International Journal of Cardiology, 24 (1989) 246–248
Elsevier

CARDIO 09088

Single balloon valvotomy for rheumatic mitral restenosis

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(Received 7 December 1988; revision accepted 8 February 1989)

Four male patients aged 22 to 35 years (mean 29 ± 5.6) with mitral restenosis following closed mitral valvotomy 6 to 12 years (mean 8.5 ± 2.5) ago were subjected to percutaneous single balloon valvotomy. There was significant increase in the area of the mitral valve accompanied by a substantial reduction in the transmitral gradient ($P < 0.01$). Mitral regurgitation of grade +1 developed in one patient. Balloon valvotomy may be safely and effectively performed in selected patients with mitral restenosis after surgical commissurotomy.

Key words: Balloon valvotomy; Mitral restenosis

Introduction

Percutaneous balloon valvotomy has been effectively utilized in severe mitral stenosis, mitral stenosis with mild to moderate regurgitation, calcific mitral stenosis [1,2] and recently also in patients with mitral valvar restenosis following surgical commissurotomy of both closed and open types [3]. This report describes the hemodynamic and clinical results of balloon valvotomy in 4 patients having mitral restenosis following closed mitral valvotomy.

Case Report

Four male patients aged 22 to 35 (mean 29 ± 5.6) years with mitral restenosis were subjected to percutaneous single balloon valvotomy. All 4 patients had undergone closed mitral valvotomy 6 to 12 years (mean 8.5 ± 2.5 years) ago and had developed progressive shortness of breath (New York Heart Association functional class III) in the last 2 to 3 years (Table 1). Clinical examination revealed moderately severe mitral stenosis. Left atrial thrombus was excluded by cross-sectional echocardiography. No patient had mitral regurgitation as assessed clinically and by Doppler echocardiography.

After informed consent, right and left heart catheterization was performed by right femoral percutaneous approach under local anesthesia. Transmitral gradient was recorded and mitral regurgitation ruled out by ventriculography. Cardiac output was calculated by the thermodilution technique and the mitral valve area by Gorlins' formula. Transseptal left heart catheterization was performed from the right femoral vein with a 7 Fr Mullins transseptal sheath and dilator (U.S.C.I., Billerica, MA) and Brockenbrough needle. A 7 Fr balloon tipped end-hole catheter was introduced into the left atrium through the Mullins sheath and negotiated into the descending thoracic aorta through the mitral and aortic valves. A 260 cm Teflon coated (size 0.038 inches) exchange guide wire was positioned in the descending thoracic aorta. The interatrial septum was dilated with an 8 mm balloon dilating catheter (Mansfield). A 23 mm valvotomy balloon catheter (Mansfield Inc.) was advanced over the exchange guide wire and positioned across the stenosed mitral valve. The valvotomy balloon catheter was inflated by hand until the indentation of the balloon due to the stenotic mitral valve disappeared (Figs. 1 and 2). Hemodynamic measurements, left ventriculography and right heart oxi-

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TABLE 1

Clinical characteristics of the patients.

Patient	Age (yr)	Cardiac rhythm	NYHA class	MR score	Post CMV (yr)
1	35	NSR	III	0	8
2	28	NSR	III	0	8
3	32	AF	III	0	12
4	22	NSR	III	0	6
Mean ± SE	29 ± 5.6		3 ± 0		8.5 ± 2.5

AF = atrial fibrillation; CMV = closed mitral valvotomy; MR = mitral regurgitation; NSR = normal sinus rhythm; NYHA = New York Heart Association; SE = standard error of mean.

metric study were performed following balloon valvotomy.

Statistics. Statistical analysis was performed using the Student *t*-test.

Results

Percutaneous balloon valvotomy using a single 23 mm balloon, was performed successfully in 4 patients with mitral restenosis. There were significant decreases in the pulmonary capillary wedge pressure and the transmitral end-diastolic gradient, accompanied by an increase in mitral valve area ($P < 0.01$) (Table 2). There was no step-up in oxygen saturation, and ventriculography revealed +1 mitral regurgitation in one patient. Over the following week all patients improved from New York Heart Association functional class I to class III. The second heart sound–opening snap duration

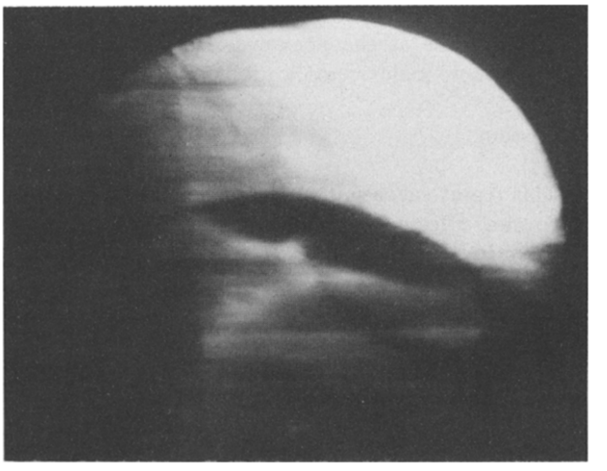

Fig. 1. Indentation on 23 mm balloon by restenosed mitral valve at early inflation.

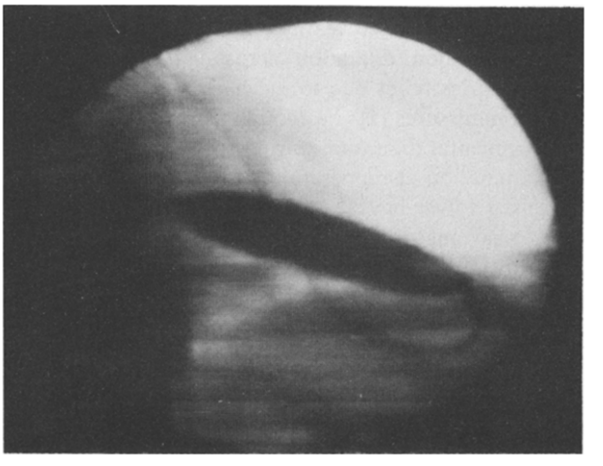

Fig. 2. Disappearance of indentation.

TABLE 2

Hemodynamic data before and after valvotomy for mitral restenosis.

Patient No.	PCWP (mm Hg)		PAP (mm Hg)		TMG (mm Hg)		CI (l/min/m^2)		MVA (cm^2)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	24	16	26	22	12	6	2.6	2.9	0.7	1.4
2	22	12	28	20	16	5	2.8	2.9	0.7	1.9
3	16	12	22	16	14	7	2.5	2.6	0.8	1.8
4	18	10	26	18	13	4	2.4	3.0	0.6	1.5
Mean ± SE	20 ± 3.7	12.5 ± 2.5	25.5 ± 2.5	19 ± 2.6	13.8 ± 1.7	5.5 ± 1.3	2.6 ± 0.2	2.9 ± 0.17	0.7 ± 0.1	1.7 ± 0.24
P	< 0.01		< 0.05		< 0.01		NS		< 0.01	

CI = cardiac index; MVA = mitral valve area; NS = not significant; PAP = mean pulmonary artery pressure; PCWP = pulmonary capillary wedge pressure; Post and Pre = after and before valvotomy; SE = standard error of mean; TMG = transmitral end-diastolic gradient.

increased, and the duration plus loudness of the mid-diastolic murmur at the apex were markedly reduced. There were no major complications.

Discussion

This report suggests that balloon valvotomy may be performed effectively and safely in selected patients with mitral restenosis following surgical commissurotomy.

Within 10 years, as many as 60 to 70% of the patients may develop recurrent stenosis following closed or open valvotomy [4,5]. There is little correlation between the frequency of restenosis and adequacy of the first surgical valvotomy [4]. The mechanism for restenosis may be refusion of leaflets and/or progressive sclerosis. Considerable contribution may be made by subvalvar pathology consisting of matted tendinous cords [4]. Balloon valvotomy would provide best results in patients with fused leaflets and little subvalvar pathology. Balloon dilatation across a stenosed mitral valve provides relief due to mechanical splitting of the fused commissures [1] – a mechanism similar to digital or instrumental dilatation during surgery.

Examination at reoperation and pathological studies of excised valves have, not uncommonly, demonstrated little or no anatomic residue of the previous commissurotomy [4,6]. Calcification of the valve is far less than anticipated, and the mitral regurgitation if produced by commissurotomy, usually does not increase. Hence, in selected patients, balloon valvotomy may provide equally good acute and long-term results as achieved by surgical commissurotomy. Moreover, repeat surgery entailing another thoracotomy with its physical, economic and psychological burden may be avoided. Additional studies are needed to delineate better the kind of patients with restenosis most appropriate for balloon dilatation, as also to assess the acute and long-term results of this technique.

Acknowledgement

Mr. B.S. Dagar's technical help is appreciated.

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