Balloon valvuloplasty for severe mitral valve stenosis in pregnancy

A report of 11 cases

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Balloon valvuloplasties for severe mitral stenosis were performed on 11 pregnant patients with excellent results and no complications. The mitral valve area was increased from a mean of 0.9 cm^2 to 2.1 cm^2. There was no clinically significant mitral regurgitation.

The pregnancies proceeded normally to delivery at or near term, with no maternal or perinatal morbidity or mortality.

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Balloon valvuloplasty is currently the procedure of choice for the surgical treatment of symptomatic tight mobile mitral stenosis in pregnancy.

Cardiac disease is the cause of significant morbidity and mortality in pregnancy. Rheumatic heart disease is unfortunately still common throughout South Africa. The Peninsula Maternal and Neonatal Service, Cape Town, delivers 28 000 women annually and manages on average 140 patients each year with cardiac disease — an incidence of 0.5%.

In a recent departmental audit (1993), pure mitral stenosis occurred in 15% and mixed mitral valve disease in 44% of cases.

Cardiac function in pregnant patients with mitral stenosis is often unpredictable. The cardiac output increases rapidly during the first half of pregnancy, rising to 30 - 40% above pre-pregnancy levels by the 24th week, with a further 20 - 30% rise during labour. These demands, which are due to vasodilatation and increased blood volume, may lead to rapid decompensation. The situation may be further aggravated by the development of hypertension, anaemia, infection or the onset of atrial fibrillation.

Medical management, utilising diuretics, digoxin or β-blockers, is often effective but, when decompensation occurs in early pregnancy, may be insufficient even when delivery by caesarean section is planned.

Termination of pregnancy in the presence of cardiac failure is hazardous, especially after 14 weeks' gestation; surgical correction of the mitral stenosis is a better option.

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The results of closed mitral valvotomy in pregnancy have been good, with few maternal or fetal complications.[1-3] Open heart surgery is more hazardous with a reported fetal mortality rate of 33%,[4] possibly due to lack of pulsatile bloodflow during bypass.[5] In addition, patients with prosthetic valves require anticoagulant therapy, which has particular risks in pregnancy.

Closed balloon mitral valvuloplasty is a more recently introduced procedure but experience with this technique during pregnancy is limited.[3,6-8]

We report the results of 11 balloon valvuloplasties for mitral stenosis performed at Groote Schuur Hospital in the period September 1989 to May 1995.

The important parameters pre- and post-valvulotomy are shown in Table I. There were no cardiac or other complications in these patients. In 2 cases technical problems were encountered when the 34-week-sized uterus impeded the passage of the femoral catheter.

There was a dramatic clinical improvement in all patients, and they were able to be discharged from hospital prior to delivery. In a few cases there was a slight increase in the degree of mitral regurgitation; this was not clinically significant.

The mitral valve area prior to the procedure varied from 0.6 cm^2 to 1.7 cm^2 (mean 0.9 cm^2) and this increased to 1.8 - 3.6 cm^2 (mean 2.1 cm^2). There was a marked lowering of the mean left atrial pressure from 30 mmHg to 14 mmHg, with the expected relief of pulmonary congestion. The obstetric data are outlined in Table II.

There were no abortions and apart from the patient with a twin pregnancy all proceeded to term. There was no fetal or maternal morbidity or mortality.

Although the caesarean section rate was high (60%) this was unrelated to the cardiac status of the patient. Two caesarean sections were performed for breech presentation, 2 for dystocia and 2 for fetal distress that developed during labour. Three patients underwent tubal ligation at the time of caesarean section.

Discussion

These excellent results support the continued use of balloon valvuloplasty in suitable patients and are similar to those of other published series.

Sananes *et al.*[7] reported 11 cases without complications apart from mild mitral regurgitation in 6 cases. However, follow-up 6 - 12 months after delivery revealed that all patients had remained symptom-free. Kalra *et al.*[9] from New Delhi reported on 26 successful percutaneous mitral commissurotomies in 27 pregnant patients without complications and universal improvement from class 4 to

Table I. Haemodynamic parameters before and after balloon valvuloplasty

	Before					After				
Patient No.	PAP	LAP	MDG	MVA	MR	PAP	LAP	MDG	MVA	MR
1	100/40/70	25	18	0.65	0-1	70/30/50	5	6	2.7	0 - 1+
2	40/25/30	23	15	1.0	0	23/15/19	9	4	2.3	0
3	65/30/45	37	24	0.65	0	60/30/42	7	5	1.8	1+
4	72/45/56	39	25	0.7	0	33/13/22	14	5	1.8	0
5	45/30/35	23	17	0.9	0	30/15/25	20	6	1.8	0
6	62/34/46	38	27	1.1	0	40/20/27	22	7	2.0	1 - 2+
7	40/15/30	23	8	1.7	0	45/25/35	10	7	2.3	0
8	50/20/40	26	20	1.4	0	33/18/20	8	3	3.6	1 - 2+
9	50/24/36	31	18	0.9	0	36/15/23	11	6	2.0	1+
10	70/40/50	37	28	0.6	0	39/14/24	14	6	1.9	0
11	76/46/59	28	18	1.0	0	63/36/47	13	4	1.9	0
Means	63/34/47	30	19	0.9		46/23/28	14	5.4	2.1	

PAP = pulmonary artery pressure (mmHg), systolic/diastolic/mean; LAP = mean left atrial pressure (mmHg); MDG = mean diastolic gradient across mitral valve (mmHg); MVA = mitral valve area (cm^2); MR = mitral regurgitation.

Table II. Obstetric data and outcome after balloon valvuloplasty

Patient No.	Age (yrs)	Gravidity	Gestational age (wks)	Class	Delivery	Weight (g)	Comment
1	23	2	34	4	Forceps	3 000	Uncomplicated
2	32	4	27	4	Caesarean	3 300	Breech
3	27	2	17	4	Spontaneous	3 400	Uncomplicated
4	27	1	26	3	Caesarean	3 220	Fetal distress
5	28	2	23	4	Caesarean	2 200	Breech
6	17	3	20	4	Spontaneous	2 880	Uncomplicated
7	27	2	36	4	Caesarean	3 000	Poor progress
8	36	4	30	4	Caesarean	2 700	Fetal distress
9	29	4	10	4	Spontaneous	2 650	Uncomplicated
10	29	3	17	3	Spontaneous	2 725	Uncomplicated
11	23	1	26	4	Caesarean	1 500	Poor progress
					(twins)	1 300	

Class = New York Heart Association classification.

class 1 New York Heart Association functional grades. Ribiero *et al.*[10] reported similar results in 7 pregnant patients from Riyadh. Patel *et al.*[3] described the procedure in 19 pregnant patients with immediate symptomatic improvement in all and moderate mitral regurgitation in 1 patient.

The procedure itself is relatively straightforward in experienced hands and does not require general anaesthesia. The reported low incidence of mitral regurgitation is reassuring but longer follow-up of these patients is obviously required. In the non-pregnant group reported by Reyes *et al.*,[6] the patients treated with balloon valvuloplasty had slight but significantly larger mitral orifices after 3 years.

Two patients had the procedure performed late in the third trimester, 1 at 34 and the other at 36 weeks. The procedure was technically difficult to perform in both these patients, but success was achieved by turning the patients onto their sides in order to advance the catheters and balloon along the inferior vena cava.

Two major concerns need to be addressed — mitral valve rupture, with consequent severe mitral regurgitation requiring urgent valve replacement surgery, and fetal radiation exposure. The incidence of severe mitral regurgitation is 3% in large series,[3] although mild-to-moderate mitral regurgitation is seen in up to 30% of patients. In small series, severe mitral regurgitation has not been reported during pregnancy.[3,9] A possible explanation could be that the hormonal changes occurring during pregnancy make the valves more 'splittable'.

The lower abdomen is shielded throughout the procedure but fetal radiation exposure is still a concern. Using the Inoue balloon as opposed to the bifoil, experienced hands can perform the procedure rapidly with a total fluoroscopy time of less than 10 minutes. In both the Durban group's[3] and our experience, when radiation levels were measured beneath the abdominal shield, they were found to be negligible and far from hazardous.

Current evidence supports balloon valvuloplasty in suitable cases as the procedure of choice in pregnancy.

The procedures were performed by the medical staff of the Cardiac Clinic, Groote Schuur Hospital, and we pay tribute to their skill and patient care.

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