



# The surgeon's role in the control and prevention of cardiovascular disease in contemporary China

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Received 20 February 2008; accepted 29 August 2008  
Available online 25 January 2009

## KEYWORDS

Surgery;  
Cardiovascular disease;  
China

**Summary** Cardiovascular diseases, including stroke, are the leading cause of illness and death in contemporary China. In mainland China, congenital heart disease (CHD) is the most common congenital defect of the newborn. Ventricular septal defect (VSD) is the most common congenital cardiac abnormality in infants and children. Atrial septal defect (ASD) and patent ductus arteriosus (PDA) take the second and third positions, respectively. Among cyanotic defects, tetralogy of Fallot (TOF) is the most common disease. Rheumatic fever is still prevalent, especially in the countryside of south China. Chinese surgeons began paying attention to the control and prevention of cardiovascular disease in the mid 1940s. Further progress has been made since the 1990s in accordance with the growing Chinese economy. Until now, the correction of CHD has been the most common cardiac surgical procedure performed by Chinese cardiovascular surgeons. An increasing number of coronary artery bypass grafting operations are being performed in several large heart centers in China. The surgeon's role in prevention and control is performing the proper intervention at the correct time in order to halt the process of the disease, and improving the quality and quantity of the patient's life.

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Cardiovascular diseases, including stroke, are the leading cause of illness and death in contemporary China. Every year, approximately 2,500,000–3,000,000 deaths are attributable to cardiovascular disease, accounting for 45% of all deaths in mainland China [1,2].

In mainland China, congenital heart disease (CHD) is the most common congenital defect of the newborn. Estimates of the incidence of CHD in living newborns vary from 6.85/1000 to 13.9/1000 in different areas of China [1]. Assuming that 13 million infants are born annually (according to the official birth rate: 1%), this would represent between 89,310 and 180,700 new cases of CHD each year. Ventricular septal defect (VSD) is the most

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common congenital cardiac abnormality in infants and children. Atrial septal defect (ASD) and patent ductus arteriosus (PDA) take the second and third positions, respectively. Among cyanotic defects, tetralogy of Fallot (TOF) is the most common condition.

Although decreasing significantly over the past 20 years, rheumatic fever is still prevalent, especially in the countryside of south China. As a result, the prevalence of rheumatic heart disease (RHD) is much higher than in developed countries (0.05/1000–0.01/1000) [1]. In mainland China, the prevalence of RHD in 5–18 year old boys is 0.22/1000 (in urban areas: 0.14/1000; in rural areas: 0.29/1000), and it is slightly higher in females than in males (0.24/1000 vs. 0.20/1000) [1,2]. Therefore, in contemporary China, an estimate of the number of patients with RHD is at least 2.5 million, and RHD continues to be the major etiology of valvular heart disease. Most of these patients eventually need a valvular surgical procedure. At the same time, with the increasing aged population in China, valvular surgical procedures for congenital, degenerative and infective valvular disease have also increased. In China's largest heart center, Fu Wai Hospital, the etiological distribution of valvular surgery has changed appreciably in recent years (Fig. 1). In Fu Wai Hospital, surgical procedures for RHD decreased from 92.5% of all valvular procedures between 1956 and 1990 to 71.4% between 1997 and 2006 [3].

In a country with the most population in the world, Chinese cardiovascular surgeons are always confronted with an enormous patient population. Chinese surgeons began paying attention to the control and prevention of cardiovascular disease

in the mid 1940s. Dr. WU Ying-Kai, a leading Chinese thoracic surgeon, performed the first ligation of a PDA in October 1944 and the first successful pericardiectomy for constrictive pericarditis in 1948. Then in 1958, Dr. SU Hong-Xi performed the first open-heart operation with cardiopulmonary bypass (CPB) support. These valuable experiences laid a solid basis for the development of Chinese cardiac surgery. However, the development of cardiac surgery in China bears a close relation to the political and socioeconomic conditions of the country. During the political turmoil of the "Cultural Revolution" from the mid 1960s to the early 1970s, cardiac surgery in China came to a complete halt. When China initiated its "open door" policy in the early 1980s, cardiac surgery gained a great opportunity to flourish once again. Further progress has been made since the 1990s in accordance with the growing Chinese economy. At the same time, 'technical cooperation and training centers' were established in several large heart centers, such as Fu Wai Hospital. Many cardiovascular surgeons all over the country received advanced training in these centers. The latter greatly improved the popularization of cardiovascular surgical techniques in the whole country.

Only a total of 6444 open-heart operations were recorded in mainland China for the year of 1982. The number increased to about 15,000 cases a year by 1990. With rapid technological development during the last 15 years, the number of cardiac operations in mainland China reached 118,627 in 2006, including 98,804 cases supported by cardiopulmonary bypass (Fig. 2). In China, there are 16 centers with over 1000 open-heart operations annually [3]. Until now, the correction of CHD has

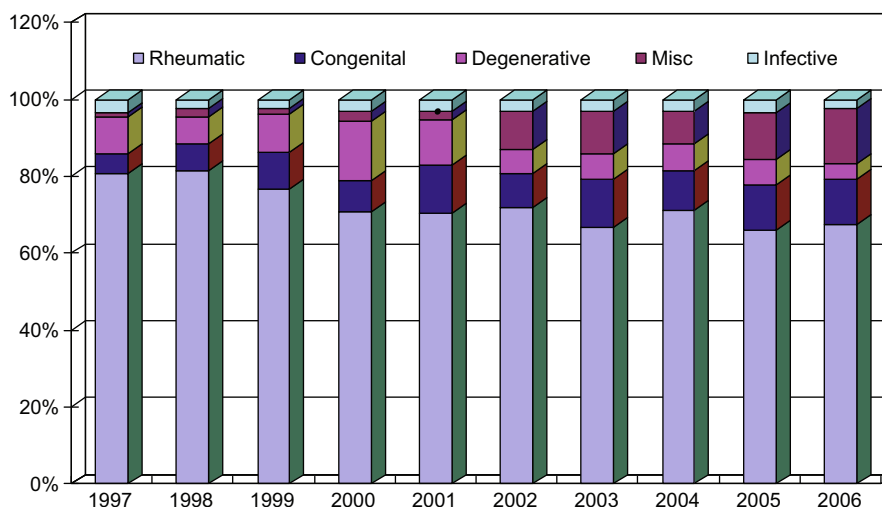
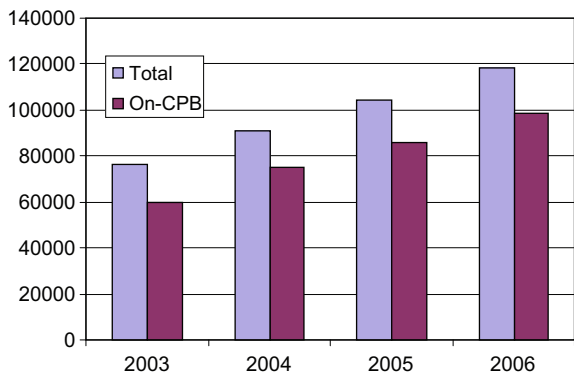
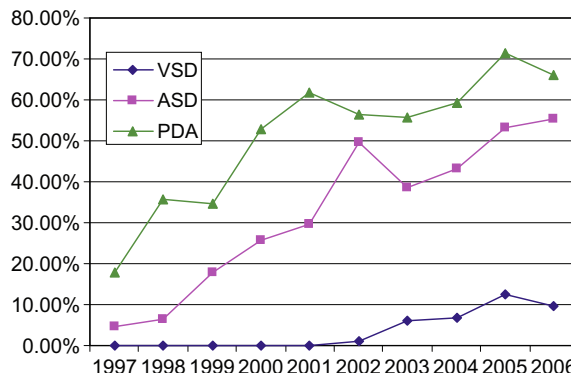


Figure 1 The etiological distribution of valvular surgery in Fu Wai Hospital.



**Figure 2** Cardiac operations in mainland China: 2003–2006.



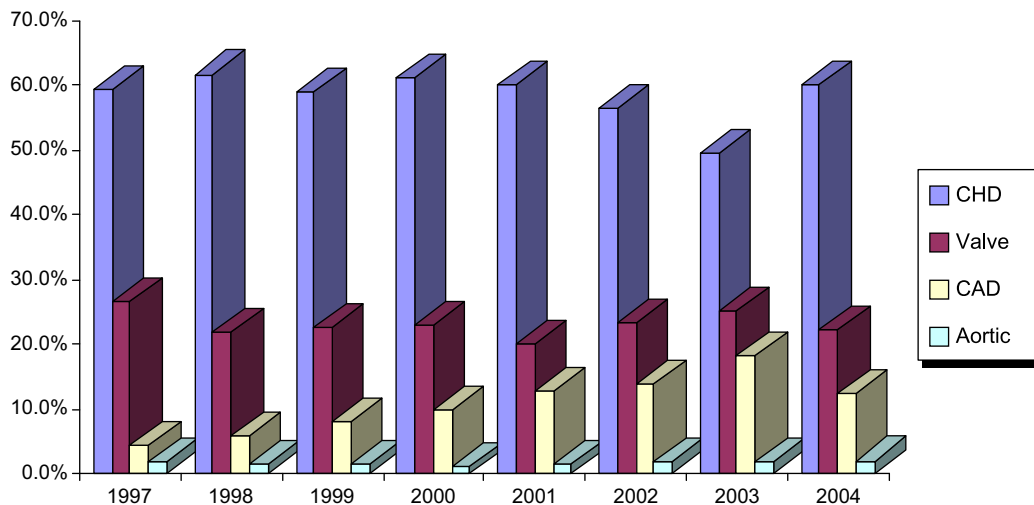
**Figure 4** Percentage of interventional therapy for isolated simple CHD in Fu Wai Hospital.

been the most common cardiac surgical procedure performed by Chinese cardiovascular surgeons. It occupies 50–60% of the total cases of cardiac operations (Fig. 3). Before the 1990s, open-heart surgery was the only method for treatment of CHD. With the introduction and rapid development of percutaneous interventional therapeutic techniques, more and more isolated ASD, PDA and some kinds of VSD are treated by this minimally invasive approach. For some selected patients with complicated CHD, a hybrid technique combining a surgical procedure with interventional cardiac catheterization has become an effective choice.

In Fu Wai Hospital, currently the percutaneous interventional approach is becoming the major means of treatment of isolated simple CHD (Fig. 4). During the period from 1997 to 2006, 4200 patients were treated by this approach. Therefore, in Fu Wai Hospital, the composition of open-heart surgical procedures for CHD treatment

has changed substantially over the years. The percentage of complex CHD (complexity more than that of TOF) in all CHD operations increased from 7.15% in 1997 to 11.4% in 2006 [3].

Encouraged by the good results of surgical procedures in combination with the improvement of China's economic condition, more and more patients with CHD go to see the doctor much earlier than before, and receive treatment in time. This trend is also reflected by the age composition of patients for cardiac surgical procedures in Fu Wai Hospital. Before 1990, adults (age over 18 years) with CHD constituted 89.2% of all operative cases for CHD in this hospital. However, between 1997 and 2006, of a total of 22,195 cases of CHD operations, the adult patient population constituted only 19.49%. Although ASD is the most common CHD in adults, the percentage of ASD closures in adulthood has decreased in the past 10 years (Fig. 5).



**Figure 3** Composition of cardiovascular surgical procedures in mainland China: 1997–2004.

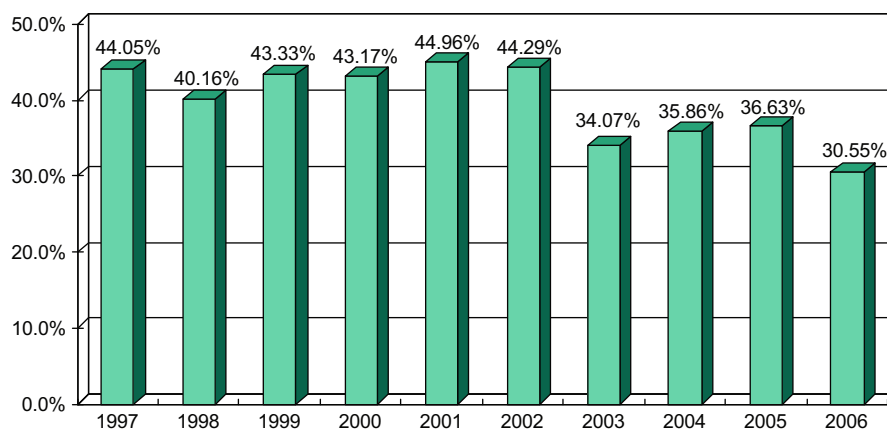


Figure 5 Percentage of ASD closures in adulthood in Fu Wai Hospital.

On the other hand, the number of infant patients is increasing rapidly. For example, during the 35 years from 1956 to 1990, only 131 operations (constituting 0.84% of all CHD operations) were performed on infant patients less than 1 year of age in Fu Wai Hospital. However, in the last 10 years, this number increased markedly to 4000 cases, which constituted 18.02% of all CHD operations. The percentage of infants less than 6 months among all infants with CHD increased from 1.38% in 1997 to 7.27% in 2006 (Fig. 6). At the same time, the percentage of infant patients who weighed less than 6 kg increased from 1.88% to 6.53% [3].

As a result of effective surgical interventions, the lethal complications of CHD, such as severe pulmonary hypertension (more than 60 mmHg), have decreased dramatically in mainland China. For instance, in Fu Wai Hospital, the incidence of associated severe pulmonary hypertension in all isolated cases with VSD was 26.4% before 1980, decreasing to 8.79% in 2006 (Fig. 7).

With the increasing number of coronary artery bypass grafting operations performed in several large heart centers in China, since 2002 valvular operations have changed from the second most common cardiac surgical procedure to the third. In mainland China, closed mitral commissurotomy, which had been the most common valvular procedure before the 1980s, gradually decreased in number and was finally replaced by percutaneous balloon mitral valvuloplasty after 1986. From then on, valve replacement has assumed the first position among all valvular surgical procedures. Even in large heart centers such as Fu Wai Hospital, surgical valve repairs constitute only 7% of all valvular procedures today.

Among 9205 cases of valve replacement performed between 1997 and 2006 in Fu Wai Hospital, mitral valve replacement (MVR) constituted 43.9%. The next was combined mitral valve and aortic valve replacement (35.4%). Isolated aortic valve replacement (AVR) was in the third position

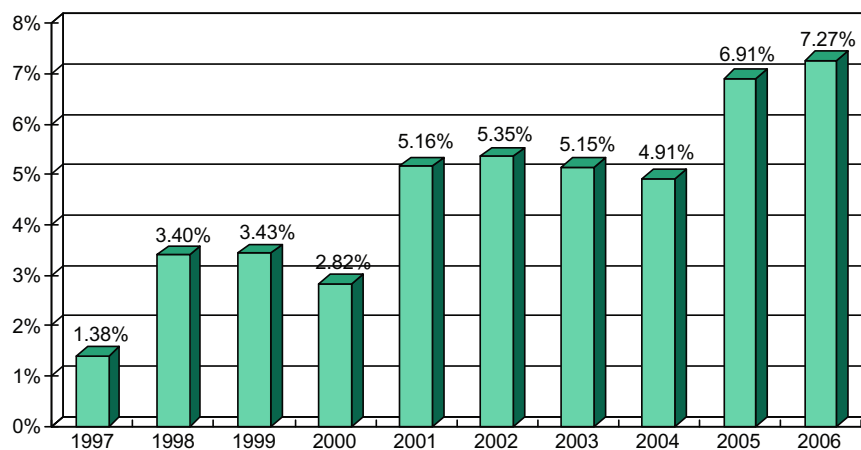


Figure 6 Percentage of CHD patients less than 6 months of age in Fu Wai Hospital.

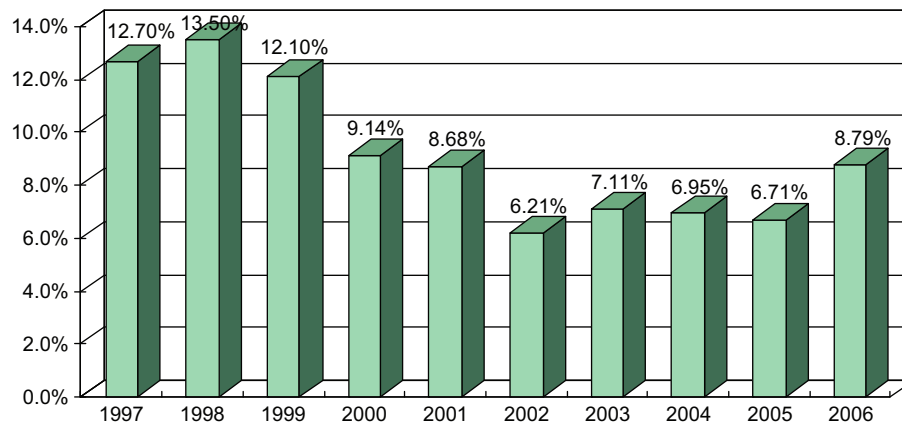


Figure 7 Percentage of cases of severe pulmonary hypertension in isolated VSD.

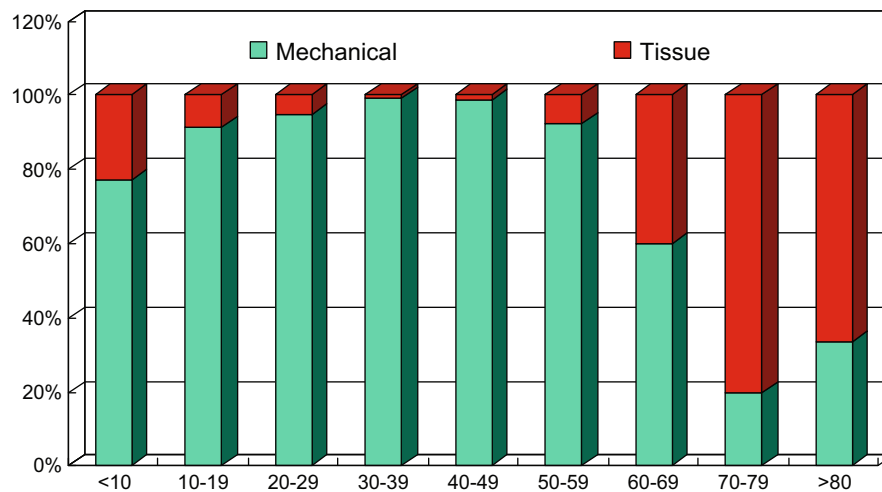


Figure 8 Types of valve prostheses used in different age groups in Fu Wai Hospital.

(20.7%). The ratio of mechanical prostheses to tissue prostheses in patients less than 60 years of age was 9:1. But in patients more than 60 years old, that ratio was near 1:1 (Fig. 8) [3].

In contemporary China, valve replacement has been performed frequently with very satisfactory results (Table 1). Radio-frequency ablation for valvular patients with atrial fibrillation may be quite beneficial for preventing strokes. Because of the

surgeon's intervention, the prognosis for patients with valve disease has improved, and many of them have been prevented from developing chronic heart failure.

Today, the phrase 'disease prevention and health promotion' is commonly encountered. According to one health scientist, "Medicine has moved from a focus mainly on cure toward one increasingly concerned with life enhancement.

Table 1 The results of valve replacement in three large series of patients in China

	Cases	Year	Valve type	Survival rate		
				5 years (%)	10 years (%)	15 years (%)
Beijing	12,000	1976–2005	MVR + AVR	96.34	92.48	87.97
Shanghai	3,416	1978–2003	MVR	98.05	94.58	92.23
Shanghai	1,154	1981–2001	MVR + AVR	89.46	86.5	67.86

AVR = aortic valve replacement, MVR = mitral valve replacement.

Try turning the eyes increasingly toward the basic mechanisms of life, rather than disease and death.” The ideal of disease prevention is quite clear: “Primary prevention means averting the occurrence of disease... (and)... secondary prevention means halting the progression of disease from its early unrecognized stage to a more severe one.” So, the surgeon’s role in this procedure is performing the proper intervention at the correct time in order to halt the process of the disease, and improving the quality and quantity of the patient’s life.

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