Acquired valvular heart diseases + Infective and other endocarditis

Prof. Janaki Hewavisenthi
Department of Pathology
Faculty of Medicine
University of Kelaniya.

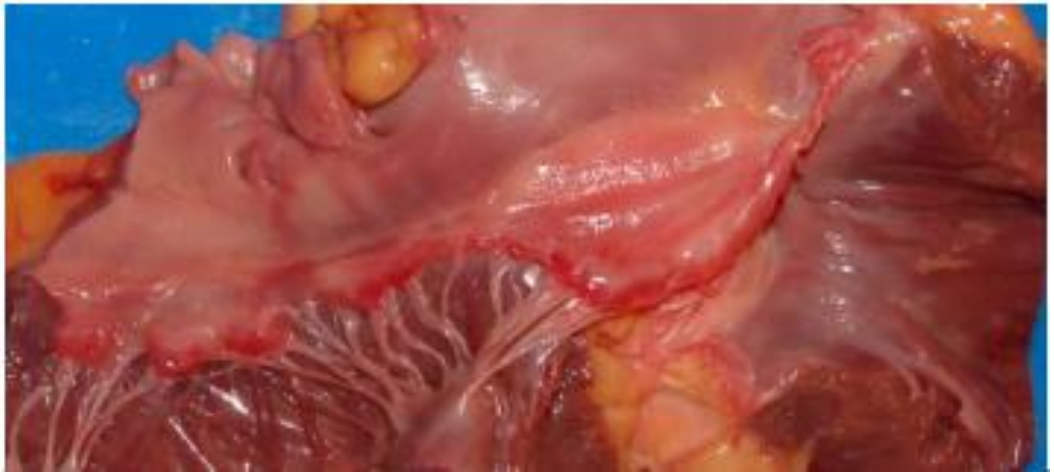
Mitral valve prolapse

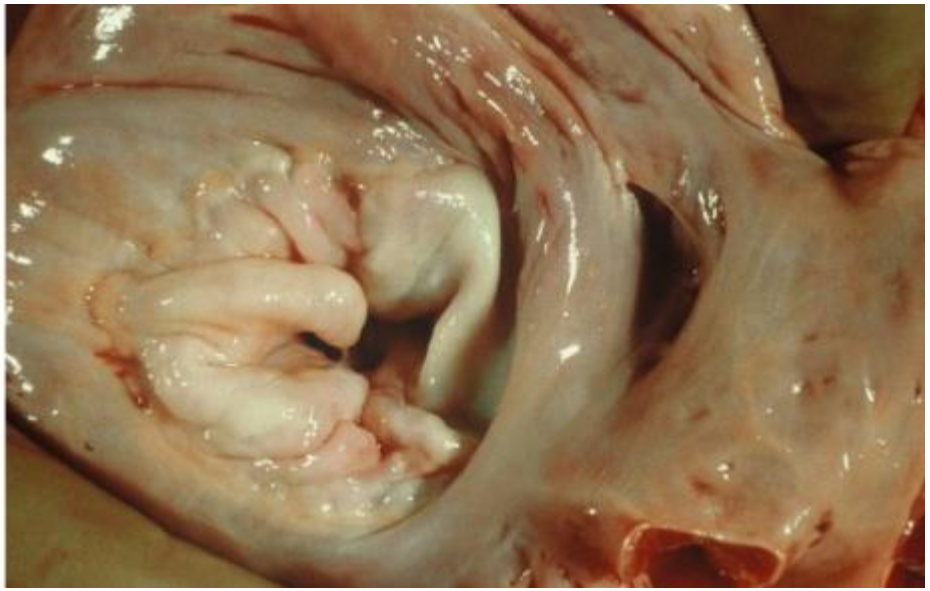
- Myxomatous degeneration is the key histological feature.
- Floppy / prolapse or ballooning back of the MV into the LA during systole
- 3% of adults in USA
- Pathogenesis
  - Associated with Marfans syndrome
  - Mutation in fibrillin – 1 (which alters cell – matrix signaling and dysregulates TGF- β

Mitral valve prolapse

- Affected leaflets are enlarged, reduntant thick and rubbery
- Associated tendinous cords are elongated, thinned and even ruptured
- Annulus is dilated
- The tricuspid, aortic and even pulmonary valve may be affected.

Normal mitral valve





Hooded or parachute redundant valves

Redundant valves with chorda tendinae showing a parachute configuration.

Mitral valve prolapse

- Histology
  - Attenuation of the lamina fibrosa
  - Marked thickening of the spongiosa with deposition of mucoid material (proteoglycans)
- Secondary changes
  - Fibrous thickening of the valve leaflets (rubbing together)
  - Linear fibrous thickening of the LV endocardial surface (cords rubbing)
  - Thickening of the LV / LA endocardium (prolapsing or hypermobile valve cusps)
  - Thrombi of the atrial surfaces of the leaflets / LA wall
  - Focal calcification of the posterior mitral leaflet

Collagen in the fibrosa is loose and disorganized with deposition of proteoglycans the spongiosa. The elastin is disorganized.

INFECTIVE ENDOCARDITIS

Infective Endocarditis

- Colonization or invasion by microbes of the
  - heart valves
  - mural endocardium
  - Aorta, aneurysmal sacs, blood vessels and prosthetic valves also involved

↓

FORMATION OF FRIABLE BULKY VEGETATIONS

(composed of thrombotic debris and organisms)

+

DESTRUCTION OF THE UNDERLYING CARDIAC TISSUE

Infective Endocarditis

spectrum

SUBACUTE INFECTIVE ENDOCARDITIS

Organisms of low virulence

Causing infection in a previously abnormal heart

Insidious onset

Protracted course – weeks – months

Most patients recover after antibiotic therapy

Less destructive vegetation with evidence healing

ACUTE INFECTIVE ENDOCARDITIS

Highly virulent organisms

Causing infection in a previously normal heart.

Tumultuous / sudden onset

Severe illness – days – weeks

Most patients die despite therapy Requires even surgery.

Organisms produce invasive valvular infections – necrotizing, and ulcerative

Aetiopathogenesis

Cardiac or vascular abnormality

Rheumatic heart disease

Myxomatous mitral valve

Bicuspid aortic valve

Artificial or prosthetic valves

Indwelling vascular catheters

Any cardiac conditions that cause impingement of jet streams leading to accumulation of platelet – fibrin deposits

Host factors

Neutropaenia

Immunodeficiency

Malignancy

Immunosupression

Diabetes mellitus

Alcohol

Intravenous drug abuse

Seeding of the organisms / entry into the blood stream (Bacteriaemia)

Intravenous drug abusers

Occult source from gut oral cavity or trivial injury

Dental / surgical procedures

Aetiology (Causative organisms)

- Streptococus viridans– 50-60% abnormal valves
- Staphylococcus aureus –10–20% healthy or deformed valves and intravenous drug abusers
- HACEK group
- Haemophillus
- Actinobacillus
- Cariobacterium
- Eikenella
- Kingesella
- Oral cavity commensals
- Gram negative bacilli
- Fungi
- Staphylococcus epidermidis

Clinical features

- Fever - most consistent feature
  - Acute – with chills and rigors
  - Subacute and in elderly – non specific symptoms such as fatigue, LOW, flu-like symptoms
- Murmurs
  - Due to pre – existing cardiac abnormalities
  - New murmurs developing due to vegetations
- Extracardiac manifestations
  - Vascular – microemboli
    - These are rare due to the shortened course of the disease as a result of antibiotic therapy
  - Immune complex mediated - glomerulonephritis

DIAGNOSIS

- Based on Dukes criteria
  - Two major criteria
  - One major criteria and three minor criteria
  - Five minor criteria

- Investigations
  - Microbiology department will elaborate

Dukes criteria

- Major criteria
  - Positive blood culture on 2 occasions *
  - Positive echocardiogram *
  - New murmur
- Minor criteria
  - Predisposing cardiac lesion or IV drug abuse
  - Fever
  - Vascular phenomenon
  - Immunological phenomenon
  - Positive blood culture) not meeting above
  - Positive echocardiogram)

Minor criteria

- Vascular phenomenon
  - Major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, Intracranial haemorrhage, conjuctival haemorrhage and Janeways lesions, splinter haemorrhages
- Immunological phenomenon
  - Oslers nodes
  - Roths spots
  - Glomerulonephritis
  - Rheumatoid factor

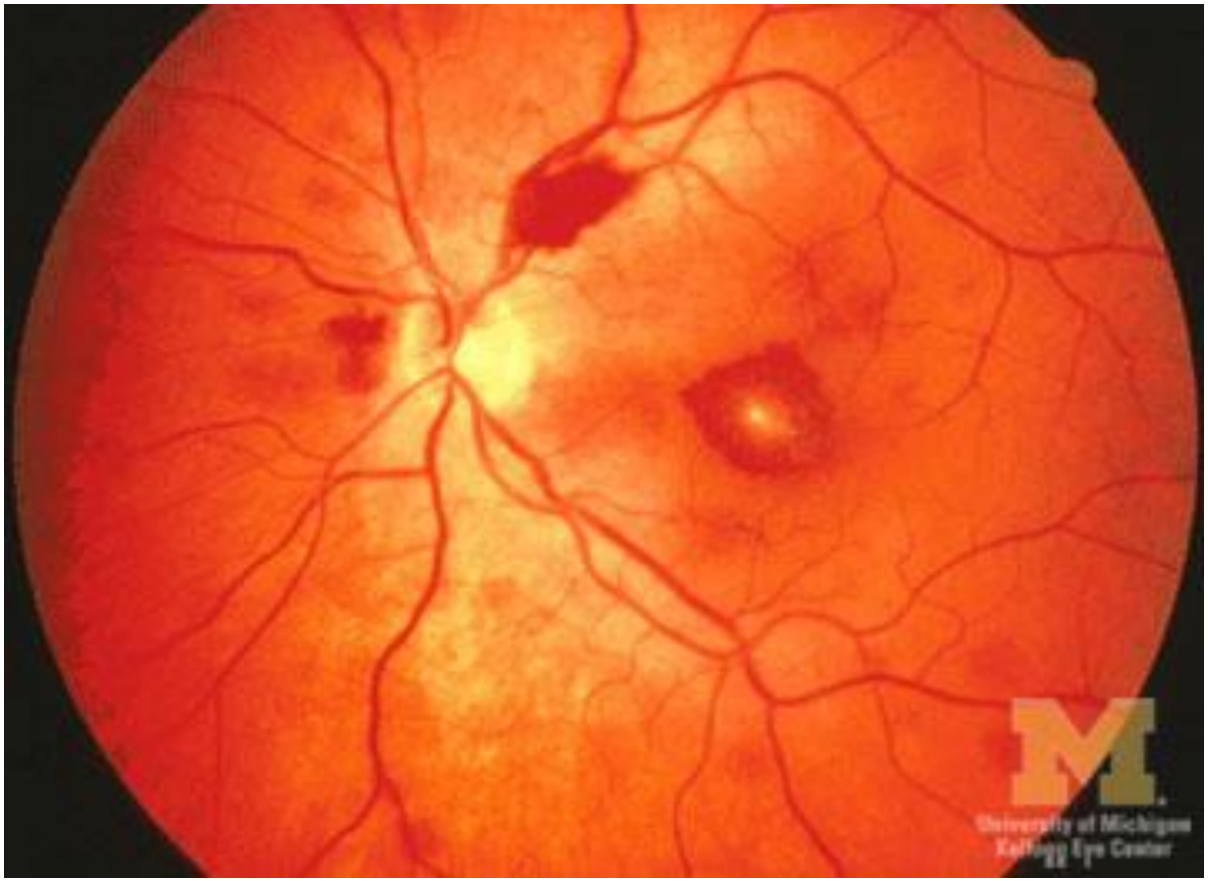
Janeways lesions

They appear as flat, painless, red to bluish-red spots on the palms and soles (caused by septic emboli).

Oslers nodes

These are painful erythematous nodules in the hand (caused by immune complexes)

Roth's spots



White centered retinal haemorrhages

(Immune mediated vasculitis)

Splinter haemorrhages

Caused by tiny clots causing damage to the capillaries beneath the finger nails or by damage to vessels due to swelling (vasculitis)

Pathology

- **Vegetations**
  - Friable bulky and destructive vegetations
  - Containing fibrin, inflammatory cells and organisms
  - The aortic and mitral valves are most commonly affected
  - Right side valvular involvement in intravenous drug abusers
  - Single or multiple vegetations
  - Depend on the type of organisms Eg: fungal vegetations are larger and more friable

Pathology (Complications)

- Abscesses
  - Vegetations erode into the underlying myocardium
- Septic infarcts
  - Brain, kidney etc.

The vegetations of SABE are associated with less valvular destruction

Non bacterial endocarditis (NBTE)

- Sterile small masses / vegetations containing
  - Fibrin platelets and other blood components with no accompanying inflammatory reaction
  - 1 – 5 mm in diameter
  - Single or multiple
  - Along the lines of closure of the leaflets or cusps
  - If patient survives - heal with delicate fibrosis.

Non bacterial thrombotic endocarditis

- Often encountered in debilitated patients

  (Marantic endocarditis)
- Although local effects on the valves are unimportant they produce emboli and infarcts in the brain and heart
- Tends to occur in persons with a hypercoagulable state (Trousseau's syndrome, a paraneoplastic syndrome associated with malignancies) and in very ill persons.

Pathogenesis

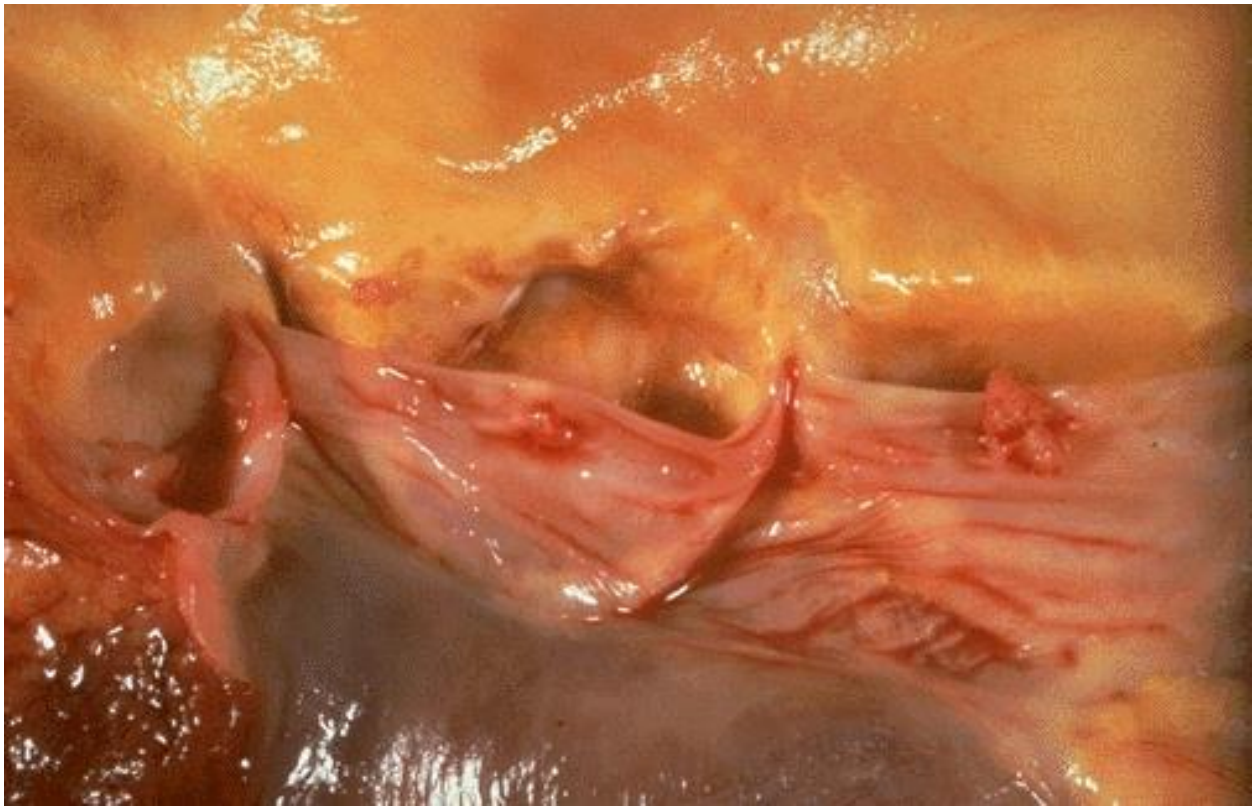
- Concomitant venous thromboses and pulmonary embolism
- Association with mucinous and non mucinous malignancy

↓

Common Hypercoagulable state with activation of blood coagulation such as disseminated intravascular coagulation

Non bacterial thrombotic endocarditis

The small pink vegetation on the rightmost cusp margin



Endocarditis of Systemic lupus erythematosus (Libman- Sacks disease)

- Vegetations
  - Small – 1-4mm in diameter
  - Single or multiple
  - Located on
    - the undersurfaces of the atrioventricular valves
    - valvular endocardium,
    - on the cords
    - mural endocardium of atria or ventricle
    - Mitral valve more involved than the aortic valves

Endocarditis of Systemic lupus erythematosus - Vegetations

- Histology
  - – finely granular fibrinoid eosinophilic material material that may contain haemotoxyphil bodies
  - Intense valvulitis characterized by fibrinoid necrosis.
  - Subsequent fibrosis and valvular deformity can result requiring surgery

Pathogenesis

- **Antiphospholipid syndrome**
  - The circulating antiphopholipid antibodies are also associated
    - Venous and arterial thromobosis
    - Recurrent pregnancy loss
    - Thrombocytopenia

Libmann Sachs endocarditis

These are are flat, pale tan, spreading vegetations over the mitral valve surface and even on the chordae tendineae.

Carcinoid heart disease

- This is the cardiac manifestations of the systemic syndrome caused by carcinoid tumours (neuroendocrine tumours)
  - Episodic flushing
  - Flushing of the skin
  - Cramps
  - Nausea
  - Vomiting
  - Diarrhoea

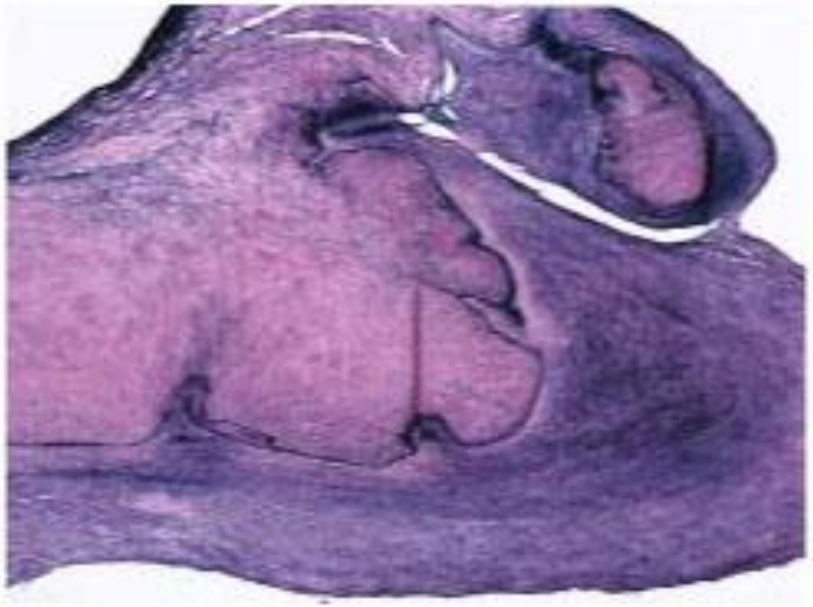
Pathology

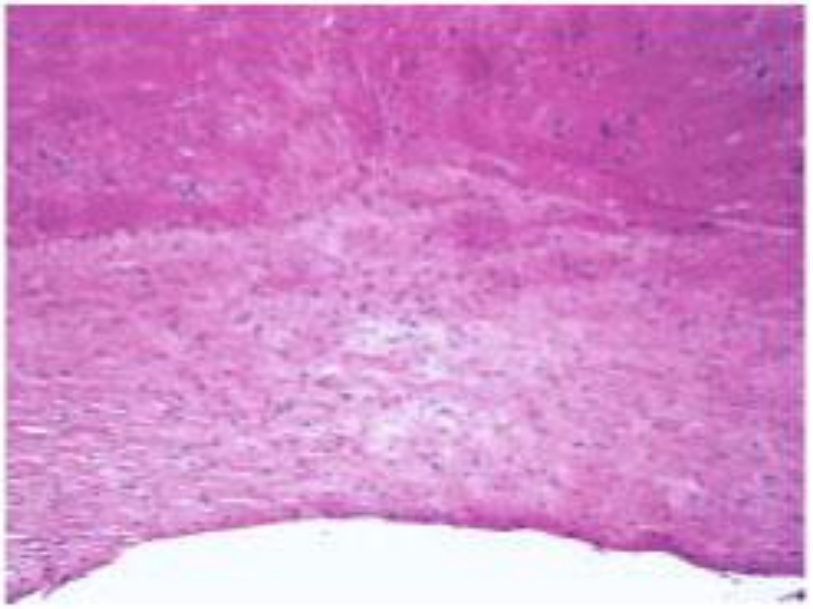
- Fibrous intimal thickening of the inside surfaces of the cardiac chambers and valvular leaflets
- Mainly right sided
  - Right ventricle
  - Tricuspid valves
  - Pulmonic valves
- Endocardial plaque like thickenings are composed of
  - Smooth muscle cells and sparse collagen fibres in an acid muopolysaccaride rich matrix

Pathogenesis

- Variety of bioactive products
  - Serotonin (5 Hydroxytryptamine) * - most important
  - Kallekrein
  - Bradykinin
  - Histamine
  - Prostaglandins
  - Tachyminins
- Mainly right sided due to inactivation of both serotonin and bradykinin in blood during passage through the lungs by the monamine oxidase present in the pulmonary vascular endothelium

Carcinoid heart disease





Diffuse thickening of the distal leaflets, tendinous cords, and papillary muscle endocardium

Histologically, the lesions consisted of surface proliferation of myofibroblasts and deposition of fibroelastic extracellular matrix

.

Endocarditis in unusual situations

Prosthetic valves

- Infective endocarditis
- Thromboembolic complications
- Structural deterioration of the valve

Endocarditis in the elderly

- The disease
  - Is more common than in the young
  - Presentation is atypical
  - Complications are more
- More prone to endocarditis
  - Senile calcific aortic stenosis
  - Presence of prosthetic valves
- Most often infected by Staph aureus
- Predisposing causes include
  - Genitourinary infections
  - Surgical procedures
  - Pressure sores
  - Tooth extractions

Drug Addicts

- The vegetations are
  - Right sided
  - Larger especially if they are fungal
  - More likely to embolize
- The principle source for bacteraemia is the skin from which the drug is injected

Assignment

- List and compare the different types of valvular vegetations

- Read about prosthetic valves and their complications