response. However, rather more important was the finding that whatever the length of the nitrate free interval the therapeutic effects became somewhat attenuated within eight hours of the start of treatment and appreciably so after 12 hours: there was therefore no point in testing a shorter nitrate free interval because important therapeutic effects do not seem to last for over 12 hours of continuous therapy. Waters *et al* were also unable to show therapeutic benefit during intermittent treatment when they tested 12 and 16 hours after patch application[3] and though Schaer *et al*[4] showed significant effects at four and eight hours it was clear from inspecting their data that the results at eight hours were rather less statistically significant than those at four hours. It thus seems likely that tolerance develops so quickly during transdermal therapy that it limits its efficacy as a day long prophylactic agent.

The study reported by Fox *et al* rather supports our findings because treatment had very little influence on the circadian pattern of silent ischaemia—as one would expect if treatment had only been effective during the first few hours.

It is certainly not justified to conclude that the significant treatment effects demonstrated between three and five hours after patch application indicate that tolerance has been "avoided". Our results supported by data from other studies suggest that while the effects measured at 3–5 hours may have remained significantly better than those seen during placebo treatment, they are likely to be significantly worse than those seen after only 30–60 minutes of treatment and significantly better than those measured after eight hours or more. In other words, it seems likely that tolerance is a gradual but continuous process beginning from the moment that treatment is initiated.

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Novel exercise protocol suitable for use on a treadmill or a bicycle ergometer

SIR,—In their letter Dr Essamri and colleagues correctly state that the standardisation of exercise tests is now a major issue (*British Heart Journal* 1991;66:405–6) but they criticise the standardised exponential exercise protocol (STEEP) devised by Dr Northridge and colleagues (*British Heart Journal* 1990;64:313–6). In this useful protocol the exponential increase in work rate tends to keep exercise duration within the "ideal" range of 5–15 minutes even if exercise capacity in terms of peak external work rate differs widely. Detailed tables are provided for cycle ergometry work rates adjusted for the subject's weight so that their STEEP will be similar on a cycle ergometer and on a treadmill.

The differences between the cycle ergometer STEEP and treadmill STEEP protocols reported by Dr Essamri are relatively small—approximately a 13–19% difference in $\dot{V}O_2$ over the last six minutes of exercise. Such differences are expected because the cardiopulmonary responses to exercise vary according to the mass of active muscle: at a given submaximal work rate, heart rate and $\dot{V}O_2$ tend to be higher with cycle ergometry, whereas peak heart rate and $\dot{V}O_2$max tend to be higher on treadmill exercise.[1,2] Standardisation of work rate according to lean body mass rather than total body weight might further reduce these differences,[3,4] but to expect cycle ergometry and a motorised treadmill to be equivalent is unrealistic.

Dr Essamri and collegues also suggest that the relatively slow rise in $\dot{V}O_2$ over the first minutes of the STEEP makes it an unsuitable basis for the prediction of $\dot{V}O_2$max from $\dot{V}O_2$ at submaximal work rates. However, such extrapolations are always subject to large errors[5,6] and maximal tests are preferred when $\dot{V}O_2$max is to be determined.[7]

However, in the graphs presented by Dr Northridge and Dr Essamri we note that $\dot{V}O_2$ continues to increase steeply as a function of time over the last few minutes of exercise, whereas in many other protocols $\dot{V}O_2$ tends towards a plateau—it rarely if ever attains a plateau but at least becomes less steep, with a negative second derivative $d^2\dot{V}O_2/d(\text{time})$.[2] If subjects perform maximal symptom limited exercise then the effect of the continued steep rise in $\dot{V}O_2$ may be to amplify the effects on measured $\dot{V}O_2$peak of small changes in exercise duration due to variations in motivation and encouragement.

The debate between proponents of the cycle ergometer and proponents of the motorised treadmill is likely to continue for many years—the advantages and disadvantages of each are balanced and preferences often differ on a geographical basis.[8,9] As it is unlikely that cardiologists in all countries will agree to standardise on one or other form of exercise testing, the STEEP is a useful attempt to bridge this divide.

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BOOK REVIEW

Cardiac Electrophysiology and Arrhythmias. Eds Charles Fisch, Borys Surawicz. (Pp 448; $84) New York: Elsevier, 1991. ISBN 0–444–01601–5

This book is in many ways a testimony to the extraordinary progress in the subject over the past two or three decades. Indeed, 30 years ago there would have been little worth writing save for the six chapters on clinical arrhythmias, and each of these is in any case substantially influenced by the advent of clinical electrophysiological studies.

The editors, two leaders in the field, and respected because they have proved themselves in the classic tradition over the years, are to be commended for the fact that they have broadened the scope so considerably beyond Fisch's own recent book on the electrocardiographic diagnosis of arrhythmias. The first two major parts include chapters on mechanisms and on experimental arrhythmias which some might, unwisely, decide to gloss over. Difficult though some may be for the clinician, they are well worth reading for they form the scaffolding upon which the edifice of clinical arrhythmias, their diagnosis and management, depend. Over the past 20 years we have all become aware of the importance of the cardiac action potential and of ion movements, both in the genesis of normal and abnormal rhythms and in consideration of their treatment in some instances. But no longer can one divide arrhythmias in an apparently simple fashion into those dependent on automaticity and those that arise because of reentry; one can get deeper, by looking into the factors that promote such changes and also give rise to afterdepolarisations, the relevance of which are now becoming better appreciated.

Many will turn first, and justifiably, to the two excellent chapters on the differential diagnosis of tachycardias dependent on the width of the QRS, by Fisch and by Wellens; but there is important information in all the other chapters on clinical arrhythmias, and many who read these chapters will thereby be reminded of difficult cases that perhaps "got away". The use of exercise testing, signal averaged electrocardiography, and programmed electrical stimulation are all well discussed in separate chapters. The pharmacological sections offer relatively less new information and the chapter on sudden cardiac death, in particular, is somewhat out of place under pharmacology and not of the same high quality as most of the other contributions. The last part, dealing with non-pharmacological treatment, with emphasis on developments in pacing and ablative techniques (both electrically based and surgical) is of great interest because there are many developments in this area that are insufficiently widely known and where more patients could receive help.

Virtually all the chapters are well and relevantly referenced and the book not only has current usefulness but will continue to be a reliable and substantial source of information for some years to come. Many cardiologisits will wish to acquire it themselves as well as to see it on departmental library shelves.

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