the proposals for general practice budget holding and hospital opting out would negate much of the enterprise. The public must be told repeatedly about the likely consequences of the proposals, and the BMA council has launched this exercise. And negotiation must take place—and on equal terms, with flexibility and without the duress of a short timetable which owes more to political expediency than to the issues at stake.

In the negotiations the BMA and the royal colleges must speak with one voice, for any seeming division will be exploited to the full. The proliferation of colleges and faculties since 1948 makes this even more difficult, and so far their

voice has not been heard. But it is important that the colleges should find tough and skilled leaders of the calibre of Webb-Johnson and Moran; after all was it not Bevan who said that under their charters the royal colleges had the duty of advising the government of the day? The British public and the health professions deserve better than a return to the poor law; though normally both the BMA and the colleges and faculties have separate roles, on this occasion they must stand together.

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Percutaneous balloon valve dilatation

Good for the pulmonary valve but less good for others

Percutaneous balloon dilatation has been used successfully in treating stenosis of the pulmonary, mitral, aortic, tricuspid, and prosthetic valves in both children and adults. Initial reports have described appreciable short term haemodynamic and symptomatic improvement and a low incidence of the complications of emboli and acute valvular regurgitation. Some stenotic valves are, however, far more amenable to balloon dilatation than others, and the United States Food and Drug Administration has approved only dilatation of the pulmonary valve. It is now considered to be the primary treatment for children and adults with pulmonary stenosis.

Balloon dilatation of the mitral valve was first performed successfully in 1984 by Inoue.¹ The procedure works by separating fused commissures and fracturing nodular calcium within the mitral leaflets. In 1985 Lock *et al* described their results in eight children and young adults with rheumatic mitral stenosis who underwent percutaneous balloon dilatation.² It almost doubled the mitral valve area, and catheterisation after two to eight weeks showed persistent haemodynamic improvement in seven of the eight patients.

These earliest cases were limited to young patients without mitral valve calcification or mitral regurgitation, but balloon dilatation has now been tried in elderly patients with severe calcified mitral valve disease.^{3,5} Over almost three years our coworkers in this laboratory performed percutaneous balloon dilatation of the mitral valve in 87 patients: cardiac output increased by almost a quarter, mitral valve area was almost doubled, and the mean mitral pressure gradient was halved. Three patients had cardiac tamponade, one had papillary muscle rupture and a coronary embolus, two had a cerebrovascular accident, 21 had an atrial septal defect created, and one died. After a mean of 14 months' follow up 77 patients showed improvement in their symptoms, four had had recurrent symptoms, and eight had died. Palacios *et al* reported similar results in 172 patients with severe mitral stenosis.⁵ Complications included death in 2% of patients, severe mitral regurgitation in 1%, thromboembolism in 2%, heart block in 1%, and pericardial tamponade in 1%. McKay *et al* achieved similar results with a double balloon technique in 12 patients with rheumatic mitral stenosis.⁶ Mitral regurgitation did not increase in any patient, and there were no embolic episodes; small left to right shunts developed in two patients.

Based on these results and others⁷ we advise balloon dilatation of the mitral valve for two groups of patients: those who are at high risk for an operation because of severe pulmonary hypertension, biventricular heart failure, and advanced age or associated medical conditions such as chronic

pulmonary or renal failure and those who are not suitable for either long term treatment with anticoagulant drugs or a porcine bioprosthesis.

Percutaneous balloon dilatation of the aortic valve was first performed in 23 children and young adults by Lababidi *et al* in 1984 and subsequently by Rupprath and Neuhaus in 1985.^{8,9} Successful balloon dilatation in adult patients with calcific aortic disease was first described by Cribier *et al* in 1986,^{10,11} and several large series have been recently reported. Our coworkers have performed balloon dilatation of the aortic valve in 193 consecutive patients and have achieved a 50% increase in aortic valve area, a small increase in cardiac output, and a reduction of the peak aortic valve pressure gradient by half.¹² The early mortality of 3.5% is comparable in this elderly frail group to that from an operation. Three quarters of the patients were free of symptoms 7.5 months after the procedure. The mortality at six months was 18%; medical treatment results in a 43% mortality at one year.¹³ Restenosis occurred in about four fifths of patients.

Letac and coworkers recently reported their results in 218 adult patients, over half of whom were aged 75 or older and a third of whom were 80 or older.¹⁴ They produced a halving of the peak aortic gradient and almost a doubling of the aortic valve area. Follow up of 144 of their patients at a mean of eight months after dilatation showed that 24 had died and in 120 the symptoms had improved. Similar results were reported by Block and Palacios in 54 patients who underwent balloon dilatation of the aortic valve with the retrograde arterial technique and in 36 patients in whom the transseptal antero-grade technique was used.¹⁵ Eight patients died in hospital within one week after the procedure. All other patients showed an improvement in their symptoms, but at follow up an average of almost six months after dilatation 23 patients had died and 22 were classified as New York Heart Association functional class III and 22 as class IV. Repeat catheterisation was performed in 15 patients, 13 of whom had recurrent symptoms. The restenosis rate was predicted to be 56%. Spriggs and coworkers have recently reported their experience from Britain with percutaneous balloon dilatation of the aortic valve.¹⁶ They showed a reduction in the peak aortic valve pressure gradient and an increase in the aortic valve area, but restenosis was the rule. Only half the patients survived for a year.

Balloon dilatation of the aortic valve thus achieves only a modest and temporary improvement in valve function, symptoms, and outcome in elderly patients with severe calcific aortic stenosis. This is presumably because the fracture through the calcium deposits within the valve cusps

quickly heals. Dilatation cannot therefore be recommended for routine treatment of aortic stenosis. In adults with calcific disease it is purely a palliative procedure.

Balloon dilatation of the aortic valve may, however, be useful as a bridge to an operation. Firstly, in patients in whom the operative risk is considered prohibitive because of poor left ventricular function balloon dilatation may be used before aortic valve replacement to reduce surgical mortality and morbidity.¹⁷ Secondly, we have used balloon dilatation in patients who have both critical aortic stenosis and a second medical condition requiring an urgent operation—for instance, resection of a malignancy, fixation of a hip fracture, or an operation for gastrointestinal bleeding.¹⁸ Thirdly, in patients with a low aortic valve gradient, a low cardiac output, and a small valve area balloon dilatation of the aortic valve may be used to assess the patient's ventricular response to a decreased afterload and may thus help in deciding whether to proceed to valve replacement.

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- Inoue K, Owaki T, Nakamura T, Kitamura F, Miyamoto N. Clinical application of transvenous mitral commissurotomy by a new balloon catheter. *J Thorac Cardiovasc Surg* 1984;87:394.
- Lock JE, Khalilullah M, Shrivastava S, Bahl V, Keane JF. Percutaneous catheter commissurotomy in rheumatic mitral stenosis. *N Engl J Med* 1985;313:1515-8.
- McKay RG, Lock JE, Safian RD, et al. Balloon dilatation of mitral stenosis in adult patients: postmortem and percutaneous mitral valvuloplasty studies. *J Am Coll Cardiol* 1987;9:723-31.
- Palacios I, Lock JE, Keane JF, Block PC. Percutaneous transvenous balloon valvotomy in a patient with severe calcific mitral stenosis. *J Am Coll Cardiol* 1986;7:1416-9.
- Palacios I, Block PC. Percutaneous mitral balloon valvotomy (PMV): update of immediate results and follow-up. [Abstract.] *Circulation* 1988;78:11-489.
- McKay CR, Kawanishi DT, Rahimtoola SH. Catheter balloon valvuloplasty of the mitral valve in adults using a double balloon technique. *JAMA* 1987;257:1753-61.
- Babic UU, Pejic P, Djuricic Z, Vucinic M, Grujicic SM. Percutaneous transarterial balloon valvuloplasty for mitral valve stenosis. *Am J Cardiol* 1986;57:1101-4.
- Lababidi Z, Wu JR, Walls JT. Percutaneous balloon aortic valvuloplasty: results in 23 patients. *Am J Cardiol* 1984;53:194-7.
- Rupprath G, Neuhaus KL. Percutaneous balloon valvuloplasty for aortic valve stenosis in infancy. *Am J Cardiol* 1984;53:194-7.
- Cribier A, Savin T, Saondi N, Rocha P, Berland J, Letac B. Percutaneous transluminal valvuloplasty of acquired aortic stenosis in elderly patients. An alternative of valve replacement? *Lancet* 1986;i:63-7.
- Cribier A, Savin T, Berland J, et al. Percutaneous transluminal balloon valvuloplasty of adult aortic stenosis: report of 92 cases. *J Am Coll Cardiol* 1987;9:381-6.
- Leonard BM, Berman AD, Kuntz RE, et al. Follow-up of balloon aortic valvuloplasty: results in 170 cases [Abstract]. *Circulation* 1988;78:11-593.
- O'Keefe JH, Jr, Vlietstra RE, Bailey KR, Holmes DR, Jr. Natural history of candidates for balloon aortic valvuloplasty. *Mayo Clin Proc* 1987;62:986-91.
- Letac B, Cribier A, Konig R, Bellefleur JP. Results of percutaneous transluminal valvuloplasty in 218 adults with valvular aortic stenosis. *Am J Cardiol* 1986;62:598-605.
- Block PC, Palacios IF. Clinical and hemodynamic follow-up after percutaneous aortic valvuloplasty in the elderly. *Am J Cardiol* 1988;62:760-3.
- Spriggs DC, Jackson G, Chambers JB, et al. Balloon dilatation of the aortic valve for inoperable aortic stenosis. *Br Med J* 1989;297:1007-11.
- Block PC. Aortic valvuloplasty—a valid alternative? *N Engl J Med* 1988;319:169-71.
- Levine MJ, Safian RD, Diver DJ, McKay RG. Palliation of valvular aortic stenosis by balloon valvuloplasty as pre-operative preparation for non-cardiac surgery. *Am J Cardiol* 1988;62:1309-10.

Examination of the placental circulation by Doppler ultrasound

Its place in management still to be defined

Ultrasound techniques allow the fetus to be observed safely and directly in ways that were unimaginable 20 years ago. The most recent development is Doppler analysis of blood flow velocities, by which the two placental circulations—uteroplacental and fetoplacental—can be studied. Identifying the circulatory problems that underlie “placental insufficiency” may now be possible.

The basic measurement is the change in the frequency of ultrasound reflected from moving blood. Apart from the physical limitations of the technique there are practical problems. The first is to identify the vessel of interest and sample the flow at a known position. When the cheaper, continuous wave instruments are used the sampling depends on the observer's recognition of waveform patterns—the measurement is taken when the “right” signal is found. With concurrent imaging at least some vessels can be identified and sampled at a particular place. The new and expensive duplex colour systems enhance this capacity.

The second problem is that, although the angle at which the vessel is insonated cannot be controlled, it affects the amplitude of the signal. Absolute measurements are therefore hard to obtain. Various ratios of the maximal frequency shifts in systole and diastole are used instead, which are independent of the angle of insonation and reflect the degree to which blood flow is sustained during diastole. High diastolic flow characterises circulations with low resistances, including both placental circulations in healthy pregnancies.

The fetoplacental circulation is much easier to assess than the uteroplacental circulation. Values for normal pregnancy show a relative increase in diastolic flow maintained until 40 weeks of gestation, implying a gradual reduction in fetoplacental vascular resistance.¹

Reduced or absent diastolic flow in the umbilical artery is found with some fetuses that are small for gestational age,

commonly in the context of pre-eclampsia.²⁻⁴ This change should reflect an abnormally high resistance in the fetoplacental circulation, but this has not been measured and cannot be assumed. Impaired diastolic flow, however, correlates with altered structure—fewer arteries in the tertiary chorionic villi⁵—and function—the fetuses are usually hypoxaemic and often acidaemic.⁶

The best way to use this information in clinical practice has not been defined. Possible benefit has been suggested by the results of a small randomised trial: the availability of Doppler measurements of blood flow in the umbilical artery reduced the incidences of fetal distress and caesarean sections in labour.⁷

A serious limitation is that the test shows an abnormality but not the extent of fetal reserves. Nor is the investigation a global test of fetal wellbeing: fetuses that are ill with infection, Rhesus disease, or intrinsic metabolic problems would, for example, not be expected to have abnormal readings. Some fetuses with no umbilical arterial diastolic flow are neither hypoxaemic nor acidaemic—that is, they have circulatory abnormalities but function is well maintained. But even when hypoxaemia supervenes compensatory mechanisms can be activated⁸ so that delivery is not necessarily mandatory, particularly at earlier gestational ages.

In contrast, fetal heart rate patterns, controlled by the central nervous system, give a more immediate and broader, albeit incomplete, view of fetal wellbeing. The same is true of the “biophysical profile.”⁹ These tests can be used to time delivery—for example, a “terminal heart rate” as defined by Visser and Huisjes¹⁰ is an absolute indication for immediate delivery unless the fetus is not viable. Doppler readings of blood velocities in the umbilical artery do not allow the need for urgent elective delivery to be assessed.

Doppler measurements are likely to become a useful