
UNIT 3 VALVULAR HEART DISEASES AND INFECTIVE ENDOCARDITIS

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3.0 OBJECTIVES

At the end of this unit, you will be able to:

- list out common valvular diseases affecting the elderly;
- describe the aetiology, incidence, clinical features, diagnosis and management of valvular diseases;
- discuss aetiology, clinical features and guidelines in the management of infective endocarditis and its prophylaxis; and
- explain about the role of surgery in elderly persons with valvular heart diseases and in infective endocarditis.

3.1 INTRODUCTION

Valvular heart disease is increasingly prevalent in the elderly, particularly calcific degenerative aortic valve disease leading to aortic stenosis. Recent studies have both improved our understanding of disease progression and have provided insights into the aetiology of degenerative aortic stenosis, which may lead to intervention which delay or prevent the disease process in the future. You shall learn in details about calcific aortic valve disease. The other valvular heart diseases have also been summarized here.

Prevention of endocarditis is a key feature of the medical therapy of elderly adults with valvular disease because endocarditis remains a highly morbid condition with a typical clinical presentation in elderly patients. After reading this unit, you will be able to recognise infective endocarditis.

3.2 VALVULAR HEART DISEASES

The commonest valvular heart diseases affecting the elderly in the descending order of frequency are:

- 1) Calcific aortic valve disease
- 2) Mitral annular calcification
- 3) Mitral regurgitation
- 4) Aortic regurgitation
- 5) Tricuspid and pulmonary regurgitation

All of these will be dealt in detail.

Recognition of valvular heart disease in elderly is hampered by the overlap in symptom profiles and non-specific physical examination findings in many elderly patients. Symptoms of chest pain, shortness of breath, exercise intolerance and dizziness are common and have many other potential causes so that valve disease often is not considered in the differential diagnosis. Similarly since systolic murmurs are so frequent in the elderly, the patient with severe aortic stenosis, but a soft murmur, may be missed.

3.3 CALCIFIC AORTIC VALVE DISEASE

Calcific or degenerative aortic valve disease is the most common valvular lesion encountered among elderly patients. Other causes of aortic stenosis in the elderly include rheumatic aortic valve disease (always occurs in conjunction with mitral valve involvement) and late degeneration of a congenital bicuspid valve.

The prevalence of aortic sclerosis is 25 per cent in elderly aged 65 years and older and 48 per cent in those aged 75 years and older.

3.3.1 Aetiopathology

Aortic sclerosis, defined as thickening and calcification of the aortic valve without significant obstruction to ventricular outflow is increasingly recognized because of echocardiography. It is clear from pathologic studies that aortic sclerosis and stenosis represent extremes of the same disease process. Prevalence of hemodynamically significant aortic stenosis is 2-9 per cent in those over age 65 year. The clinical factors associated with aortic sclerosis are listed in Table 3.1.

Table 3.1: Clinical Factors Associated with Aortic Sclerosis

Demographic	:	Age
	:	Male Gender
Clinical History	:	Smoking
Physical Examination	:	Height, Hypertension
Lab. Data	:	LDL-C
		Lp (a)
		Diabetes mellitus

Histopathologic studies also support the concept that calcific aortic valve disease represents an active disease process and is not simply an inevitable consequence of aging.

3.3.2 Clinical Features

Most of the patients with aortic stenosis remain asymptomatic, with the onset being 70-80 years for degenerative calcific disease and 50-60 years in patients with secondary

calcification of congenital bicuspid aortic valve. However onset is much earlier in case of rheumatic aortic stenosis. The classical symptoms of angina, heart failure, syncope, may be absent in the elderly. The commonest initial symptoms being impaired exercise tolerance, exertional dyspnoea or dizziness and chest pain.

Heart failure symptoms in aortic stenosis is mainly due to diastolic dysfunction and occasionally due to systolic dysfunction. Exercise intolerance is caused due to the inability to raise cardiac output across the stenotic valve.

50 per cent of patients will have co-existent coronary artery disease, so exertional anginal type of pain may also be seen. Conversely, anginal pain may also be due to the hemodynamic effects of aortic stenosis without associated significant coronary artery disease.

The third classical symptom is syncope or light headedness, due to ventricular arrhythmias and left ventricular systolic dysfunction inappropriate left ventricular baroreceptor response in the presence of fixed cardiac output.

The symptoms of aortic stenosis may be neglected by the patient because they may attribute these symptoms to normal aging. Patients may present with more severe symptoms when there is hemodynamic stress, anaemia or infectious process.

Signs

- 1) Pulse amplitude is decreased (pulsus parvus) and occurs later in systole (pulsus-tardus). However amplitude and timing of pulse may appear to be normal if there is coexisting atherosclerosis and associated regurgitation, due to the rapid and excessive rise in aortic pressure in the stiff vessels. Hence low volume pulse is relatively high in specificity but has low sensitivity.
- 2) On auscultation, S_2 is soft and may be split. Split S_2 indicates that obstruction is not so severe because the leaflet motion is unlikely to be impaired by calcification.
- 3) Presence of harsh, crescendo-decrescendo ejection systolic murmur that is loudest at the base, with radiation to the carotid arteries and sometimes radiation to the apex instead of carotids associated with systolic thrill. However, 1/3rd of hospitalized elderly patients may have basal systolic murmur, in the absence of aortic valve disease. Hence, clinical sensitivity and specificity of a systolic murmur for detection of aortic stenosis in elderly is low.

3.3.3 Investigations

- 1) **X-ray chest:** Demonstrates left ventricular hypertrophy and valve calcification.



Fig. 3.1: X-ray chest PA view of a patient of RHD with MS with AS with AR. X-ray also shows cardiomegaly with enlargement of left atrium and left ventricular (courtesy Dr. S. Dwivedi and Dr. S.S. Giri)

- 2) **ECG:** Left ventricle hypertrophy is present in 50 per cent of patients with severe aortic stenosis.
- 3) **Doppler echocardiography:** It is a cost-effective and accurate strategy for diagnosing aortic stenosis in the elderly. Echocardiography reveals valve cusp thickening and calcification and doppler evaluation allows accurate determination of the severity of valvular obstruction, by measuring aortic jet velocity and valve area. Echocardiography also allows evaluation of left ventricular size, systolic function, co-existent aortic regurgitation and involvement of other valves and presence of vegetation.

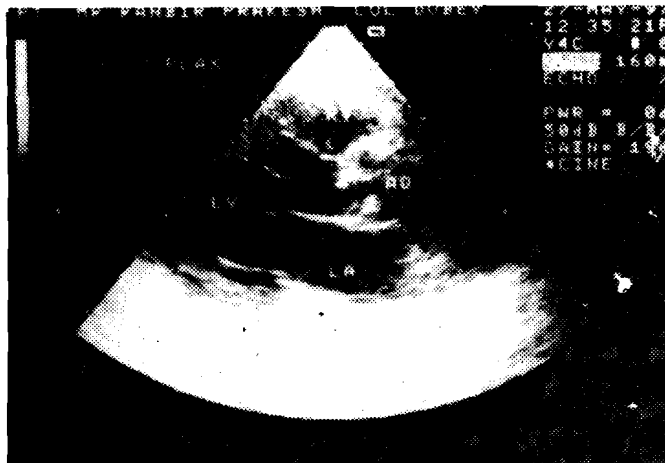


Fig. 3.2: Echocardiogram of 62 year old male with RIID with severe calcific AS with moderate AR (courtesy Dr. S. Dwivedi and Dr. S.S. Giri)

- 4) **Exercise testing:** This may be useful in asymptomatic patients, but is not needed in symptomatic patients. Hence it is not routinely advocated.
- 5) **Cardiac catheterization:** Not required for the diagnosis, but coronary angiography is essential to rule out coronary artery disease in elderly patients with symptomatic severe aortic stenosis in whom surgical intervention may improve the outcome.

3.3.4 Management

Both medical and surgical management are available.

- 1) **Medical Management:** Medical management is usually advocated in asymptomatic patients and patients in whom surgery is contraindicated due to co-morbid factors. It includes management of cardiac failure and prophylaxis against infective endocarditis. While managing heart failure in patients with aortic stenosis, one should be cautious in reducing the pre-load with diuretics, because it will exacerbate the symptoms due to low cardiac output. Although after-load reduction is desirable. However if the stenotic valve serves as a fixed resistance, peripheral vasodilation may lead to systemic hypotension without a compensatory increase in cardiac output occurs. Management of cardiac failure has been dealt in detail in the corresponding sections.
- 2) **Surgical Intervention:** Age is not a contraindication for surgery. Surgery is always considered in symptomatic patients and in asymptomatic patient with a jet velocity over 4 m/sec unit, who is undergoing coronary artery bypass grafting. Management of patients with intermediate degrees (jet velocity 3 to 4 m/sec) of aortic stenosis undergoing coronary surgery is less clear. Current surgical mortality rates in elderly patients undergoing aortic valve replacement ranges from 4 per cent to 24 per cent. Aortic valve stenosis and coronary atherosclerosis frequently co-exist and about 50 per cent of patients undergoing valve replacement also undergo coronary re-vascularisation. Post-operatively left ventricular systolic performance improves and hypertrophy regresses due to the favourable effects on after load. The valves that are used in aortic valve replacement may be mechanical or bioprosthesis. Other alternatives to valve replacement include percutaneous balloon valvuloplasty. No other technique is as better as valve replacement in terms of long-term survival.

Check Your Progress 1

- 1) The commonest valvular heart disease in the elderly is:
 - a) Aortic regurgitation
 - b) Aortic stenosis
 - c) Mitral regurgitation
 - d) Mitral stenosis
- 2) The commonest cause of aortic valve disease in elderly is

3.4 OTHER VALVULAR DISEASES

The other valvular diseases include mitral annular calcification, mitral stenosis, aortic regurgitation and right sided valvular disease. Let us deal these one by one.

3.4.1 Mitral Annular Calcification

Mitral annular calcification is a degenerative calcific process, possibly similar to that of aortic sclerosis and stenosis. Calcific, crescent-shaped deposits in the posterior portion of the mitral valve annulus can be seen in about half of elderly patients by echocardiography or fluoroscopy. Some degree of mitral regurgitation is seen in about half of elderly patients with mitral annular calcification and is moderate or severe in about 20 per cent to 33 per cent. Mitral annular calcification has been found to be associated with a higher incidence of thromboembolic strokes and cardiovascular event including myocardial infarction and sudden cardiac death.

3.4.2 Mitral Regurgitation

Some degree of mitral regurgitation is present in many elderly patients, but is mild in severity. It results from several pathological processes and is the result of a complex interaction of several factors. Competency of mitral valve requires normal anatomic relationships and function of the entire mitral valve apparatus including annulus leaflets, chordal apparatus, papillary muscles and left ventricular wall. Abnormalities of any one or combination of these components can result in mitral regurgitation. Hence it could be caused due to mitral annular calcification, dilated cardiomyopathy, ischemic heart disease (both acute and chronic), primary valve abnormalities due to rheumatic fever or endocarditis and myxomatous mitral valve disease and mitral valve prolapse. Mitral valve prolapse is the most common cause of significant mitral regurgitation requiring valve replacement or repair in the elderly.

Diagnosis

The diagnosis of mitral regurgitation is by auscultating pan systolic murmur over the apex, that radiates to the axilla. The apical impulse is high pitched displaced laterally. Doppler echocardiography is the best diagnostic procedure for evaluating mitral regurgitation, assessing LV function, left atrial dilatation and pulmonary artery pressures.

Management

- 1) Medical management of mitral regurgitation in the elderly focuses on endocarditis prophylaxis, periodic echocardiographic evaluation and symptomatic relief of pulmonary congestion with diuretics. After-load reduction especially angiotensin converting enzyme inhibitor is beneficial in patients with co-existent, left ventricular systolic dysfunction.
- 2) Surgery is indicated for all symptomatic patients. Surgery is not indicated in patients with hypokinetic left ventricle though the patient is symptomatic. In patients with mitral regurgitation and ischaemic heart disease, surgery is directed towards myocardial ischaemia rather than the mitral valve in the form of revascularisation alone or revascularisation with mitral annuloplasty.

The role of surgery is also controversial in patients with ruptured papillary muscle producing mitral regurgitation. It carries a high mortality rate in elderly. In patients with mitral valve prolapse, mitral valve repair is preferred over mitral valve replacement, because the latter procedure decreases the ejection fraction after surgery which is very problematic in elderly. Mitral valve repair is the procedure of choice whenever possible in the elderly patient with mitral regurgitation.

3.4.3 Mitral Stenosis

The causes of mitral stenosis (MS) in elderly are mitral annular calcification and rarely rheumatic fever. Elderly patients with mitral stenosis most commonly present with symptoms of right heart failure. Typical finding of MS i.e. diastolic rumble, opening snap and loud S1 are heard in fewer than 50 per cent of elderly patients. Often only a systolic murmur of aortic sclerosis is heard. The most frequent ECG finding is atrial fibrillation. Medical therapy includes diuretics to alleviate pulmonary congestion heart rate, control of atrial fibrillation and chronic anticoagulation to prevent left atrial thrombi and embolic events. Endocarditis prophylaxis is recommended even though it is so rare because of co-existent mitral regurgitation. If surgery is needed, commissurotomy may be possible if there is no significant calcification of valve cusps and no major concomitant mitral regurgitation. If relief of hemodynamic obstruction cannot be achieved with commissurotomy, mitral valve replacement should be considered.

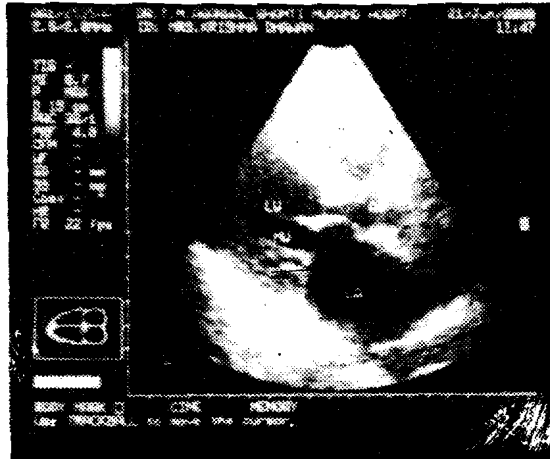


Fig. 3.3: Echocardiogram of a 70 year old female patient with RIIID with MS showing Mitral valve stenosis with left atrium enlargement (courtesy Dr. S. Dwivedi and Dr. S.S. Giri)

3.4.4 Aortic Regurgitation

Commonest causes of aortic regurgitation (AR) in elderly are aortic valve sclerosis or aortic root dilation due to hypertension or atherosclerosis. Its severity is usually mild, hence surgical intervention is rarely needed. Management of AR in elderly includes endocarditis prophylaxis, after-load reduction with ACE inhibitors and careful evaluation of the cause. In a patient with chest pain, a new finding of AR on auscultation or echocardiography should prompt consideration of aortic dissection in the differential diagnosis.

3.4.5 Right Sided Valvular Diseases

A minimal degree of both tricuspid and pulmonic regurgitation can be detected by doppler echocardiography in a majority of adults with an increasing prevalence of mild regurgitation with age. However hemodynamically significant right sided regurgitant lesions are rare in the elderly. Right sided valvular disease is usually secondary to pulmonary hypertension from left heart failure or lung disease.

Check Your Progress 2

- 1) Name the commonest cause of regurgitation which needs repair of the valve.

2) Which is the best diagnostic procedure for diagnosis of mitral regurgitation?

.....

3) Which is the commonest cause of mitral stenosis in elderly?

.....

3.5 INFECTIVE ENDOCARDITIS

The prevalence of infective endocarditis in the elderly is now slowly rising due to the increasing number of elderly patients with prosthetic valve.

Aetiology

The causative organisms are usually Staphaureus, Group-D streptococci, and enterococcus and they more frequently arise from a gastrointestinal or genitourinary source. The commonest of these is the staphaureus.

Diagnosis

Diagnosis is difficult in elderly because the symptoms of fatigue, weight loss and a murmur are often attributed to old age. The more insidious clinical course may contribute to the more severe prognosis in the elderly because the diagnosis often is not considered until after irreversible complications have occurred. The recently introduced Duke criteria for the diagnosis of infective endocarditis increased the ability to diagnose it. It is presented in Table 3.2 below.

Table 3.2: Duke Criteria for Diagnosis of Infective Endocarditis

Clinical Diagnosis:	2 major criteria
	or
	1 major and 3 minor
	or
	5 minor criteria
Major Criteria	
1) <i>Positive blood culture for infective endocarditis</i>	
Typical microorganism for infective endocarditis:	
— from two separate blood cultures.	
— persistently positive blood cultures.	
2) <i>Evidence of Endocardial Involvement</i>	
— Positive echocardiogram for infective endocarditis	
or	
— New valvular regurgitation	
Minor Criteria	
— Predisposition: Heart disease/IV drug abuse	
— Fever $\geq 38^{\circ}\text{C}$	
— Vascular phenomena	
— Immunologic phenomena	
— Microbiologic evidence: Positive blood culture but not meeting major criteria or serologic evidence of active infection with organism consistent with infective endocarditis.	
— Echocardiogram: Consistent with infective endocarditis but not meeting major criteria.	

You already know that antimicrobial treatment of bacterial endocarditis is antibiotic according to type of organism detected. The standard antibiotics treatment is given below in Table 3.3.

Table 3.3: Antimicrobial Treatment of Infective Endocarditis

Organism	Agent	Dose	Duration
Strep. viridans	Benzyl Penicillin + Gentamicin then amoxycillin orally	2-4 million unit 4 hourly 1 mg/kg 8 hourly 6 g daily for 2-6 weeks	4 weeks
Strep. faecalis	Benzyl Penicillin + Gentamicin then amoxycillin orally	4-8 million unit 4 hourly 3 mg/kg 8 hourly 6-8 g daily for 2-6 weeks	4-6 weeks
Staph. aureus	I/v Flucloxacillin	2 g 6 hourly	6 weeks
	then oral flucloxacilin	2 g 6 hourly	4 weeks
	or Fusidic acid	580 mg 8 hourly	6 weeks
	or Clindamycin	Doses vary	6 weeks
If Methicillin resistant	I/v Vancomycin +	1 g 12 hourly	6 weeks
Staph. aureus	Erythromycin	500 mg 6 hourly	
Coxiella burnetti	I/v Tetracycline + Doxycycline orally	0.5-1 g 12 hourly 100 mg 12 hourly	1 year

Indications for Cardiac Surgery in Infective Endocarditis

You have to decide about surgical intervention in case if:

- 1) Heart failure due to valve damage
- 2) Failure of antibiotic therapy (persistent uncontrolled infection)
- 3) Large vegetations on left sided heart valves
- 4) Abscess formation/obstruction of valve
- 5) Patients with prosthetic valve endocarditis or fungal endocarditis.

Antibiotic Prophylaxis Against Endocarditis

You should also know the prophylactic antibiotic required in the following situation against development of endocarditis.

- 1) Dental procedures or upper respiratory tract
 - Amoxycillin 3 g orally 1 hour prior to procedure
 - or
 - Erythromycin 1.5 g orally 1 hour before procedure
 - or
 - Clindamycin 600 mg orally IV 1 hour before procedure

- 2) Gastrointestinal and Genitourinary surgery
- Amoxycillin+Gentamicin 1.5 g/kg IV ½ hr prior to the procedure
 - or
 - Vancomycin 1 gm IV 30 min. before the procedure.

Check Your Progress 3

- 1) The commonest organism responsible for infective endocarditis is
- 2) The minimum duration of treatment for infective endocarditis is:
 - a) 2-4 weeks
 - b) 4-6 weeks
 - c) 6-8 weeks
 - d) 8-10 weeks
- 3) The commonest organism of infective endocarditis in I.v. drug abuse

3.6 LET US SUM UP

As the incidence of valvular disease in the elderly is increasing understanding of its pathogenesis and natural progression as well as surgical approaches is necessary. Future studies are needed to develop medical interventions that slow or halt the degenerative valvular processes associated with aging. At present, the degenerative valvular processes must be followed closely by the clinical, and individual management decisions for the elderly based on the type and severity of valve disease, comorbid medical conditions, and the risks of benefits of intervention, along with patient preference, rather than on the chronological age of the patient. It is becoming clear that both survival and quality of life outcomes can improve by consideration of surgery at the onset of indications, before further deterioration eliminates the opportunity to provide benefit for the elderly patient with valvular disease.

Prevention of endocarditis is a key feature of the medical therapy of elderly patients with valvular disease because endocarditis remains a highly morbid condition with an atypical clinical presentation in elderly patients. Despite higher operative risk, earlier surgical intervention should be considered in elderly adults with endocarditis and its indications being fever, positive blood culture, vegetations demonstrated by echocardiography and significant valvular regurgitation.

3.7 KEY WORDS

- Cardiac Catheterization** : Passage of catheter (cannula) into the cardiac chamber through blood vessels to study the volume and pressure changes, oxygen saturation and cardiac output.
- Echocardiography** : Noninvasive technique which uses the ultrasound to visualise internal cardiac structures and functioning of heart.
- Mitral stenosis** : Narrowing of mitral valve leading to obstruction to flow of blood from left atrium to left ventricle.

3.8 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

- 1) b
- 2) calcific or degenerative

Check Your Progress 2

- 1) Mitral valve prolapse
- 2) Echocardiography
- 3) Mitral annular calcification

Check Your Progress 3

- 1) Streptococcus viridans
- 2) b
- 3) Staph aureus

3.9 FURTHER READINGS

Fauci, Braunvald, Isselbacher *et al.*, *Harrison's Principle of Internal Medicine*, 15th edn., McGraw Hill, 2001.

Tallis, Raymond, Howard Fillit and J.C. Brocklehurst, *Brocklehurst's Textbook of Geriatric Medicine and Gerontology*, Churchill Livingstone, London, 5th edn., 1998.