management of patients with rheumatic mitral stenosis (MS).However, symptomatic MS develops in 7% to 21% of PMV patients [5]. Surgical mitral valve replacement (MVR) could be an alternative treatment options for these patients. So, we performed this study to define factors before or after the PVM that could predicts intervention.

This analysis has shown that approximately one of ten patients went on to have surgery after PVM in our population; however, only a small proportion (13%) had procedure within the first month. The majority (64%) underwent surgery outside of the first year. The main indication was coalition of others valve diseases, while in literature, the main indication is the acute mitral regurgitation [1]. On one hand, this may be explained by the prevalence of acute articular rheumatism which is the first cause of mitral stenosis in our country, and which affected many valves on the same time, on the other hand, 221 patients (62%) undergoing PVM had a pure mitral stenosis in our population so there is a low risk of severe mitral regurgitation after PVM.

On multivariate analysis, 3 factors emerged after PVM as predictors of surgery: small mitral area, high systolic or diastolic arterial pressure after PVM. These findings are similar to literature data.

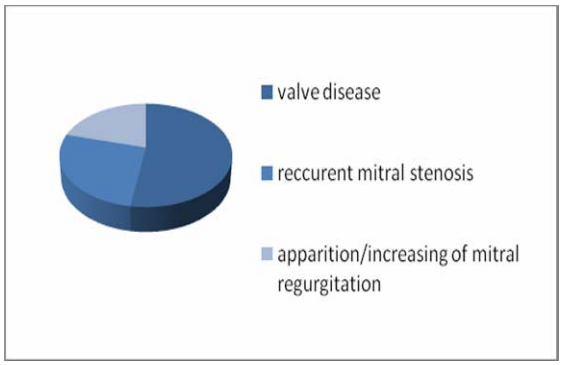
In fact many studies reported that mitral valve area is predictor of event free survival, of restenosis following PVM and so of surgery [6]. Thus could be explained by the major risk of complication when very small area, especially valve regurgitation by torn valve cusp.

High systolic and diastolic pulmonary pressure are also predictors of VMR as they reflects a severely stenotic valve, one that may not be initially suitable for PVM, and a persisting of high pressures after PVM reflects lack of success of the procedure. So, RVM in that situation is rational as we know that persistent, severe mitral stenosis and recurrent mitral stenosis after PVM were indications commonly encountered in the surgical group [7].

Some factors that normally might be expected to increase the need for surgery, for example, NYHA class (NYHA=II, p=0, 35) or massive calcifications(p=0,62)[7], didn't seem to be predictors of MVR in our patients . This is may be due that NYHA class is a subjective data and patients especially women (78% of patients undergoing surgery in our population) overestimate symptoms. For calcification, many operators had performed echocardiography and only someone had indicated the importance of calcification. Moreover, an important result of our study that number of dilatations was not predictors of surgery (p=0, 09). Even though the surgery group did have more dilatations on average, this did not be statically significant. Although, increased number of dilatation increase the post PVM regurgitation [7]this has no independent bearing on the need for surgery.

Finally, our data suggest that the indications for percutaneous mitral commissurotomy should be reconsidered, since there are unlikely to be satisfactory. In such cases, mitral valve replacement might be indicated after a short period of observation. And postponement of mitral valve replacement in elderly people may result in them coming to surgery in a worse physical condition than at the initial screening, because of functional deterioration after PVM as a primary procedure. Moreover, in this subset of patients, we have more expenditure, since the cost of balloon mitral commissurotomy, needs to be added to the cost of mitral valve replacement a few years later.

Fig 1: Indication of RMV



CONCLUSION

Certainly, PVM is an excellent treatment option in mitral stenosis. It is minimally invasive, well-tolerated and has a high success rate. But the need of surgery after PVM is not uncommon and further studies are needed to determine what combination of events or variables may lead to an increased risk of surgery after PMV, and whether or not these can be flagged for possible early surgical intervention or even surgery in the first instance to avoid any other morbidity associated with the PMV

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