DISEASE MANAGEMENT IN THE ELDERLY
Volume 2

Heart Disease in the Elderly

Edited by
Anthony Martin
and
A.John Camm

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Heart Disease in the Elderly

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DISEASE MANAGEMENT IN THE ELDERLY

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Volume 2
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A. Martin and A.J. Camm

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Series preface

In 1881 the clinical lectures of the great French physician Jean-Marie Charcot on senile and chronic diseases were translated and published in English. In these lectures he emphasized the importance of studying the pathology of the diseases of old age, claiming that only by such careful study would these diseases be clearly understood. In other words he was saying, 'What happens?', 'Why does it happen?', and 'How can we put it right?'

Geriatric Medicine is a comparatively new specialty. There were only four consultant physicians in Geriatric Medicine when the NHS started in 1948. In 1981 the number has expanded to exceed 500 and if the recommendations of the Short report are implemented, the number may well exceed 800. Such an expansion could not have occurred if those who practice in the specialty did not achieve satisfaction from their work. As Charcot pointed out, this is a 'very interesting part of medicine'. Doctors and others who are working in the field of the elderly have become fascinated by the 'What?' and 'Why?' and 'How?'.

As a result a discipline with its own body of knowledge has developed. That this body of knowledge exists has even been recognized by the Education Committee of the General Medical Council in 1980 when, in issuing new recommendations concerning the undergraduate medical curriculum, it emphasized that the 'attention of the student should be constantly directed to . . . the growing importance of the problems posed by disability and disease in an increasingly elderly population', and 'should receive instruction in the special problems and diagnosis and treatment of illness in the elderly . . .'

Sir William Osler once wrote that to study medicine without books is like sailing the sea without a chart. The same applies to Geriatric Medicine. Many excellent books have already been written on the subject. The specialty though, is still developing and our knowledge of the 'What, why and how?' is expanding. As Charcot said, 'its difficulties can only be surmounted by long experience and a profound knowledge of its peculiar characters'.

In this series of books concerning disease management in the elderly, the Authors and Editors have tried to draw on their experience and knowledge to attempt to answer some of the questions posed by What? Why? and How? in relation to the topics which they have chosen. It is hoped that the series will help students of Geriatric Medicine, whether they be undergraduates or postgraduate doctors or students or practitioners in the professions complementary to medicine such as nursing and remedial therapy, to a greater understanding of illness in the elderly. If this hope is achieved then some of the difficulties posed by 'senile pathology' may be surmounted so that those elderly may be enabled to lead fuller and more active lives.

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Preface

There is increasing recognition of heart disease in the elderly in the Western World. The enthusiastic cooperation of our specialist contributors in this book, on the special problems of heart disease in the elderly, highlights the importance of the subject in current medical practice.

We have been very fortunate in being able to collect contributors who are all experts of international reputation in their respective fields. Very few of them specialize exclusively in the problems of the elderly, but specialists in cardiological medicine and surgery inevitably have to deal with a large number of elderly patients. As editors we have taken the view that, since the field of cardiovascular disease in the elderly is so complex, it would be inappropriate to confine our contributors to doctors specializing solely in geriatric medicine. The advances in our knowledge of cardiac electrophysiology and pacing techniques, for example, have been so rapid in recent years that only full-time workers in cardiac departments have sufficient current knowledge to write authoritatively on the subjects.

In recent years several books have been published on various aspects of cardiovascular disease in the elderly. The present volume is distinguished by the fact that all our contributors are British and are thus able to provide a general overview of current practice in this country. In addition, most have worked in North America and regularly attend and address international meetings. We hope, therefore, that the analysis of the problems presented by disease of the heart in the elderly and their management by chemical, electrical, and surgical means will be relevant to doctors practising in the United Kingdom as well as in other parts of the world.

We have painted the subject of heart disease in the elderly with a broad brush, and have included extensive reviews of the epidemiology and pathology of the ageing heart in order to clarify the fundamental principles of the subject. The continuing discussion as to the relevance and importance of such diverse problems as hypertension, ischaemic heart disease, valvular disease, and heart failure need amplification, and these

are examined in some detail. Clinical electrocardiography has grown up during this century and with it a vast literature of findings in patients of all ages. Much of the evidence is conflicting and some of the earlier work on resting 12-lead electrocardiograms has now been clarified by the more recent introduction of the technique of dynamic electrocardiography. A substantial chapter in this book puts all this information into perspective and summarizes the current state of thinking as far as the elderly population is concerned.

Advances in our knowledge of cardiac electrophysiology and the recent introduction of highly sophisticated pacing techniques has revolutionized the quality of life for great numbers of old people. However, despite this, there are still vast numbers of people in the community who could benefit from cardiac pacing and we hope that a whole chapter devoted to this subject will go some way in helping physicians to rectify this situation.

The importance of drug therapy in modern medicine hardly needs stressing. However, there are very special problems in the clinical pharmacology of the elderly heart. This subject has been covered in a general way in a companion volume of this series. We feel that special treatment should be given to the area of cardiovascular drugs and have included an important chapter devoted entirely to this subject.

The final chapter in this book deals at some length with the matter of heart surgery in the elderly. As with so many aspects of the treatment of old people, physicians tend to be obsessed by numerical age. We believe that attitudes to the management of old people will have to change, because it can be clearly shown that the quality of life of the elderly may be greatly enhanced by aggressive treatment in some circumstances. In no area is this more true than with pacemaker implantation and cardiac surgery. The indications for surgical intervention may remain, for the time being, in some dispute, but it is incumbent on all physicians who treat elderly people to have a working knowledge of the implications of cardiac surgery.

In parts this volume is profusely illustrated and in others not at all. Indeed, this must be the only cardiological text to include no ECG tracings! We believe that our readers will have already examined a surfeit of ECG's, whereas they may not be so familiar with gross and microscopical specimens of pathology in the elderly. Our aim has been to provide a contemporary review of the wide spectrum of heart disease in the elderly. We realize that, even as we write, new advances in medical science may make us change our views, but that has never been a valid reason for delaying publication of a book.

ANTHONY MARTIN
A. JOHN CAMM

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Edited by A. Martin and A.J. Camm

Chapter 1

Introduction

ANTHONY MARTIN AND A. JOHN CAMM

In recent times the importance of the cardiological problems of old age has become particularly relevant due to the explosion in the size of the elderly population. The phenomenon of greatly increased numbers of old people is already a fact of Western countries, but, as will be seen, is about to become a problem in many other parts of the world. During the same time our understanding of the physiological and pathological aspects of heart disease has grown apace and a wider range of satisfactory treatment has become available.

The reasons for the expansion of the number of people living into old age are well illustrated by the situation in Great Britain. In the last 70 years there has been a reduction in the death rates in all age groups under the age of 65 years. This phenomenon has been most marked in the first year of life. For example, in the 1851 census the infant mortality rate was 153 per thousand live births in England and Wales (Millard, 1971). The impact of public health measures, such as the Sewage and Sanitation Act and the Smallpox Vaccination Act at the end of the last century, has resulted in a great reduction in the childhood mortality. By 1941 the mortality in the first year of life had fallen to 58 per thousand live births and the present rate is 13 per thousand (OPCS, 1980). The expectation of life for a male infant is now 68.8 years and for a female infant 74.8 years.

However, during the same period of time there has been no dramatic decline in the mortality rate of old people. A man aged 65 years at the time of the 1851 census had an expectation of life of 10 years, but in the following 120 years this figure had only increased to 12 years, despite all the major advances in medical techniques that had occurred in that time. A similar pattern is seen in women (Millard, 1971).

The result of these changing mortality patterns has produced a situation where there are now more than 8 million people in the United

Kingdom who are aged 65 years and over. This represents more than 14% of the total population. Perhaps of more importance in the consideration of health care is the fact that there are now about 3 million people over the age of 75 years, and of these three-fifths are women. Projections of the population in the United Kingdom suggest that the numbers of elderly people will continue to increase for at least the next 10 years (Table 1.1).

Table 1.1 The changing elderly population in the United Kingdom (OPCS, 1980)

Year	Total numbers (millions)			
	65–74 years	75–84 years	85 years and over	Total over 65 years
1981	5.1	2.6	0.6	8.3
1991	4.9	2.9	0.7	8.5
2001	4.5	2.8	0.9	8.2
2011	4.7	2.6	0.9	8.2

The population trends in the United States show a very similar pattern to that in the United Kingdom, although the proportion of the elderly is rather lower. In the next century it is estimated that there will be a sharp rise in the number of elderly persons (Table 1.2).

Table 1.2 Population projections for the USA, 1975–2050

Year	Total numbers (millions)		
	65–74 years	75 years and over	Total over 65 years
1975	13.9 (6.5%)	8.4 (3.9%)	22.3 (10.4%)
1990	17.5 (7.1%)	11.4 (4.7%)	28.9 (11.8%)
2000	17.1 (6.5%)	13.5 (5.1%)	30.6 (11.7%)
2050	29.1 (9.2%)	22.1 (6.9%)	51.2 (16.1%)

The population pattern in Eastern countries is rather different from that of the United States and Europe. The numbers of the old are increasing rapidly, largely as a result of improved health care. In the majority of Eastern countries the proportion of elderly people remains at about 5% of the total population as a result of the continuing high birth rate and a fall in perinatal and infant mortality rates. In Japan, however, a very different state of affairs exists, since there has been a precipitous fall in the birth rate since 1950. In fact, Japan now has the lowest birth rate in the world. This fall in the number of births, allied to much improved standards of health care, has already contributed to the beginnings of a very steep rise in the proportion of elderly people in that country. There are

currently about 8% of the population aged 65 years and over. The elderly population explosion in Japan will be more dramatic than in any country in the history of the world. By the end of this century there will be nearly 20% of the population over 65 years. This will be especially important as there are some similarities between the pattern of heart disease in Japan and in Western countries, although there has been a slight fall in the incidence of ischaemic heart disease in Japan in the last 10 years (Marmot *et al.*, 1981).

These ageing population statistics are important since we know that there is a progressive amount of physical disability with advancing years (Sheldon, 1948). This is particularly true of those aged 75 years and over. Old age sees the arrival of the major diseases of middle life, such as ischaemic heart disease, with much greater frequency. Degenerative diseases, such as disintegration of the conducting tissue of the heart and senile cardiac amyloidosis, rarely occur before the advent of late life (Pomerance, 1965; Davies, 1971). The impact of these diseases is much more serious on old people than on the young; the elderly frequently suffer from multi-system degenerative changes, and thus relatively minor degrees of cardiovascular abnormality may have devastating effects on cerebral, renal, pulmonary, and gastrointestinal function.

The mechanism of ageing in the human body is poorly understood, despite being the subject of considerable research (Rowlatt and Franks, 1978). Ageing processes cannot be satisfactorily explained by any single model. As in so many other aspects of life, genetic influences are extremely important when considering the features of ageing (Korenchevsky, 1961). External factors, such as exposure to ionizing radiation (Curtis, 1966) and to toxic chemicals (Stevenson and Curtis, 1961), may impair normal protein synthesis and cause frequent mutations. There does, however, appear to be a fundamental difference between mutations caused by external factors and those normally attributable to ageing (Price and Makinodan, 1973).

For some time it has been considered that autoimmune factors may have an important effect on ageing mechanisms (Burnet, 1959; Walford, 1974). Certainly as age advances there appears to be increased immunological incompetence. Lymphocytes and fibroblasts may undergo mutation and result in antigenically altered cell protein. Thus there is both the possibility of immune responses being set up against these cell proteins and also the development of clones of lymphocytic cells with potential autoimmune pathogenicity (Walford, 1974). There appears to be a decline in B cell immune activity with age; this may be due to a total reduction in the numbers of B cells or to a change in function of

these cells. These changes may account for the age-related shift in the levels of immunoglobulins in humans (Makinodan and Adler, 1975). The T cells also undergo defects with ageing and this is probably due to their reduced ability to proliferate (Makinodan and Adler, 1975). Whatever the mechanisms involved, there is an acceleration of the ESR (erythrocyte sedimentation rate) with ageing, and the appearance of autoimmune diseases such as amyloidosis and giant cell arteritis with increasing frequency.

The concept of cellular fall-out, the progressive loss of cells throughout the body, is an attractive theory. Some impetus to this concept was given by the *in vitro* experiments of Hayflick (1965), where he showed that the lifespan of human diploid fibroblasts was limited, but there is little evidence that this situation obtains *in vivo*. Limitations of lifespan potential *in vitro* may be due to deficiencies in the culture media (Hay and Strehler, 1967). Nevertheless, it has been shown that there is muscle cell loss in the sinoatrial node and internodal tracts in elderly people where there is no other obvious explanation, for example rheumatic inflammation, coronary artery disease, or secondary carcinoma (Davies and Pomerance, 1972). This may account for the well established high incidence of atrial fibrillation in otherwise healthy elderly subjects (Martin, 1974; Camm *et al.*, 1980).

The effects of hormonal, ethnic, and dietary factors in the development of heart disease in the elderly are extremely complex, and some features of these will be considered in more detail later in this volume. Certainly in all Western communities there is an increased incidence of atheromatous coronary artery disease as age advances. There is evidence of a decline in the secretory capacity of various endocrine organs, including the hypothalamic–hypophysial system, the adrenals, the thyroid, and the gonads (Gusseck, 1972). However, the true importance of these secretions in the elderly is unclear and has to be assessed in the light of the reduced lean body mass and decreased peripheral utilization of some hormones in the aged (Gusseck, 1972).

It is important to remember that heart disease in itself is not only likely to contribute to morbidity in the elderly, but is a significant factor in limiting the recovery of patients who have other medical and surgical problems. Similarly there are many others features of ageing that have an important influence on elderly patients with heart disease. With increasing age there is impairment of homeostasis; thus the individual has less ability to react to stress and changes in the external environment. For example, there is often impairment of temperature regulation, and the resulting hypothermia may produce serious cardiovascular problems in

old people (Royal College of Physicians, 1966). Studies of both hospital patients (Johnson *et al.*, 1965) and of elderly people living at home (Caird *et al.*, 1973) have shown that the adjustment of blood pressure with change in posture becomes less efficient with advancing age due to the reduced sensitivity of the baroreceptors. Other vasomotor mechanisms are also involved with the high incidence of postural hypotension in the elderly. These include the loss of arterial elasticity which allows the blood pressure to fall more rapidly with gravity before baroreceptor reflex activities come into play (Thulessis, 1976), and the presence of varicose veins which can affect the immediate pooling of blood in the capacity vessels (Caird *et al.*, 1973). In some patients with postural hypotension the expected rise in catecholamines, plasma renin activity, and plasma aldosterone may not occur with standing (Wollner, 1978). Plasma volume may be reduced by haemorrhage or sodium depletion, and postural hypotension may be an early feature of Addison's disease. Potassium deficiency is common in elderly people, as a result of diuretic therapy or because of a dietary deficiency, or both, and may cause postural hypotension which is correctable by potassium repletion (Cox *et al.*, 1973). Thus elderly people are at great risk from postural hypotension due to both degenerative autonomic changes and other factors, and even slight reduction in cardiac output or peripheral vascular resistance may have catastrophic results.

Increased sensitivity to many drugs may contribute to postural hypotension, amongst other unwanted effects. Antihypertensive agents are frequently responsible for causing postural hypotension, and the adrenergic neurone blocking agents guanethidine, bethanidine, and debrisoquine are especially likely to produce a marked fall in the standing blood pressure (Opie, 1980). However, there are many other groups of drugs that reduce blood pressure in the upright position, for example laevodopa, chlorpromazine, and the tricyclic antidepressants. Impairment of drug metabolism and excretion, as well as altered target organ sensitivity, occur in the elderly and will be discussed in detail in this volume.

The ageing process affects all body systems to a greater or lesser extent. These changes are sometimes measurable, for example the diminution of pulmonary function with increasing age. There is both a reduction in the forced vital capacity and the forced expiratory volume in one second (Morris *et al.*, 1971). This is the result of musculoskeletal changes in the chest wall as well as loss of compliance of the lung substance. On the other hand, in the kidney, progressive nephron loss with age may not be associated with any measurable change in the blood urea or creatinine