Inflammatory and Valvular Heart Disease

APPROVED

TV = Tricuspid Valve
PV = Pulmonic valve
MV = Mitral valve
AV = Aortic valve

Some random stuff I think is interesting or high yield is in green.

Body and Disease 2011

Outline slide.. Low yield.

INFLAMMATORY HEART DISEASES

"Another issue that unfortunately if you do not diagnose it, you get phone calls from risk management, visits from attorneys and depositions."

ENDOCARDITIS

MYOCARDITIS

PERICARDITIS

RHEUMATIC HEART DISEASE

Outline slide.. Low yield.

ENDOCARDITIS

Endocarditis: inflammation of the inner surface of the heart (endocardium) that usually involves the valves.

INFECTIVE

- Bacteral (most common)
- Fungal

NON-INFECTIVE

- Non-bacterial thrombotic endocarditis (NBTE)
- Libbman-Sacks endocarditis secondary to SLE

Low yield, but getting higher yield.

INFECTIVE ENDOCARDITIS

USUALLY BACTERIAL

LESS COMMONLY, FUNGAL

- Highly virulent organisms
- Occurs most commonly in immunocompromised patients (Candida)

More commonly involves left-sided valves, except for IV drug abusers

- IV drug abusers seed their venous circulation with bacteria or fungi, which travel back to the right side of the heart via the inferior vena cava to involve the TV and PV.

Medium-high yield.

INFECTIVE ENDOCARDITIS
Predisposing Factors

Endothelial Injury

→ **Left > Right**

Turbulent Flow

- Left sided valves (MV, AV) experience more shear stress, injury, and subsequent bacterial seeding.

Bacteremia

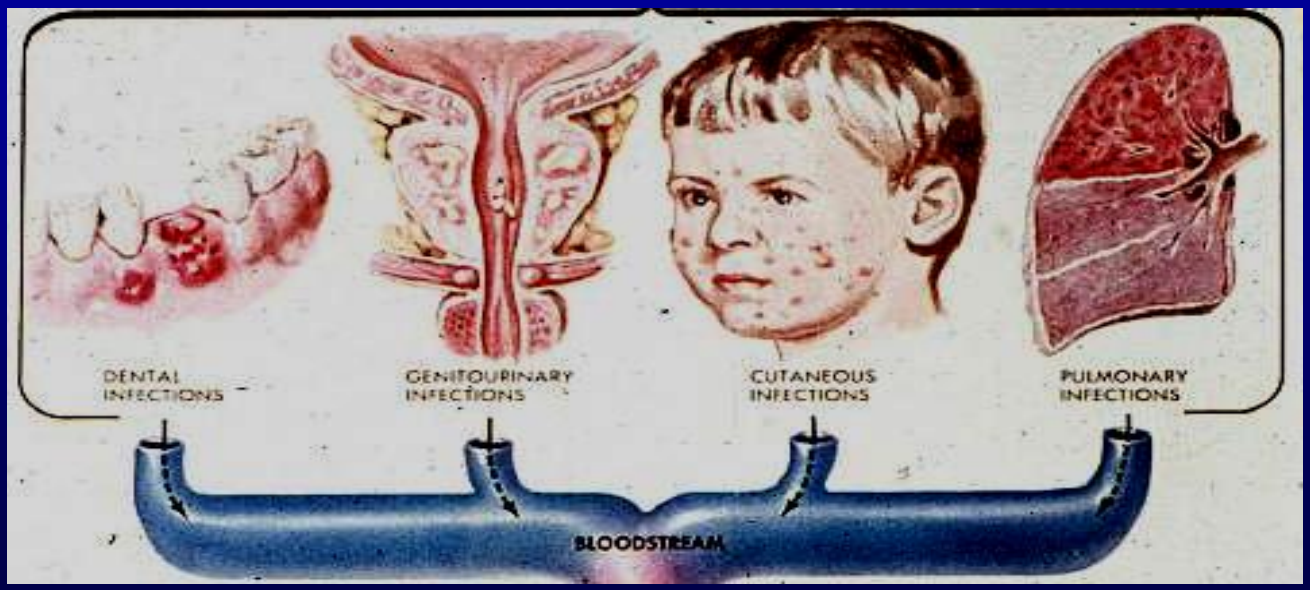
- Transient bacteremia is a common occurance

Infectious Endocarditis

- **Source of Bacteremia**
  - **Skin Lesions**
  - **Dental Caries**
  - **Genitourinary Tract**
  - **Pulmonary Infections**
  - **Invasive Procedures**

Staph aureus (catalse positive, coagulase positive)
Staph epidermidis (catalase +, coagulase -, novobiocin S)

Streptococcus viridans (catalase negative, alpha-hemolytic, optochin resistant)

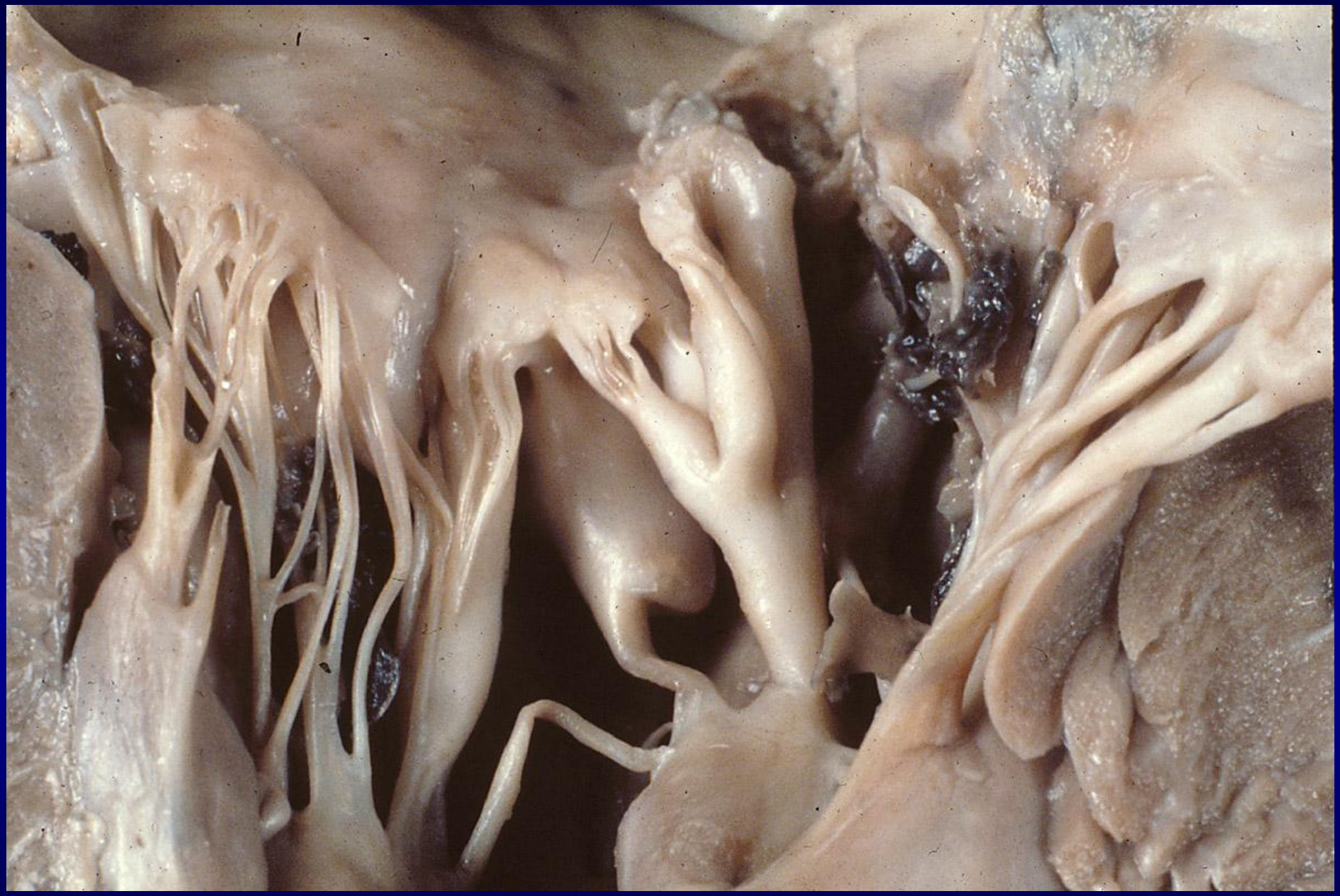


HIGH YIELD, BRO!!

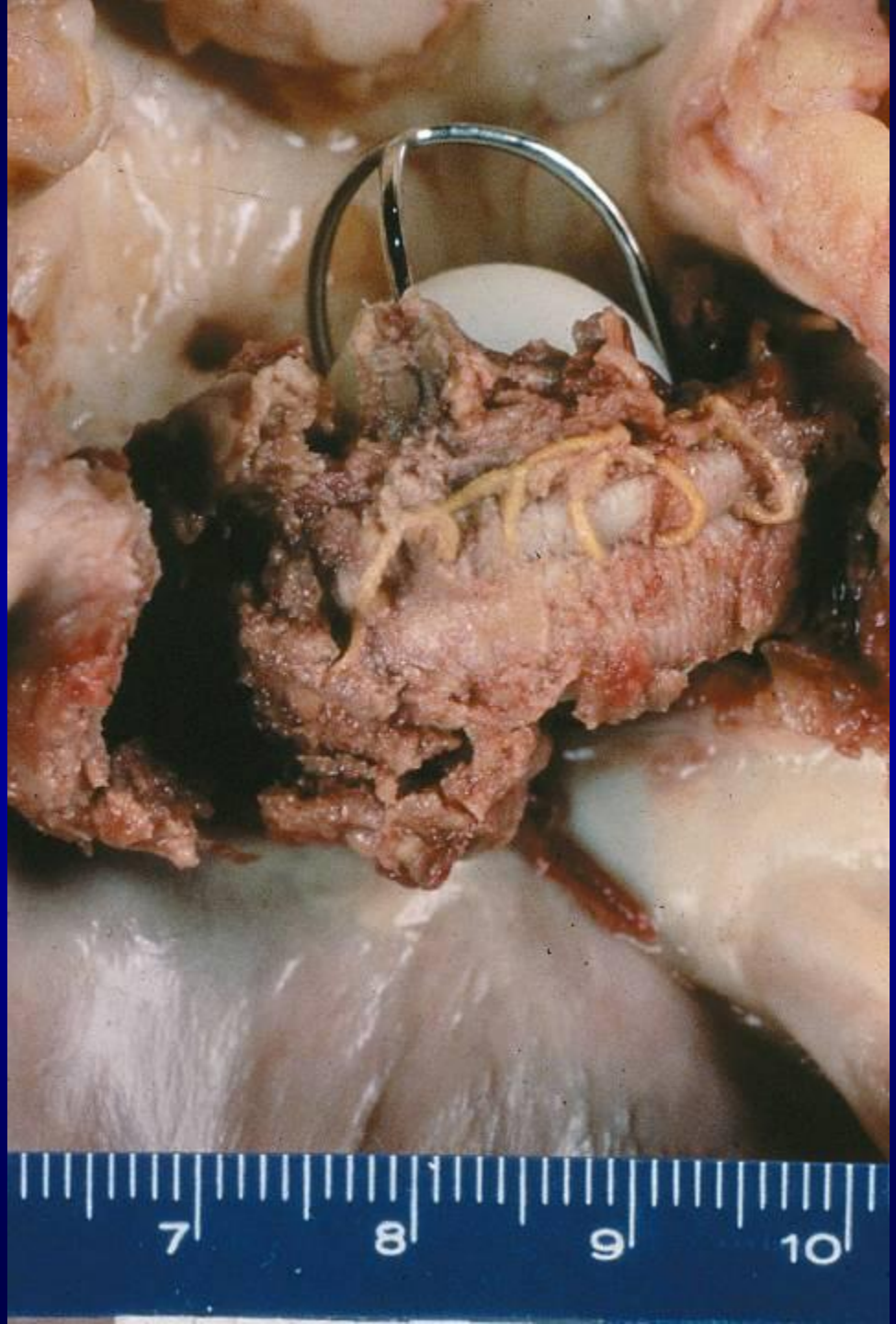
Infectious Endocarditis

- **Predisposing Lesions – Nidus**
  - **Bicuspid Aortic Valve** (congenital valve defects)
  - **Rheumatic valve disease**
  - **Shunts:** Turbulence and endothelial injury
    - VSD with "Jet Lesion"
    - Patent Foramen Ovale
    - Patent Ductus Arteriosus
  - **Foreign Material**
    - Prosthetic Valves – leaflets and sewing ring
    - Artificial conduits
    - Suture lines

Blood is flowing through holes in the heart, creating turbulent flow. Jet lesion refers to a small lesion creating a jet that shoots against and damages the endocardium. The endocardium under these jets will be thickened due to chronic irritation, creating a nidus



Staph endocarditis in mitral valve with chronic rheumatic damage



Fungal endocarditis of prosthetic valve

Read slide

Infective Endocarditis

- Vegetations
  - Fibrin
  - Bacterial Colonies
  - Inflammatory Cells

    - Organizing fibrous tissue
    - Calcification can occur rapidly
    - Underlying valve inflammation and destruction depending on organism

HIGH YIELD, BRO!!

CLINICAL PRESENTATION OF INFECTIVE ENDOCARDITIS

	SUBACUTE	ACUTE
Pre-existing Valve Disease	Present	Absent
Agent	Strep. Viridans	Staph. Aureus
Onset/Course	Insidious/Slow	Acute/Rapid
Prognosis	Better	Worse

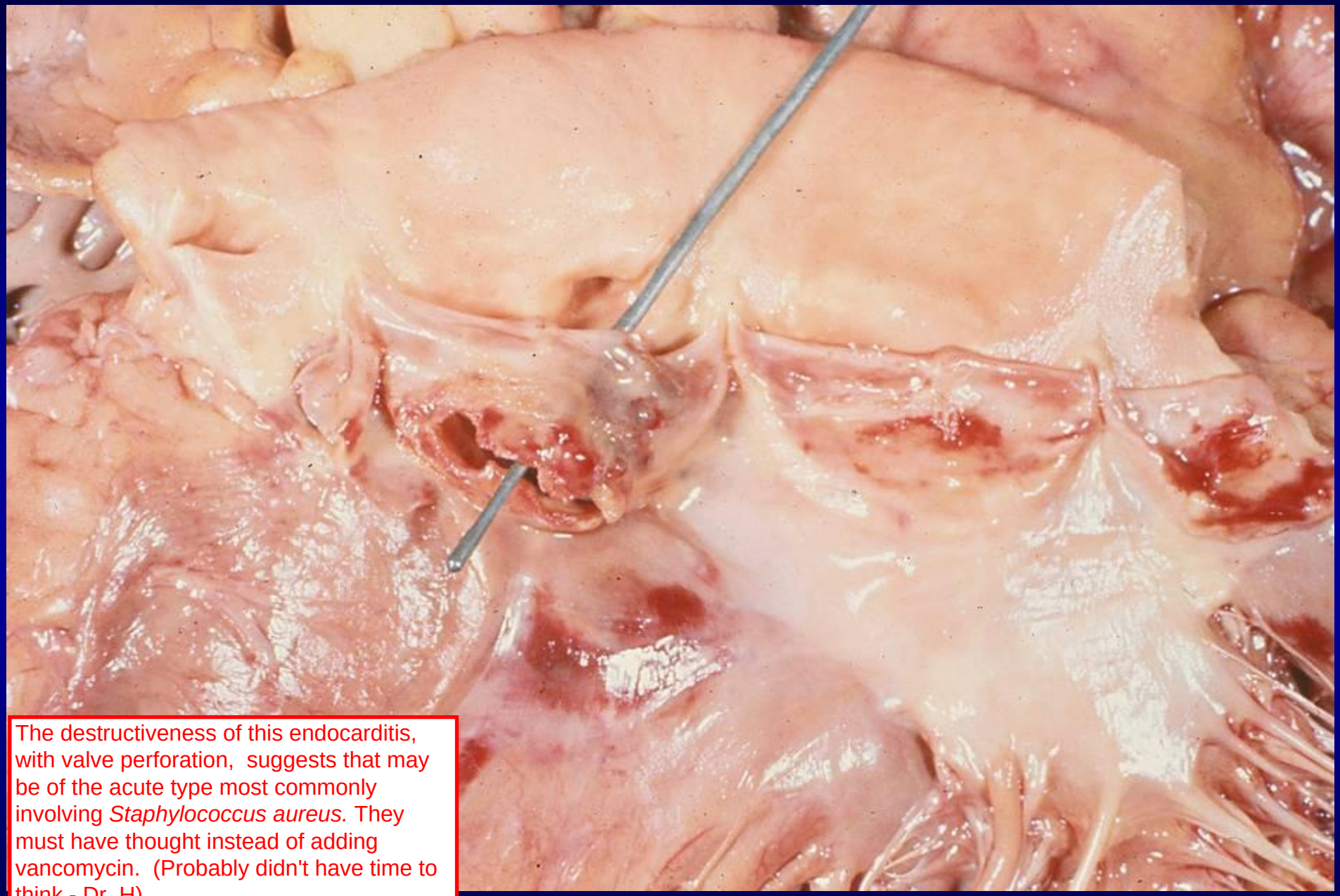
Strep pneumo common DUMC autopsy

Subacute = Long Incubation; Acute = Short Incubation < 6 weeks

HACEK organisms – seen in infants and immunocomp. children

(*Haemophilus, Actinobacillus, Cardiobacterium, Eikenella,* and *Kingella* species)

HACEK cause culture negative endocardiits

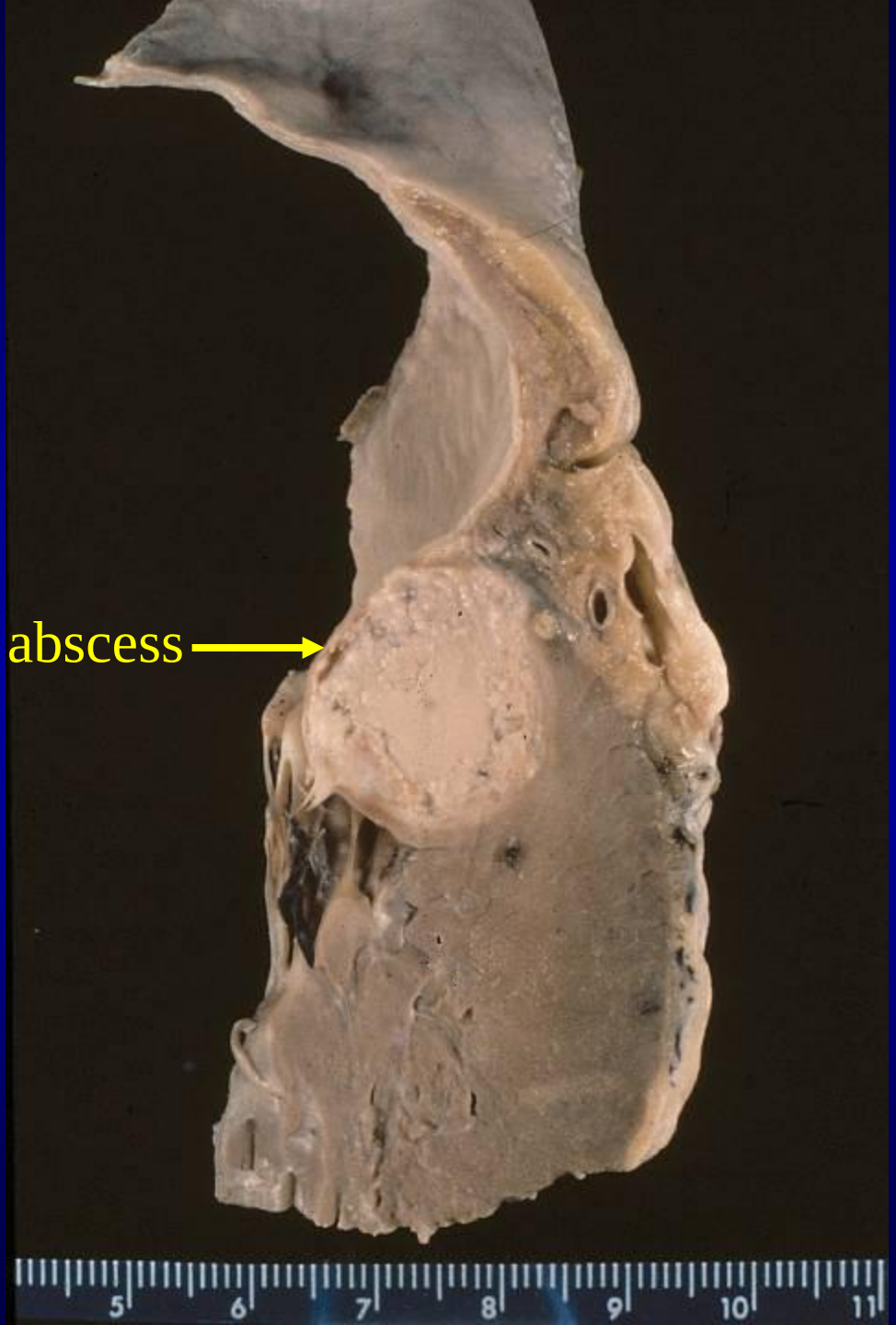


The destructiveness of this endocarditis, with valve perforation, suggests that may be of the acute type most commonly involving *Staphylococcus aureus.* They must have thought instead of adding vancomycin. (Probably didn't have time to think - Dr. H)

Acute bacterial endocarditis of aortic valve

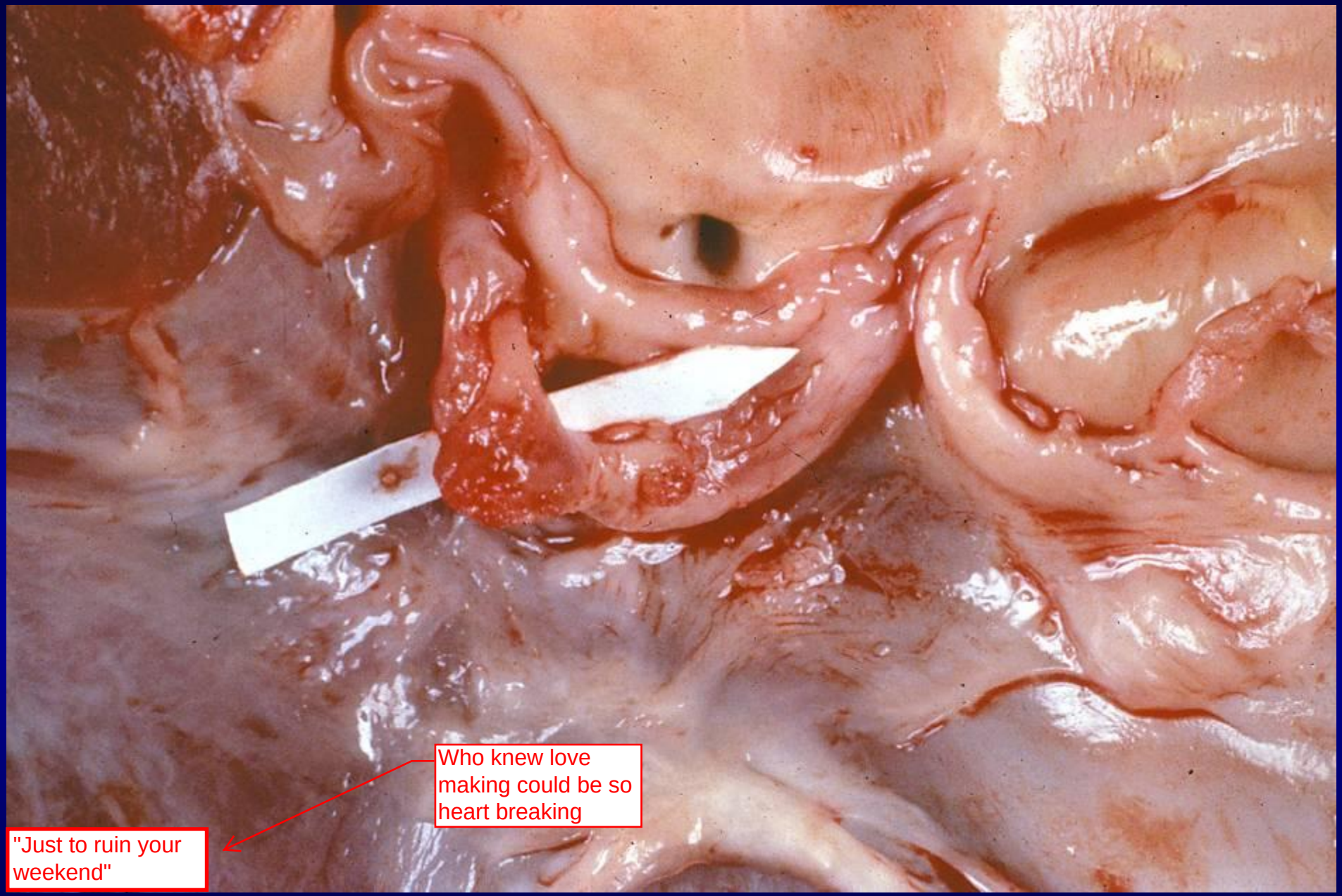
Staph aureus endocarditis of otherwise normal mitral valve, with perforation

There is no evidence of previous rheumatic fever, which might predispose patients to the subacute type of endocarditis produced by Streptococcus viridans.



Staph endocarditis of mitral valve and abscess of left ventricular myocardium

"Ring abscess" -- a complication of infective endocarditis



Acute gonococcal endocarditis of aortic valve

Complications

Emboli:

- Septic
- Infarcts

Petechiae

Janeway Lesions

- nontender macules

Osler's Nodes

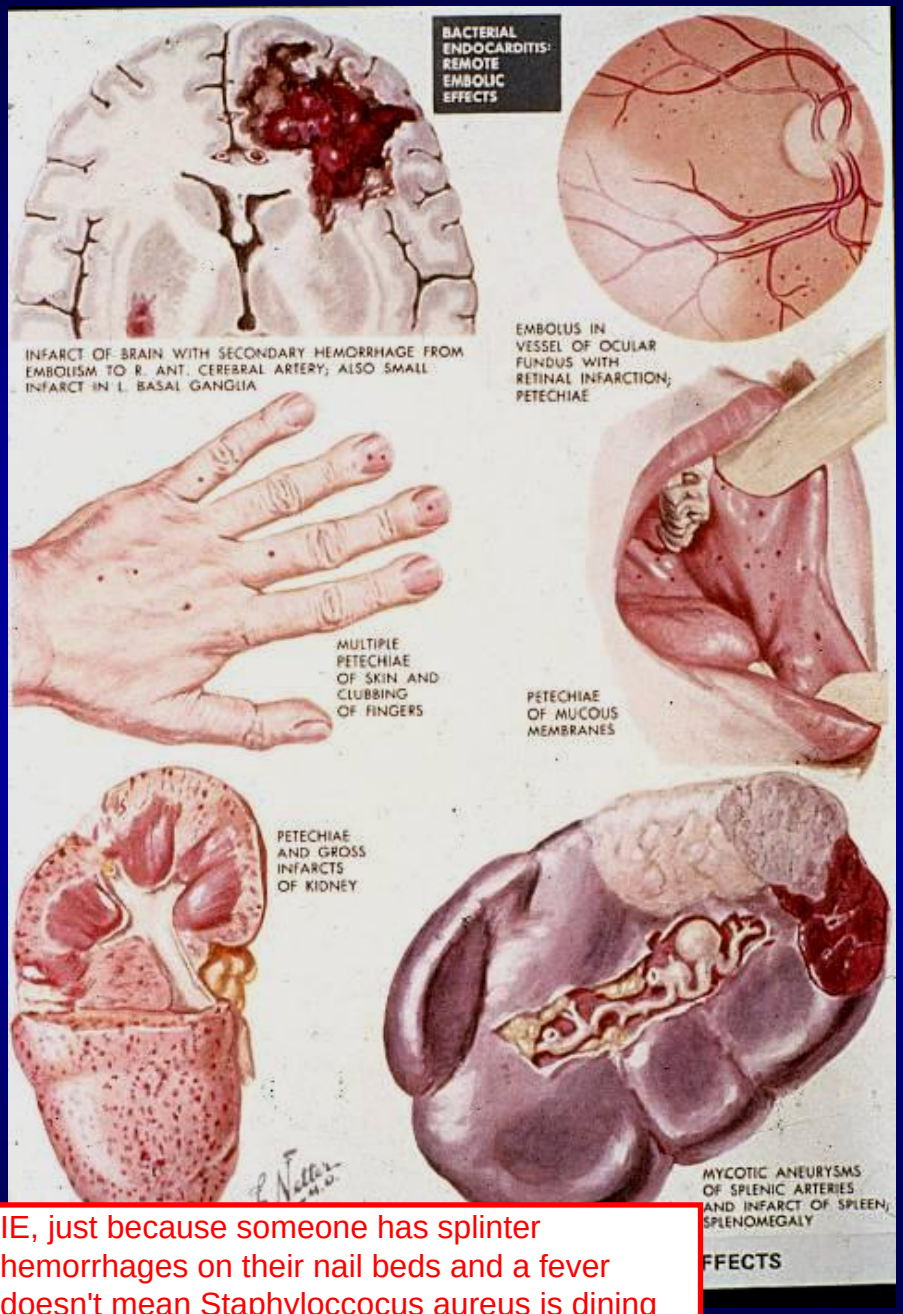
-tender, palpable

-immune complexes

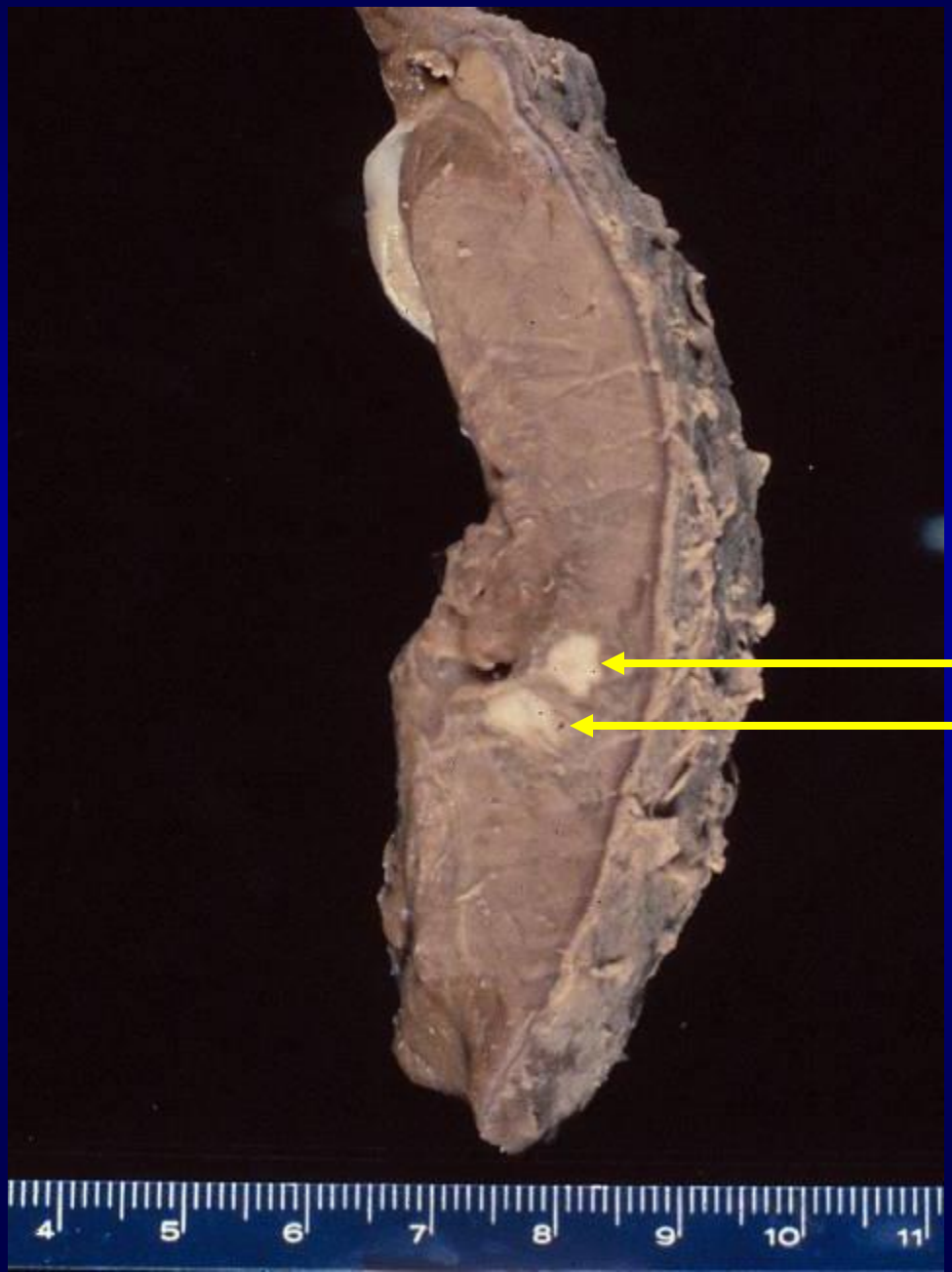
Splinter Hemorrhages

Roth Spots

Not All Are Specific for Endocarditis



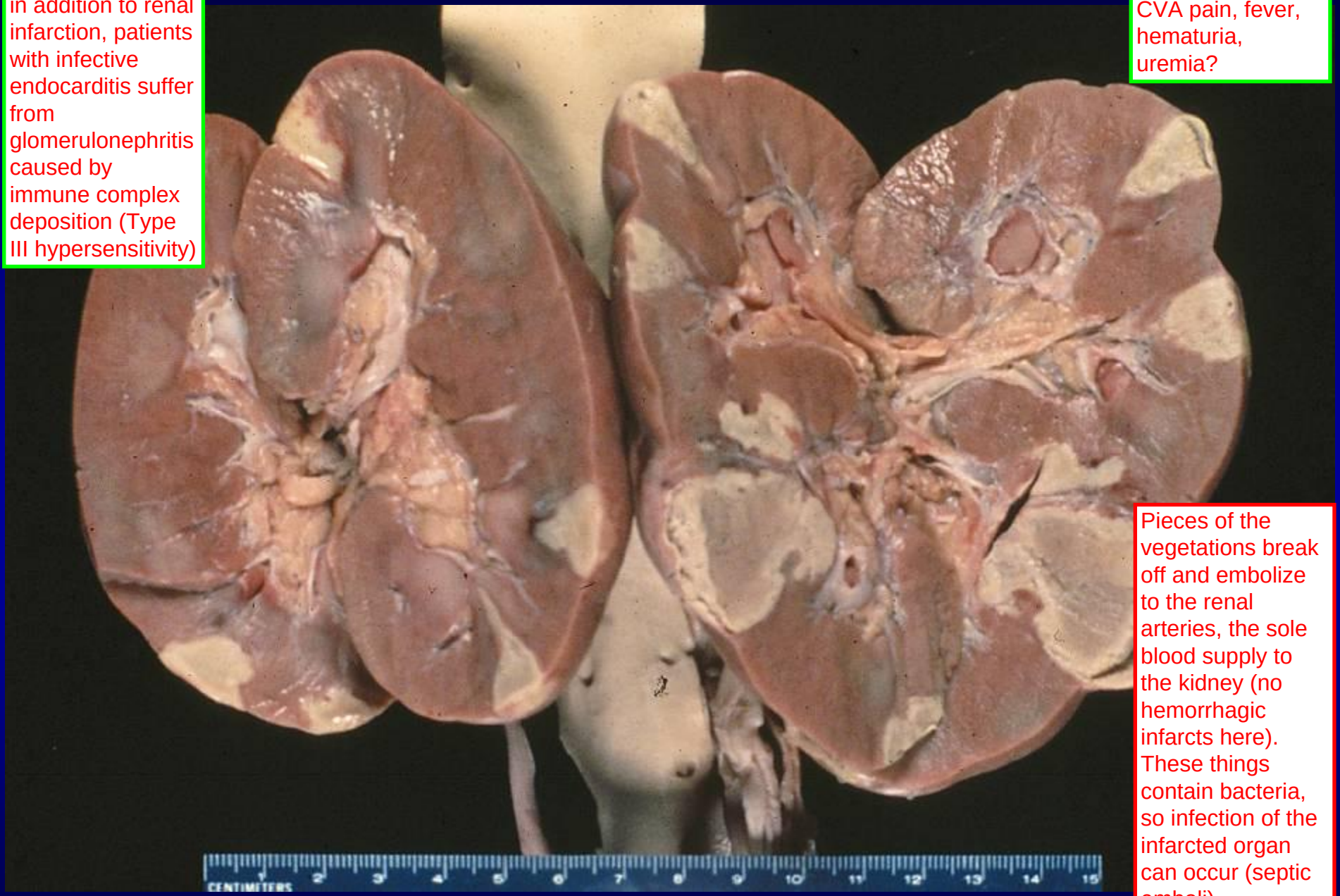
IE, just because someone has splinter hemorrhages on their nail beds and a fever doesn't mean Staphyloccocus aureus is dining on their mitral valve.



Myocardial abscesses in patient with infectious endocarditis

in addition to renal infarction, patients with infective endocarditis suffer from glomerulonephritis caused by immune complex deposition (Type III hypersensitivity)

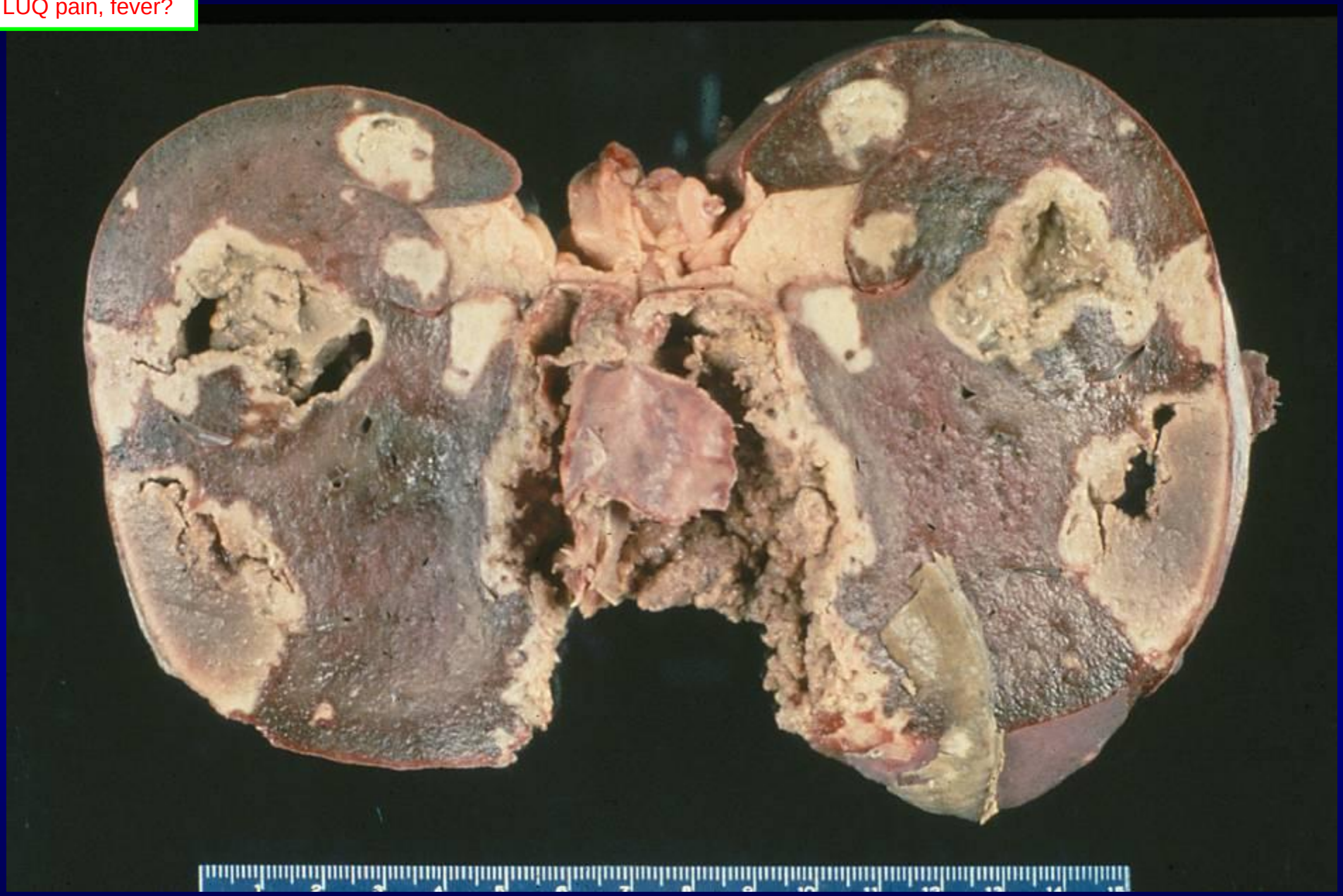
CVA pain, fever, hematuria, uremia?



Pieces of the vegetations break off and embolize to the renal arteries, the sole blood supply to the kidney (no hemorrhagic infarcts here). These things contain bacteria, so infection of the infarcted organ can occur (septic emboli).

Septic renal infarcts in patient with bacterial endocarditis

LUQ pain, fever?



Septic splenic infarcts in patient with bacterial endocarditis

Bacterial endocarditis

Fever (most common symptom), Roth's spots (round white spots on retina surrounded by hemorrhage), Osler's nodes (tender raised lesions on finger or toe pads), new murmur, Janeway lesions (small erythematous lesions on palm or sole), anemia, splinter hemorrhages on nail bed. Valvular damage may cause new murmur (see damaged aortic valve below). Multiple blood cultures necessary for diagnosis.

1. Acute—*S. aureus* (high virulence). Large vegetations on previously normal valves. Rapid onset.
2. Subacute—viridans streptococci (low virulence). Smaller vegetations on congenitally abnormal or diseased valves. Sequela of dental procedures. More insidious onset.

Endocarditis may also be nonbacterial 2° to malignancy or hypercoagulable state (marantic/thrombotic endocarditis). *S. bovis* is present in colon cancer, *S. epidermidis* on prosthetic valves; HACEK organisms cause culture-negative endocarditis.

Mitral valve is most frequently involved.

Tricuspid valve endocarditis is associated with IV drug abuse (don't **tri** drugs). Associated with *S. aureus*, *Pseudomonas*, and *Candida*.

Complications: chordae rupture, glomerulonephritis, suppurative pericarditis, emboli.

Bacteria **FROM JANE**:
Fever
Roth's spots
Osler's nodes
Murmur
Janeway lesions
Anemia
Nail-bed hemorrhage
Emboli

NON-INFECTIVE ENDOCARDITIS

Nonbacterial Thrombotic Endocarditis (NBTE)
"Marantic Endocarditis"

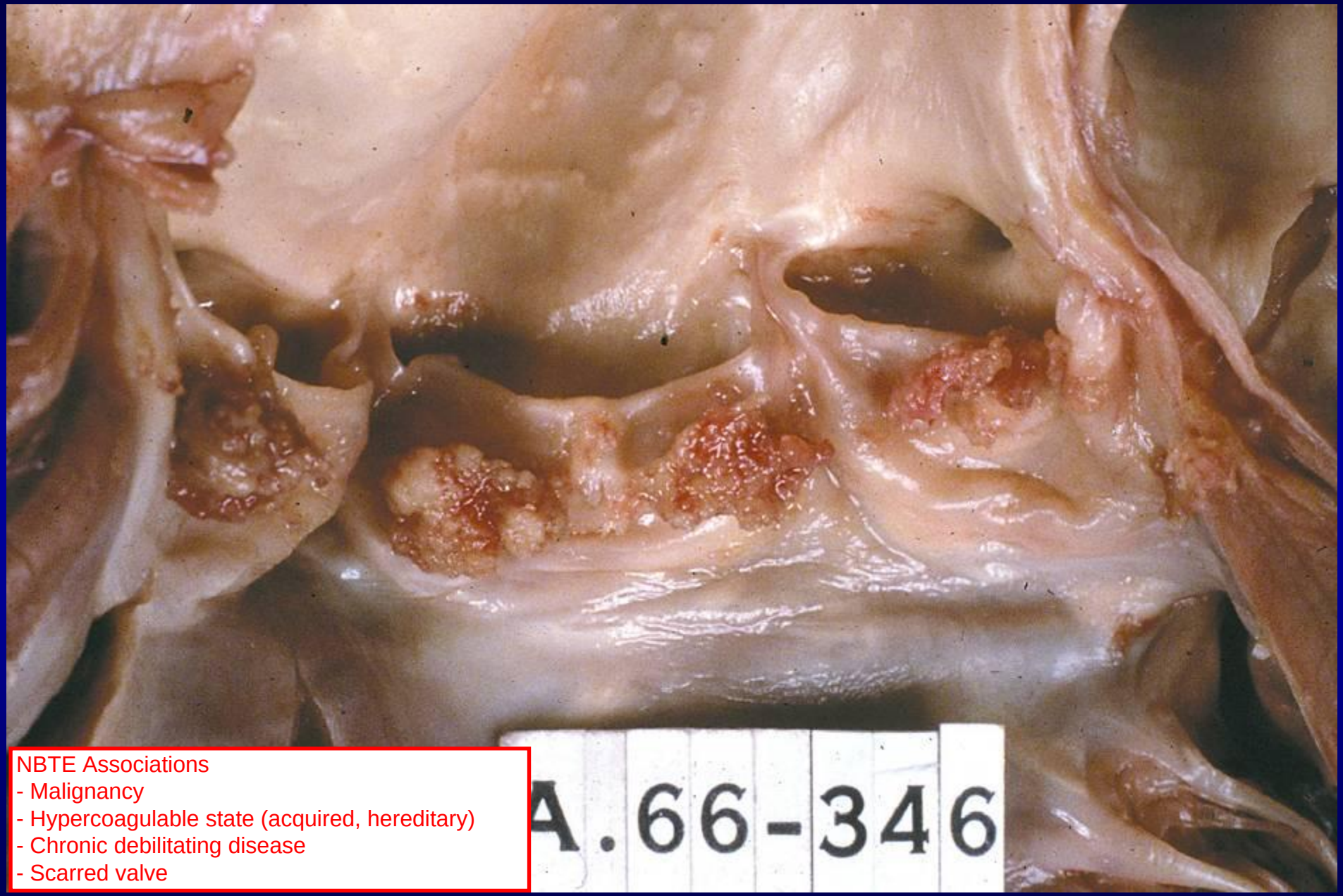
Predisposing Factors

- **Malignancy** or debilitating chronic disease
  - example: adenocarcinoma of the colon or pancreas secreting procoagulants (Trosseau syndrome)
- Hypercoagulable state
  - Acquired and inherited factors
- Scarred valves
  - Previous rheumatic fever

Libman-Sacks Endocarditis - occurs in Lupus

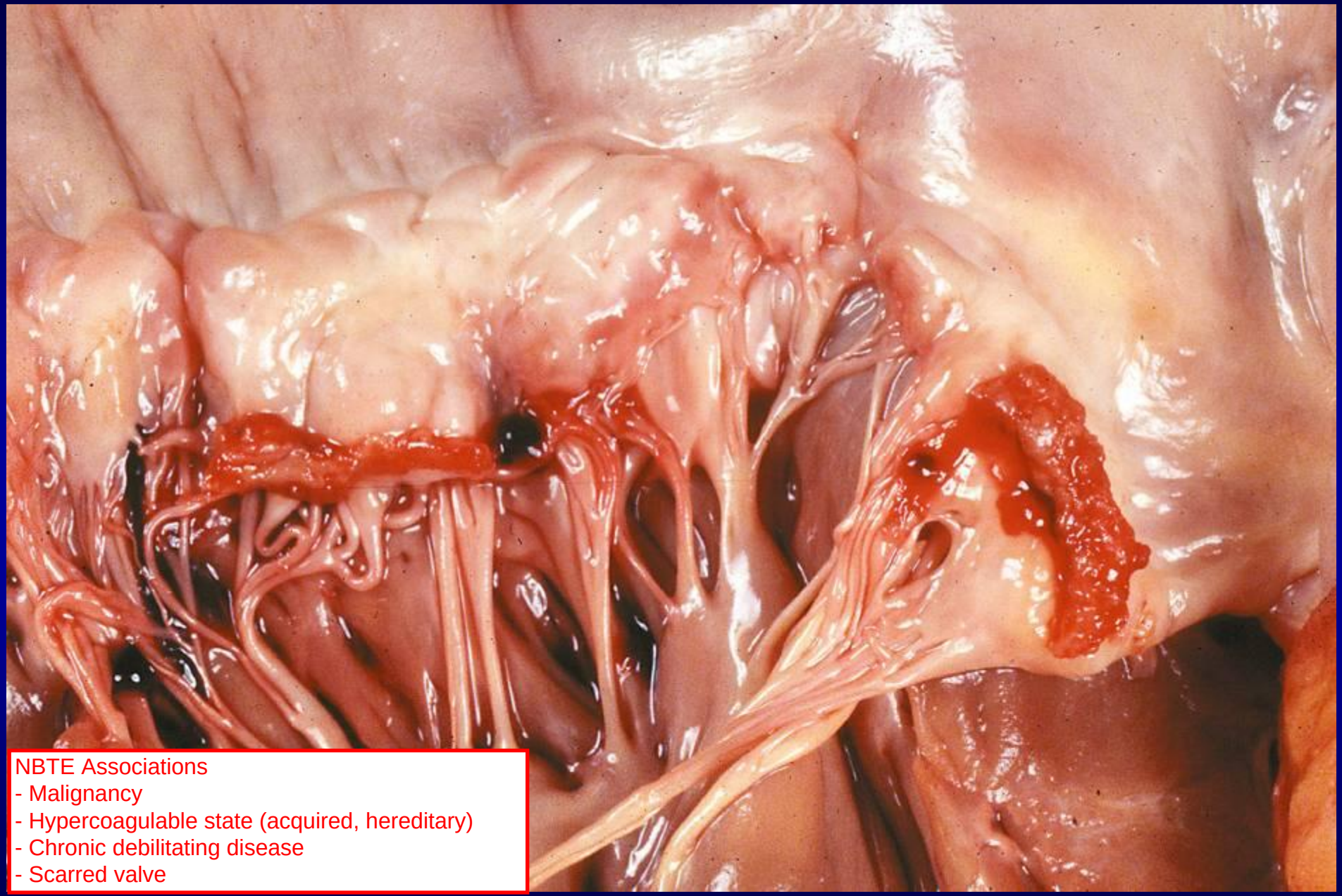
- **Verrucous** growths include immune complexes and mononuclear inflammatory cells
  - Verrucous = ugly, warty looking.
- Frequently on **ventricular surface of mitral valve**
  - Cause mitral regurgitation, stenosis.

What autoantibodies are characteristic of SLE?

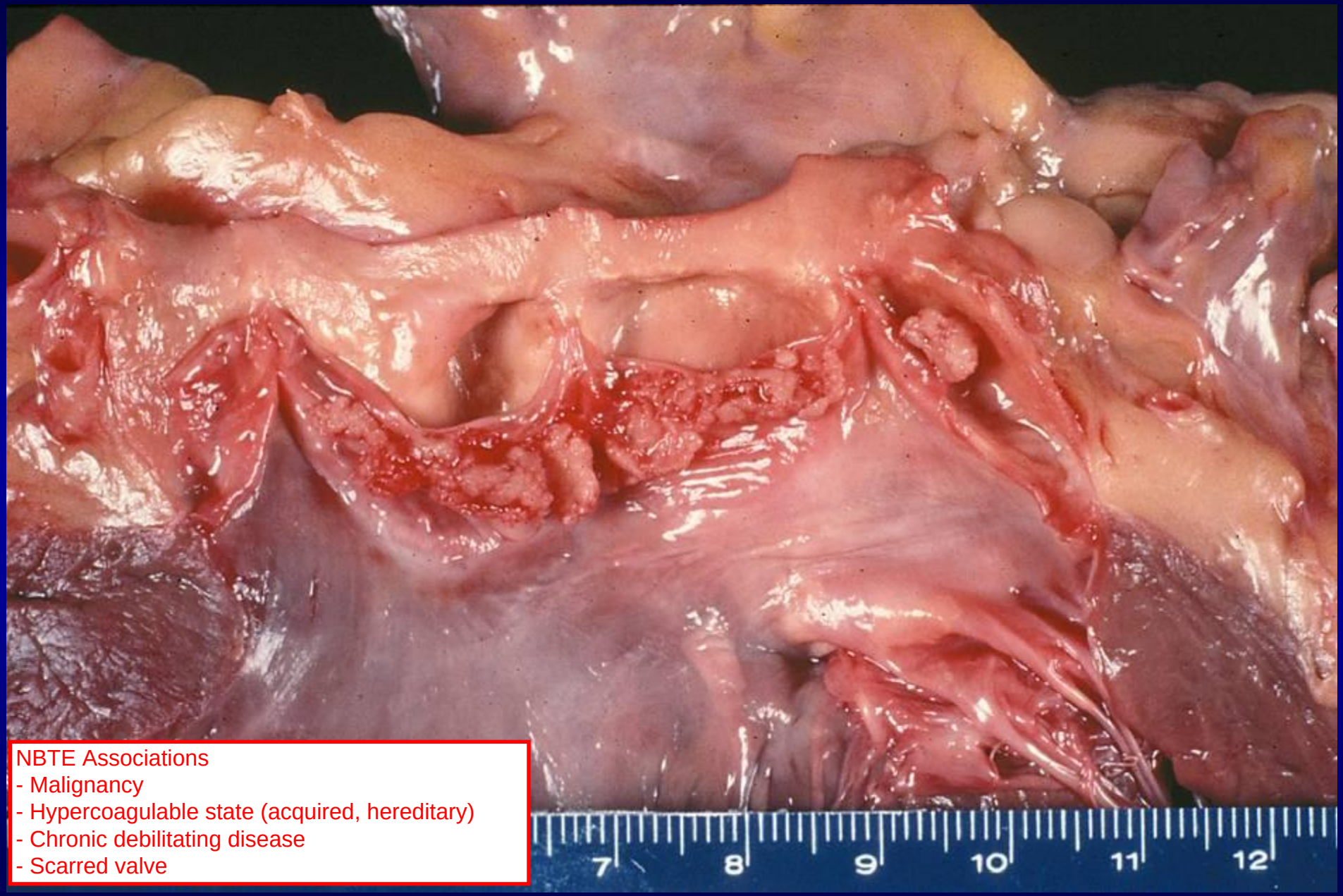


NBTE Associations
- Malignancy
- Hypercoagulable state (acquired, hereditary)
- Chronic debilitating disease
- Scarred valve

Nonbacterial Thrombotic Endocarditis - aortic valve

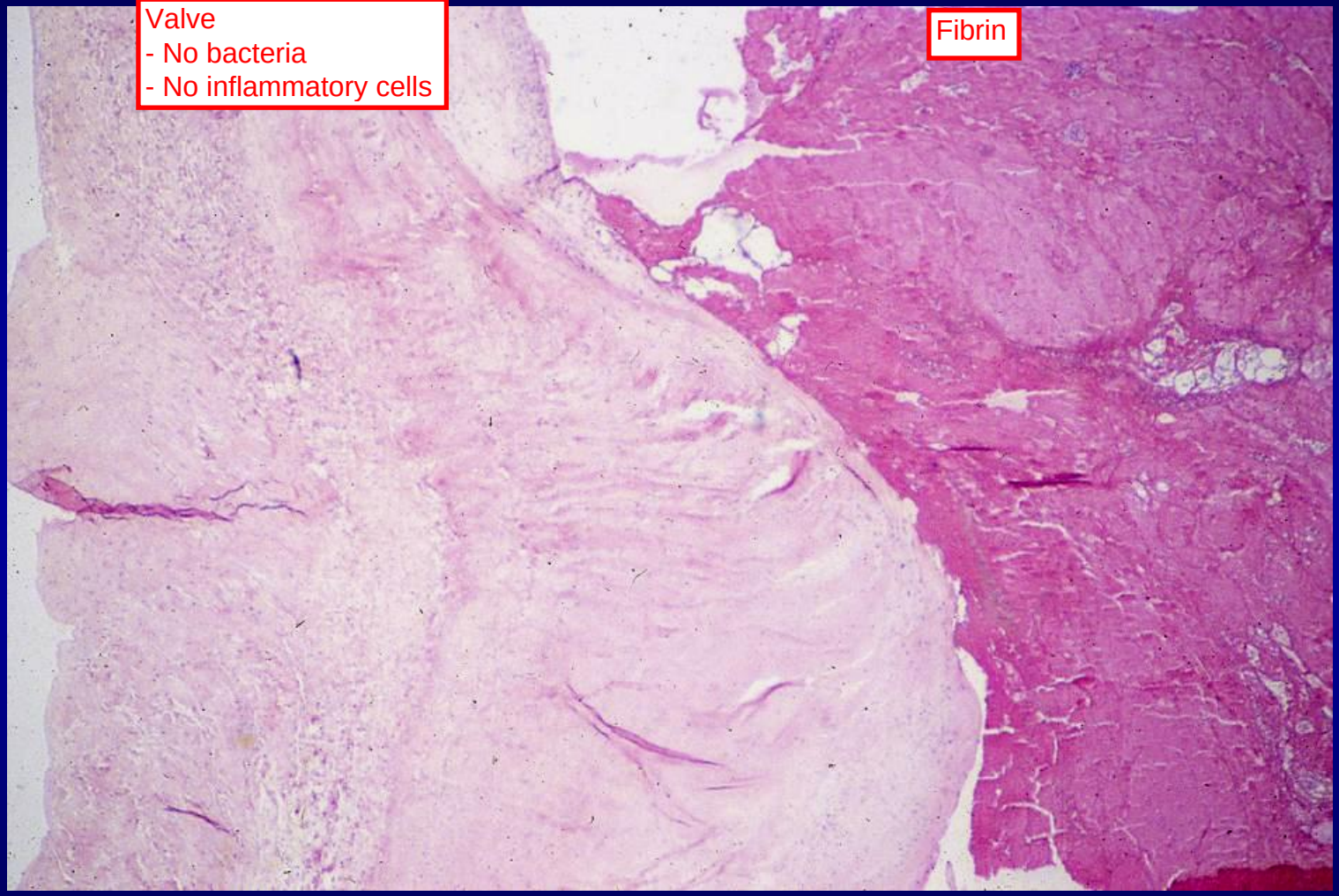


Nonbacterial Thrombotic Endocarditis - mitral valve



Nonbacterial Thrombotic Endocarditis - aortic valve

Nonbacterial Thrombotic Endocarditis



Fibrin overlying valve surface with **minimal inflammation**

Consequences of Non-bacterial Thrombotic Endocarditis

Embolism is the most common way in which NBTE would become clinically significant.

Can be an incidental finding at autopsy (i.e., asymptomatic)

Emboli non-septic

Does not affect valve function

- **no perforation**

often do not effect flow b/c on underside of valve

Libman-Sacks endocarditis	Verrucous (wartlike), sterile vegetations occur on both sides of the valve. Most often benign; can be associated with mitral regurgitation and, less commonly, mitral stenosis. The most common heart manifestation of SLE.	**SLE** causes **LSE**.

Myocarditis: Etiologies

INFECTIOUS

Viral Cocksackievirus (most common)

Bacterial

Protozoal Trypanosoma cruzi

Rickettsial Borrelia burgdorferi

T. Cruzi (Tiao Cruz) is only gonna break break, break break break your heart.
- Jonk

NON-INFECTIOUS

Hypersensitivity/Toxic

Giant Cell/Sarcoid

Rheumatic fever

Type II hypersensivitiy / infectious
-Rheumatic fever
Toxic
- Cocaine
- Anthracyclines (daunorubicin, doxorubicin)

? Peripartum

Peripartum cardiomyopathy: women who have acute onset heart failure related to late pregnancy or early postnatal period. Some have myocarditis, etiology uncertain.

Which one of these viruses frequently causes aplastic anemia?

Viral Myocarditis:

MOST COMMONLY COCKSACKIEVIRUS

- **Implicated Viruses:**
  - **Inoculation studies, Immunohistochemistry, Viral culture, PCR**
  - **Coxsackie B virus: Enteroviruses** non-enveloped positive strand ssRNA
  - **Adenovirus** non-enveloped dsDNA
  - **Parvovirus B19** non-enveloped ssDNA
  - **Hepatitis C** enveloped negative strand ssRNA (flavivirus)
  - **Influenza A and B** enveloped negative strand ssRNA (orthomyxoviridae)
  - **HIV** enveloped retrovirus
  - **Herpesviruses: CMV, HH6, EBV, VZV, HSV** enveloped linear dsDNA

Which of these viruses is causes heterophil positive infectious mononucleosis ("mono")?

Myocarditis: Etiology

- Direct injury
- Toxins
- Autoimmune

LOW YIELD!!

Viral Myocarditis: Mechanisms

- **Viral infection/Direct Injury**
  - **Coxsackie-adenovirus receptor (CAR)**
  - **Potentiated by co-receptors**
    - **Viral death and cellular injury**
      - **Proteases cleave dystrophin and associated proteins**
    - **Triggering of Apoptosis**
- **Innate Immune and Acquired Autoimmune Responses:**
  - **Innate Early (complement, NOS→NO); Acquired/adaptive builds**
  - **Natural Killer giving way to Cytotoxic T cell response**
  - **Injury increased by cytokines – Th1, Th2, Th17 cells**
  - **T reg cells: decreased limitation of CD4+ & CD8+ T cell activity**
  - **Recruitment and activation of antigen presenting cells**
    - **CVB upregulates Toll-like receptors and MyD88 signaling in dendritic cells (also role in NOS production)**

paraphrase "the take home message in these slides is that not only do we have **infection**, but we have also a **chronic immune response** that creates myocarditis"

LOW YIELD!!

Viral Myocarditis: Mechanisms

- **Prolongation of Autoimmune Response**
  - Following initial myocyte injury allowing exposure to myocyte antigens
  - **Epitope Spreading**: cross reactivity with **additional auto-antigens as the response persists**
    - Multiple antibody targets often detected in studies of active myocarditis
  - **Failure of Apoptosis: reduced loss of activated lymphocytes**
  - **Persistent Viral Infection: Demonstrated on PCR**
    - May lead to long term myocardial injury and **dilated CM**

Other targets include myosin and other endogenous cardiac proteins.

Focus on the big picture: there are two sources of injury, viral infection and dysregulated immune response to that infection.

LOW YIELD!!

Viral Myocarditis: Mechanism

- **Antigens that stimulate autoimmune response**
  - **Cross reactivity**
    - **Coxsackie B, Streptococcal M proteins and Myosin**

Type II hypersensitivity or molecular mimicry

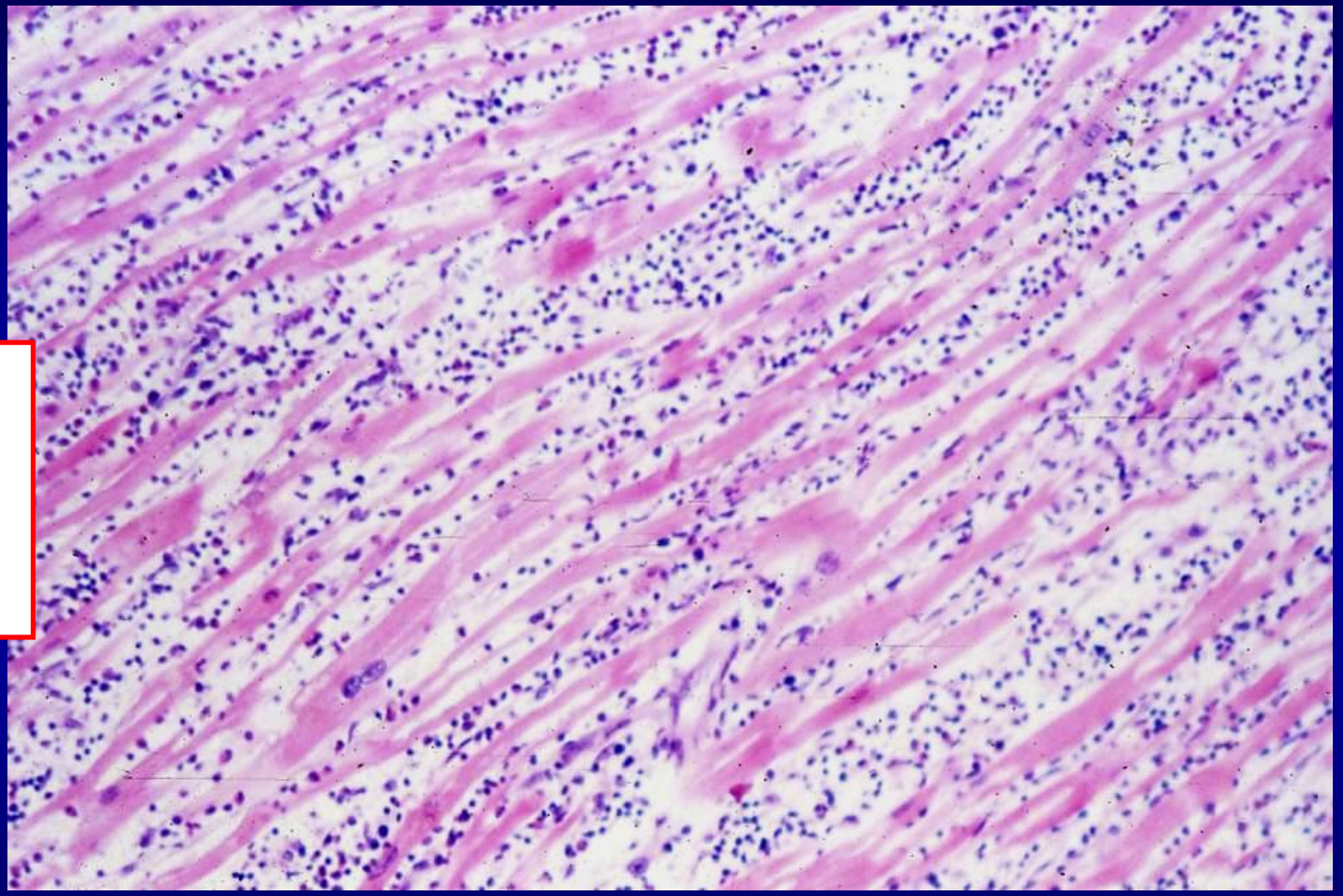
  - **Self Antigens**
    - **Myosin, actin, laminin, ß-adrenergic receptor (pro-apoptosis for myocytes), mitochondrial proteins – antinucleotide translocator (ANT)**
    - **MHC antigens –Specific class II antigens associated with susceptibility to myocarditis**

Gross Pathology

Biventricular dilation seen with myocarditis

Destruction of heart muscle and extensive inflammation leads to dilated cardiomyopathy (DCM) with biventricular systolic heart failure.

Viral Myocarditis



Most common cause of viral myocarditis?

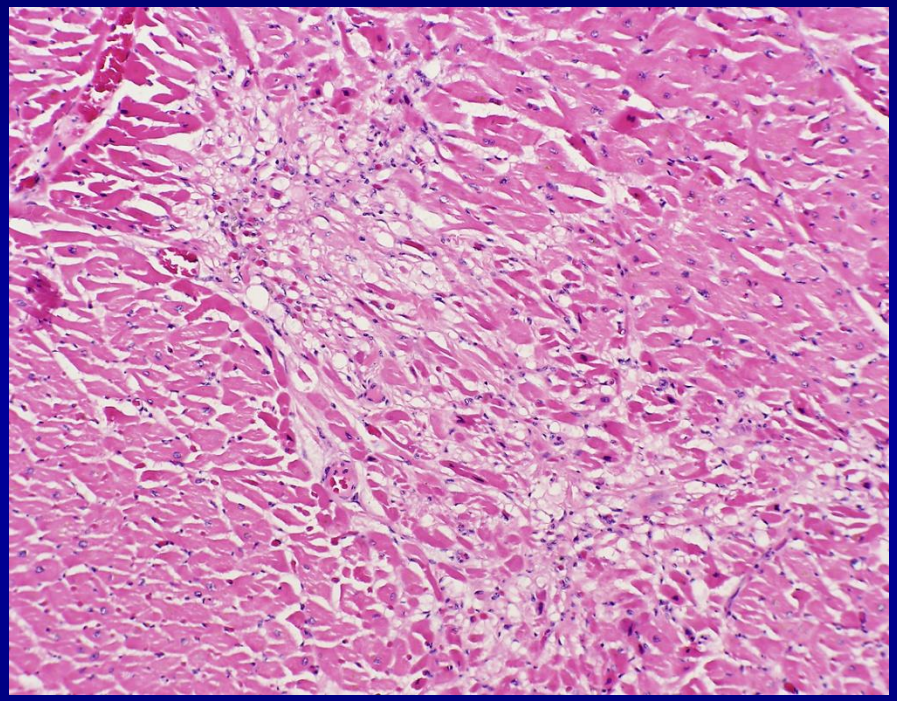
Lymphocytic Infiltrate

Myocytolysis

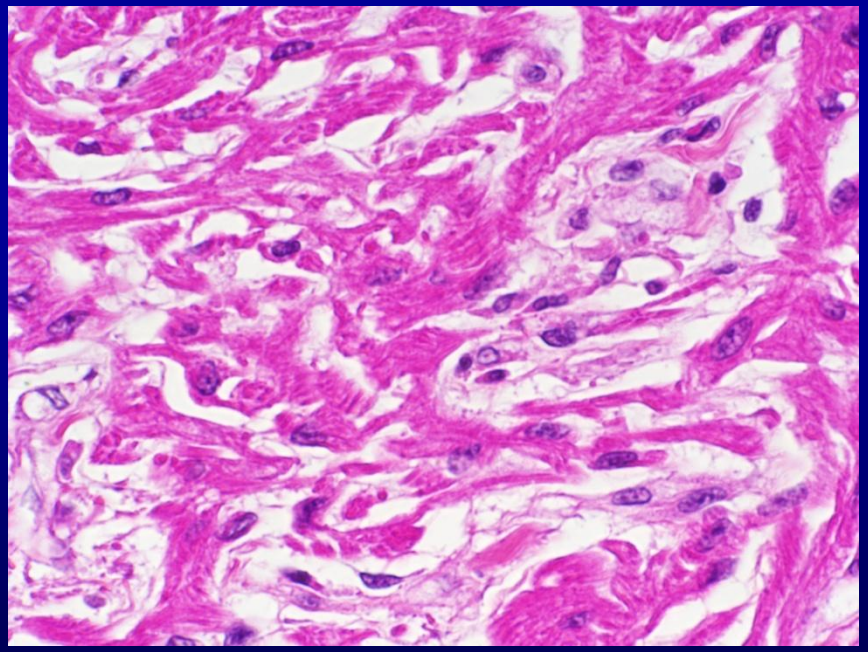
Destruction of heart muscle

May be **disconnect between clinical picture and histopathology**

Resolving Viral Myocarditis

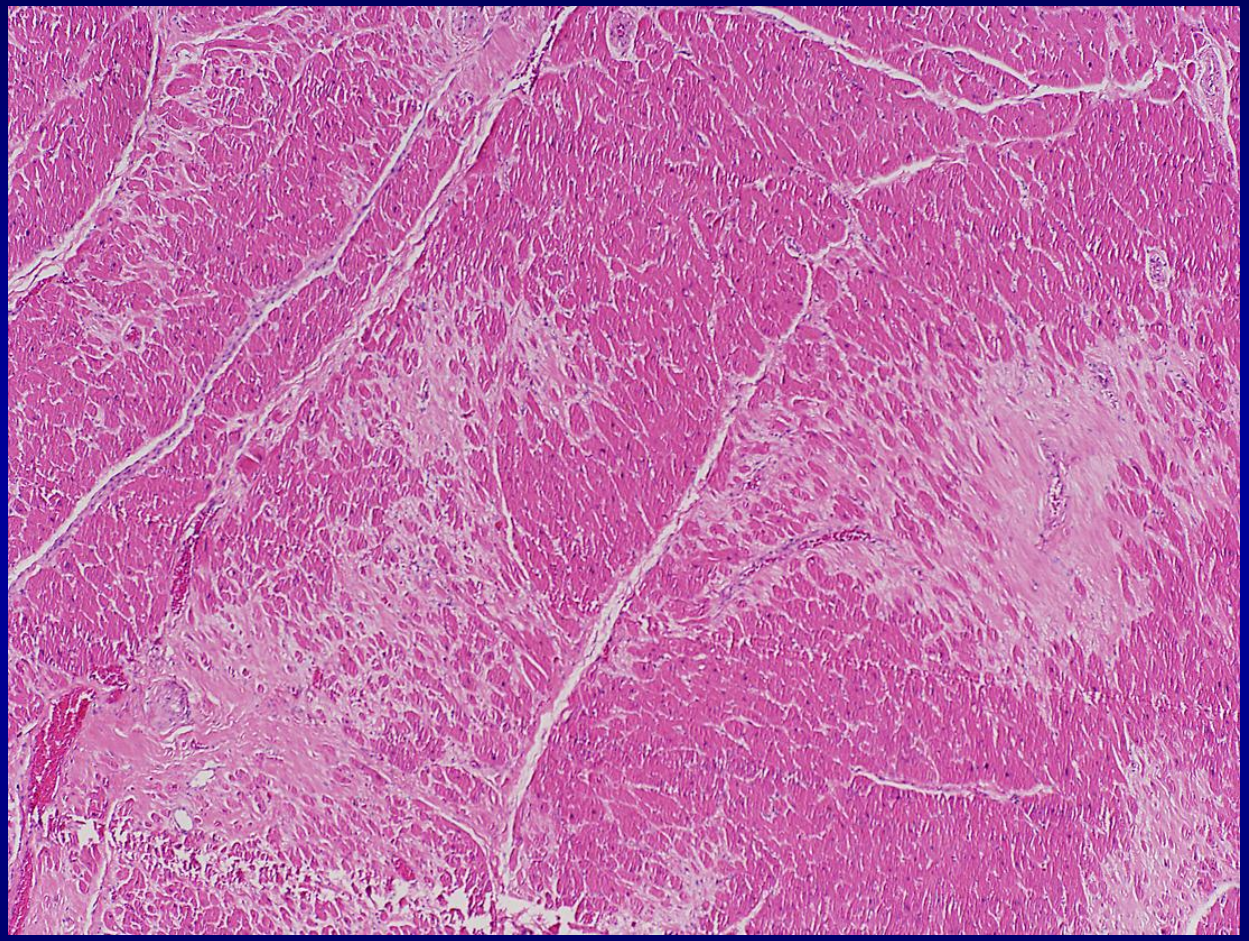


Loose fibrosis. Often patients become symptomatic during this "healing phase" rather than the period of active mononuclear infiltration with myocytolysis.



Loose fibrosis with damaged myocytes

Resolved Viral Myocarditis



Patchy replacement fibrosis, focally perivascular
Could be toxic injury

Patchy perivascular pattern distinguishes this pattern of fibrosis from that which follows acute MI.

Histology: Dallas Criteria

- **Developed 1984; Activity and severity assessed**
- **First Biopsy:**
  - **Active Myocarditis: Inflammatory infiltrate with any cell type and associated myocyte injury**
  - **Borderline Myocarditis: Limited inflammation with no substantial myocyte injury**
  - **No evidence of myocarditis**
- **Follow Up Biopsy:**
  - **Persistent Myocarditis: Ongoing acute injury**
  - **Resolving Myocarditis: Reduced inflammation with myophagocytosis and fibrous healing**
  - **Resolved Myocarditis: No ongoing inflammation or injury, replacement fibrosis**

But Remember ...

Dallas Sucks

- Clinical picture often not reflected by Dallas Terminology
- Infiltrate description not uniform

Below is the preferred scheme of describing myocarditis

World Heart Federation 1999

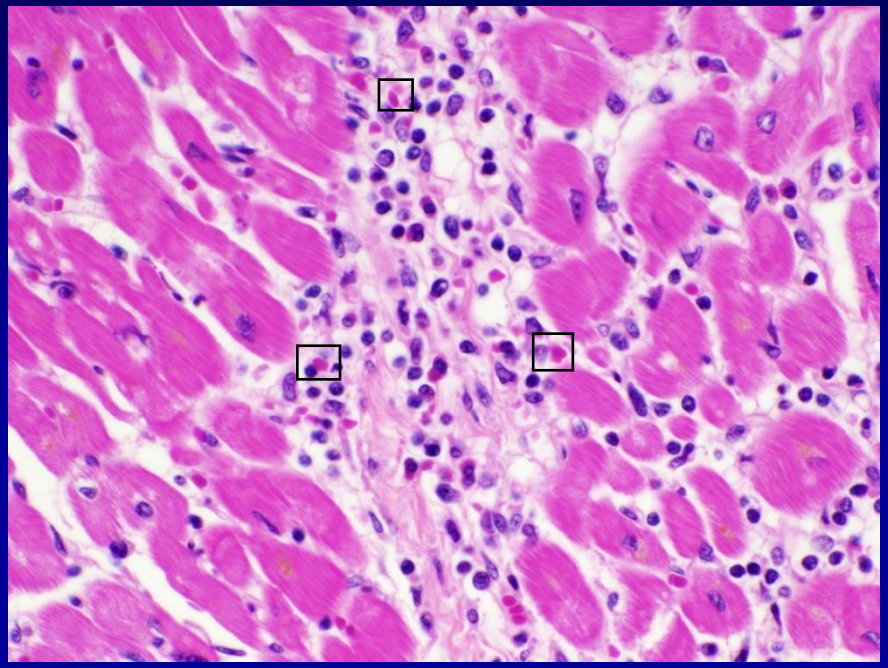
- Requires ≥ 14 cells/mm2
- Requires characterization of infiltrate type and distribution
- IHC lymphocyte identification
- Viral PCR to confirm etiology
- Application to dilated CM

Hypersensitivity Myocarditis

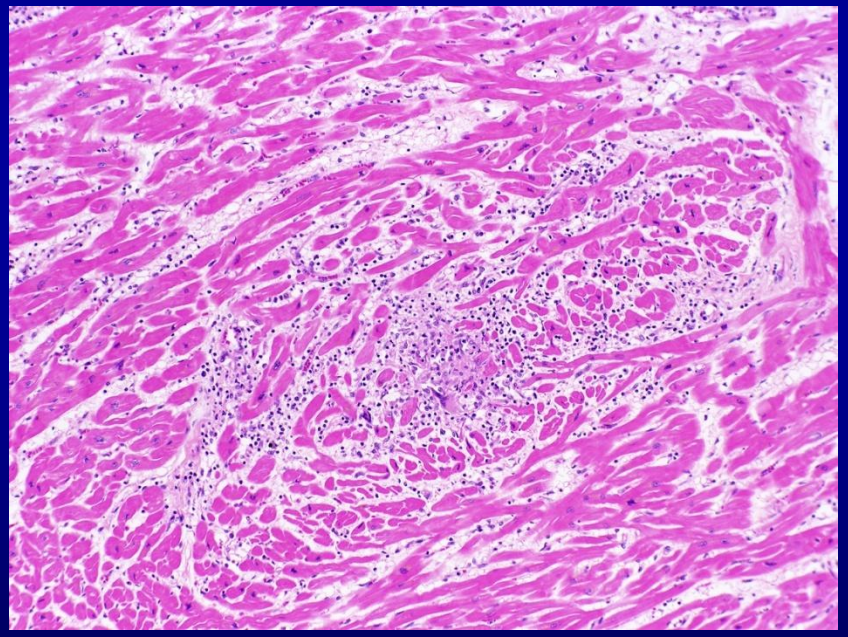
- **Growing number** of associated **drugs**:
  - **Penicillins**, Cefaclor, Ephedra, Clozapine, Methyldopa, Tetanus toxoid, Phenylbutazone

- **Eosinophils** - largely **perivascular** with some admixed lymphocytes, macrophages
  - **Less diffuse than eosinophilic myocarditis**
  - **Not necrotizing** vasculitis as in toxic myocarditis
  - Generally **limited focal myocyte necrosis**
  - **Loose granulomas** may be present

Hypersensitivity Myocarditis

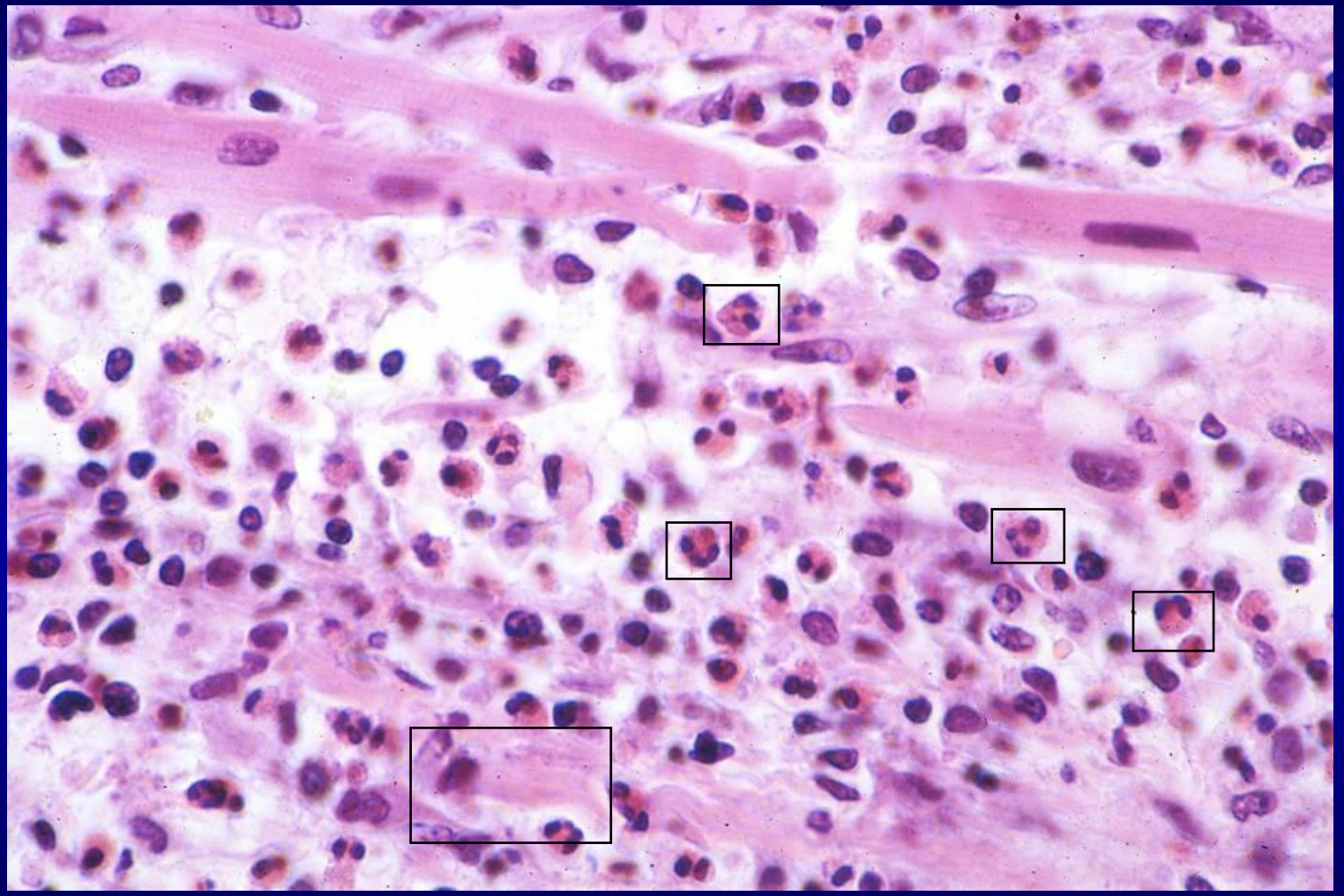


Eosinophils are present in perivascular location. This patient had sudden cardiac death due to involvement of the conduction system.



Loose granuloma

Eosinophilic Myocarditis



Numerous Eosinophils and Myocyte Necrosis

There is diffuse infiltration by eosinophils with more widespread necrosis of myocytes and edema. Worse outcome than hypersensivitiy myocarditis.

Giant Cell Myocarditis

- Generally young and healthy adults
- Associated with Thymoma – Myasthenia gravis, Ulcerative colitis, Rheumatoid arthritis, Wegener's, thyroid disorders
- Aggressive
  - Leads to death or transplant within 3 – 12 months
  - 25% recur in transplant heart

Misery.

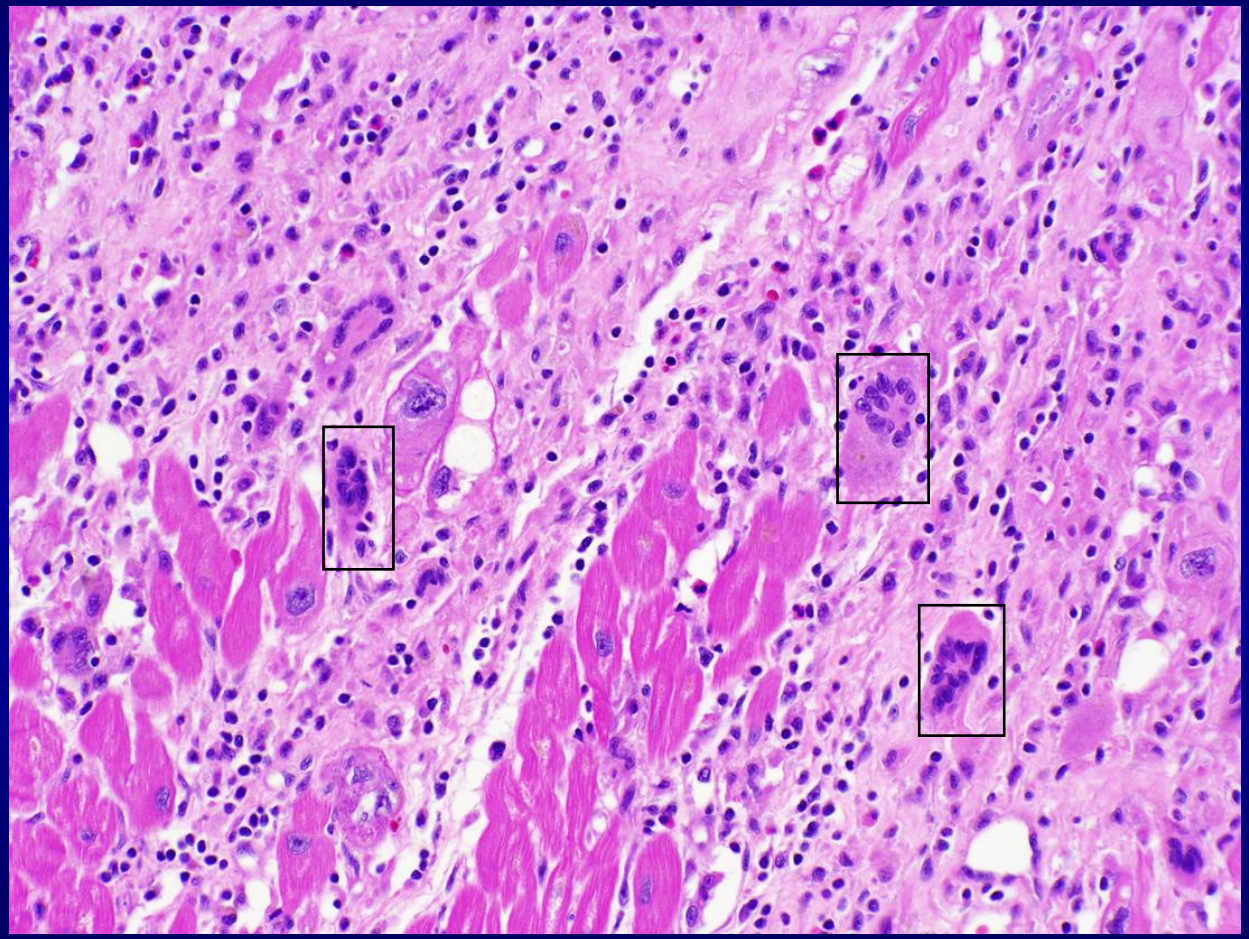
Rarely associated with giant cell arteritis, valvulitis

Sarcoidosis – ? Spectrum?

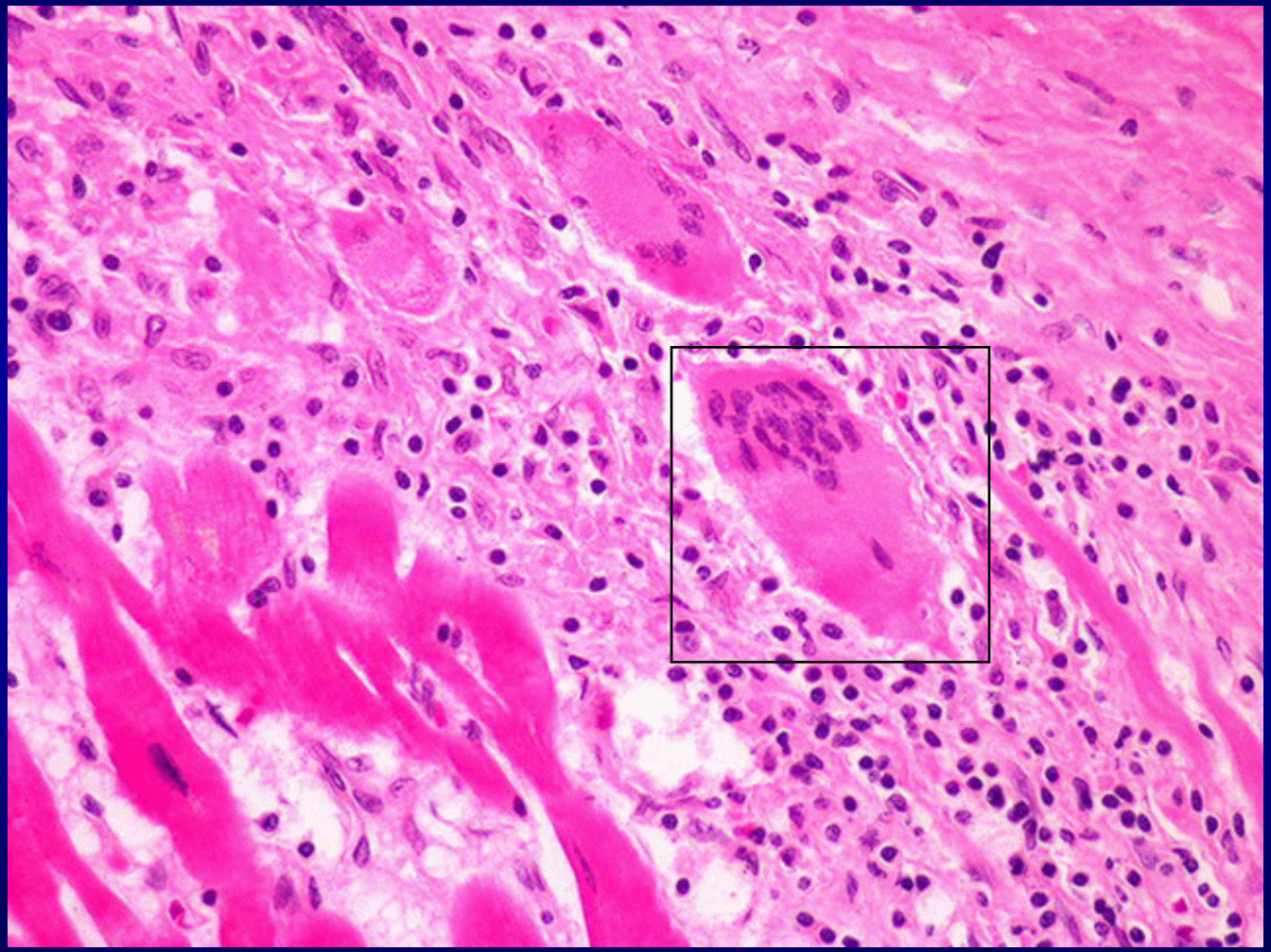
has granulomas, asteroid bodies

Sarcoid and giant cell myocarditis may be part of the same spectum, but you see more eosinophils in giant cell than pure sarcoid.

Giant Cell Myocarditis



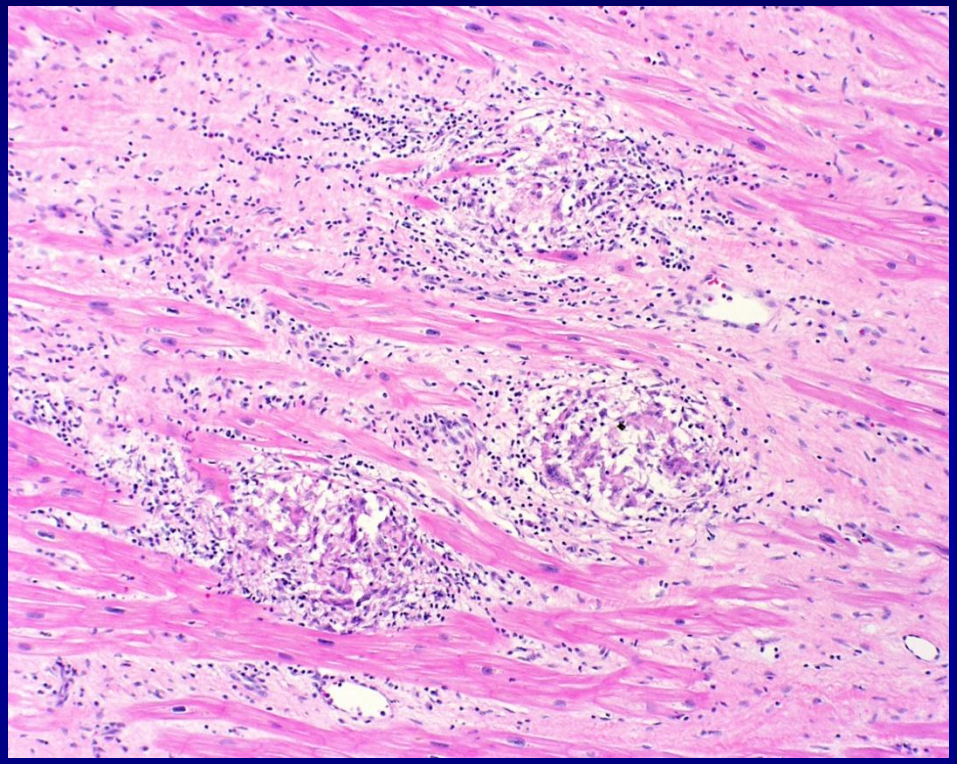
Giant Cell Myocarditis

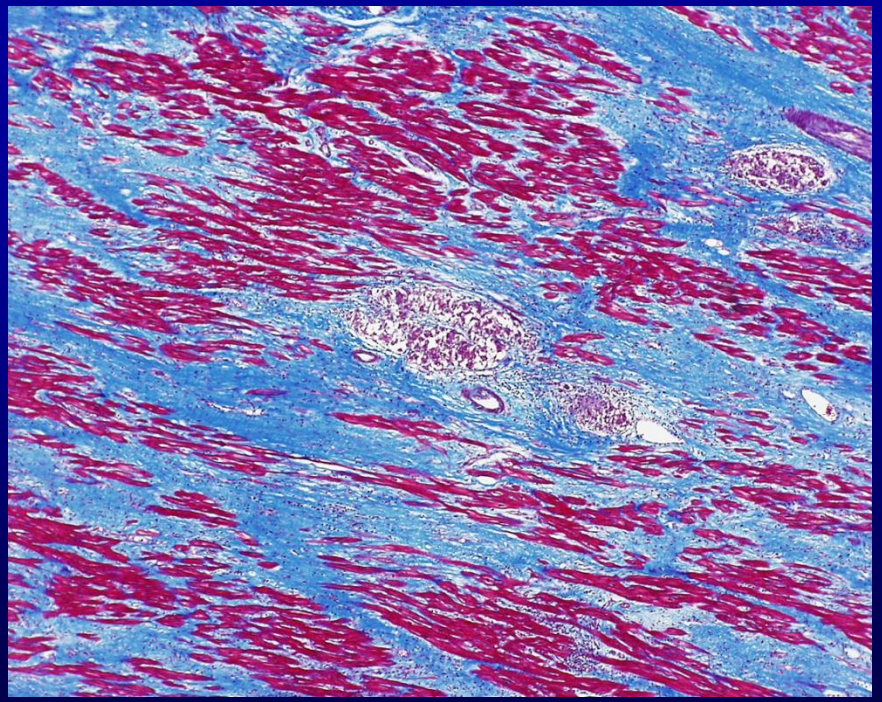


JHU

Cardiac Sarcoid

This is the disease that sacked Reggie White.





Numerous non-caseating granulomas.

What race is predisposed toward sarcoid?

What sex is predisposed toward sarcoid?

Dilated (congestive) cardiomyopathy	Most common cardiomyopathy (90% of cases). Etiologies include chronic Alcohol abuse, wet Beriberi, Coxsackie B virus myocarditis, chronic Cocaine use, Chagas' disease, Doxorubicin toxicity, hemochromatosis, and peripartum cardiomyopathy. Findings: S3, dilated heart on ultrasound, balloon appearance on chest x-ray.	Systolic dysfunction ensues. Eccentric hypertrophy (sarcomeres added in series).

Restrictive/obliterative cardiomyopathy	Major causes include sarcoidosis, amyloidosis, postradiation fibrosis, endocardial fibroelastosis (thick fibroelastic tissue in endocardium of young children), Löffler's syndrome (endomyocardial fibrosis with a prominent eosinophilic infiltrate), and hemochromatosis (dilated cardiomyopathy can also occur).	Diastolic dysfunction ensues.

CHAGAS' DISEASE

Caused by the intracellular protozoan parasite, Trypanosoma cruzi, which is common in South America, esp Brazil

It is important to ask patients about travel/immigration history. Board favorite.

Chagas Disease (Trypanosoma cruzi)

Kissing Beetle

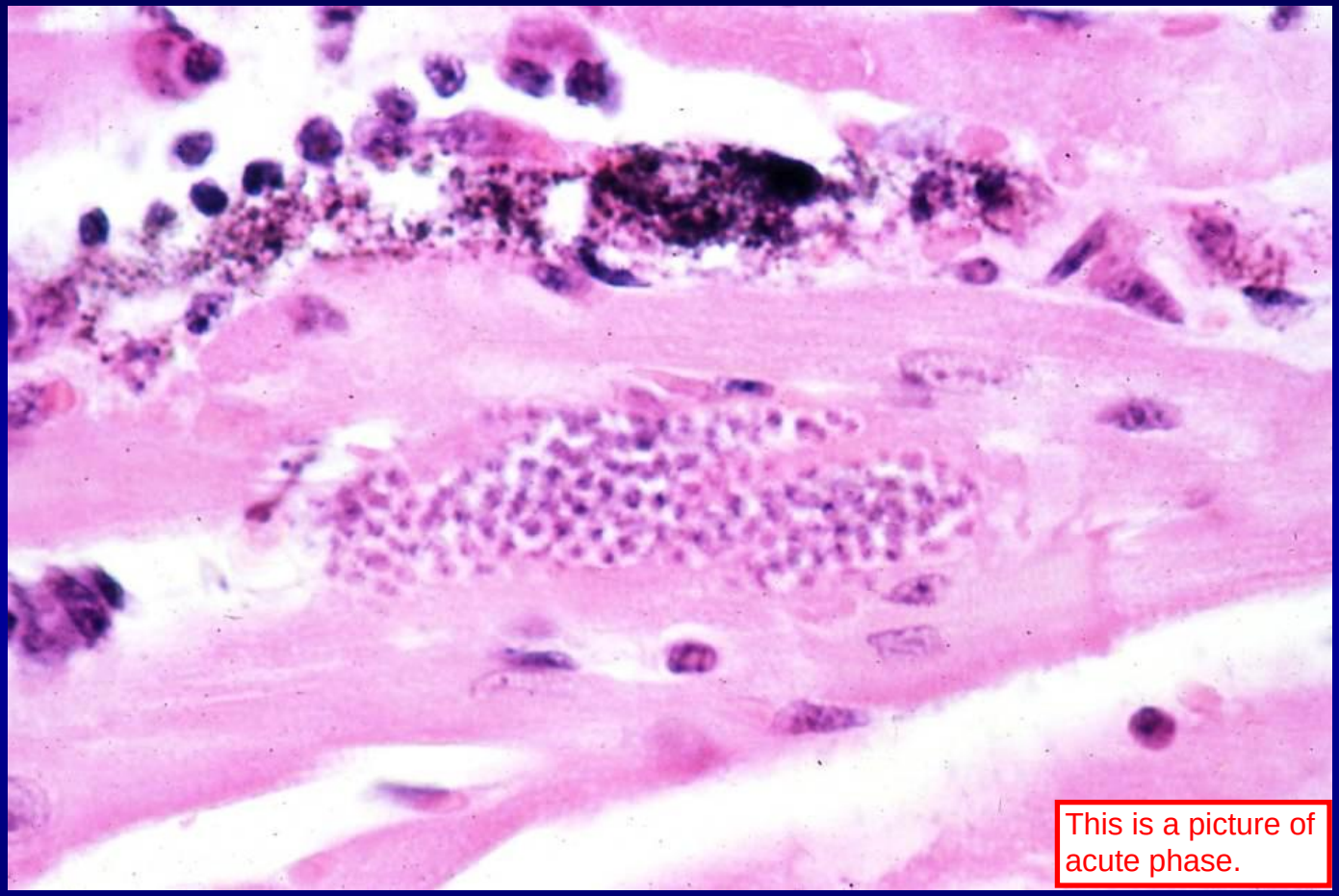
Assassin Bug

AKA Reduviid bug

trypomastigotes

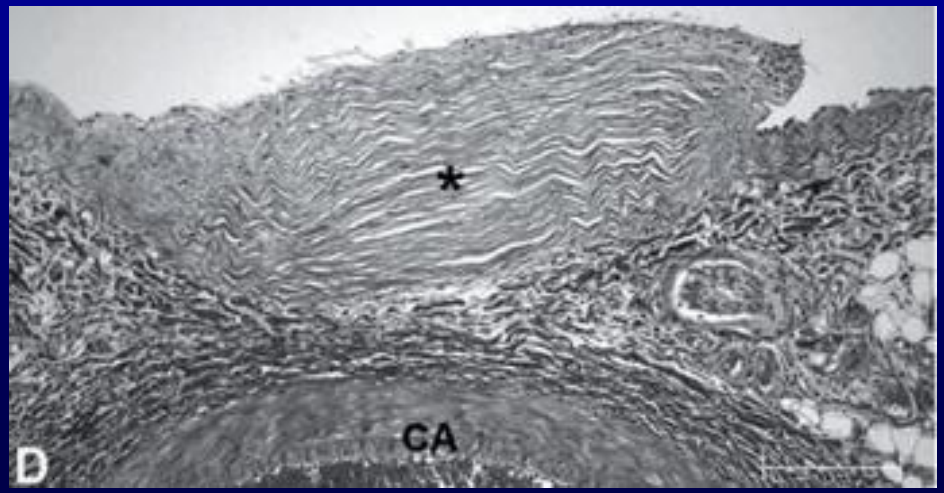
Enjoys biting people on the lips, which is why it is called the kissing beatle. Transmits trypomastigotes of *Trypanosome cruzi.*

Chagas Disease (Trypanosoma cruzi)



- Acute Phase – Myocarditis, intracellular amastigotes in pseudocysts
- Latent Phase – Cardiac Dilation
- Also conduction defects, epicardial lesions, “Chagasic Rosary”

Chagasic Rosary



Little bundles of fibrosis form on epicardial surface of heart following the course of coronary arteries.

Benvenuti 2007

Trypanosoma cruzi 	Chagas' disease (dilated cardiomyopathy, megacolon, megaesophagus); predominantly in South America	Reduviid bug ("kissing bug"), a painless bite (much like a kiss)	Blood smear	Nifurtimox

Lyme Carditis

- **Tick borne Rickettsia - *Borrelia burgdorferi***
- **5-10% cardiac complications**
- **Acute Phase**
  - **Myopericarditis - lymphoplasmacytic**
  - **Conduction Disturbances**
    - **AV block, Bundle Branch Block, Intraventricular delays**
    - **May require pacing – 90% resolve**
  - **Congestive Heart Failure**
- **Latent Phase**
  - **Dilated Cardiomyopathy**

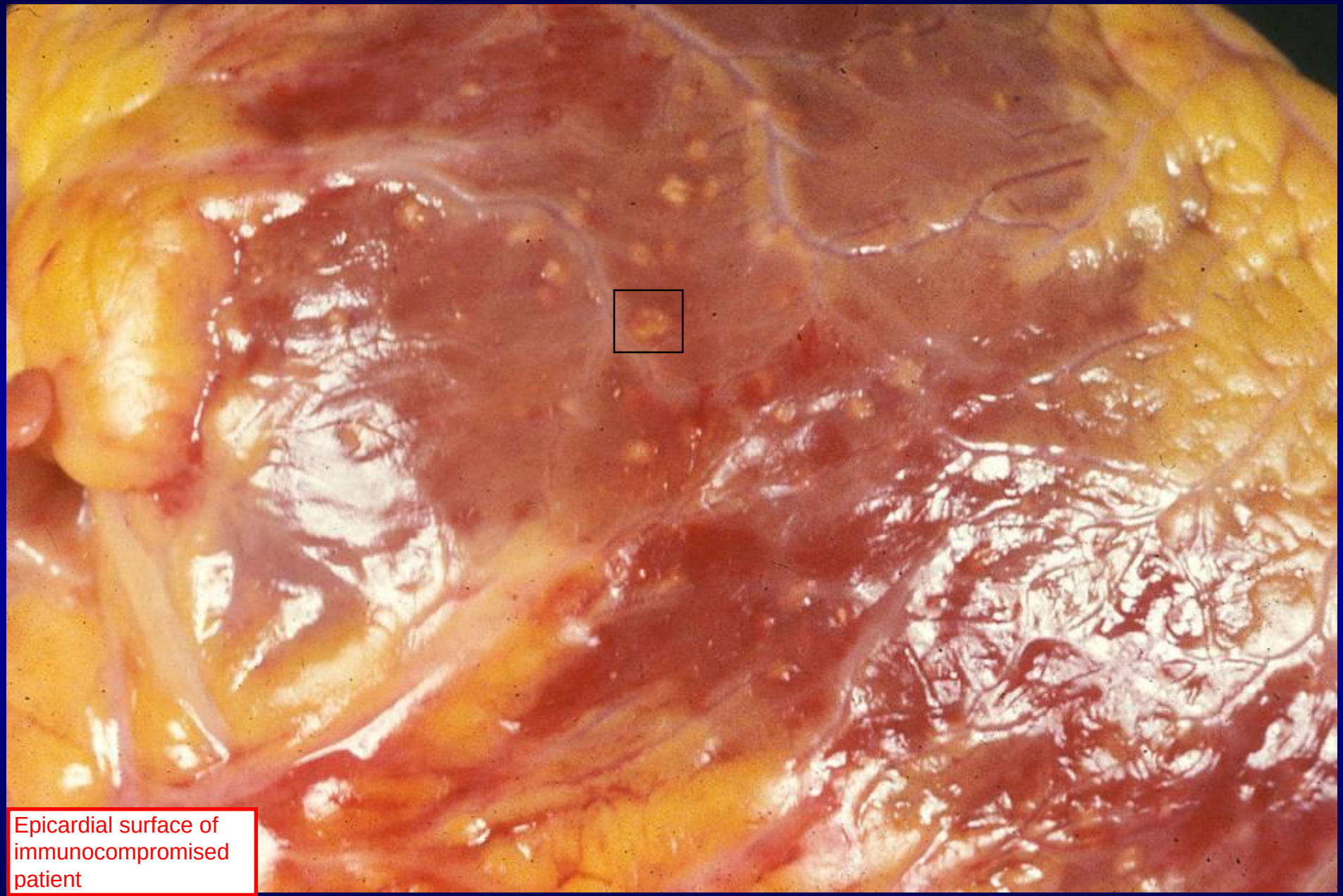
Deer ticks that harbor the lyme bacteria are in North Carolina but they are not

Lyme disease	Caused by *Borrelia burgdorferi*, which is transmitted by the tick *Ixodes* (also vector for *Babesia*). Presents with erythema chronicum migrans, an expanding "bull's eye" red rash with central clearing. Also affects joints, CNS, and heart. Mice are important reservoirs. Deer required for tick life cycle. Treatment: doxycycline, ceftriaxone. Named after Lyme, Connecticut; disease is common in northeastern United States.	3 stages of Lyme disease: Stage 1—erythema chronicum migrans, flulike symptoms. Stage 2—neurologic (Bell's palsy) and cardiac (AV nodal block) manifestations. Stage 3—chronic monoarthritis, and migratory polyarthritis. **BAKE** a Key Lyme pie: **B**ell's palsy, **A**rthritis, **K**ardiac block, **E**rythema migrans.

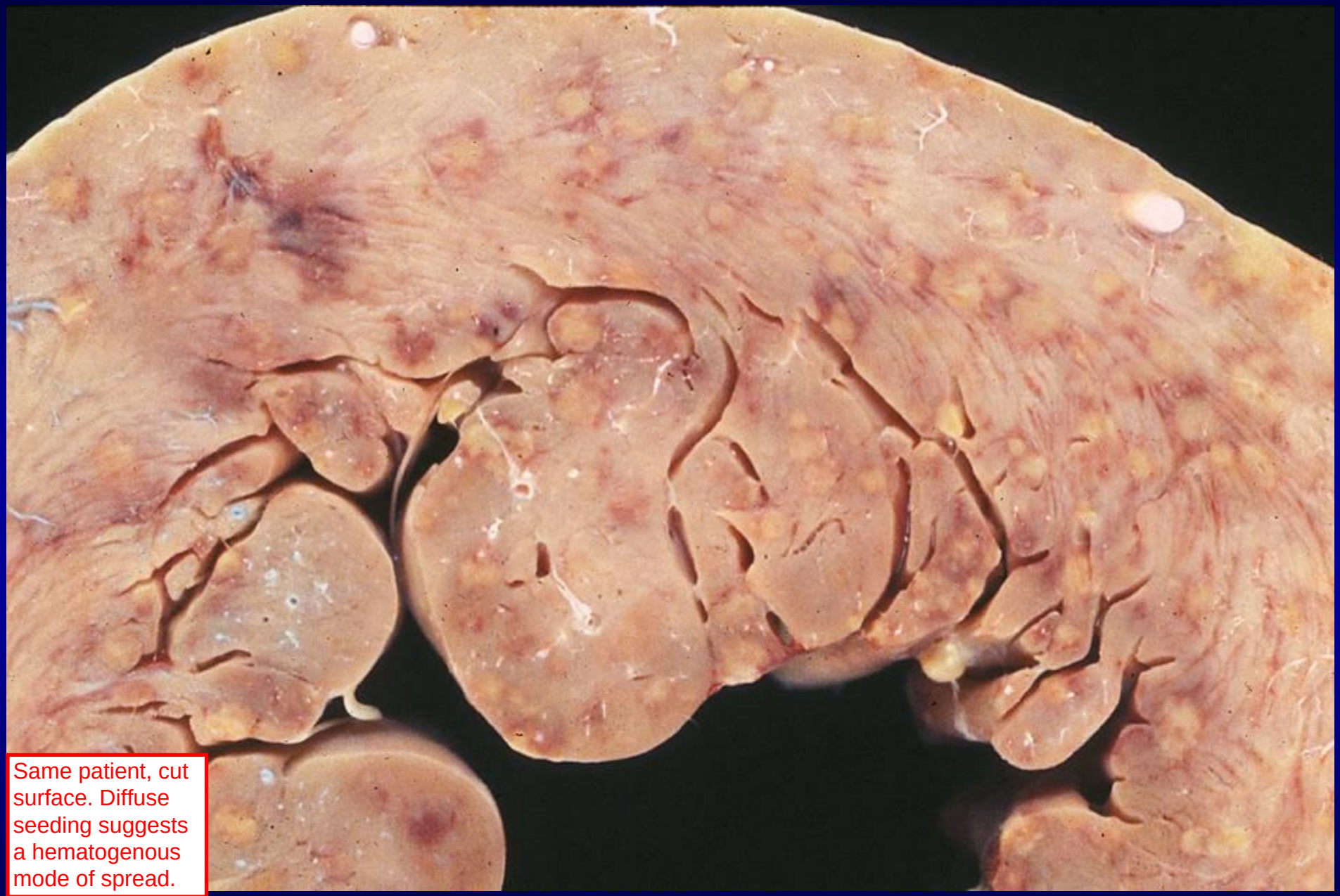
DIRECT BACTERIAL OR FUNGAL INFECTION OF THE MYOCARDIUM

Can occur when organisms get access to the blood stream

Often microabscesses rather than diffuse involvement of the myocardium

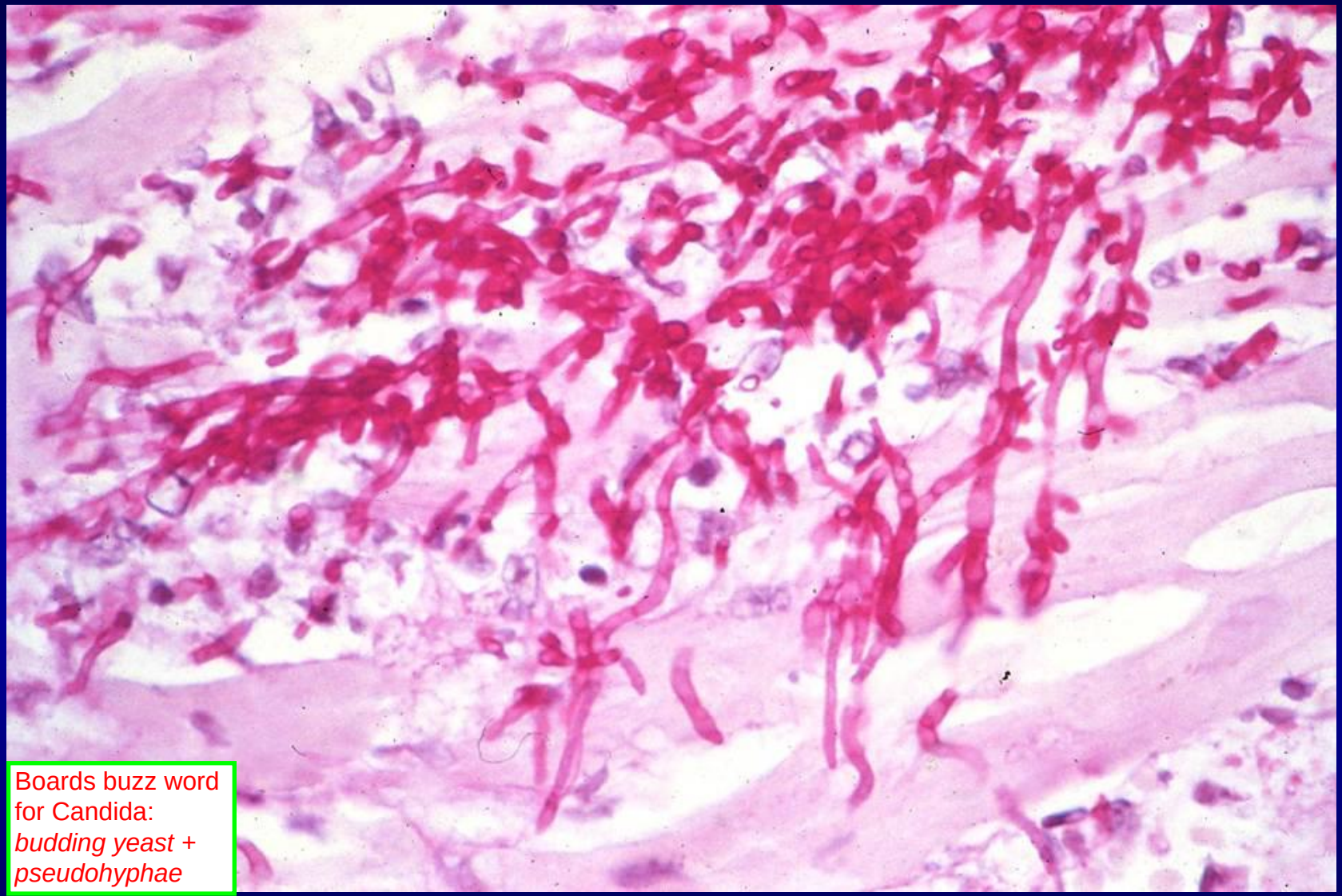


Candida Infection of Heart



Same patient, cut surface. Diffuse seeding suggests a hematogenous mode of spread.

Candida Infection of Heart



Candida Infection of Heart

Opportunistic fungal infections

Candida albicans (*alba* = white)

Systemic or superficial fungal infection. Yeast with pseudohyphae in culture at 20°C; germ tube formation at 37°C (diagnostic). Oral and esophageal thrush in immunocompromised (neonates, steroids, diabetes, AIDS), vulvovaginitis (high pH, diabetes, use of antibiotics), diaper rash, endocarditis in IV drug users, disseminated candidiasis (to any organ), chronic mucocutaneous candidiasis (see Image 9).

Treatment: nystatin for superficial infection; amphotericin B for serious systemic infection.

PERICARDITIS

Dresseler is secondary form of pericarditis that occurs in the setting of injury to the heart or the pericardium (the outer lining of the heart). It consists of a triad of features, fever, pleuritic pain and pericardial effusion. Dressler's syndrome is also known as **postmyocardial infarction syndrome**[1] and the term is sometimes used to refer to **post-pericardiotomy pericarditis**.

ETIOLOGY

Infective

- Primary - Viral
- Secondary - almost any organism

Non-infective

Renal failure causes uremia.

- Metabolic, i.e. Uremic, hypothyroid (cholesterol)
- Neoplastic — Direct or as part of a paraneoplastic syndrome.
- Acute MI – Dressler's Pericarditis
- Hypersensitivity, i.e. rheumatic fever or post-MI
- Autoimmune — SLE, scleroderma, rheumatoid arthritis, mixed connective tissue disease
- Radiation-induced, Traumatic, Idiopathic

Common in radiation of left sided breast and lung cancer.

CLINICAL FEATURES OF PERICARDITIS

Wikipedia "Chest pain with radiation to the trapezius ridge (the bottom portion of scapula on the back), which is relieved by sitting up and bending forward and worsened by lying down (recumbent or supine position) or inspiration (taking a breath in), is the characteristic pain of pericarditis."

General signs of infection

Chest pain – positional features

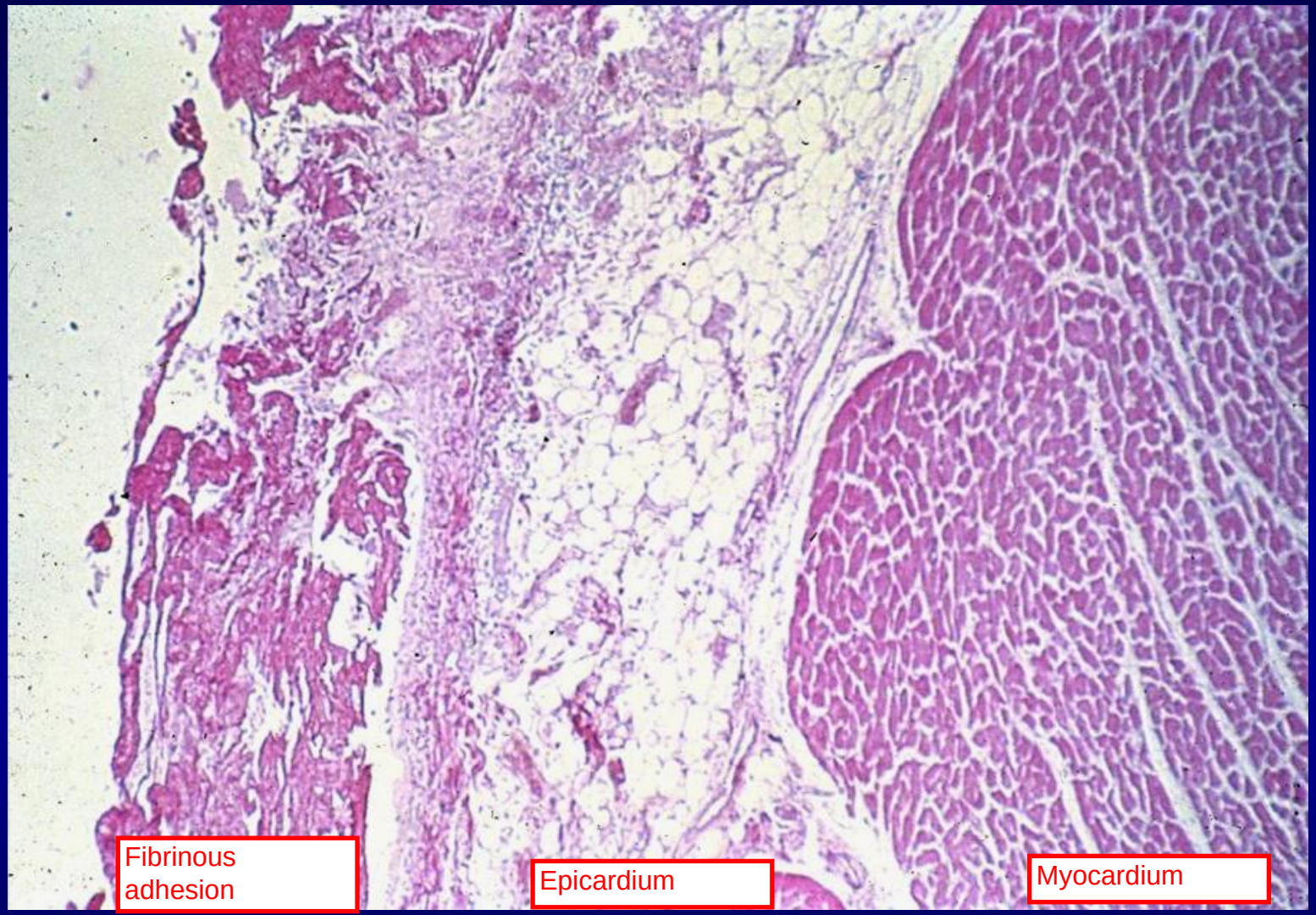
Friction rub

Non-specific ECG changes that do not conform to any anatomic vascular distribution

Here he mentions that elevated CK-MB and Troponin I/T can occur in any condition that injures heart muscle-- myocarditis, pericarditis, acute MI, etc.

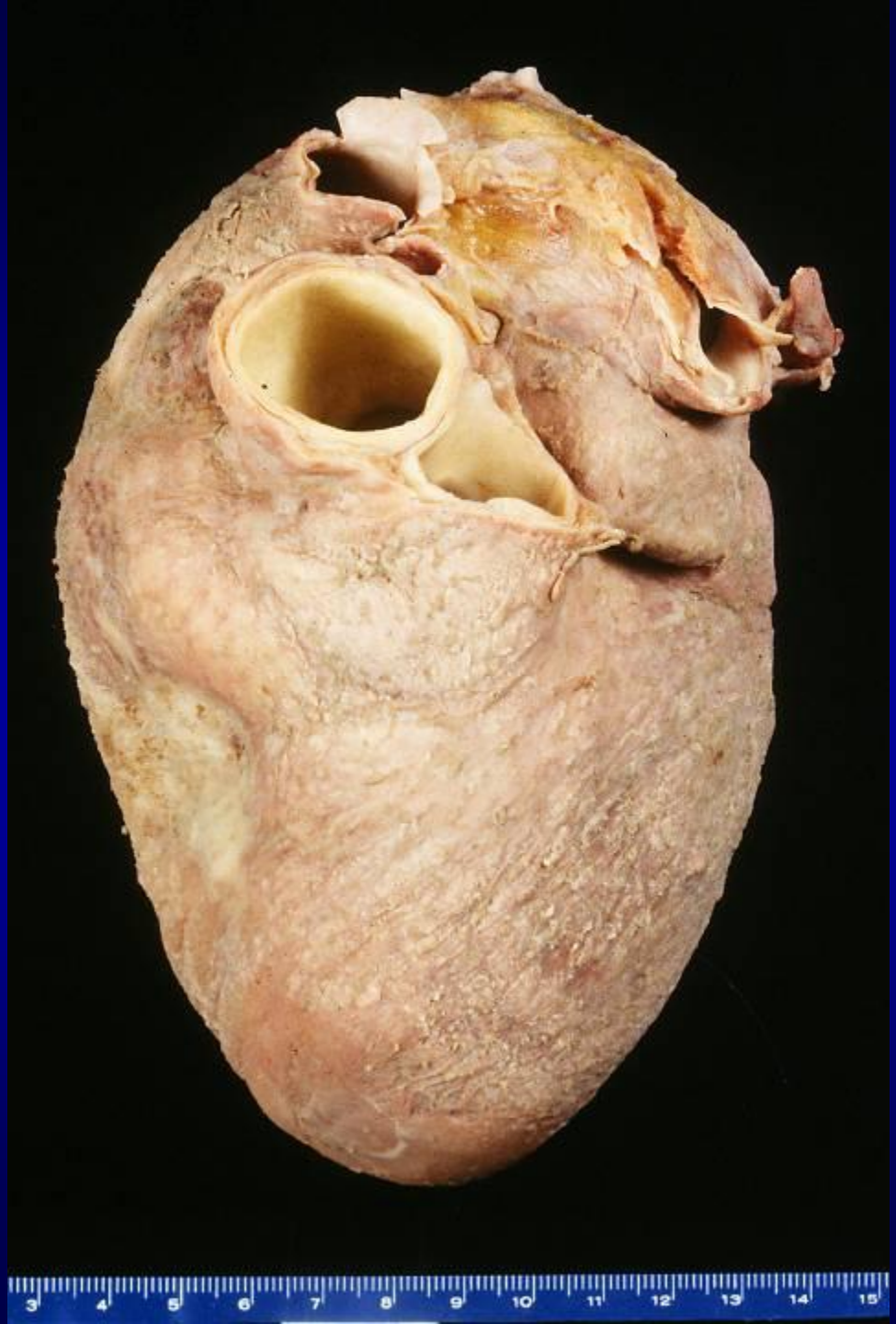
Fibrinous pericarditis

Patient had uremia from renal failure



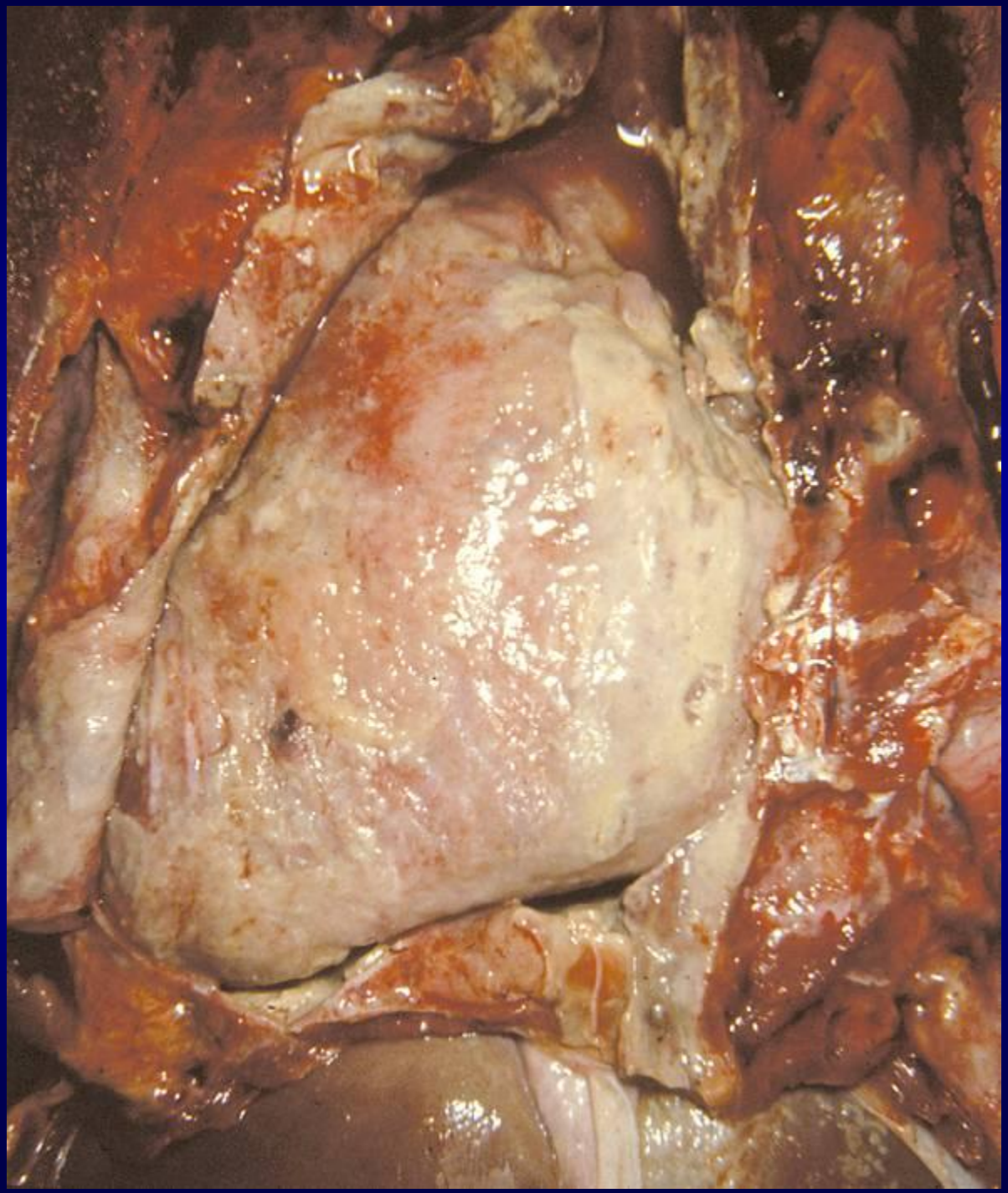
Fibrinous Pericarditis

A possible complication includes superimposed hemorrhage and pericardial tamponade.



Bacterial pericarditis

Pyogenic



Bacterial pericarditis following gunshot wound to the chest

PERICARDITIS
Outcomes and Complications

- Mild cases resolve
- Early complications
  - Pericardial effusion
  - Cardiac tamponade
    - Effusion
    - Hemorrhage
- Late complications
  - Adhesive pericarditis
  - Constrictive pericarditis

Pericardium constricts on healing, and the heart is squeezed. Diastolic failure.

Pericarditis

Serous	Caused by SLE, rheumatoid arthritis, viral infection, uremia.
Fibrinous	Uremia, MI (Dressler's syndrome), rheumatic fever.
Hemorrhagic	TB, malignancy (e.g., melanoma).
	Findings: pericardial pain, friction rub, pulsus paradoxus, distant heart sounds. ECG changes with ST-segment elevation in multiple leads.
	Can resolve without scarring or lead to chronic adhesive or chronic constrictive pericarditis.

RHEUMATIC HEART DISEASE

A non-suppurative inflammatory disease that may involve the joints, heart, blood vessels, skin, and CNS; it usually follows a group A beta-hemolytic streptococcal pharyngitis; it often recurs

Pathogenesis: involves cross-reactivity between the immune response to Strep cell surface antigens and antigens on cardiac myocytes and with heart valve glycoproteins

RHEUMATIC HEART DISEASE

Acute Rheumatic Fever is a **PANCARDITIS**, involving all layers of the heart. Pericarditis and myocarditis often responsible for initial symptoms.

PERICARDITIS - fibrinous

MYOCARDITIS

Aschoff bodies: Perivascular nodules of inflammatory cells including multinucleated Aschoff cells, Anitschkow cells, lymphocytes, and plasma cells

Myocarditis can lead to CHF and even death

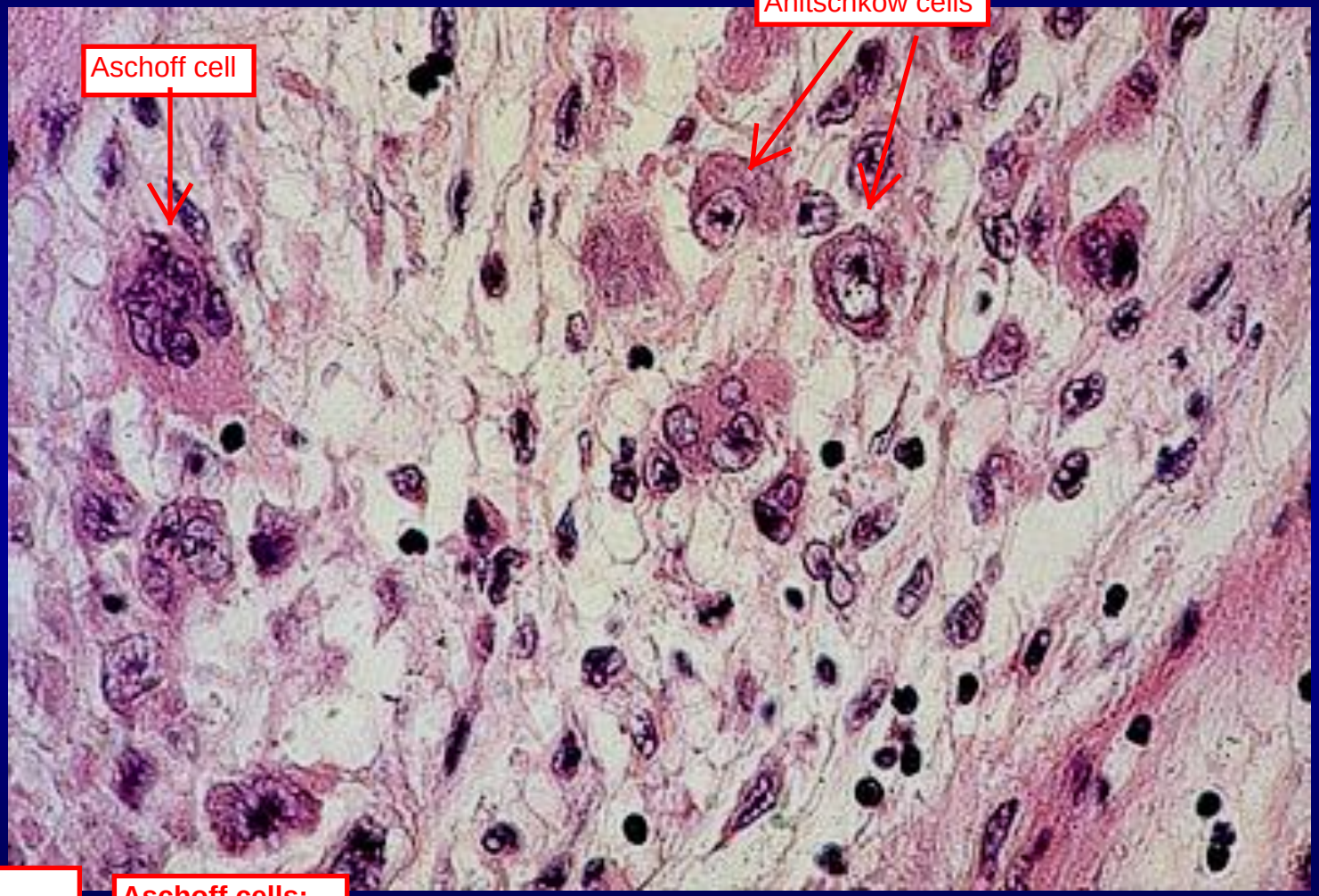
ENDOCARDITIS - initially results in tiny vegetations along lines of closure of mitral and aortic valves, with little functional significance

most common sequelae

Rheumatic Heart Disease: Phases

- Early (to 4 weeks): Degeneration
- Intermediate (4-12 weeks): Granulomatous
  - Anitschkow Cells – Histiocytes, Enlarged, Owl-eye Nuclei
  - Aschoff Cells – Multinucleated giant cells, Basophilic cytoplasm
- Late: Fibrous Healing

RHEUMATIC HEART DISEASE



Anitschkow cells: enlarged histiocytes with owl eye nuclei /

Aschoff cells: basophillic mutlinucleated giant cells

Achoff body:
myocardial interstitial Aschoff cells + Anitschkow cells + fibrinoid necrosis

Path.vcu.edu

RHEUMATIC VALVULAR DISEASE

More clinically relevant than the myocardial involvement

With repeated episodes of Rheumatic Fever, the valve damage progressively increases. Nevertheless, it requires many years or decades before valvular damage becomes functionally significant.

Latency may reflect the slowly progressive, cumulative effect of turbulence created by relatively mild deformity as well as the direct effect of inflammation.

Valvular damage is characterized by fibrosis, fusion, and shortening of chordae tendineae and fibrosis and fusion of commissures. Calcification is also common and can be platelike

Valves become stiff and neither open fully nor close completely; therefore, often there is a combination of stenosis and insufficiency,

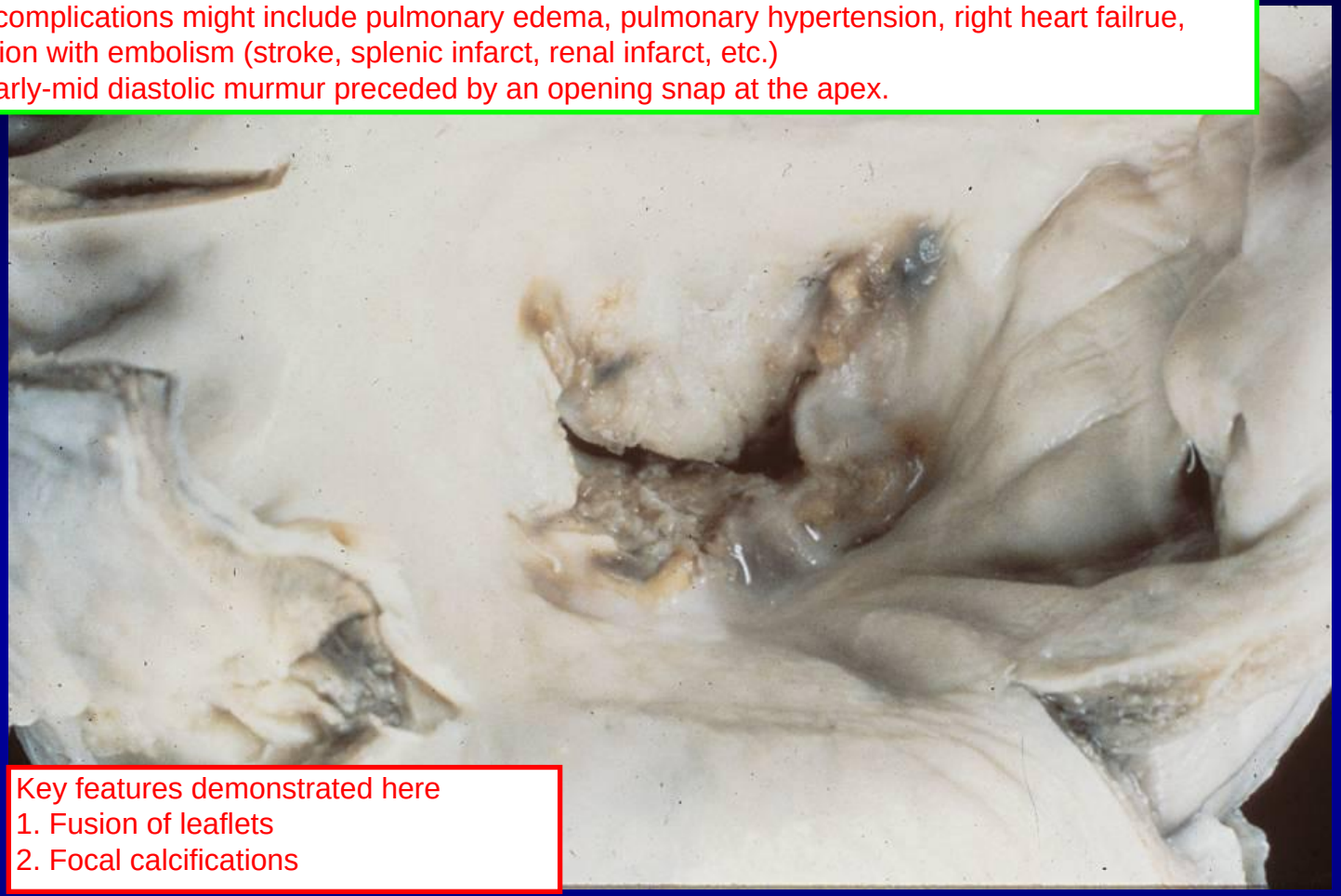
- **stenosis is often more severe.**

CHRONIC RHEUMATIC HEART DISEASE

Frequency of Valve Involvement:

Mitral Valve alone	**48 %**
Mitral and Aortic	**42 %**
Mitral, Aortic, Tricuspid	4 %
Aortic alone	2 %
Mitral and Tricuspid	2 %
All 4 Valves	1 %

Mitral stenosis
-Secondary complications might include pulmonary edema, pulmonary hypertension, right heart failrue, atrial fibrilllation with embolism (stroke, splenic infarct, renal infarct, etc.)
-Rumbling early-mid diastolic murmur preceded by an opening snap at the apex.

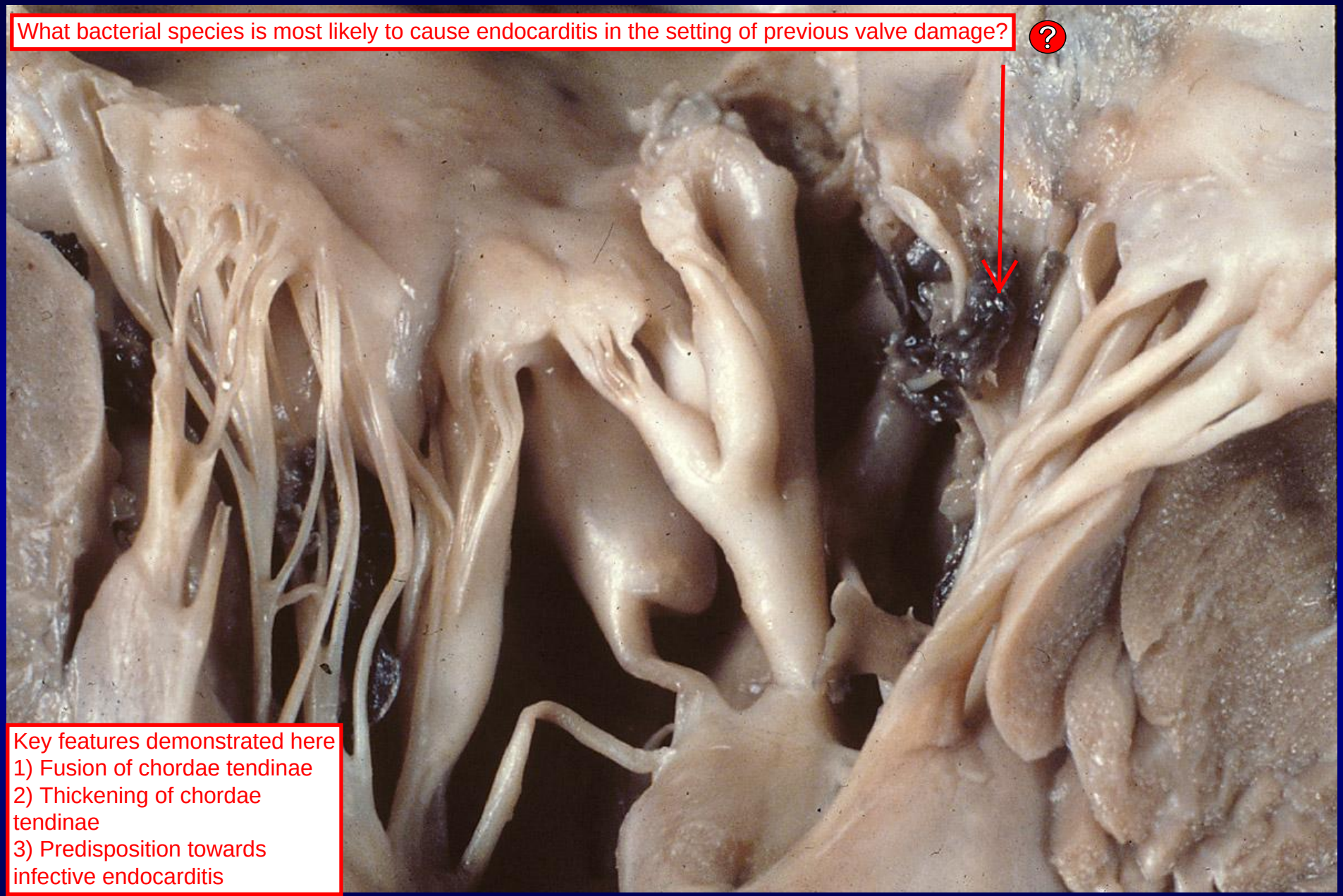


Key features demonstrated here
1. Fusion of leaflets
2. Focal calcifications

Chronic mitral valve stenosis secondary to rheumatic fever, with fusion of leaflets and focal calcification

"fish mouth"

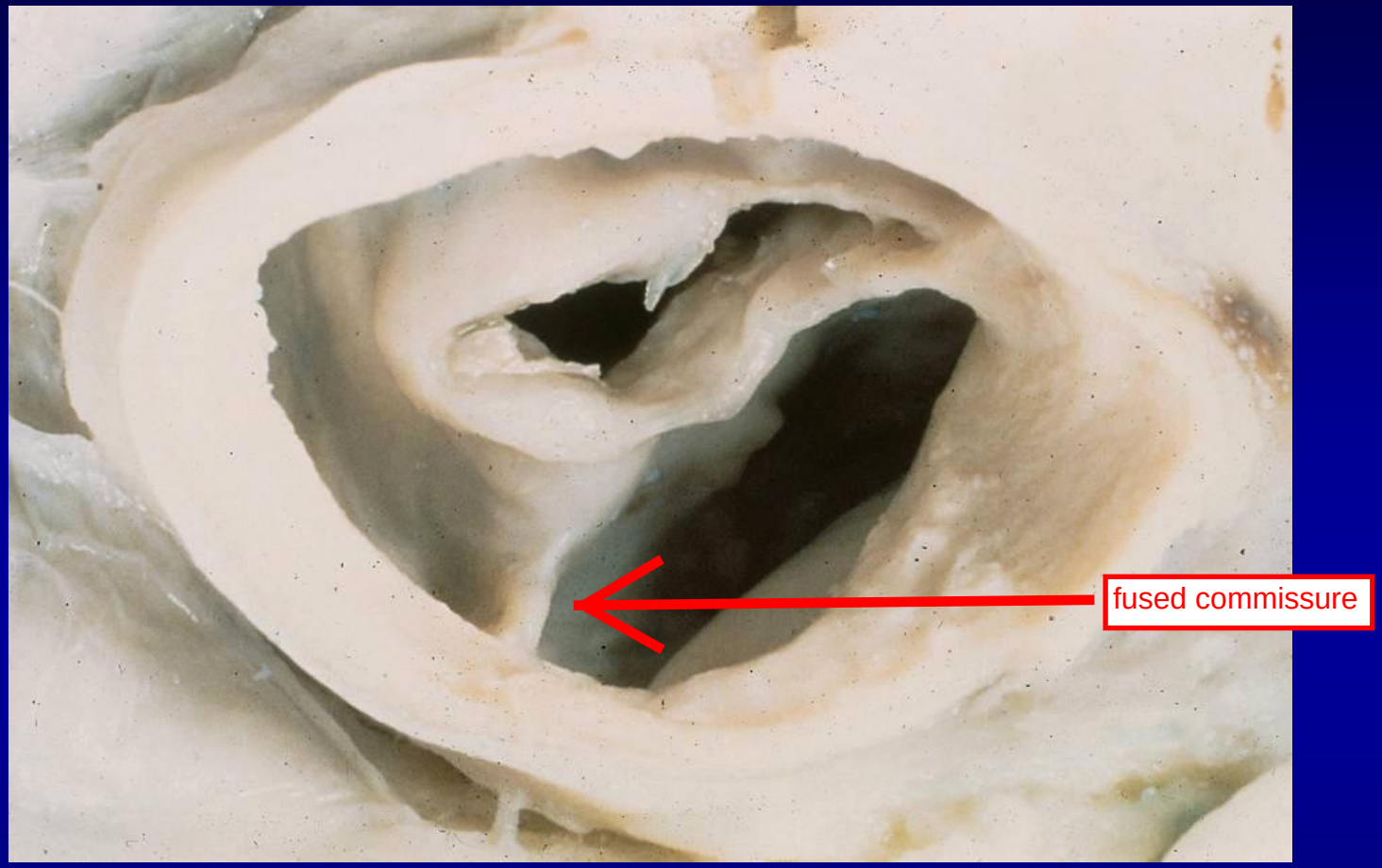
What bacterial species is most likely to cause endocarditis in the setting of previous valve damage?



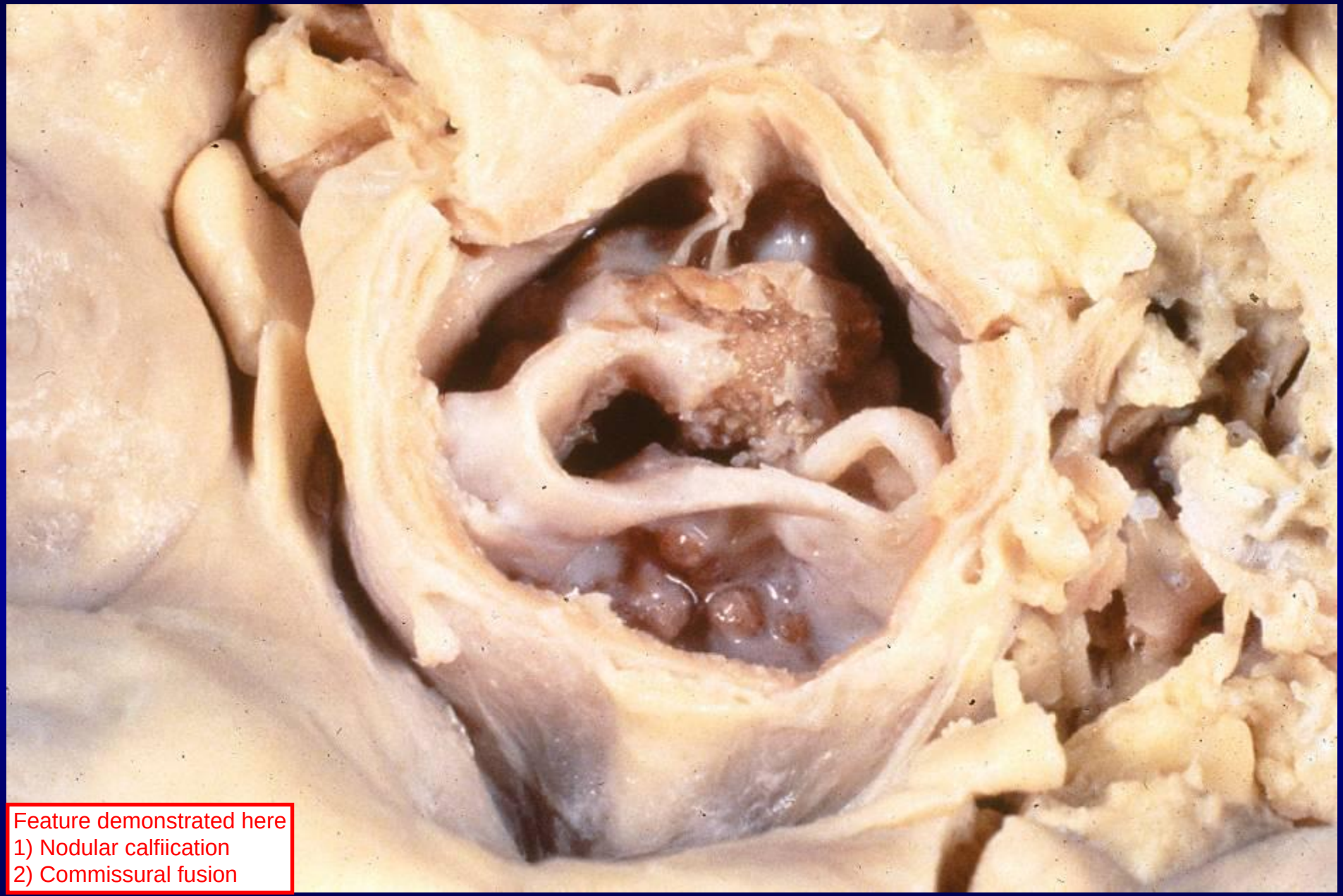
Key features demonstrated here
1) Fusion of chordae tendinae
2) Thickening of chordae tendinae
3) Predisposition towards infective endocarditis

Rheumatic mitral valve disease with fusion and thickening of chordae tendineae (and superimposed bacterial endocarditis)

Aortic stenosis
- You'd expect a crescendo-decresencdo systolic ejection murmur
- Causes left ventricular hypertrophy, widened pulse pressure, syncope, angina.



Commissural fusion – Aortic valve with resulting stenosis and insufficiency



Rheumatic aortic valve disease with marked calcification

Rheumatic heart disease

A consequence of pharyngeal infection with group A β-hemolytic streptococci. Early deaths due to myocarditis. Late sequelae include rheumatic heart disease, which affects heart valves—mitral > aortic >> tricuspid (high-pressure valves affected most). Early lesion is mitral valve prolapse; late lesion is mitral stenosis. Associated with Aschoff bodies (granuloma with giant cells), Anitschkow's cells (activated histiocytes), elevated ASO titers.

Immune mediated (type II hypersensitivity); not direct effect of bacteria. Antibodies to M protein.

FEVERSS:

- Fever
- Erythema marginatum
- Valvular damage (vegetation and fibrosis)
- ESR ↑
- Red-hot joints (migratory polyarthritis)
- Subcutaneous nodules (Aschoff bodies)
- St. Vitus' dance (chorea)

Valvular Disease: Common Etiologies in Adults

What are the two most common patterns of valve involvement in RF?

Mitral Stenosis - mostly rheumatic

Mitral Regurgitation - rheumatic, annular dilation, prolapse, Ischemia, acute endocarditis

Aortic Stenosis - rheumatic, congenital defect (bicuspid valve), degenerative (calcific, Conn. tissue), Aortitis

Aortic Regurgitation - rheumatic, acute endocarditis, dilation of proximal aorta

Tricuspid and Pulmonary Valves can have similar abnormalities as above (except prolapse)

Carcinoid disease

Carcinoid tumors secrete 5-HT. Somehow cause diffuse fibrosis of the right heart including TV, PV. Does not effect left side of heart (MAO activity in lungs).

Valve Repair/Replacement

- Structural vs geometric (ischemic ventricle)
- Repair: Leaflets, Chordae, Valve rings
- Replacement
  - Mechanical: Durable, Requires anticoagulation
  - Bioprosthetic: Less durable, less anticoagulation
    - Determinants: Stress on valve, size, patient age, lifestyle
    - Ross Procedure (Remember?)

Questions?

What is this pig doing to that beer?