ing Doppler studies and colour flow mapping, in only six patients. Transoesophageal echocardiography clearly showed paraprothetic leaks in all six patients with a mechanical prosthesis and central leaks due to leaflet dehiscence in all three patients with a bioprosthesis. These results were confirmed by cardiac catheterisation or operation or both in five patients, with two patients proceeding to surgery on the basis of transoesophageal echocardiographic findings alone.

The evaluation of prosthetic mitral valve dysfunction by transthoracic echocardiography is limited by acoustic masking by the prosthesis, whereas the transoesophageal probe can be positioned directly behind the left atrium. The results of transoesophageal echocardiography of mitral prosthetic dysfunction correlate well with surgical findings.^{2,3}

I W BLACK
A HOPKINS
C L LEE
B JACOBSON
W F WALSH

Department of Cardiovascular Medicine,
Prince Henry Hospital,
Anzac Parade, Little Bay 2036,
Sydney, Australia

- 1 Seward JB, Khandheria BK, Oh JK, *et al*. Transoesophageal echocardiography: technique, anatomic correlations, implementation and clinical applications. *Mayo Clin Proc* 1988;63:649-80.
- 2 van den Brink RBA, Visser CA, Basart DCG, Duren JR, de Jong AP, Dunning AJ. Comparison of transthoracic and transoesophageal colour Doppler flow imaging in patients with mechanical prostheses in the mitral valve position. *Am J Cardiol* 1989;63:1471-4.
- 3 Calafiore P, Stewart WJ, Lombardo H, *et al*. Transoesophageal echocardiography in mitral prosthetic dysfunction: echo-surgical correlation [Abstract]. *J Am Coll Cardiol* 1989; 13(suppl A):69A.

Follow up of patients treated with balloon dilatation of the aortic valve

SIR,—Vogel *et al* (1989;62:148-53) used pressure differences measured invasively as peak to peak gradients and non-invasively by Doppler echocardiography as peak instantaneous gradients to evaluate the success of treating aortic valve stenosis by balloon dilatation. They used a regression equation obtained by comparing the results in 12 patients to correct Doppler gradients to the corresponding peak to peak gradients. There are several objections to this approach:

(a) Peak to peak gradients measured by catheterisation and peak instantaneous gradient measured by Doppler echocardiography are conceptually different and the use of regression equations to estimate one from the other is not reliable.¹ Large differences are frequently seen between these two types of gradient.^{2,3}

(b) This difference is often considerable in patients with aortic regurgitation,² which was present in 60% of the patients in this study after the procedure.

(c) The peak instantaneous gradient is always higher than the peak to peak gradient.³ The regression equation applied showed that the inverse was the case in the reported study, indicating less than perfect Doppler echocardiographic recordings.

If pressure gradients are used it is probably more appropriate to estimate either mean gradients or peak instantaneous gradients, both of which can be measured invasively as well as

by Doppler echocardiography. This eliminates the need for a regression equation.

The use of valve areas has been recommended for follow up of adult patients.⁴ This is probably more important in children, in whom the absolute valve areas vary more than in adult patients. I recommend use of the continuity equation to calculate the valve areas according to Skjaerpe *et al*⁵ using the actual transvalvar flow.

DAG TEIEN

Department of Clinical Physiology,
Umeå University Hospital,
S-901 85 Umeå, Sweden

- 1 Currie PJ, Seward JB, Reeder GS, *et al*. Continuous-wave Doppler echocardiographic assessment of severity of calcific aortic stenosis: a simultaneous Doppler-catheter correlative study in 100 adult patients. *Circulation* 1985;71:1162-9.
- 2 Krafchek J, Robertson JH, Radford M, Adams D, Kisslo J. A reconsideration of Doppler assessed gradients in suspected aortic stenosis. *Am Heart J* 1985;110:765-73.
- 3 Hegrenäs L, Hatle L. Aortic stenosis in adults. Non-invasive estimation of pressure differences by continuous wave Doppler echocardiography. *Br Heart J* 1985;54:396-404.
- 4 Vogel JHK, King SB III. *Interventional cardiology. Future directions*. St Louis: CV Mosby, 1989:242.
- 5 Skjaerpe T, Hegrenäs L, Hatle L. Noninvasive estimation of valve area in patients with aortic stenosis by Doppler ultrasound and two dimensional echocardiography. *Circulation* 1985;72:810-8.

This letter was shown to Dr Benson, who replies as follows:

SIR,—Dr Dag Teien's comments prompted us to review our study and we agree with him that peak to peak gradients are poor reflections of instantaneous gradients across the stenosed aortic valve.¹ The instantaneous gradient generally does overestimate the peak to peak gradient. Our regression equation was obtained at the same time as direct measurements of aortic and left ventricular pressures in the catheterisation laboratory. Upon reflection, it has become clear to us that under these conditions alterations in pressure and flow dynamics, systolic ejection times, and arterial compliance can influence the contour of the upstroke of the aortic pressure curve in such a way as to have the peak to peak gradient approach the instantaneous gradient. We no longer use the regression equation to correct the pressure gradient estimate.

Because we did not find depressed pump function in children with aortic stenosis we still regard the left ventricular to aortic gradient as clinically useful in decision making. This view is supported by the studies of the course of untreated aortic stenosis² in the paediatric patients in which peak to peak gradients rather than valve areas were used for assessment. Furthermore, from infancy to adolescence valve areas change considerably, in a non-linear way, which additionally complicates estimating a normal valve area for a given patient.

LEE BENSON

Division of Cardiology,
Department of Paediatrics,
The Hospital for Sick Children,
555 University Avenue, Toronto,
Ontario, Canada M5G 1X8

- 1 Gordon JB, Folland ED. Analysis of aortic valve gradients by transeptal technique, implications for noninvasive evaluation. *Cathet Cardiovasc Diagn* 1989;17:144-51.
- 2 Wagner HR, Ellison RC, Keane JF, Humphries J, Nadas AS. Clinical course in aortic stenosis. *Circulation* 1977;56:1-47-1-56.

BOOK REVIEWS

Electrocardiography of Arrhythmias. Charles Fisch. (pp 451; £34.03.) Philadelphia and London: Lea and Febiger, 1990. ISBN 0-8121-1265-2.

Does the surfeit of books on basic electrocardiography—introductions, primers, guides and the like—tell us that the subject is unduly difficult to comprehend? Perhaps it is too much taken for granted or possibly ignored by teachers; certainly in the United Kingdom, the home of Waller and Lewis two of the founding fathers, this seems to be so. We have no tradition of the "heart station" with reporting of tracings as a regular feature of hospital life and thus less opportunity for the watching student to learn the practical side of reporting from a mentor.

The European masters did know their fundamentals, however, though many had to make their way to the United States in the years encompassing the second world war. A happy liaison then developed between the rising expert on arrhythmias at the Michael Reese Hospital in Chicago, Louis N Katz, and two immigrants from Prague, Richard Langendorf and Alfred Pick. From them came a succession of papers and books on arrhythmias that have become classics. And now we have a major contribution from one of their foremost disciples and colleagues, Charles Fisch of Indianapolis. Dr Fisch is particularly well known for the courses he conducts at his Krannert Institute; but his programme on advanced arrhythmias on the Sunday before the annual meeting of the American College of Cardiology has brought him to the attention of many more who crowd into the lecture theatre to learn from his incisive analyses carried out in the form of a dialogue with members of a team to whom he shows complex tracings.

Now he has assembled and analysed representative selections from his extensive collection of material in the form of this book. It is not for the beginner, who might be better advised to have at hand and consult something like Dunn and Lipman's *Lipman-Massie Clinical Electrocardiography* (which also reflects the approach of the Chicago school) as well as a recommended introductory text. What Fisch does provide is an essential code book that explains concepts and phenomena which must be understood if the electrocardiographic analysis of arrhythmias—simple as well as complex—is to be more than the memorisation of some patterns.

Here we find descriptions of events that influence the electrocardiogram in classic, important, but too often poorly comprehended ways. The chapter headings indicate that this is no ordinary book that starts at the sinus node and ends with the recovery of the ventricles. They show the reader what is so often missing from the more conventional texts: careful descriptions of, for example, concealed conduction, aberration, and entrance and exit block that make possible understanding of what otherwise seems so difficult to sort out.

Although the text is liberally explained by well annotated examples of conventional elec-