

Aortic Stenosis – An Analysis of Patients with Aortic Stenosis Presenting for Surgery in Nelson Hospital in The Last 10 Years and Suggestions for Pre Operative Assessment.

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Introduction: Aortic sclerosis affects 1 in 4 people over 65 in the USA. 1 in 6 sclerotics progress to aortic stenosis (AS) affecting 4% of the population over 75 years old. As people survive for longer with medical advances it is likely the number of patients presenting for surgery with aortic stenosis will increase. AS was first recognised as a perioperative risk factor by Goldman in 1977 and further quantified in the 1990's. His findings were supported by Kertai in 2004 who estimated that if the mean aortic gradient was greater than 25 mmHg there was a 14% risk of perioperative myocardial infarction or death. If the gradient was over 50 mmHg this increased to 31%. Other studies using case controls however have shown no increased risk for perioperative complications in patients with AS. Along side this work there has been much interest in the severe aortic stenotic who is asymptomatic. A small percentage of these patients die suddenly or become symptomatic very quickly requiring AVR. The question of when to intervene with AVR (with its inherent perioperative and post operative risks) in these patients has led an in depth study of this group and in particular their cardiac physiology and predictors of cardiac events. What has become clear is that patients with AS are a physiological heterogenous group and anaesthetic reliance on classification of severity of stenosis only is a simplification. In Nelson Hospital there is an excellent echocardiography database and we were interested to look at patients with AS who presented for surgery and ultimately produce a standardised aortic stenosis assessment and database that can be used in New Zealand. In time we hope to be able to characterise the types of patients with AS presenting for surgery and to provide a risk profile for perioperative complications.

Method: The Nelson Hospital Echocardiology database was used to identify all patients referred for pre operative assessment in the last 10 years. If a patient was identified with aortic stenosis then their notes were retrieved from medical records and examined for age, comorbidities, type of surgery, perioperative cardiac complications and echocardiography data. The severity of stenosis (using the British Society of Echocardiography guidelines), degree of calcification and presence of left ventricular hypertrophy (LVH), diastolic dysfunction and systolic dysfunction was recorded. No patients had undergone exercise testing preventing assessment of the asymptomatic patients exercise ability. No patients had dobutamine stress echocardiography and therefore an assessment of contractility reserve in those patients with systolic dysfunction was not made and the identification of pseudo-aortic stenosis (PAS) impossible.

Results: 58 patients were identified from the database. 14 of these patients were cancelled and did not undergo surgery. 44 patients proceeded to surgery undergoing 51 operations. 80% of the anaesthetics were general. 12 patients had severe aortic stenosis, 24 had moderate stenosis and 8 had mild stenosis. The age range was from 57-100 years. 1 operation was low risk surgery whilst the rest were divided equally between moderate and major risk. Of those undergoing surgery 29 patients had documented ischaemic heart disease but only 12 had ongoing angina, 26 had shortness of breath and 2 had presyncope or syncope. 39 patients had a left ventricular ejection fraction (LVEF) greater than 50%. 3 had a LVEF between 35-49% and 2 patients had a LVEF less than 35%. The echocardiography data is shown in the table below:

Grade of AS	Number	LVH	Preserved diastolic and systolic function	Abnormal diastolic dysfunction only	Abnormal diastolic and systolic function	Heavy calcification
Severe	12	5	3	5	4	9
Moderate	24	12	12	12	0	5
Mild	8	6	1	6	1	0

Further classification of those patients with severe AS (as calculated by valve area) is given below:

Patients	Normal LV, high gradient across the aortic valve	Failing LV but high gradient across the aortic valve	Failing LV, low gradient across the aortic valve	Low gradient across the aortic valve but preserved EF
Numbers	7	2	2	1

There were 7 perioperative cardiac complications. These are shown below with some clinical data.

Patient	Age	Sex	Ischaemic Heart disease	Surgical risk	Angina (Canadian Class)	Shortness of breath (NYHA [#] Class)	Pre syncope or syncope	AS	LVEF	Complication
1	76	F	yes	Moderate	-	2	no	Mild	>50%	MI [*]
2	69	M	yes	Moderate	-	3	no	Mild	>50%	MI
3	100	F	yes	Moderate	-	3	yes	Moderate	>50%	AF ^{**} ,LVF ⁺
4	77	F	no	Moderate	1	1	no	Moderate	>50%	AF
5	87	M	yes	Major	1	1	no	Moderate	>50%	AF
6	84	F	yes	Moderate	3	2	no	Severe	>50%	AF,LVF
7	89	M	no	Moderate	-	3	no	Severe	<35%	MI

[#] New York Heart Association

^{*}MI myocardial infarction

^{**}AF atrial fibrillation

⁺LVF left ventricular failure

Of the 5 complications in the severe and moderate AS groups 1 occurred in a patient with preserved systolic and diastolic dysfunction, 2 occurred in patients with diastolic dysfunction only and 2 (out of a total of 4 patients) occurred in patients with abnormal systolic and diastolic dysfunction. None of these patients had LVH and one was in the low flow/low gradient but severe stenosis group.

Conclusions and discussion: Despite anaesthetising 44 patients with moderate or severe AS for intermediate and high risk surgery there were no perioperative deaths and few complications. This is reassuring. The complications in the mild AS patients probably reflect underlying ischaemic heart disease. Complications in the other patients are hard to predict as the AS group is a heterogeneous mix of degree of calcification and types of ventricular dysfunction or hypertrophy. The complications do not seem to be related to the severity of the AS and may in fact be more related to the degree and type of ventricular dysfunction. This may explain the lack of difference in outcomes in the case control studies. However this is only an assumption. What is needed is a clear pre operative assessment and the characteristics of the patient with AS defined. If enough cases are collected then information may emerge as to what are the important factors predicting outcome in the perioperative period. Studies looking at the natural history of the asymptomatic patient with severe AS have shown outcome to be related to peak jet velocity,

ejection fraction, haemodynamic progression, aortic valve calcification, results from exercise testing, assessment of contractility reserve and BNP levels. Taking the above into consideration what follows is a suggested standardised AS pre operative assessment. This can hopefully be used to create a national NZ database from which the prediction of operative risk in non cardiac surgery can be calculated. We welcome any suggestions.

Pre operative assessment of Aortic Stenosis

Age/wt

ASA

Surgical Risk

Emergency/Elective

Co morbidities

Canadian Cardiovascular Society Angina Grading Score

New York Heart Association Functional Classification Score

Presence of Pre syncope or syncope

Rhythm other than sinus

Exercise testing in asymptomatics (if able) +ve/-ve

Echo data

Severity of stenosis (jet velocity, valve area, mean gradient)

Rate of progression if serial measurements available

Diastolic dysfunction

Systolic dysfunction – ejection fraction

Is there a low flow/low gradient severe stenosis

If EF is less than 50% is there contractility reserve (stress echocardiography)

Is EF is less than 50% is there pseudo-aortic stenosis (stress echocardiography)

LVH

Degree of calcification

Other valvular pathology

BNP level