Expanding Armamentarium in Heart Disease

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Cardiovascular diseases (CVD) account for a large proportion of deaths and disability worldwide. It is predicted that by the year 2020, CVD will become the world's number one cause of death and disability. In India 24.2% deaths have been attributed to CVD, approximately half of which occur because of coronary artery disease (CAD) [1].

Management of CVD calls for a multipronged approach. Prevention addresses issues like smoking cessation, dietary discretion with avoidance of atherogenic foods and regular exercise to prevent obesity and insulin resistance. Early detection of hypertension, dyslipidemia, diabetes and their treatment, forms part of CVD prevention. Effectively implemented preventive strategies will result in upto 80 % reduction in risk of a fatal outcome. Drugs like aspirin, beta blockers, angiotensin converting enzyme (ACE) inhibitors and statins have improved survival significantly in patients with myocardial infarction.

Medical management has its limitations. It may become less effective with the progression of the underlying pathology (in cases of heart failure or CAD), appearance of other comorbidities or remodelling related changes in the cardiovascular hemodynamics. Beyond a certain point medical management may even become counterproductive. For example, use of ACE inhibitors in patients of heart failure once they develop azotemia and renal failure is harmful. Similarly with the progression of CAD, optimization of medical management is possible only to a certain extent beyond which the patients may not tolerate drugs and the symptoms of angina or breathlessness may continue to limit his quality of life (QOL) and functional status. These situations necessitate additional therapeutic measures including mechanical solutions for relief of underlying pathology.

Cardiac problems for which surgical correction is presently the only modality of management include complex congenital diseases, pericardial diseases like constrictive pericarditis, valvular diseases requiring

repair or replacement of valve with or without coronary revascularization, and aortic root surgeries. Coronary artery bypass graft surgery (CABG) is one of the most frequently performed operation for CVD. CABG has come of age since its birth in 1968 as has been discussed in an article in this issue by Bharadwaj et al [2]. It provides excellent short and intermediate term results in management of stable CAD. Available data suggests that surgery is better than medical management in improving survival in patients who are sicker (based on age, symptoms or ischemia, number of vessels involved, LV dysfunction etc) and in diabetics. CABG prolongs survival in significant left main disease irrespective of symptoms, multi-vessel disease (MVD) with LV dysfunction, MVD involving proximal left anterior descending (LAD) irrespective of LV function and even in double vessel disease with LV dysfunction [3,4].

The long term results of CABG have improved greatly after routine use of Left Internal Mammary Artery (LIMA) to LAD. Substituting all venous grafts with arterial conduits improved results further. Cardio-pulmonary bypass (CPB) related complications like postoperative bleeding, cerebrovascular embolism, renal insufficiency etc have also diminished greatly, due to better materials and better techniques. Beating Heart Surgery or Off-Pump Coronary Artery Bypass (OPCAB) surgery, has further contributed to lowering the morbidity and mortality of surgery, by avoiding the complications of CPB. Similarly techniques have been devised to avoid cross-clamping of aorta to prevent embolization of detached atherosclerotic plaque fragments. Minimal access surgery and Robotic Surgery is being developed to reduce operative trauma of sternotomy and hospital stay. Nevertheless it will not be possible to reach zero-morbidity and zero-mortality figures in cardiac surgery in near future.

Catheter based interventions have rapidly expanded over the years. To start with, they were used in CAD but with the interventionists gaining experience, it soon

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found place in valvular and congenital cardiac defects also. Initially it was used in the patients of CAD unresponsive to medical management where balloon angioplasty was performed. But because of the problem of abrupt closure of the treated vessels in 3 to 5 % of cases and restenosis in 15 to 30 % of patients within six to nine months of treatment, newer modalities were tried. These included atherectomy devices, laser ablation techniques and stenting with bare metal and later drug eluting stents. Only stenting has stood the test of time, in that it consistently improved the safety and late clinical outcomes as compared to balloon angioplasty. Whereas earlier it started as an alternative to CABG only in small, focal and noncalcified proximal coronary lesions, the scope is ever expanding with their use in more complex coronary anatomy, multivessel disease, patients with severe LV dysfunction, thrombus containing lesions and in the primary setting of myocardial infarction. With the advent of technological advances of catheter designs, stent characteristics, distal protection devices and imaging techniques, it is now possible to successfully deal with progressively more complex lesions. A successful percutaneous intervention (PCI) in CAD with significant proximal artery stenosis with class III angina is an example where PCI improves survival as compared to medical management.

The role of catheter based percutaneous valvuloplasties in mitral, pulmonary and aortic stenosis is increasing. They are safe and effective alternatives to surgical repair in selected patients. Some subsets of ostium secundum atrial septal defects, patent ductus arteriosus (PDA) and certain small muscular VSDs are the examples where percutaneous device closure of the defect is possible. Coarctation of aorta and PDA dependent circulations in congenital cardiac anomalies are other examples where balloon angioplasty or stenting with special stents is possible as an alternative to surgery. Closure of certain anomalous vascular channels like multiple aortopulmonary collateral arteries (MAPCAs) is carried out routinely by catheter based techniques. In this issue Bharadwaj et al [5], have reported a VSD closure and balloon valvotomy of pulmonary stenosis in a young patient in single sitting. They have also shown feasibility of closure of perimembranous VSD in hospitals of Armed Forces. These procedures are limited in their applicability by the lesion characteristics requiring strict patient selection.

While the indications for catheter based management involving valvuloplasties are well crystallized, the management of simple congenital defects is result of more imaginative and successful use in experienced hands. Indications for surgery and PCI overlap significantly in the CAD subsets of CVD. Indications

for PCI are frequently being extended for more complex lesions. Presently, in patients with diffuse triple vessel lesions including chronic total occlusions (CTO), CABG is a better option for long term benefit if one or more arterial grafts are used. Similarly a diabetic with diffuse disease in two or more vessels will benefit better with CABG [4]. In multi-vessel disease with focal lesions in large diameter coronaries, multiple stent placement may be an acceptable alternative to surgery. The cost consideration of stenting and all other dimensions of both treatment modalities should be discussed with the patient and patient preference should dictate the choice of revascularisation procedure.

While gene mapping and fetal diagnostic methods are being developed for early recognition of congenital cardiac anomalies, the induced 'angiogenesis' and 'myogenesis' is being attempted in CAD. Stem cell based therapies are undergoing trial for improvement of post MI left ventricular (LV) dysfunction whereas gene based therapies using direct intramyocardial administration of naked plasmid vascular endothelial growth factor (VEGF-165) are being developed to induce angiogenesis [6,7]. There are attempts to develop vaccines against oxidized LDL in atherosclerotic plaques to modify the pathophysiology itself [8] and lately there is a report of successful development of vaccine against hypertension. All these developments portend exciting times ahead in the management of CVD.

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