# *"How I do it"*
# Aortic Valve Replacement in case of Double Valve Replacement

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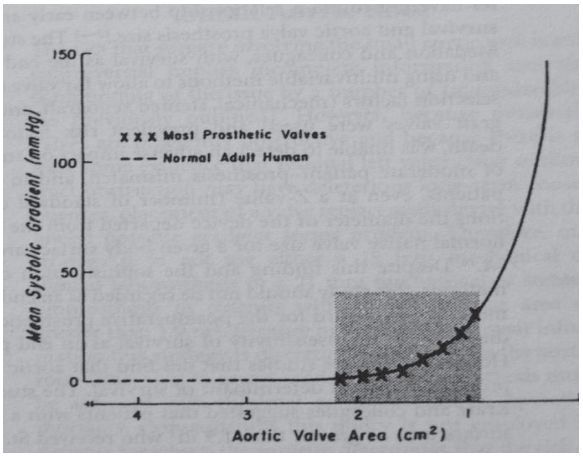
Small aortic annulus is frequently found in patients undergoing aortic valve replacement, for patients with rheumatic aortic disease or elderly female with calcific aortic valve . All mechanical and stented bioprothesis have a smaller effective orifice area than that of a normal human aortic valve. The size of a valve prosthesis and body surface area of the patient has been reported as being important for late results. A small-sized valve prosthesis may cause residual obstruction of left ventricular outflow tract and interfere with regression of LV hypertrophy and clinical improvement and affect long term survival[1,2].

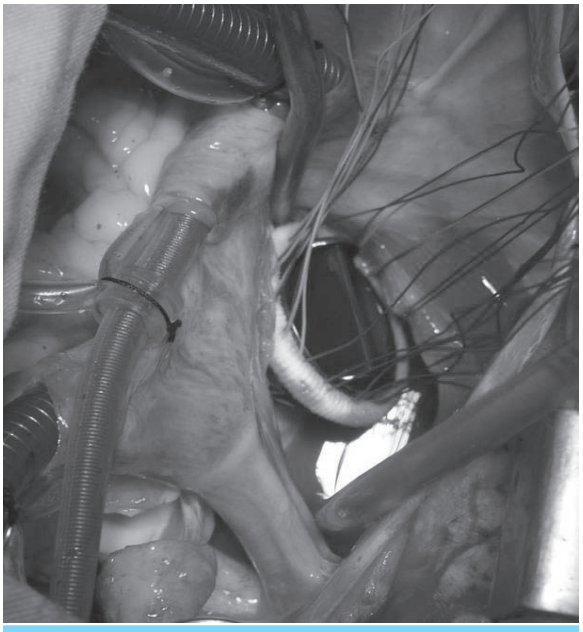



Relationship of mean systolic gradient to the aortic valve area, assuming the cardiac output and velocity of flow are constant.(from Rahimtoola SH.)

Patient-prosthesis mismatch (PPM) is a feared complication of inserting smaller size aortic valve. The relationship between aortic valve area and mean systolic gradient is exponential. Because of curvilinear relationship between a prosthetic valve gradient and valve area, a relatively modest improvement in aortic valve area produces proportionately greater reduction in valve gradient. The valves that are on transition point of curve, small decrease in valve area may result in large increase in gradient (fig 1). Dumensil and Yoganathan showed that indexed "Effective Orifice Area"(EOA) greater than 0.85cm2. m2 will keep pressure gradient from rising during exercise, indexed EOA less than that considered to represent prosthesis-patient mismatch because of rapid rise in mean pressure gradient during exercise.[3]

The degree of regression of LV hypertrophy may be a sensitive indicator of adequacy of an implanted aortic prosthesis. Data from Sim and colleagues suggested that the regression of left ventricular hypertrophy was less in patients receiving a 19 mm stented bioprosthesis or mechanical valve compared with that in patients receiving larger valve sizes[4]. It is likely that regression of left ventricular hypertrophy after AVR is associated with long term survival. Study from Mayo Clinic reported that patients receiving a 19 mm

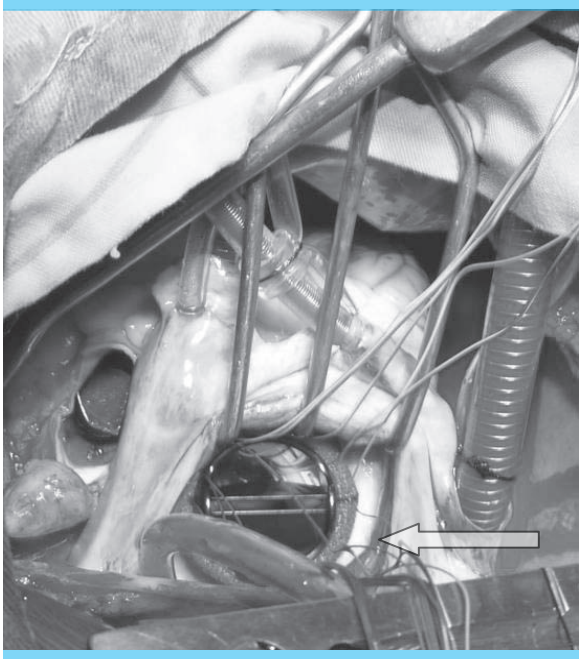
or 21 mm St Jude Medical prosthesis with average BSA of 1.76 m2, the prevalence of PPM was 60% ( 17% severe, 43% moderate), and severe PPM was found to be an independent predictor of higher long-term mortality and congestive failure.[5] Smaller prosthetic valve size has been associated with increased risk of mortality. The study by Kratz and colleagues suggested that patients with a BSA of greater than 1.9 m2 who received St Jude valve 19 mm or 21 mm had a greater probability of late sudden death[6].



Mitral valve loosely kept inside left atrium.

Pledgetts put outside aortic wall along non-coronary sinus for aortic valve.

Aortic valve implantation.



Mitral valve (arrowed) implanted finally into the annulus.

Various surgical techniques are described for insertion of larger prosthesis. The root enlargement techniques like Nicks or Manouguian procedure are associated with operative risk of bleeding, increasing clamp time and mortality. Moreover, there is limitation in enlargement when performing double valve replacement, because of close association of aortic & mitral annulus. Aortoventriculoplasty ( Konno procedure) is again a 'big" procedure associated with morbidity and mortality.

The accepted classical technique in double valve replacement (DVR) is to implant mitral valve before aortic valve. This tradition comes from the fact that after inserting AV it will be difficult to visualize and put stitches along anterior mitral annulus. The problem of inserting mitral valve first is that it narrows the aortic annulus and downsizes the aortic valve to be inserted by at least one size, for eg. if aortic annulus is of 23 mm, after inserting mitral valve it will accept only 21 mm aortic valve. To circumvent this problem of aortic downsizing, I have started to implant aortic valve first. However, the trick here is to put pledgetts along the mitral annulus beforehand and then only implant aortic valve. So aortic annulus gets the size of the valve that it deserves. Then one can easily implant mitral valve. For better hemodynamic effect, I prefer to implant aortic valve (bicuspid, mechanical) in antero-posterior direction. With this technique, the only compromise if at all is to avoid implanting too big a mitral valve, for instance 31 mm. And while tying the pledgetts for mitral valve, its easier to tie those lying in anterior annulus first, which still is under excellent view. I prefer to put mitral valve in anatomical position, so that struts of mitral valve do not impinge upon aortic valve, which is already in position.

This is fairly simple and highly reproducible procedure, yet gives an immense result. Even with aortic root enlargement, one cannot put more than 2-3 mm upsize valve in case of DVR. The same benefit is achieved here without added morbidity of bleeding & cross-clamp time. The fear of crowding too much in the annulus can be relieved to some extent by putting pledgetts outside the aortic wall along noncoronary sinus area.

Patient-prosthesis mismatch is present after virtually every aortic valve replacement. In aortic stenosis, we are trying to trade severe native valve disease for mild or moderate aortic stenosis. And as pointed out earlier, the lesser the better. Though controversy surround whether a device used for aortic valve replacement can be too small for a patient and affect immediate and long term outcomes, it's wiser to use larger size valve whenever possible, if it can be achieved without costing too much for the patient.

## REFERENCE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