Natural History of Ventricular Septal Defect

Isolated ventricular septal defect (V.S.D.) is the commonest single form of congenital heart disease at birth and accounts for 30% of all cardiac abnormalities at this time, or about 2 per 1,000 live births.\(^1\)\(^2\) This means that at least 1,700 babies with isolated V.S.D. will be born each year in Britain. There has been considerable interest in the natural history of the condition because a wise decision regarding treatment can be reached only if the future of each patient can be reasonably well predicted. Dr. Maurice Campbell has recently reviewed this aspect again, summarizing the incidence, closure rate, and age at death in V.S.D. both from his own experience and from other published work.\(^3\)

Spontaneous closure is now known to be common in infancy and between 35 and 50% of ventricular septal defects present at birth will close completely or almost completely.\(^3\)\(^4\) Most but not all of these close during infancy, usually probably through the adherence of the overlying septal cusp of the tricuspid valve to the margins of the defect. A less common mechanism is by the adherence of a right ventricular muscle bundle such as the so-called moderator band or by a fibrous plug.\(^7\) The incidence of the defect in premature babies may be four or five times higher than that in full-term babies, but (unlike patent ductus arteriosus) prematurity is not associated with a higher incidence of spontaneous closure of the defect.\(^1\)\(^2\)

The harsh pansystolic murmur of V.S.D. is usually audible within the first week of life, but heart failure is rare in the first month. Then, with continuing postnatal body growth and increase in the capacity of the pulmonary vascular bed, low output failure and pulmonary oedema may supervene, because too much blood is diverted from the left ventricle through the defect into the lungs. Less than half of all infants with V.S.D. develop symptoms from the condition, and J. I. E. Hoffman and A. M. Rudolph found no difference in their incidence or age of development between premature and full-term babies.\(^2\) Babies who got into difficulty had higher pulmonary blood flows, larger pulmonary to systemic blood flow ratios, and higher pulmonary artery pressures than those who were free from symptoms. Moreover, the height of the left atrial pressure could be correlated both with pulmonary blood flow and with the presence of symptoms.

Some of these sick infants may survive despite the persistence of a large shunt. Nevertheless, improvement may also occur naturally in several different ways: by the development of obstruction to flow in the blood vessels of the lung; by a tendency for some defects in infancy to get smaller or even close entirely; or by the development of a muscular obstruction to the outflow tract at infundibular level, which is sometimes even severe enough to cause reversal of the shunt and the development of cyanosis.\(^8\)

The most difficult infants to treat are those with a high pulmonary blood flow. In 1952 W. H. Muller and J. R. Damman first carried out banding of the pulmonary artery to reduce the blood flow and pressure in the pulmonary artery in infants with V.S.D. and heart failure.\(^5\) Nevertheless, though many centres have used this operation with relatively low death rates,\(^9\)\(^10\)\(^13\) many cardiologists now think that the banding operation has exceeded its usefulness.\(^14\) Thus for those infants who remain ill primary closure in infancy is desirable. The death rate of less than 10% for primary intracardiac repair of ventricular septal defect in infancy\(^15\)\(^16\)\(^18\) compares favourably with that occurring with banding, and this figure should be feasible provided the operations are carried out in one of few centres in Britain who have the medical team, facilities, and experience of cardiac surgery in this age group.

After infancy death between 1 year and 25 years of age is rare in ventricular septal defect, and its commonest cause is surgical closure of the defect.\(^13\) Even so, the risk of closure of an uncomplicated V.S.D. in childhood should be under 1%. Children with big defects and severe pulmonary vascular disease are in a different category. If closure is delayed too late the pulmonary artery pressure may remain raised after operation or even continue to rise.\(^19\)\(^20\) Though irreversible pulmonary vascular obstruction is rare below the age of 2 years it may occur, and this possibility must be faced.\(^21\) Banding does not help these children, and early repair is mandatory in this group.\(^14\) The life expectancy of the older person with a big V.S.D. is curtailed whether or not pulmonary vascular obstruction has become severe. Without operation, heart failure may be expected at between 25 and 40 years, though such instances are now rare and hence the data are sparse in consequence. More often patients who are seen with large defects in their 20s or later have a diminished pulmonary blood flow with shunt reversal due to obstructive changes in the lung vessels (Eisenmenger complex). Operation is impracticable in these patients, who are usually dead before the age of 50.

For smaller defects the risks seem to be few in later life, and there is no evidence that a low pulmonary artery pressure
associated with a small V.S.D. in childhood tends to rise in later life.22 The risk of infective endocarditis has often been listed as a reason for surgical closure of small defects, but this is now agreed to be small.23 So to summarize it may be stated that the natural history of ventricular septal defect with low pulmonary artery pressure is benign. Heart failure in infancy does not necessarily lead to death or to later inoperability but if either of these possibilities seems likely then primary closure of the defect in infancy should be preferred to banding, provided the services of a first-class centre are available. After infancy the presence of pulmonary hypertension is the key to prognosis, and surgical closure is likely to modify this favourably provided pulmonary vascular obstruction is not too far advanced.

3 Campbell, M., British Heart Journal, 1971, 35, 246.

Clinical Tutors and Medical Centres

The formation in 1970 of the National Association of Clinical Tutors emphasized how greatly postgraduate medical education has developed in Britain in recent years. From a position where postgraduate medical education and training were haphazard and poorly integrated there has emerged a situation in which opportunities for keeping abreast with new advances and the best current practice are probably second to none in the world. Major factors in this change of scene have been the formation of medical teaching centres in regional hospitals; an administrative structure for postgraduate education based on universities, with medical schools working closely with regional hospital boards; and the appointment of clinical tutors.

The shortage of postgraduate facilities, underlined after the second world war by the number of demobilized Service medical officers needing further training and later by the influx of doctors from overseas seeking specialist diplomas, was first met by individual initiative, using funds collected from local private sources (including members of the medical profession and from industry), and by generous grants from charitable trusts. The Association for the Study of Medical Education was formed in 1957, and it added to the mounting pressure to put the postgraduate educational house in order.

After a conference in 1961, called by the Nuffield Provincial Hospitals Trust,1 of those interested in promoting postgraduate medical education the Trustees set aside £250,000 to finance regional and area schemes for postgraduate training in the provinces. The King Edward Hospital Fund provided a similar sum for use in the Metropolitan regions. The Ministry of Health, to its great credit, encouraged the movement in 1964 by providing for the appointment of clinical tutors by universities after consultation with regional hospital boards and local consultants and for a small honorarium to be paid. The Ministry also emphasized the need to provide physical facilities for teaching in regional hospitals available to doctors in all branches of medicine, and the crucial guidance and controlling role of the universities working in conjunction with regional boards was acknowledged. The Todd report in 19682 recommended an extension of these developments, and the Department of Health and Social Security is now providing more money for the furtherance of postgraduate medical education.

Unfortunately, money available from public sources is often insufficient to meet the demands upon it, and help from other quarters is still often necessary. A potential source of help is the pharmaceutical industry, but the type of publicity a firm might expect in return may lead to difficulty. One of the topics discussed at last week's meeting of the tutors' association (see p. 634) was the relationship of pharmaceutical firms to medical centres. Certain guidelines have been put forward by the Department of Health which, on the whole, met with approval. It would certainly seem to be essential that all activities in medical centres involving or helped by pharmaceutical firms should be controlled by the clinical tutor, who must retain complete academic freedom in arranging programmes and selecting speakers—however critical these may be of any product marketed by the sponsoring firm.

The task of postgraduate medical education, consisting as it does of vocational training for all the specialties, together with the continuing education so essential to enable all doctors to keep reasonably abreast of the rapid advances in their subject, is quantitatively much greater than that of undergraduate education. This requires the work to be widely spread, and its effect on the more senior members of the profession who have to participate is generally regarded as stimulating.

The first medical centre was conceived at Stoke-on-Trent in 1959 and came into use in 1964. The National Association of Clinical Tutors, in conjunction with the Council for Postgraduate Medical Education in England and Wales and with help from the Nuffield Provincial Hospital Trust, is now producing a directory of medical centres. Their number at present is uncertain. From the most recent count3 there are probably about 300 clinical tutors in the United Kingdom, and would be only slightly fewer centres, for it is now accepted that no district general hospital is complete without one. They serve as a meeting place for hospital staff, general practitioners, and medical officers of health, thus they are an important means of bringing together the three branches of the Health Service. Apart from the clinical demonstrations, clinicopathological conferences, and