What's new in valvular heart surgery?

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Mitral valve surgery

Replacement. For patients who will require long-term warfarin anticoagulation, the current prosthetic valve of choice is the St. Jude medical bileaflet valve. Long-term hemodynamic performance is excellent and there are probably no proven cases of mechanical failure at more than 20-year follow-up. Tissue valves are used when anticoagulation can be avoided safely. Currently available porcine bioprostheses have shown long-term durability and valves made from strips of calf pericardium appear promising but long-term results are not yet available for mitral valves as they are for aortic.

Repair of regurgitation, balloon valvuloplasty for stenosis. The repair of the mixominous mitral valve that produces significant mitral regurgitation is now standard and Carpentier s original technique is used worldwide with excellent long-term results in most experienced centers. For mitral stenosis, open mitral commissurotomy is a valid and often preferable option to prosthetic mitral valve replacement in carefully selected patients. In recent years, excellent results with balloon mitral valvuloplasty have been achieved in the cardiac catheterization laboratory in patients who would otherwise be candidates for surgical commissurotomy. Transesophageal echocardiography in the catheterization laboratory and the operating room has become an important and necessary adjunctive technique for both mitral valve repair and balloon mitral valvuloplasty.

Maze procedure for atrial fibrillation. The Mayo Clinic (Schaff H. et al.) and Georgetown University Hospital (Cox J.) have pioneered the technique of the maze procedure for atrial fibrillation. The procedure has been modified over the past decade and now elimination of atrial fibrillation appears realistic in 8 0-90% of patients. Combination of electrical surgery with mitral valve repair for mitral regurgitation is also feasible and both groups are reporting good medium-term results.

Valve-sparing aortic root replacement

Dacron graft. The standard and most widely used technique for aortic root replacement in patients with aneurysms is the Dacron tube graft. The experience at Johns Hopkins in patients with Marfan s syndrome using a composite graft consisting of a Dacron tube with a St. Jude medical or bioprosthetic aortic valve has been excellent. Recently, Dr. Vincent L. Gott collected the combined results of several large volume centers internationally and reported them in the *New England Journal of Medicine*.

Homograft. This procedure avoids the need for long-term warfarin anticoagulation in younger and middle-aged patients who would otherwise receive a mechanical prosthesis. The surgical techniques are somewhat challenging but have been satisfactorily developed notably in New Zealand (Barrett-Boyes) and Birmingham, Alabama (Kirklin). While attractive, the problem with homografts is availability and this is not likely to be overcome in the future. Nevertheless, for certain patients where a suitable graft can be found, for example replacement of an infected previously placed prosthesis, results can be good.

Porcine xenograft (stentless tissue valves). The principal proponent of this type

of valve has been Dr. Tyrone David in Toronto, Canada. He is now reporting an 8-10 year actuarial survival and freedom from cardiac-related death at 95% compared with 8 0% for the Hancock stented porcine valve.

Pulmonary valve autotransplant (Ross procedure)

Sir Donald Ross in London first reported pulmonary autograft replacement of the aortic valve in the late 1960s. Excellent long-term results have been reported in the 1990s from his group as well as Dr. Ronald Elkins in Oklahoma City, Oklahoma. The original technique has been modified somewhat but current results suggest freedom from replacement of the pulmonary autograft at 95% or better at 8 years. Criteria for selection of suitable candidates, both clinically and anatomically, are now generally agreed upon and in Dr. Elkins series the median range is 20 years with a range of 10 to 62 years.

Minimally invasive valve surgery

Port-access techniques. The main purpose of this procedure is to avoid the problems associated with median sternotomy. Many centers in the United States and elsewhere have reported excellent results, primarily in terms of low morbidity and reduced hospital stays for both coronary artery bypass grafting and valvular operations. However, the advantages of the various minimally invasive techniques to heart surgery remain unproven and its proponents tend to exaggerate the difficulties with sternotomies.

Tissue-engineered valves and conduits. Several laboratories are reporting very interesting experimental results in the animal laboratory using a variety of tissue-engineered conduits, with or without valves depending upon the procedure. This is still far from clinically applicable for human operations but it is hoped the well-known limitations of both mechanical valves, standard tissue valves, and even homografts may be overcome, especially in children.

Robotic technology. Significant technological advances over the last decade have enabled development of potentially widely applicable minimally invasive endoscopic operative techniques. However, there are many technical drawbacks to current methods and in the meantime, telemanipulation derived from space and military technology, is being used to provide surgeons with the necessary tools, particularly with the combination of robotics and three-dimensional visualization which creates good vision and depth perception and increases dexterity and precision. Dozens of coronary artery bypass and valve replacement operations have now been done in the United States and the prospects are exciting and encouraging for future developments.

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