



ORIGINAL RESEARCH PAPER

Surgery

SURGICAL AORTIC VALVE REPLACEMENT – SINGLE OPERATOR EXPERIENCE

KEY WORDS:

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ABSTRACT

Aortic valve is the second most affected valve in developing countries. Given the increasing life expectancy of population in our country, degenerative aortic valve disease may supersede the causes of aortic valve disease like congenital defects and rheumatic heart disease over next two decades. Stenosis, regurgitation or combination of both can lead to significant hemodynamic compromise and affect the quality of life of the patient. Once symptoms develop, the prognosis of aortic valve disease becomes bad. Aortic valve replacement either with mechanical valve or bio-prosthetic valve is the treatment of choice. SAVR (Surgical aortic valve replacement) and TAVR (Transcatheter aortic valve replacement) are available to selected patients with degenerative calcific aortic stenosis, depending on age, clinical status and co-morbid conditions. However SAVR is indicated in all other conditions, those with aortic stenosis and regurgitation, isolated aortic regurgitation, congenital defect of aortic valve and also if aortic valve disease coexists with other defects like mitral valve disease, septal defects, aortic root aneurysm etc. In this study, the experience and outcome of SAVR by the author is analyzed and compared with the data available worldwide. Mortality rate (2.5%) and other rates of complications and the need for permanent pacemaker implantation (2.5%) are comparable to the results found in literature.

INTRODUCTION:

Aortic valve disease can lead to stenosis, regurgitation or both and occur due to various causes : congenital defects like bicuspid, unicuspid, quadricuspid valves, subaortic membrane; rheumatic heart disease and degenerative valve disease. Once symptoms develop in these patients the prognosis becomes poor(1). Hence timing of intervention is critical in these patients. Aortic valve replacement either with mechanical valve or bioprosthetic valve is the treatment of choice. SAVR (Surgical aortic valve replacement) and TAVR (Transcatheter aortic valve replacement) are available to these patients depending on age, clinical status and comorbid conditions. Recently, the results of TAVR in high risk elderly calcific aortic stenosis is comparable to SAVR and looks promising. However SAVR is indicated in all other conditions, those with aortic stenosis and regurgitation, isolated aortic regurgitation, congenital defect of aortic valve and also if aortic valve disease coexists with other defects like mitral valve disease, septal defects, aortic root aneurysm etc.

AIM: To study the outcome of surgical aortic valve replacement done by a single operator in a tertiary care cardiothoracic center in south India.

Study design: Observational study

Study period: January 2013 to June 2018

Study population: All consecutive patients who underwent aortic valve replacement over the study period, operated by the author. Guidelines pertaining to SAVR were strictly followed. The average mean pressure gradient across aortic valve was > 40 mmHg in aortic stenosis; aortic regurgitation should be severe when aortic regurgitation presented alone and patient should be symptomatic at least functional class II. All patients more than 35 years underwent coronary angiogram. Three (7.6%) patients had coronary artery disease, two requiring CABG and one patient had < 50% stenosis in left anterior descending artery (LAD).

Exclusion criteria: Patients who underwent double valve replacement and aortic valve replacement along with aortic root replacement.

RESULTS:

A total of 39 patients underwent aortic valve replacement during this period. The demographic and clinical data are presented in tables 1 & 2. Age ranged from 14 – 67 years. There is male preponderance in degenerative aortic valve disease. Few teenagers underwent aortic valve replacement due to congenital bicuspid aortic valve with severe aortic stenosis. Congenital,

rheumatic and degenerative etiology contributed roughly equally in these patients. One patient with subaortic membrane underwent excision of membrane along with aortic valve replacement due to significant aortic regurgitation. In this patient the valve was tricuspid, but incompetent due to impingement of jet on the valve damaging it. All but two patients received St Jude bileaflet prosthetic valve and two patients received TTK Chitra disc valve. Most of the patients had severe aortic stenosis (64%); 10% of patients had predominant aortic regurgitation and 25% patients had combined aortic stenosis and regurgitation. One patient had complete heart block during post operative period for which a single chamber ventricular pacemaker was implanted. Two patients underwent CABG uneventfully. One patient received left internal mammary artery (LIMA) graft to LAD and saphenous vein graft (SVG) to right coronary artery (RCA). Other patient received SVG to RCA. One patient died of persistent low cardiac output on third postoperative day, that accounts for mortality of 2.5%. Two patients had pneumonitis and one patient had mild weakness of left limbs which improved before discharge and he walked home. Two patients (5%) had new onset left bundle branch block. Post-operative echocardiographic gradients were quite acceptable, with an average mean gradient for 12 mmHg. 10% of patients had minimal to mild pericardial effusion. One patient had mild paravalvar leak without any hemodynamic compromise or hemolysis. Involvement of mitral and tricuspid valves remained same as preoperative status and were not addressed during surgery because these lesions were not hemodynamically significant. Elderly patients >60 years had a few comorbid conditions like diabetes, hypertension, and COPD. None of them had any complication during or after the surgery. Patient who expired did not have any comorbid states.

DISCUSSION:

Aortic valve disease is very common, almost equal to mitral valve disease in developing countries. Chronic rheumatic heart disease and degenerative calcific aortic valve disease contribute to the illness equally, apart from congenital bicuspid aortic valve and subaortic membrane. Annuloaortic ectasia and Aortic root aneurysm may also require aortic valve replacement along with root (Bentall's procedure). In our study these entities are excluded.

In our institution, only mechanical prosthesis is implanted. Most of the patients received St Jude bileaflet valve and a couple of patients received TTK Chitra – disc valve. Mortality among the study group is 2.5% (1 patient died of low cardiac output syndrome during third postoperative day). This mortality rate is comparable to that experienced worldwide in SAVR and TAVR. Mortality among SAVR patients < 75 years was 2.5%(2). Fortunately only one patient developed complete heart block

postoperatively. Incidence of complete heart block requiring pacemaker is higher in TAVR than SAVR. (3). Stroke occurred in one of our patients which spontaneously improved without any functional neurologic deficit. Incidence of stroke is about 1% in SAVR and 2% in TAVR in European registry (2). None of our patients had myocardial infarction postoperatively. Other complications like arrhythmia, pericardial effusion, paravalvar leak etc. were comparable to that seen in world literature. Patient-prosthesis mismatch was not seen in any of our patients. This mismatch is diagnosed by echocardiographically demonstrated parameters like high gradients across the valve, Doppler velocity index, acceleration time etc. Mismatch can occur when inappropriately small valve is selected for the patient.(4)

Since there is no medical therapy for aortic valve disease, surgical aortic valve replacement (SAVR) was the only mode of treatment until transcatheter aortic valve replacement (TAVR) was introduced in the year 2002. Surgically both metallic valve and bioprosthetic valve can be implanted. Only tissue valve can be used in TAVR, that limits the life span of the valve. Hence TAVR cannot be considered in young patients with aortic valve disease.

Since the early publication of surgical aortic valve replacement by Pierre Grondin (5) the technical aspects of the surgery, design of valve and outcome of the surgery have vastly improved. Whether further technical advancement like TAVR will replace SAVR is a controversial question. At present TAVR is suitable only for calcific aortic stenosis in elderly high risk patients and its cost is prohibitive. CONCLUSION: Surgical management of aortic valve disease is currently the treatment of choice even after the advent of TAVR in many indications. Acute outcome of SAVR in our center is comparable to that seen in world literature and surgical replacement is appropriate in our country given the prohibitive cost involved in TAVR.

CONCLUSION:

Surgical management of aortic valve disease is currently the treatment of choice even after the advent of TAVR in many indications. Acute outcome of SAVR in our center is comparable to that seen in world literature and surgical replacement is appropriate in our country given the prohibitive cost involved in TAVR.

Table 1 : DEMOGRAPHIC & CLINICAL CHARACTERISTICS :

Variable	Value
Age (yrs)	14 – 67 (Mean 44.4)
Age group 20 – 40 yrs	15 (M : F = 7 : 8)
– 40 60 yrs	18 (M : F = 13 : 5)
>61 yrs	6 (M : F = 6 : 0)
Sex M:F	25 : 14
NYHA Classification	
I	0
II	18 (46%)
III	15 (38%)
IV	6 (15%)
Comorbid conditions:	
Diabetes mellitus	2
Systemic hypertension	4
COPD	2
Kyphoscoliosis	1
CAD	3

Table 2 : ETIOLOGY OF AORTIC VALVE DISEASE:

Diagnosis	No. of patients	Age range	Sex M: F	Asso. conditions
RHD	12 (31%)	14 – 62	7 : 5	MVD 4
BCAV	13 (33%)	20 – 67	7 : 6	Ao Rt dilatation 1
Degenerative	14 (35%)	50 – 65	10 : 4	CAD: 3
Subaortic Membrane	1 (1%)	32	0 : 1	NIL

MVD = mitral valve disease; Ao Rt = Aortic root; CAD = coronary artery disease; RHD = Rheumatic heart disease; BCAV = Bicuspid aortic valve

Table 3 : TYPE OF VALVE IMPLANTED:

PARAMETER	No.	Size	No.
TYPE OF VALVE			
ST JUDE BILEAFLET	37 (95%)	19	15
		21	24
TTK CHITRA	2 (5%)	21	1
		23	1
BIOPROSTHETIC	NIL		

Table 4 : SURGICAL DETAILS:

SURGERY	No. of patients
AS PREDOMINANT	25 (64%)
AR PREDOMINANT	4 (10%)
AS + AR	10 (25%)
AVR + PPI	1 (2.5%)
AVR + CABG	2 (5%)

AS = Aortic stenosis; AR = Aortic regurgitation
PPI = (Permanent pacemaker implantation)
CABG = (coronary artery bypass graft)

Table 5 : RESULTS & COMPLICATIONS:

COMPLICATIONS	No. & CAUSE
Death (in-hospital)	1 (low cardiac output)
Complete heart block	1
Paravalvar leak	2
Sternal wound infection	1
Stroke	1 (recovered)
Pneumonitis	2 (recovered)
LBBB	2

LBBB = Left bundle branch block

Table 6: POST-OPERATIVE ECHOCARDIOGRAPHIC FINDINGS

PARAMETER	VALUES
Prosthetic valve Peak gradient	12 – 32 mmHg (22 mmHg)
Mean gradient	6 – 18 mmHg (12 mmHg)
Pericardial effusion	Minimal – mild 4 cases
Paravalvar leak	2 cases (mild)
Mitral valve disease	MS mild 4 cases MR mild 2 cases
Tricuspid valve disease	TS mild TR moderate 1 case

MS = Mitral stenosis; MR = Mitral regurgitation; TS = Tricuspid stenosis
TR = Tricuspid regurgitation

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