



Cardiovascular Pathology

– inflammatory
heart diseases –

Semmelweis University
2nd Department of Pathology



2017/2018 – Autumn Semester
Tibor Glasz, MD PhD



Inflammatory cardiac diseases



Inflammatory heart diseases

- *Endocarditides*
 - parietal
 - valvular

- *Myocarditis*

- *Pericarditis*



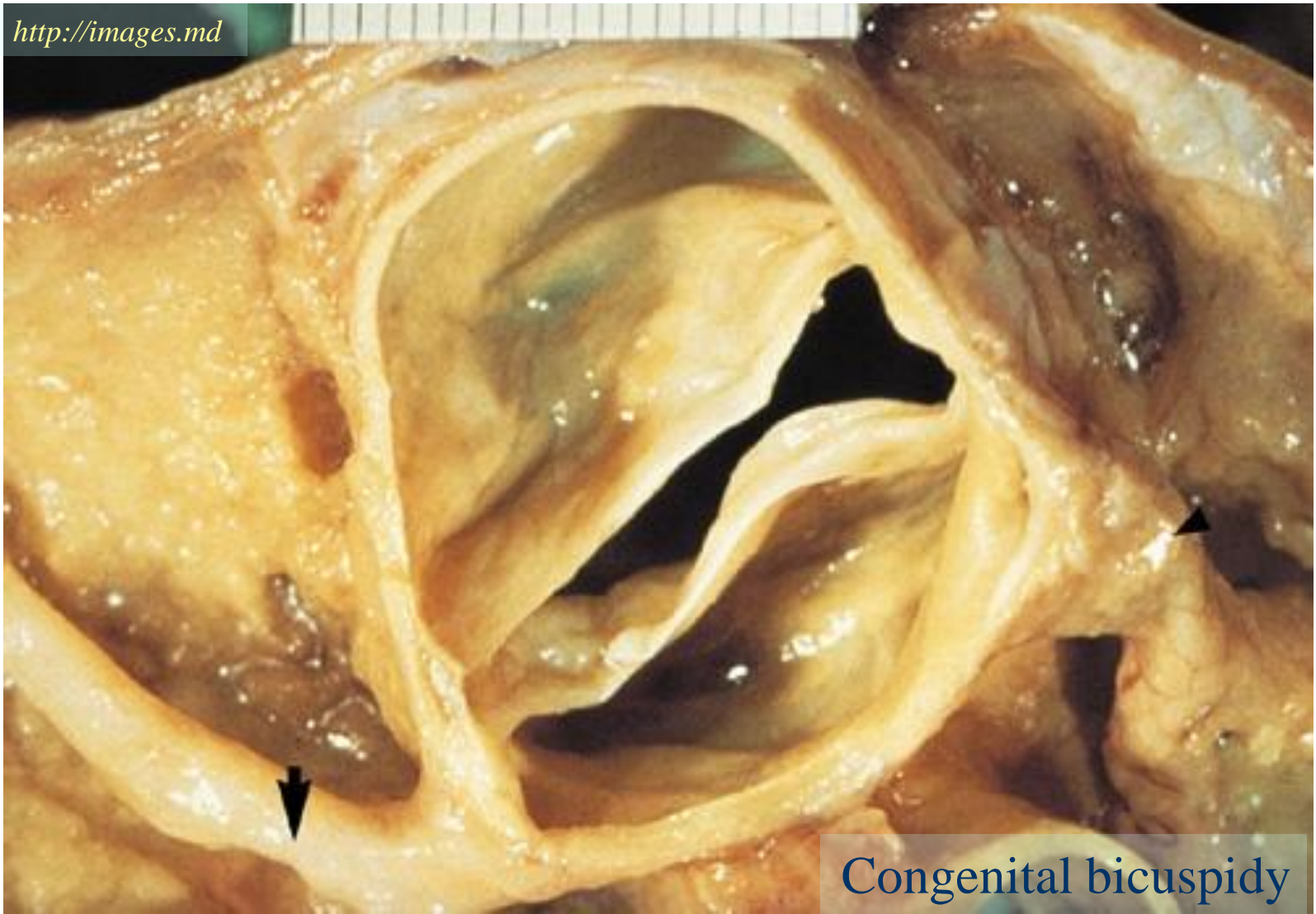
Pancarditis

Endocarditides

The infective endocarditides

- *Risk groups:*
 - ~ rheumatic or degenerative valvular deformities
 - ~ congenital valvular vicia
 - ~ valvular prostheses
 - ~ arterial long-term catheter
 - ~ intravenous drug abusers (15% of cases, *here*: localisation typically tricuspidal!)
 - *Infective agents:*
 - ~ almost always bacteria (*Staphylococcus auerus*, *Streptococcus viridans*, Gonococci, Enterobacteria; in immunodeficiency: so-called opportunistic bacteria)
 - ~ seldom fungi (in immunodeficiency /AIDS/ and iv. drug abusers)
-

<http://images.md>



Congenital bicuspidy

The infective endocarditides

- *Clinical forms:*

~ acute: sudden beginning with high fever and septic crisis > despite antibiotics mortality very high

~ subacute (*endocarditis subacuta infectiva/lenta*): begins inconspicuously with uncharacteristic systemic symptoms (weakness, fever, weight loss)

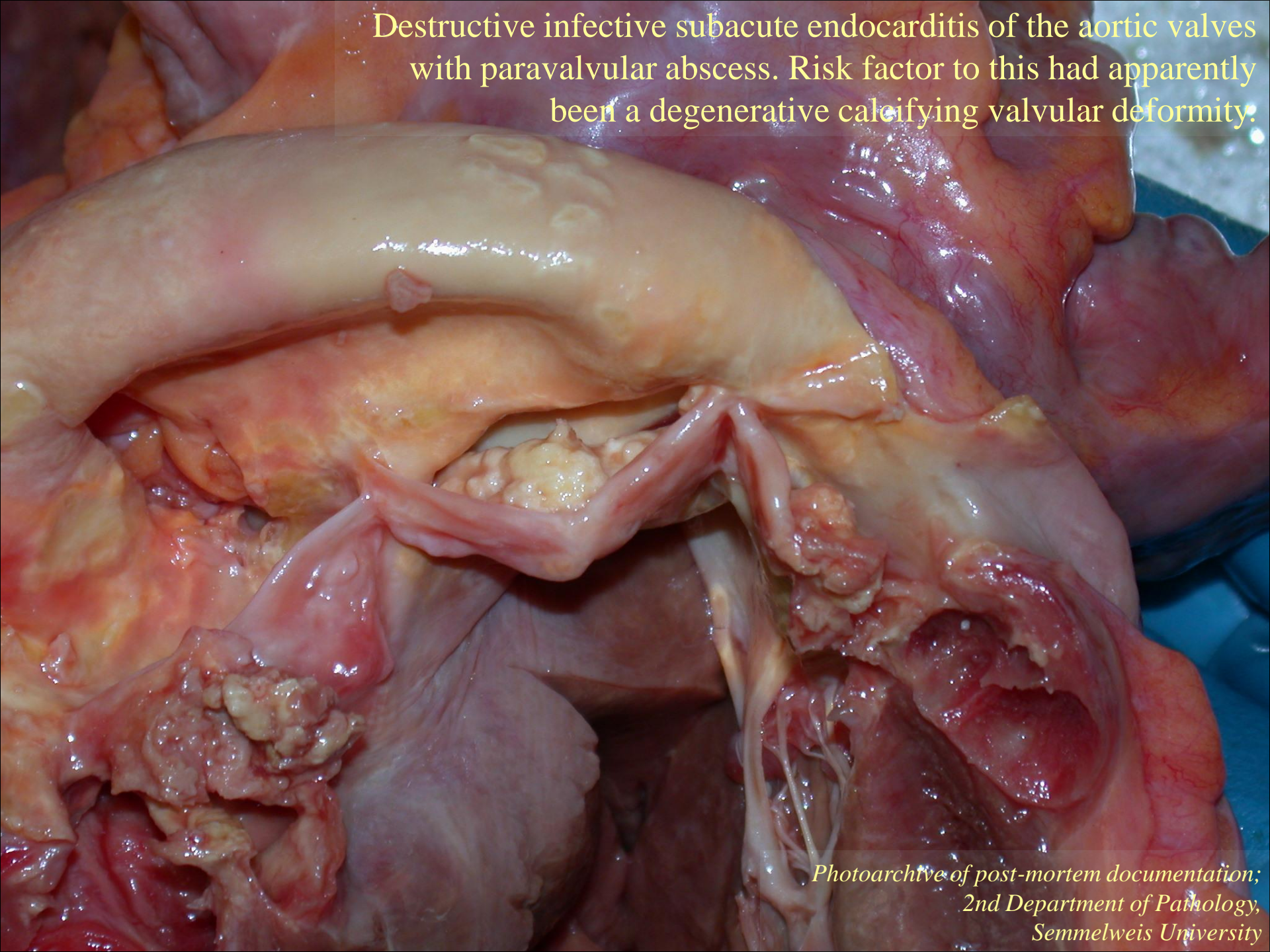
The infective endocarditides

- *Morphology*: the same in both forms:
 - ~ valvular vegetations along the closing lines of the valves: from small, finely granular to gross polypoid, stenosing
 - ~ the material of the vegetations may harbour large amounts of infective agents and is highly friable > danger of embolism > formation of metastatic abscesses
 - ~ valve destruction (*endocarditis ulcerosa*) through necrosis, ulceration, thrombotic deposits > sacculation (so-called valvular aneurysm) and rupture > sudden valve insufficiency
 - ~ extension of tissue destruction to neighbouring parts of the aorta or myocardium > so-called paravalvular abscess, paravalvular leak > cardiac/circulatory catastrophe!
 - ~ in severe cases involvement of the cordae and parietal endocardium is also possible

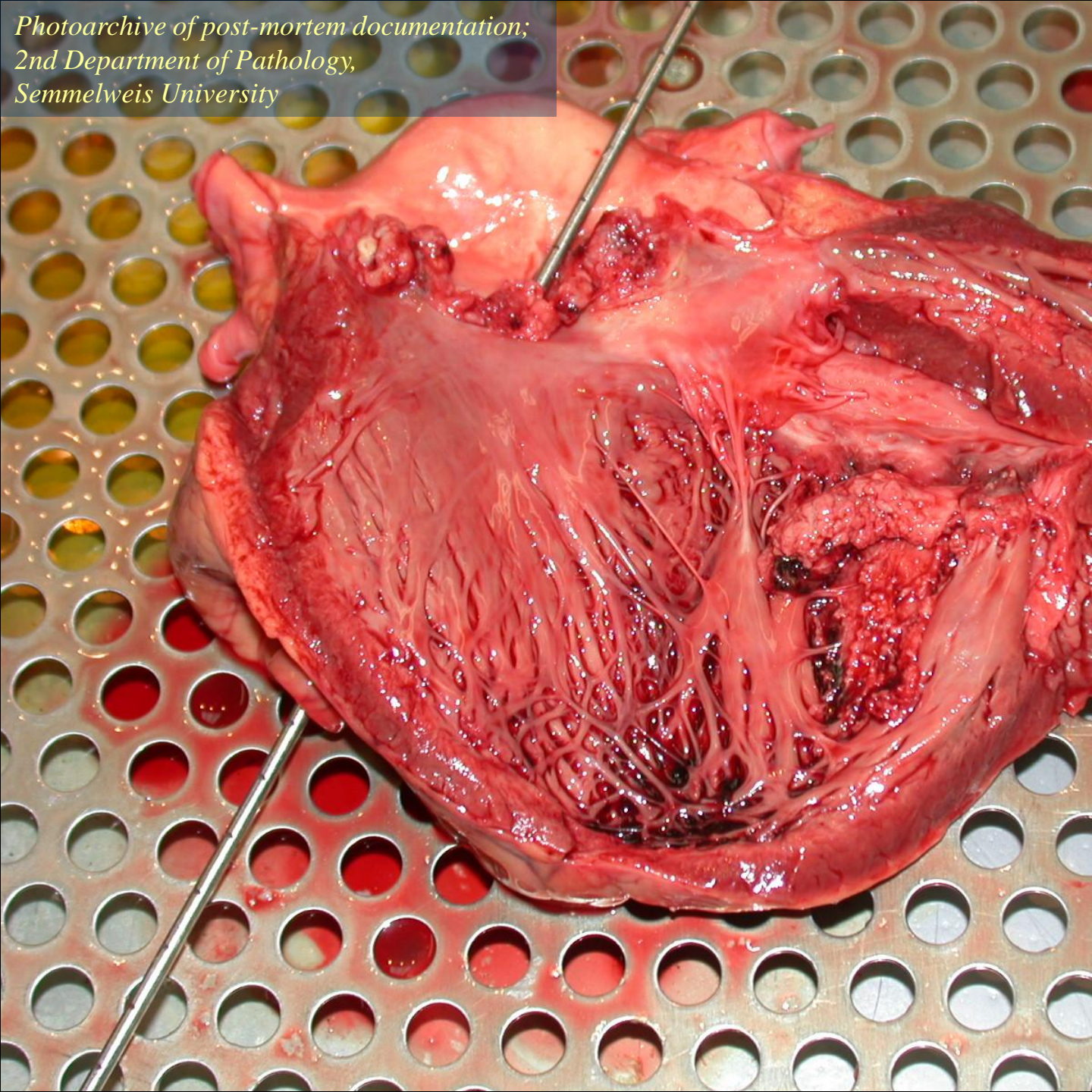
Destructive infective subacute endocarditis of the aortic valves with paravalvular abscess and septation within abscess. Risk factor to this had apparently been a degenerative calcifying valvular deformity.



Destructive infective subacute endocarditis of the aortic valves with paravalvular abscess. Risk factor to this had apparently been a degenerative calcifying valvular deformity.



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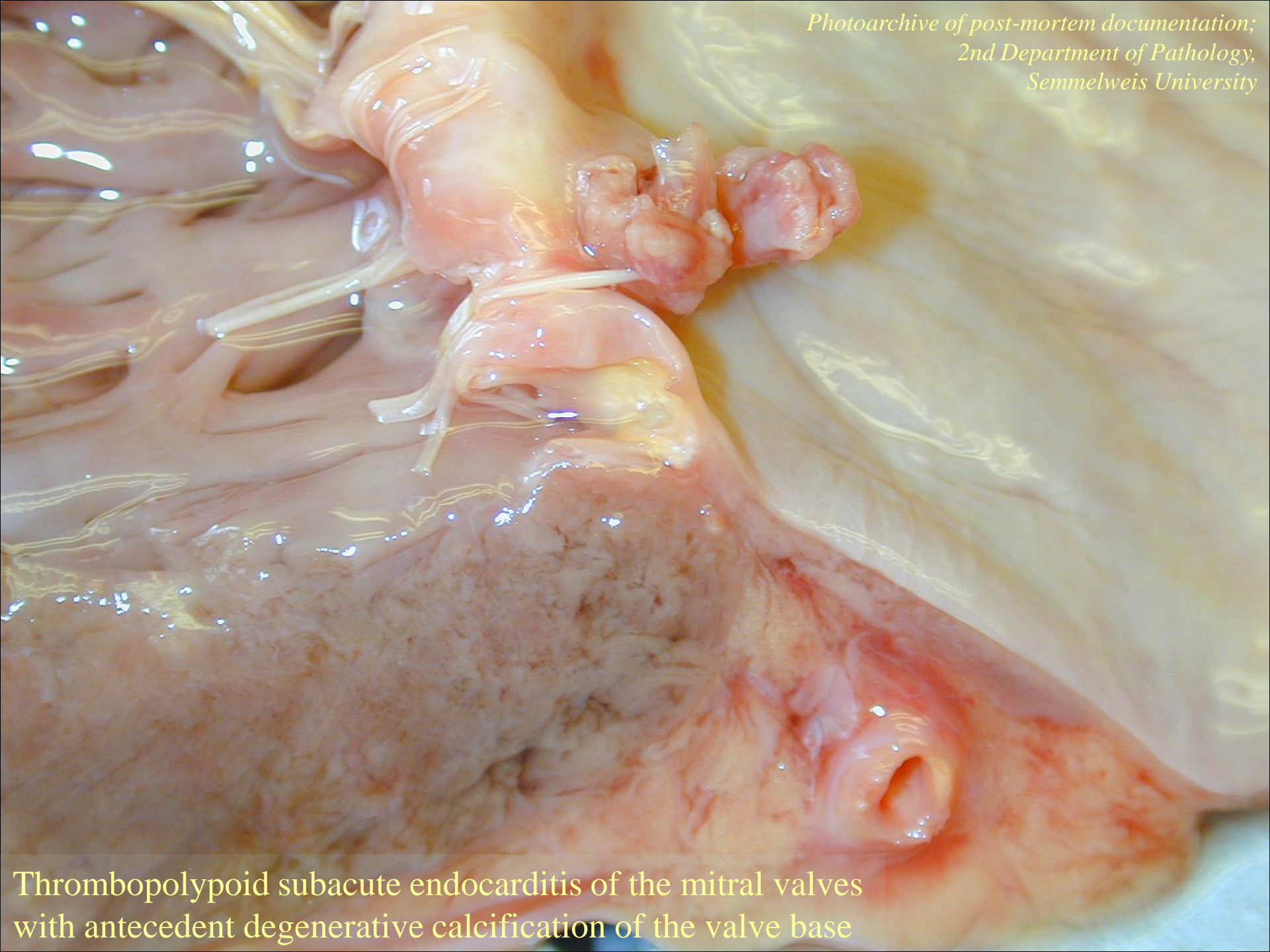


Ulcerative endocarditis (formerly known as *endocarditis ulcerosa maligna*) with massive vegetations, complete tissue destruction, paravalvular leak and involvement of the parietal endocardium. The severe valvular insufficiency resulted in a rounded dilation of the left ventricle.

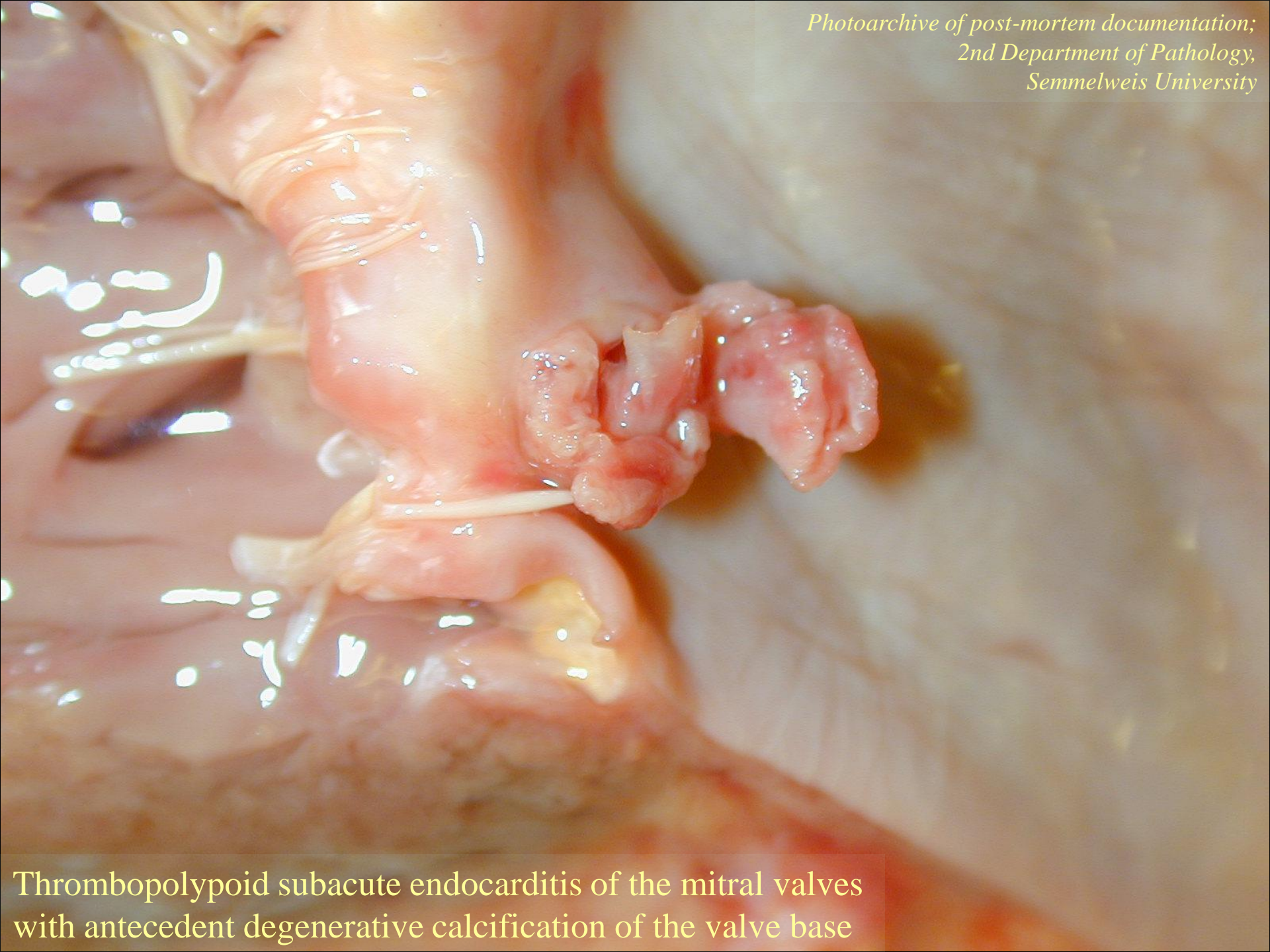
Ulcerative endocarditis of the aortic valves with massive valve destruction, valvular insufficiency and excentric myocardial hypertrophy



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*Thrombopolyloid subacute endocarditis of the mitral valves
with antecedent degenerative calcification of the valve base*

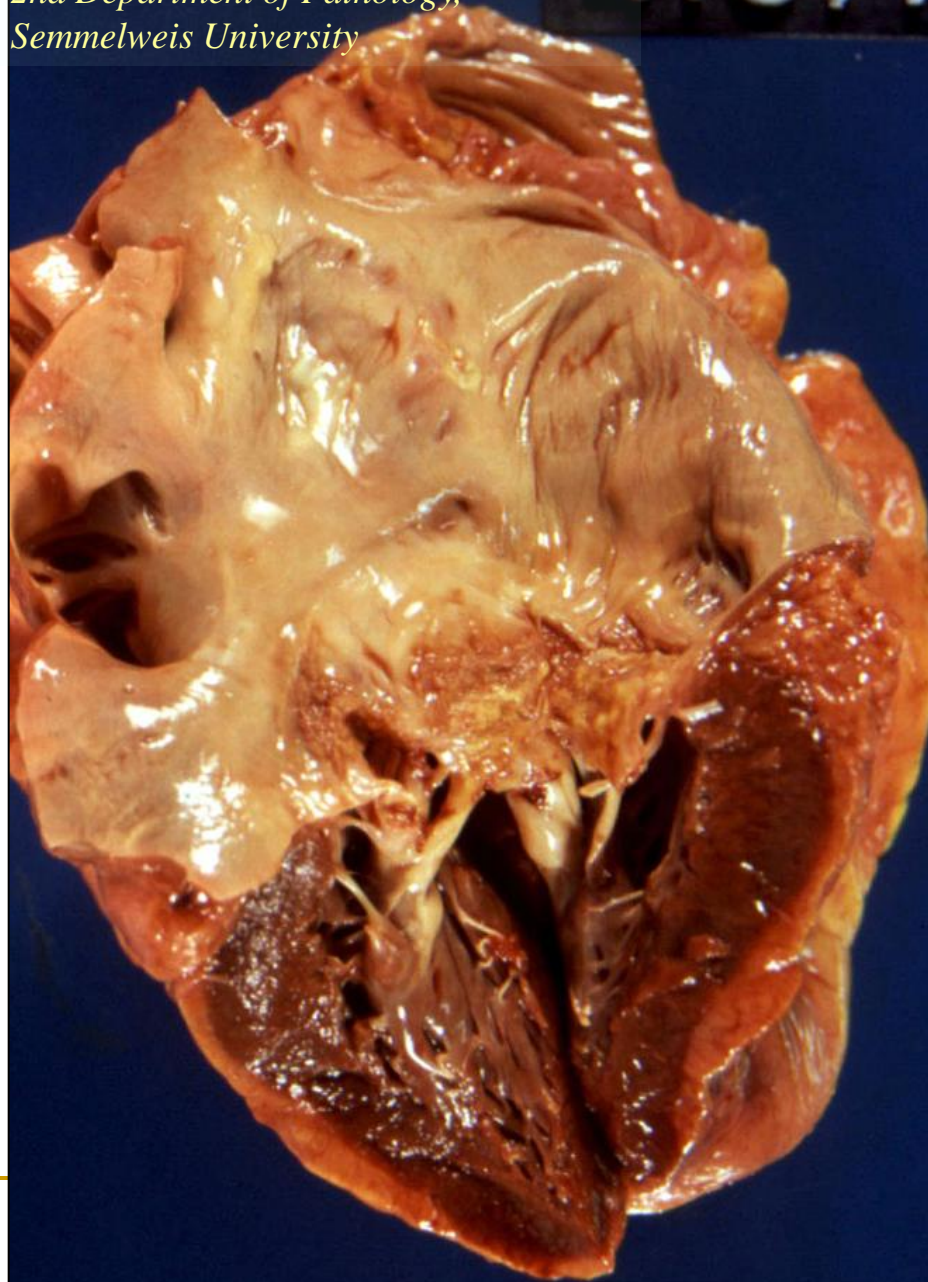


*Thrombopolypoid subacute endocarditis of the mitral valves
with antecedent degenerative calcification of the valve base*

Ulcerative and perforating endocarditis of the mitral valves



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Thrombopolioid
subacute
endocarditis of the
mitral valves. The
cordae are
severely
thickened,
referring to a
recurrent
endocardial
disease.

The infective endocarditides

- *Clinical presentation:*

~ Schottmüller's triad (*endocarditis ulcerosa*;
splenic infarctions; embolic focal nephritis)

~ Osler's nodule: lividity, swelling and tenderness of the
periungual finger areas / distal phalanges through
(micro)emboli

~ sepsis

- *Endocarditis of valvular prostheses:*

~ vegetations along the sutures of the prostheses:
paravalvular abscess and leak

Special forms of endocarditides / non-infectious endocarditides

- Non-bacterial thrombotic endocarditis (formerly known as *Endocarditis marantica*)
 - ~ sterile, small vegetations of fibrin and thrombocytes in the closing line of valves
 - ~ in the background there is often enhanced blood-clotting in severely diseased patients with bad general status (terminal tumour disease, chronic renal failure, chronic sepsis)
- Liebman-Sacks endocarditis (SLE-endocarditis)
 - ~ 1-4 mm large, verrucous vegetations in the closing line and on the undersurface of valves
 - ~ fibrinoid necrosis, fibrosis, valvular deformity and vitia are possible
 - ~ histologically demonstration of so-called hematoxyphil-bodies

Special forms of endocarditides / non-infectious endocarditides

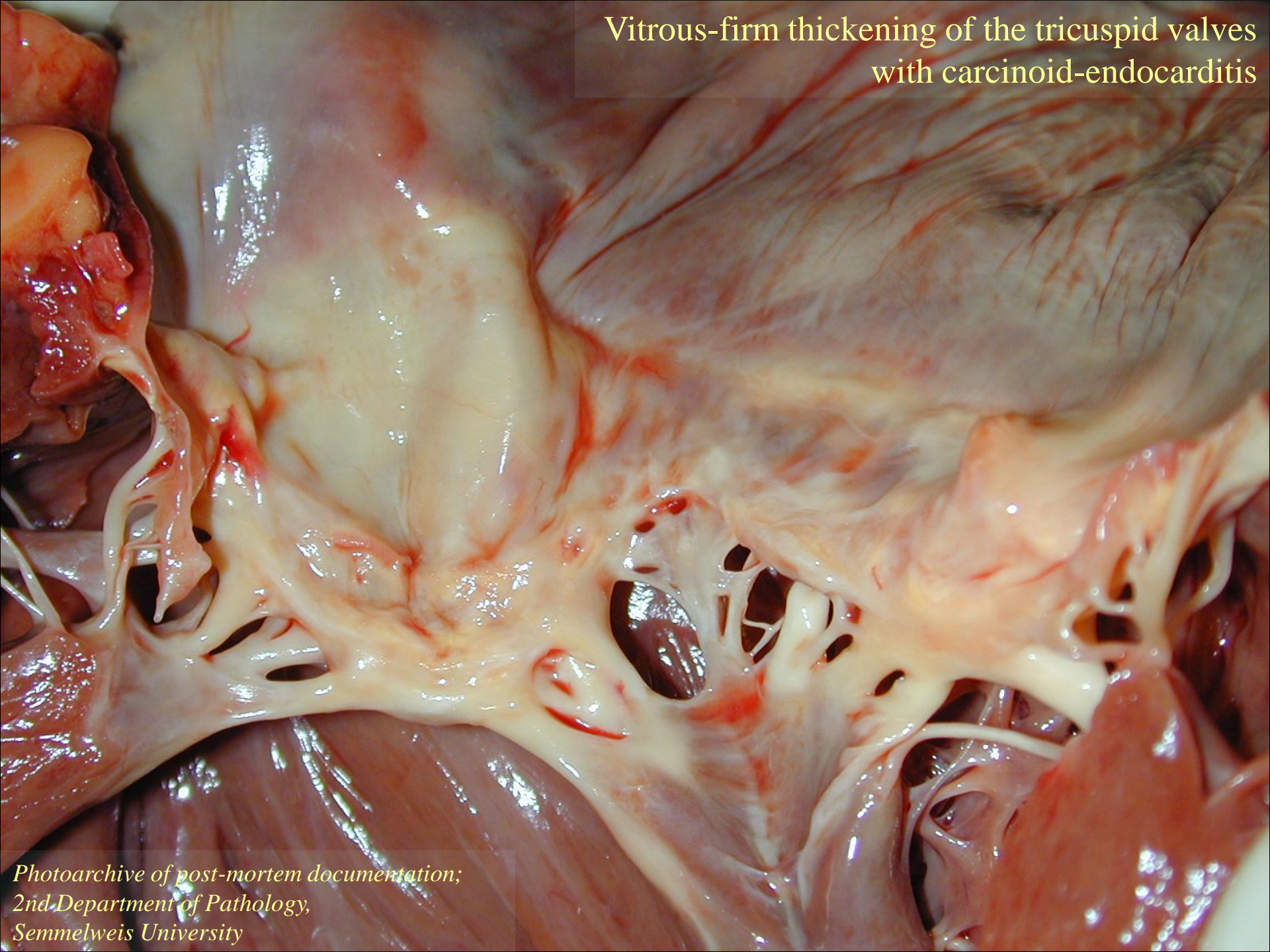
- Carcinoid-endocarditis

- ~ tumour site in the GI (appendix, duodenum)
- ~ primarily alterations of the tricuspid valves
- ~ vitreous-firm thickening of the valve cusps
- ~ similar alterations of the pulmonary semilunar valves, the endocardium of the right ventricle and in the pulmonary trunk possible
- ~ cause: high blood titer of tumour products: Serotonin, Kallikrein, Bradikinin, Histamine, Prostaglandins, Tachikinins

- Accompanying endocarditis

- ~ as with acute myocardial infarction
 - ~ typically a parietal localisation
-

Vitrous-firm thickening of the tricuspid valves
with carcinoid-endocarditis



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Special forms of endocarditides / non-infectious endocarditides

- *Endocarditis syphilitica/luetica*
 - ~ extension of a *luetica aortitis* onto the aortic valves
 - ~ valves thickened and firm, with insufficiency in the later phase

 - Endocarditis in rheumatoid arthritis (*primary chronic polyarthritis – PCP*)
 - ~ alterations similar to those seen with luetic valvulitis
-

Myocarditides

Myocarditides

- *Clinical presentation:*

- ~ presentation with slight symptoms or even without any symptoms whatsoever possible
- ~ sometimes causes sudden progression into heart failure or arrhythmias > sudden death syndrome
- ~ all age groups can be affected, most frequently in young adults

- *Classification:*

- ~ referring to pathogenesis: infectious; non-infectious; idiopathic
-

Infectious myocarditides

- *Viral myocarditides:*

~ Coxsackie A, B; Influenza; Echovirus; EBV; HIV; CMV

- *Bacterial myocarditides:*

~ Diphtheria; Leptospira; Meningococci; Borrelia (Lyme-disease)

- *Protozoal myocarditides:*

~ Trypanosoma (Morbus Chagas); Toxoplasmosis

- *So-called specific myocarditides:*

~ rheumatic fever; tuberculosis; syphilis

Non-infectious myocarditides

- *Physical myocarditides:*

~ irradiation therapy (ionising radiations); electric shock

- *Chemical myocarditides:*

~ heavy metals; drugs (cytostatics, Sulfonamides, Penicillin)

- *Post-streptococcal myocarditides:*

~ as a component of rheumatic fever

- *Transplantational myocarditis:*

~ during rejection reaction

Idiopathic myocarditides

- *Giant cell myocarditis*
 - *Fiedler's myocarditis*
 - *Sarcoidosis*
-

Morphology

- *Macroscopy:*

- ~ loose and flabby dilation of the ventricles
- ~ patchy cut surface of the myocardium with sporadic small foci of hemorrhages
- ~ dilation of the atrioventricular ostia > relative insufficiency of valves

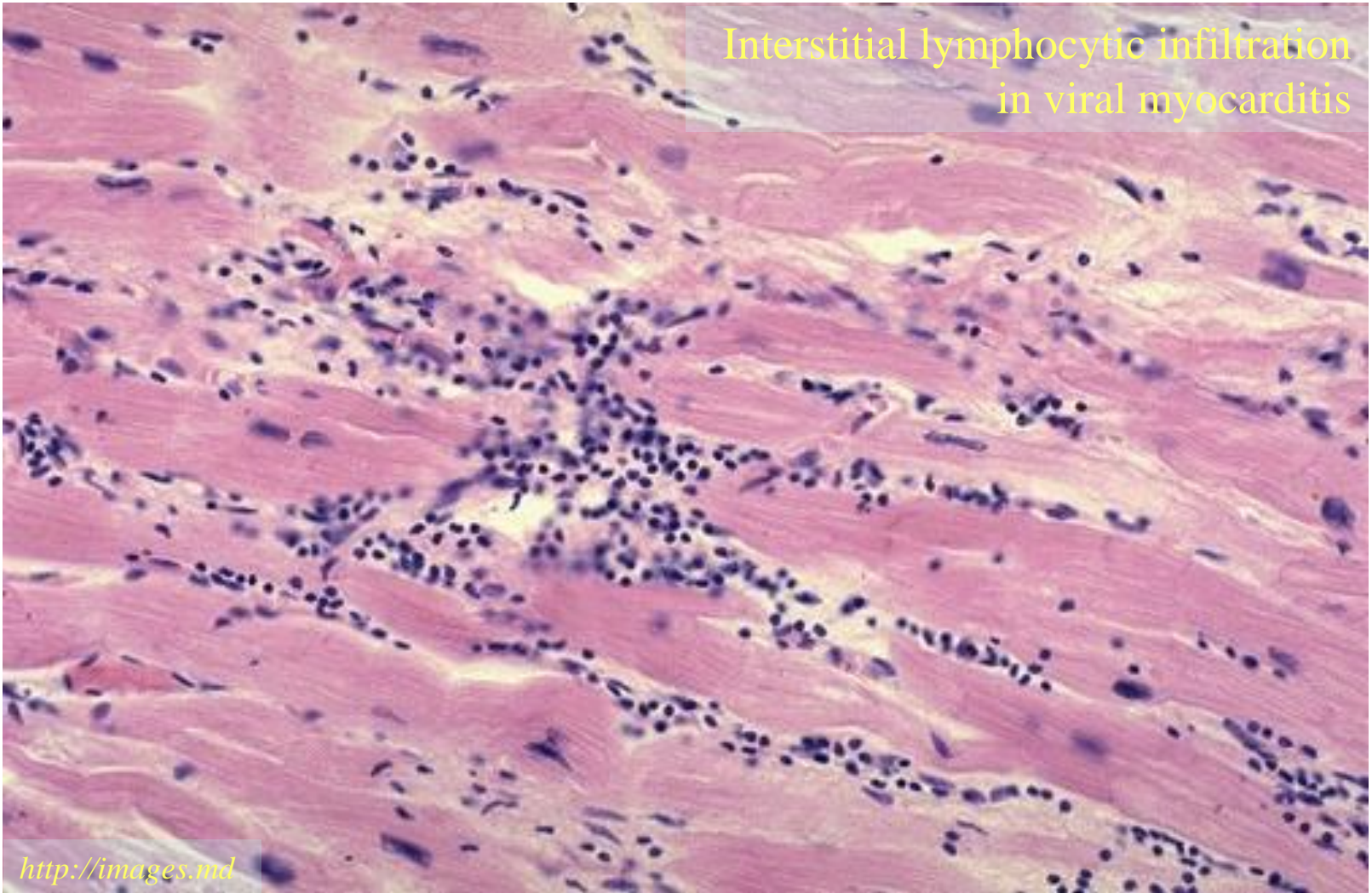
- *Microscopy:*

- ~ **important:** the primarily diseased structure is the interstitium!
 - ~ interstitial edema with lymphocytic, plasmacellular, histiocytic, mastocytic infiltration
 - ~ fibroblastic proliferation > interstitial fibrosis
 - ~ cardiac muscle cell damaging (myocytolysis, microinfarctions) are only secondary
-



Fatal myocarditis in a child

Interstitial lymphocytic infiltration
in viral myocarditis



<http://images.md>

Pericarditides

Acute pericarditides

- *Fibrinous pericarditis (pericarditis fibrinosa sicca)*:
 - ~ most frequent form of pericarditis: macroscopically *cor villosum (hairy heart)* – on auscultation: friction noise in rhythm of heart beatings
 - ~ accompanying pericarditis with acute myocardial infarction (so-called *pericarditis epistenocardiaca*)
 - ~ viral pericarditides – Coxsackie A, B; HSV; Influenza (symptomatically leading sign is thoracal pain, so it is a diagnostic problem to differentiate from an acute myocardial infarction!)
 - ~ uremia
 - ~ rheumatic fever (*pancarditis rheumatica*)
 - ~ autoimmune diseases (PCP, SLE)
 - ~ iatrogenous pericarditis (after pericardiotomy)
-

Acute pericarditides

- *Serous pericarditis*:

~ an infrequent form: in polyserositis, pericardial carcinosis (*pericarditis carcinomatosa*)

- *Purulent pericarditis*:

~ bacterial or fungal infection

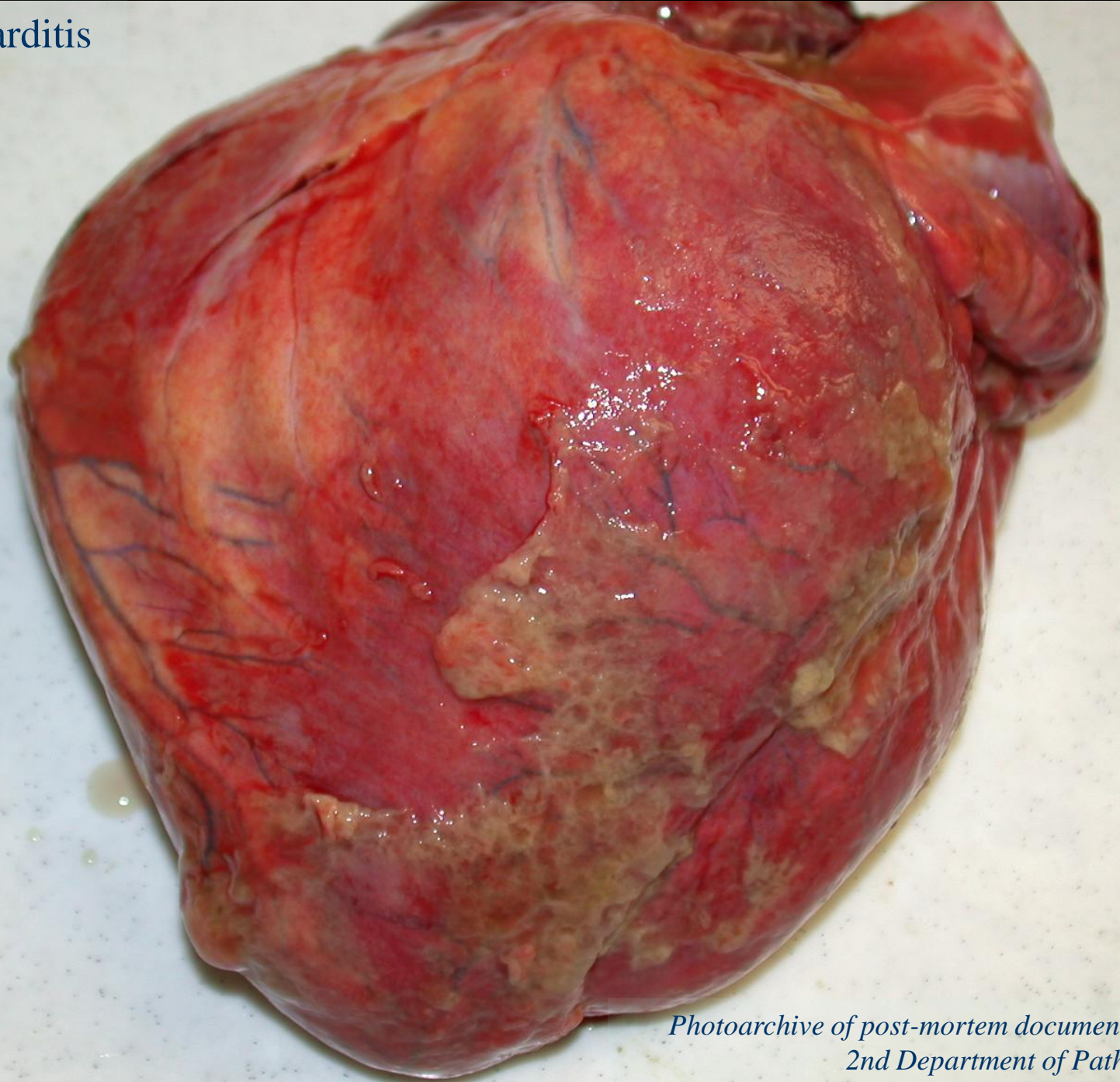
~ extension from neighbouring structures: pleural empyema, lobar pneumonia, infectious endocarditis, myocardial abscess

~ extension from distant infection through blood stream (sepsis)

~ iatrogenous: after cardiosurgery (rare)

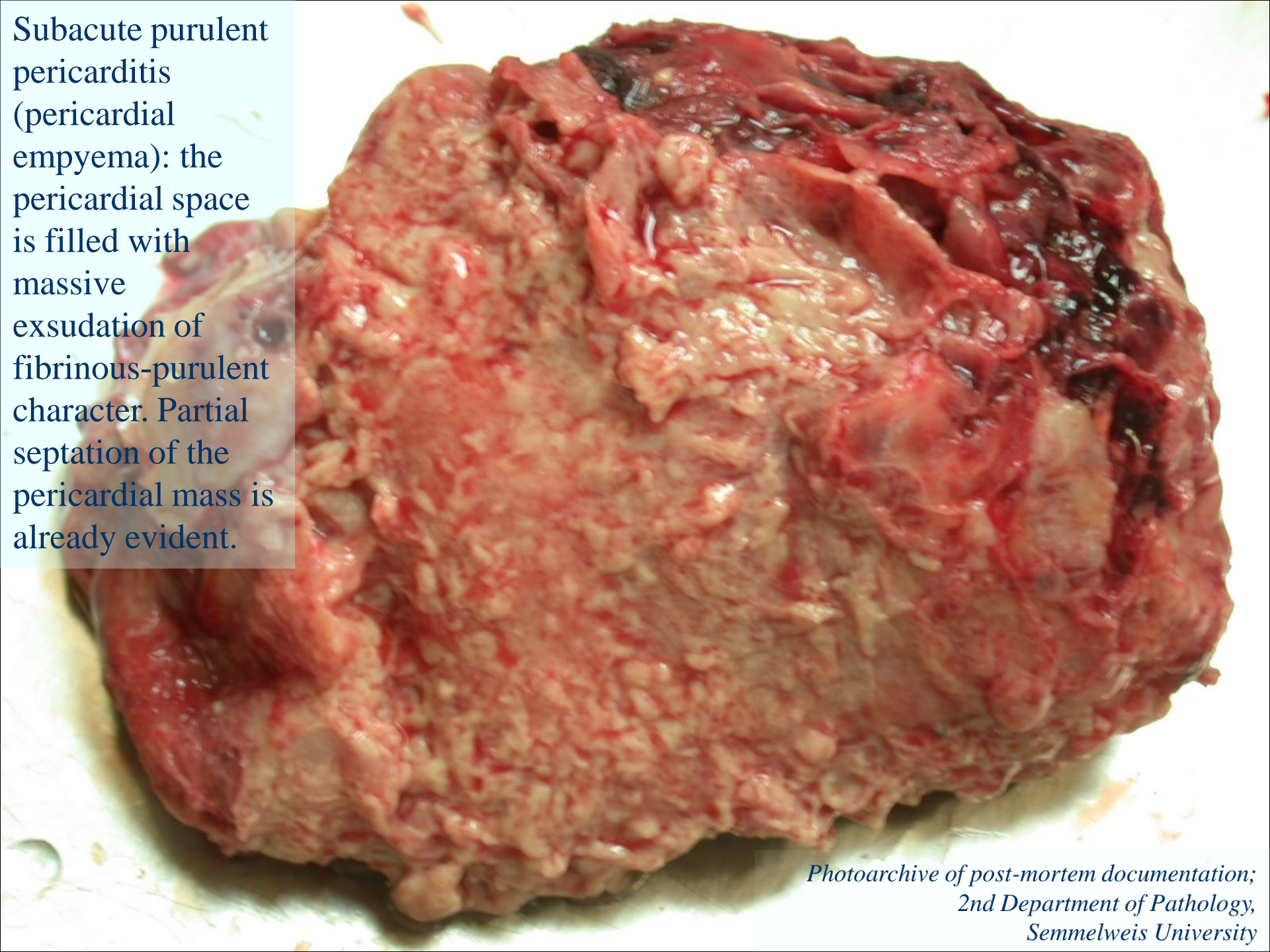
~ severe form: pericardial sack is filled with pus (*empyema pericardii*)

Fibrinous pericarditis

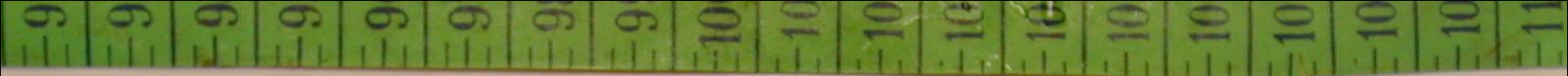


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Subacute purulent pericarditis (pericardial empyema): the pericardial space is filled with massive exsudation of fibrinous-purulent character. Partial septation of the pericardial mass is already evident.



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**Fibrinous pericarditis: aspect of the
so-called *cor villosum* (hairy heart)**

Chronic pericarditides

- *Constrictive pericarditis (concretio pericardii)*:
 - ~ organisation of unresolvable exsudates as result of an acute pericarditis
 - ~ stricture of the orifices of the large (primarily venous) vascular trunks through pericardial scarring > severe circulatory failure
 - *Adhesive mediastino-pericarditis (accretio pericardii)*:
 - ~ adhesive fibrosis of the parietal myocardium to/with mediastinal structures
 - *Posttuberculous pericarditis*:
 - ~ organisation of massive caseous exsudation (*pericarditis tuberculosa caseosa*) with formation of a partly calcified pericardial fibrosis (so-called Panzerherz)
-

Rheumatic fever



The rheumatic fever

- *Definition*: an acute, immunopathogenic, systemic, non-purulent inflammation, that represents disease of the complete mesenchymal system of the body and so, belongs to the so-called collagen diseases.

- *Pathogenesis*: Cross reaction against own structures (connective tissue ground substance) a few weeks after pharyngitis caused by *Streptococcus β-haemolyticus A*

- *Typical symptoms*:

- (a) high fever
- (b) carditis
- (c) wandering polyarthritis
(*polyarthritis rheumatica/migrans*)
- (d) subcutaneous rheumatic nodules
- (e) *erythema marginatum* of the skin
- (f) chorea minor

The rheumatic heart disease

- *valvular endocarditis*

- *myocarditis*

- *pericarditis*



rheumatic pancarditis

The rheumatic endocarditis

- *acute phase*: edema of the heart valves rich in mucopolysaccharides with friable, soft, wipable, reddish vegetations, 1-2 mm large, along the closing line of the valves, made of masses of thrombocytes

complete regression

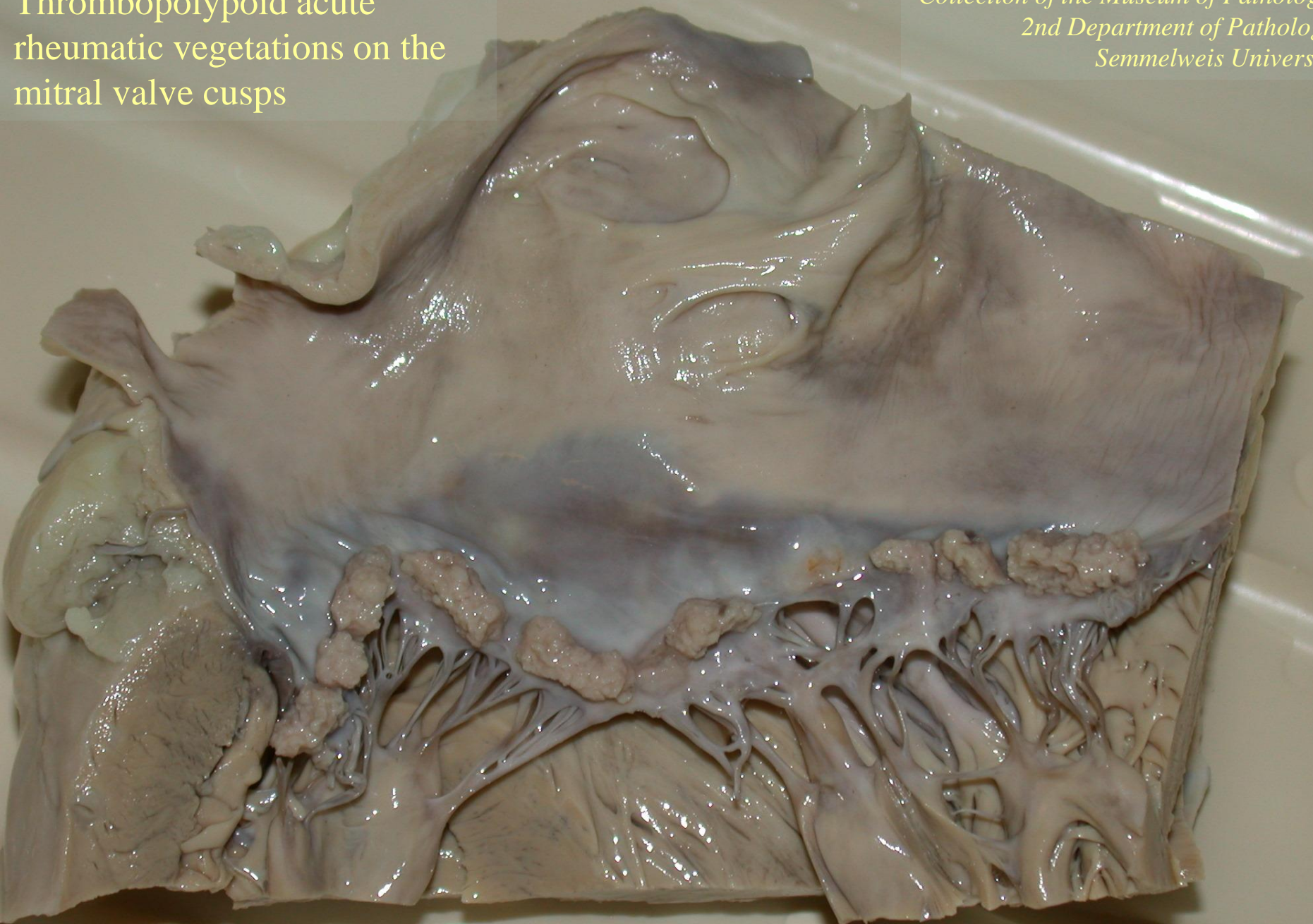
growing of capillaries into the valve tissue

- transition into a *chronic rheumatic endocarditis*:

- organisation of the vegetations
 - scarring, gross calcification of valves
 - deforming, confluence of valvular commissures
 - formation of rheumatic vicia
-

Thrombopolypoid acute
rheumatic vegetations on the
mitral valve cusps

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Thrombopolypoid acute
rheumatic vegetations on the
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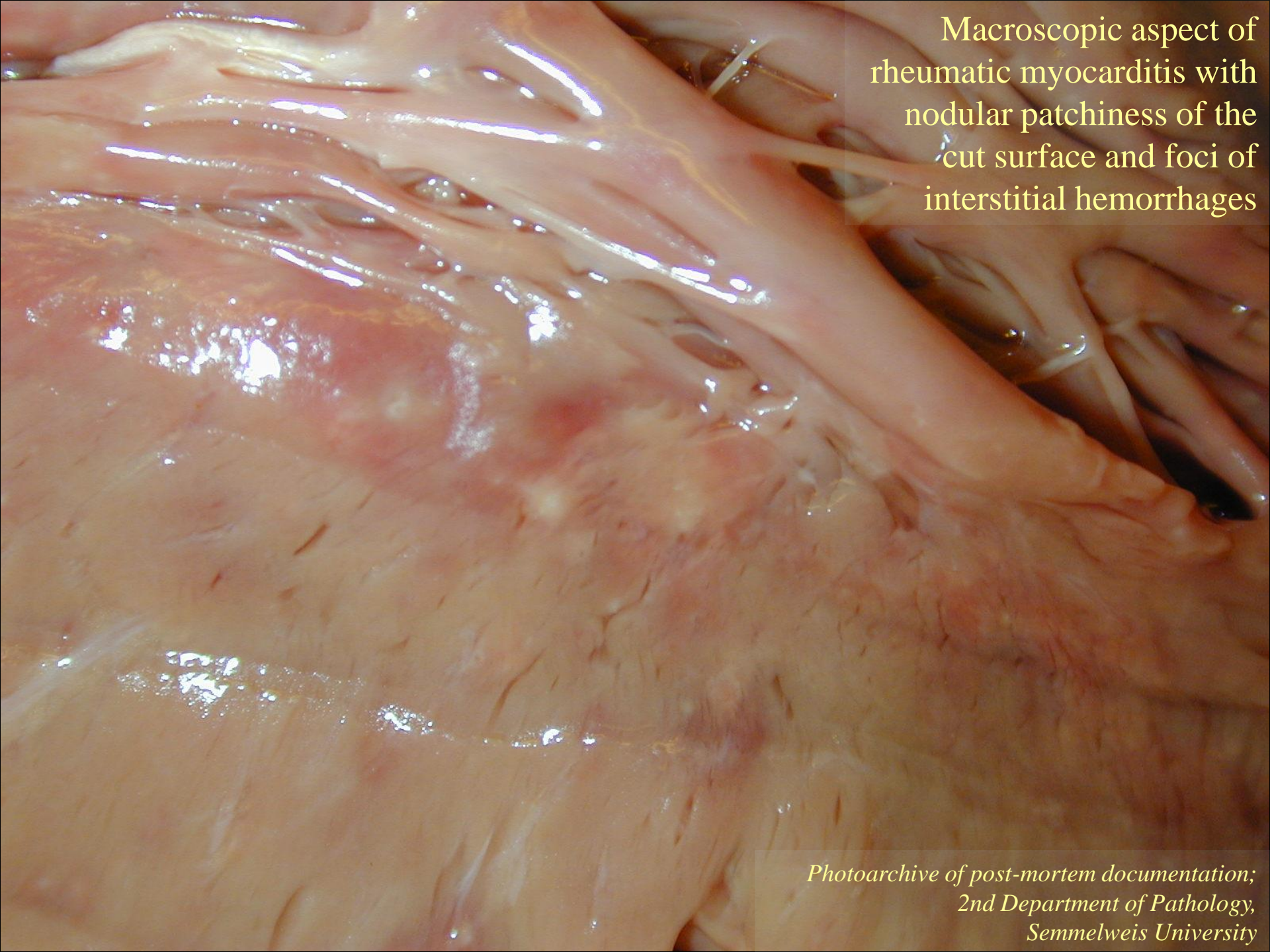


The rheumatic endocarditis

- *Topography*:
 - Mitral valves – 70-75%
 - Mitral- and aortic valves – 25%
 - Tricuspid- and pulmonary valves – very rarely
 - *Pathophysiology*:
 - transition in a chronic rheumatic heart disease
 - lasts long (5-30) years
 - probability for a chronic heart disease after an acute rheumatic fever is quite variable: 18-65%
 - rheumatic fever shows a tendency to recur: the cardial alterations will be after each recurrence more severe: *endocarditis rheumatica recidivans/recurrens*
 - cardiac valve anomalies (e.g. congenital bicuspidy) enhance the risk for rheumatic valve disease
-

The rheumatic myocarditis

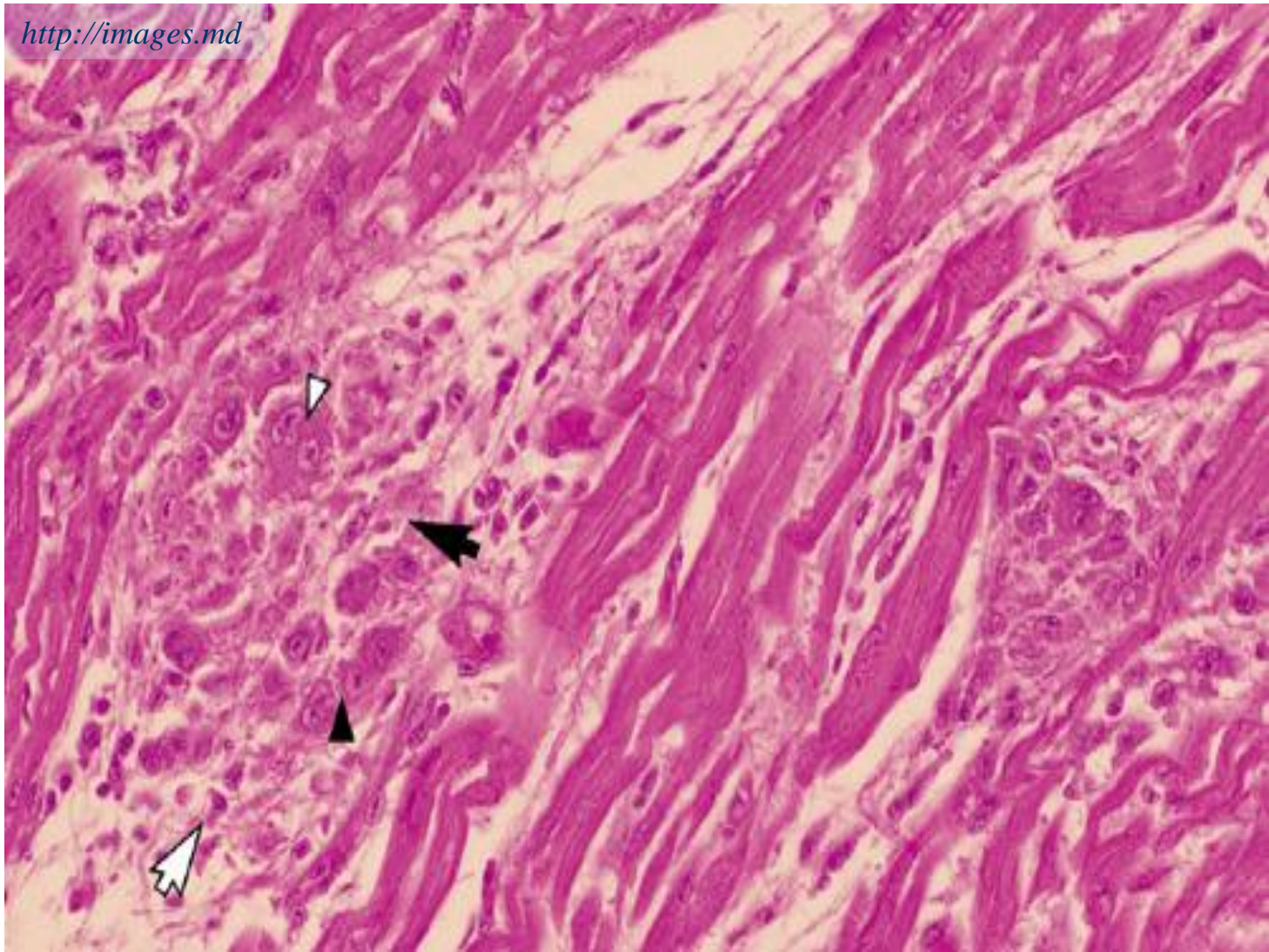
- *Pathologic forms:*
 - acute
 - Aschoff's nodules
 - chronic
 - fibrosis
- *Aschoff's nodules:*
 - small perivascular foci of inflammation
 - gathering of lymphocytes, macrophages and plasmacells
 - fibrinoid necrosis and degeneration of collagen possible
- +
- Anitschkov's cells are histiocytes with gathering of chromatin substance in the centre of the nucleus: owl's eye pattern
 - Aschoff's multinuclear giant cells result from confluence of Anitschkov's histiocytes

A macroscopic photograph of a heart specimen, likely a rat heart, showing the cut surface of the myocardium. The surface is characterized by irregular, nodular patches of reddish-pink color, interspersed with areas of normal pinkish-tan myocardium. These nodules represent areas of inflammation and hemorrhage. The overall appearance is one of a severely inflamed and damaged myocardium. The heart is surrounded by a network of blood vessels and connective tissue.

Macroscopic aspect of
rheumatic myocarditis with
nodular patchiness of the
cut surface and foci of
interstitial hemorrhages

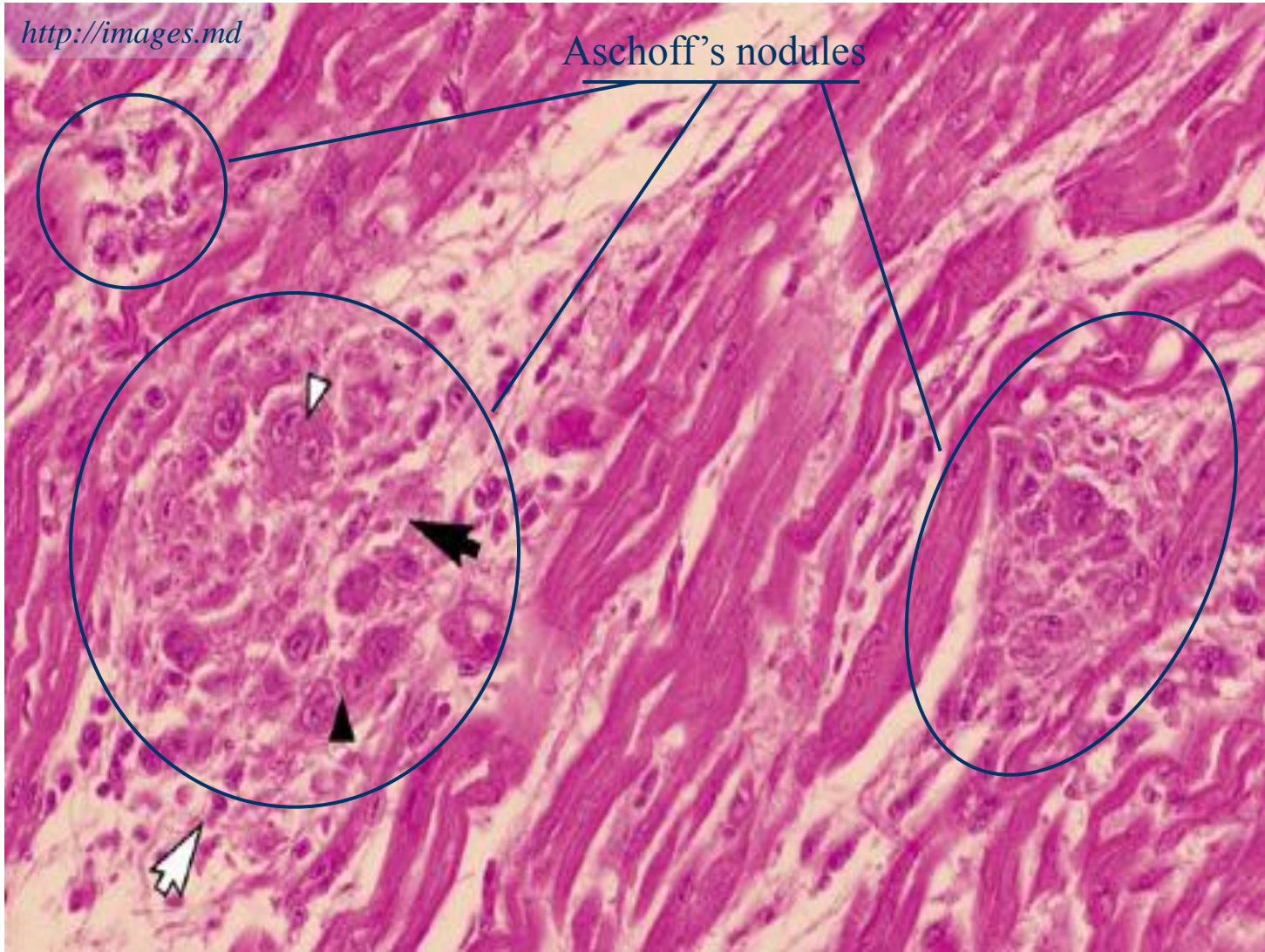
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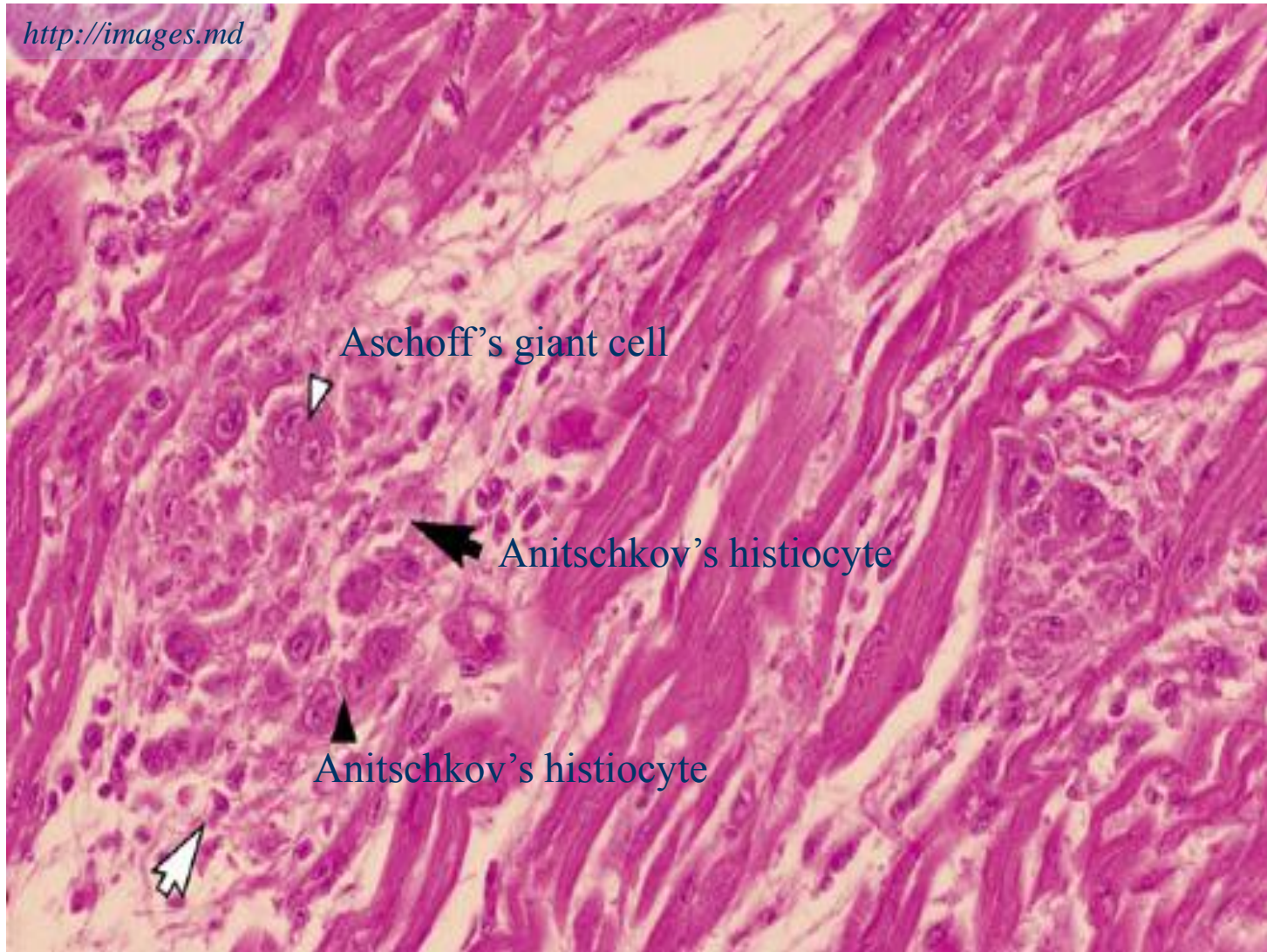


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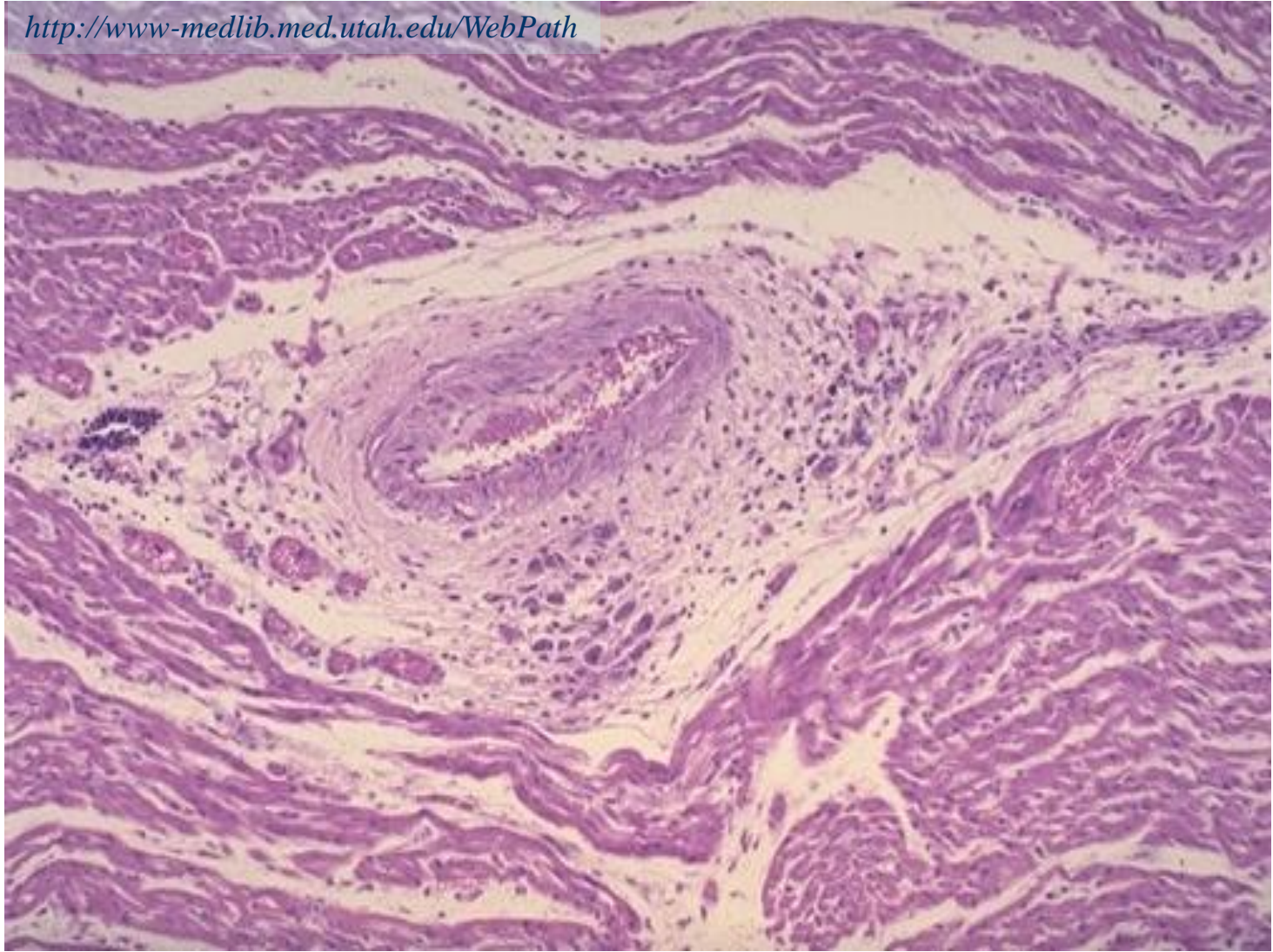
Aschoff's nodules



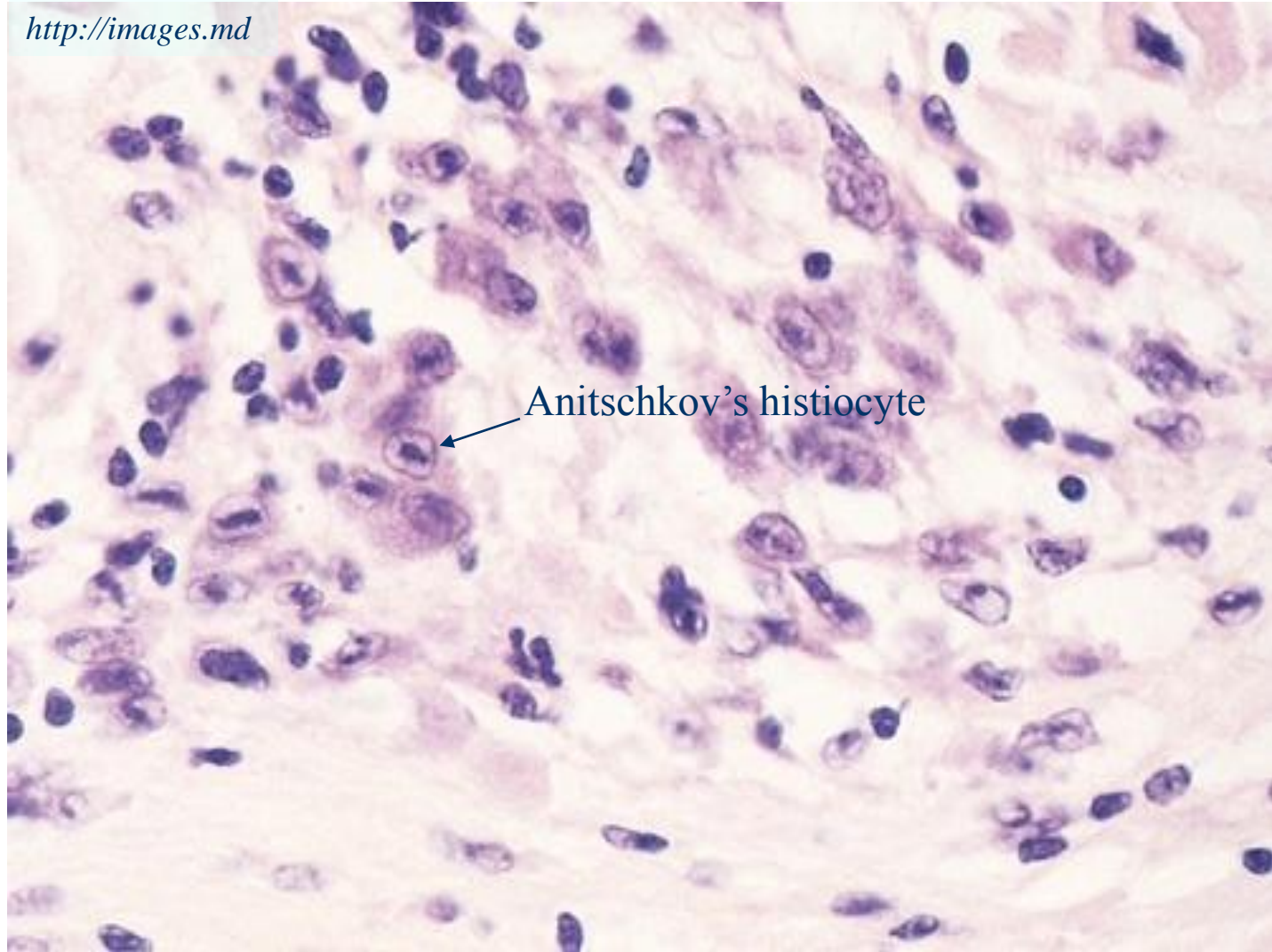
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<http://www-medlib.med.utah.edu/WebPath>



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Anitschkov's histiocyte

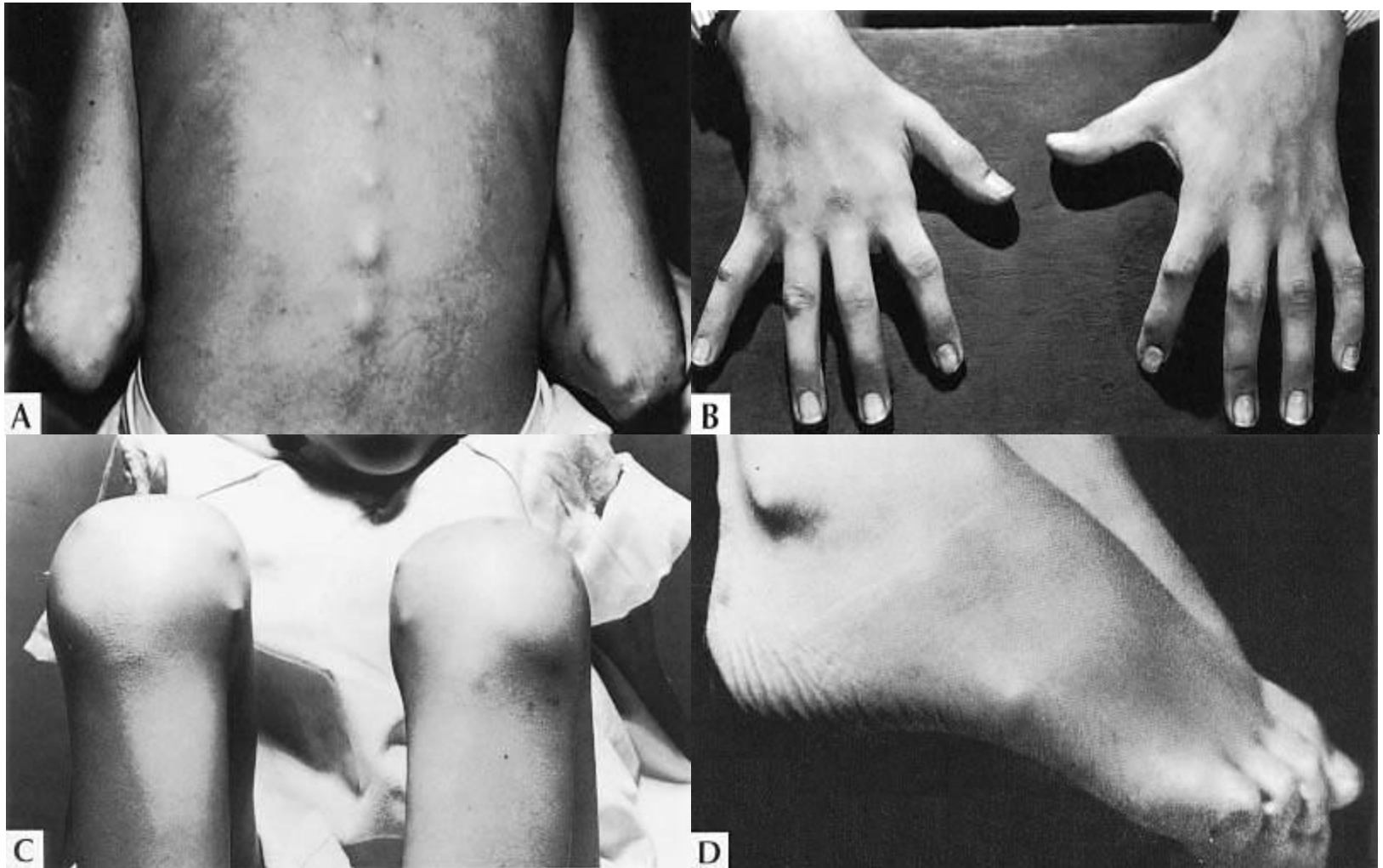
The rheumatic fever

- *Rheumatic granulomas (Aschoff's nodules)*:
 - in the pericardium (*pericarditis rheumatica*)
 - in joint capsules and periarticular soft tissues (*polyarthritits migrans*) – spontaneous regression

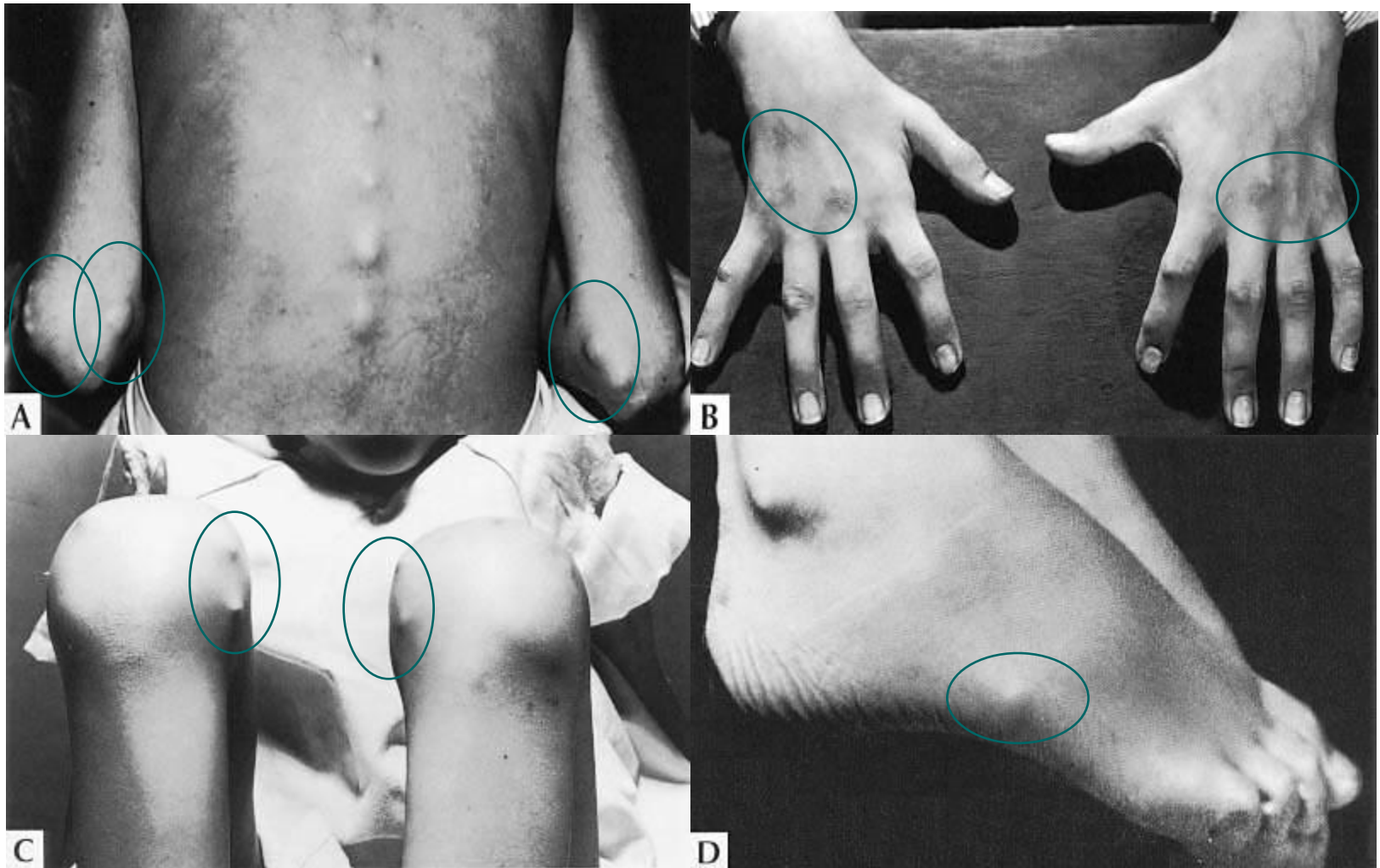
 - *Subcutaneous rheuma nodules*:
 - multiple, 5-10 mm large nodules in the region of the affected joints (e.g. around the olecranon, patella) – spontaneous regression

 - *Chorea minor*: involuntary, jerky, excessive motion of the extremities resulting from an encephalitis of the extrapyramidal system, typically in childhood and somewhat more frequently in girls – spontaneous regression
-

The clinical appearance of rheumatic nodules



The clinical appearance of rheumatic nodules



Chorea minor



Hand writing of a patient
before... and ...after
spontaneous regression.
*(The actual status of the hand writing is applicable
for monitoring the general state of the disease.)*

Date	Name	Name	Date	Name	Name
7-15-56	Charles Walsh	R. E. Doh	7-15-56	Charles Walsh	A. S. Sabin
7-16-56	Charles Walsh	R. E. Doh	7-16-56	Charles Walsh	C. M. Fagan
7-17-56	Charles Walsh	R. E. Doh	7-17-56	Charles Walsh	A. S. Sabin
7-18-56	Charles Walsh	A. S. Sabin	7-18-56	Charles Walsh	A. S. Sabin
7-19-56	Charles Walsh	A. S. Sabin	7-19-56	Charles Walsh	A. S. Sabin
7-20-56	Charles Walsh	A. S. Sabin	7-20-56	Charles Walsh	A. S. Sabin
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8-31-56	Charles Walsh	A. S. Sabin	8-31-56	Charles Walsh	A. S. Sabin

Unvoluntary, jerky
movements of the
extremities

The rheumatic fever

... the rheumatic heart alterations can have however dramatic complications:

- *Complications:*
 - acute
 - congestive cardiac insufficiency > death
 - valvular vegetations > systemic embolisation
 - chronic
 - valve vicia
 - further periods of infectious endocarditides (acute recidivations)
-

Vitia

— ∞ ∞ —

Vitium cordis

- *Definition*: morphologic *and* functional heart valve disease
 - *Forms*: stenosis > < insufficiency
 - ~ both forms result in a pathophysiologic overload of the heart (stenosis – pressure overload/hypertrophy; insufficiency – volume overload/hypertrophie)
 - ~ until the heart is capable to balance pathologic overload through use of its reserves, the vitium is *compensated*
 - ~ as soon as reserve capacities of the heart are exhausted, the vitium will be *decompensated*
 - ~ in stenosis dominates a muscular hypertrophy
 - ~ in insufficiency dominates a ventricular dilatation
-

Mitral valve vitia

- *Insufficiency:*

- ~ left ventricle and atrium are dilated and slightly hypertrophic
- ~ pulmonary congestion results later in a excentric right heart hypertrophy/failure

- *Stenosis:*

- ~ the left ventricle is underloaded, so slightly atrophic
 - ~ the left atrium is on the contrary distinctly dilated and hypertrophic
 - ~ in severe cases of mitral stenosis results the pathomorphology of a *fishmouth stenosis* (german: Knopflochstenose – ‘buttonhole stenosis’)
-

Fishmouth stenosis of the mitral valves with severe atrial dilatation



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Aortic valve vicia

- *Insufficiency:*

~ excentric left ventricular hypertrophie

- *Stenosis:*

~ primarily concentric hypertrophy of the left ventricle, which turns excentric as decompensation supervenes

~ backward pulmonary congestion and right heart failure develops only later

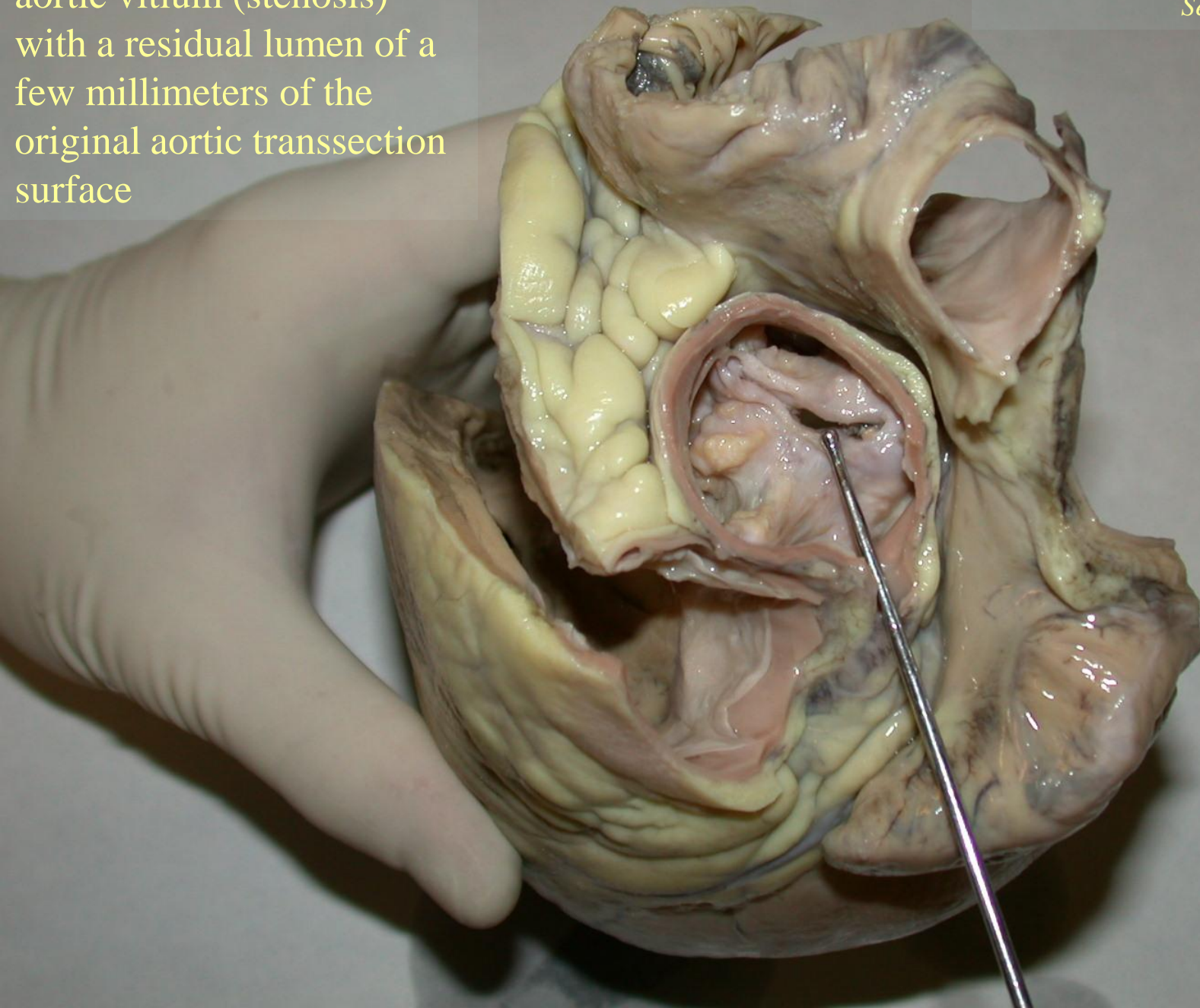
~ a similar situation is seen in hypertonic heart disease

Degenerative valvular base calcification and combined
aortic valve vitium (stenosis + insufficiency)



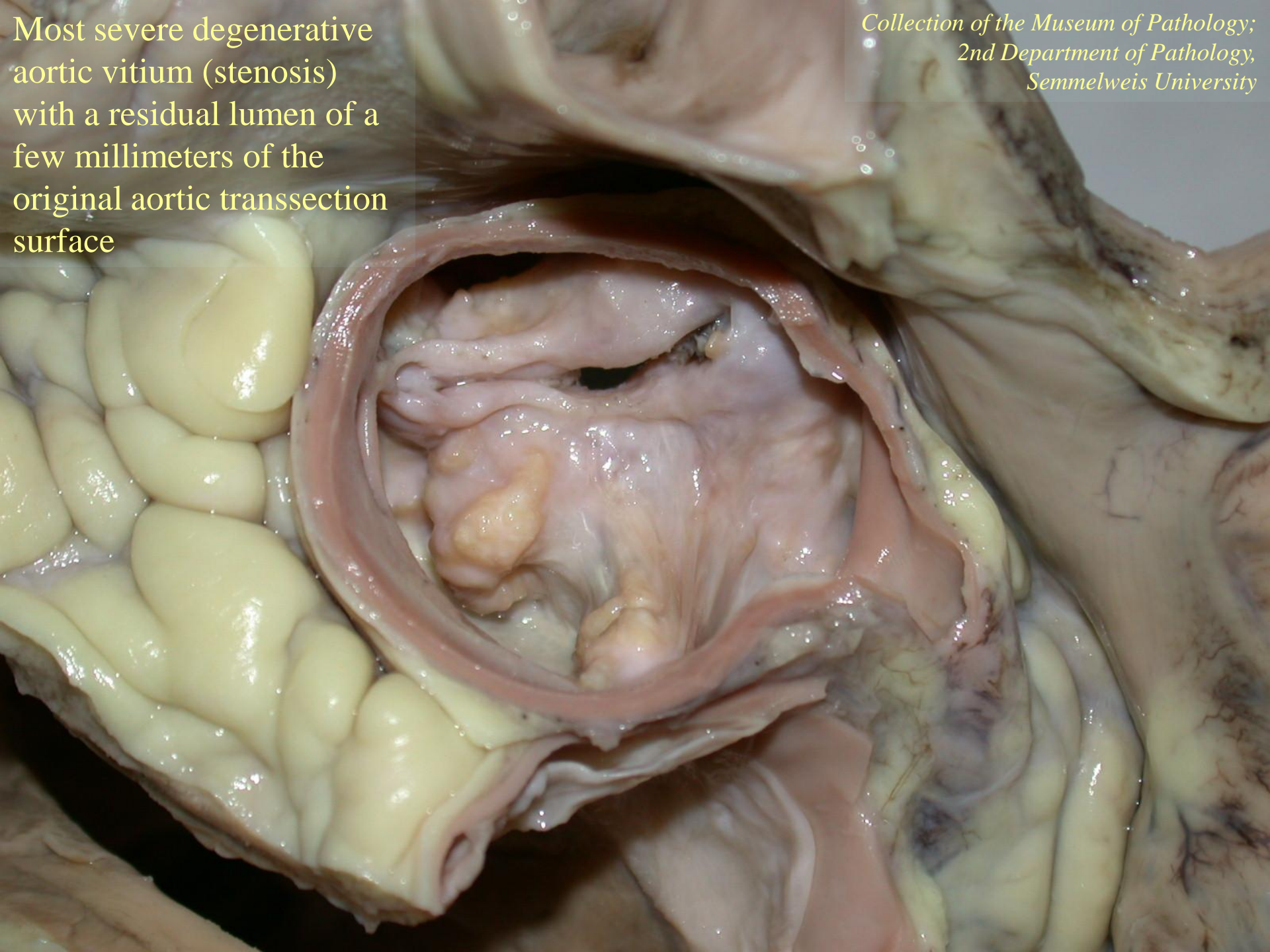
Most severe degenerative aortic vitium (stenosis) with a residual lumen of a few millimeters of the original aortic transection surface

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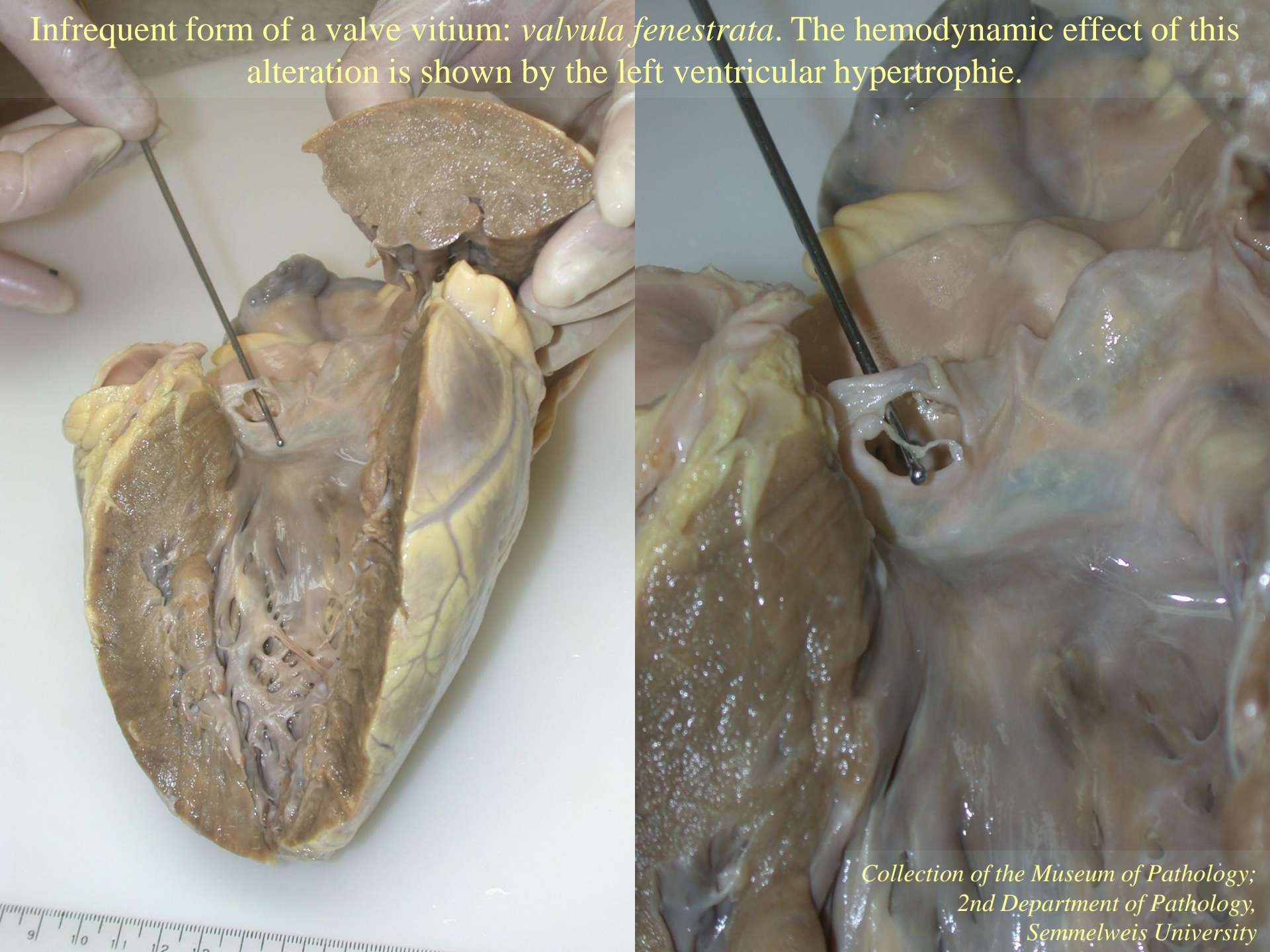


Most severe degenerative
aortic vitium (stenosis)
with a residual lumen of a
few millimeters of the
original aortic transection
surface

*Collection of the Museum of Pathology;
2nd Department of Pathology,
Semmelweis University*

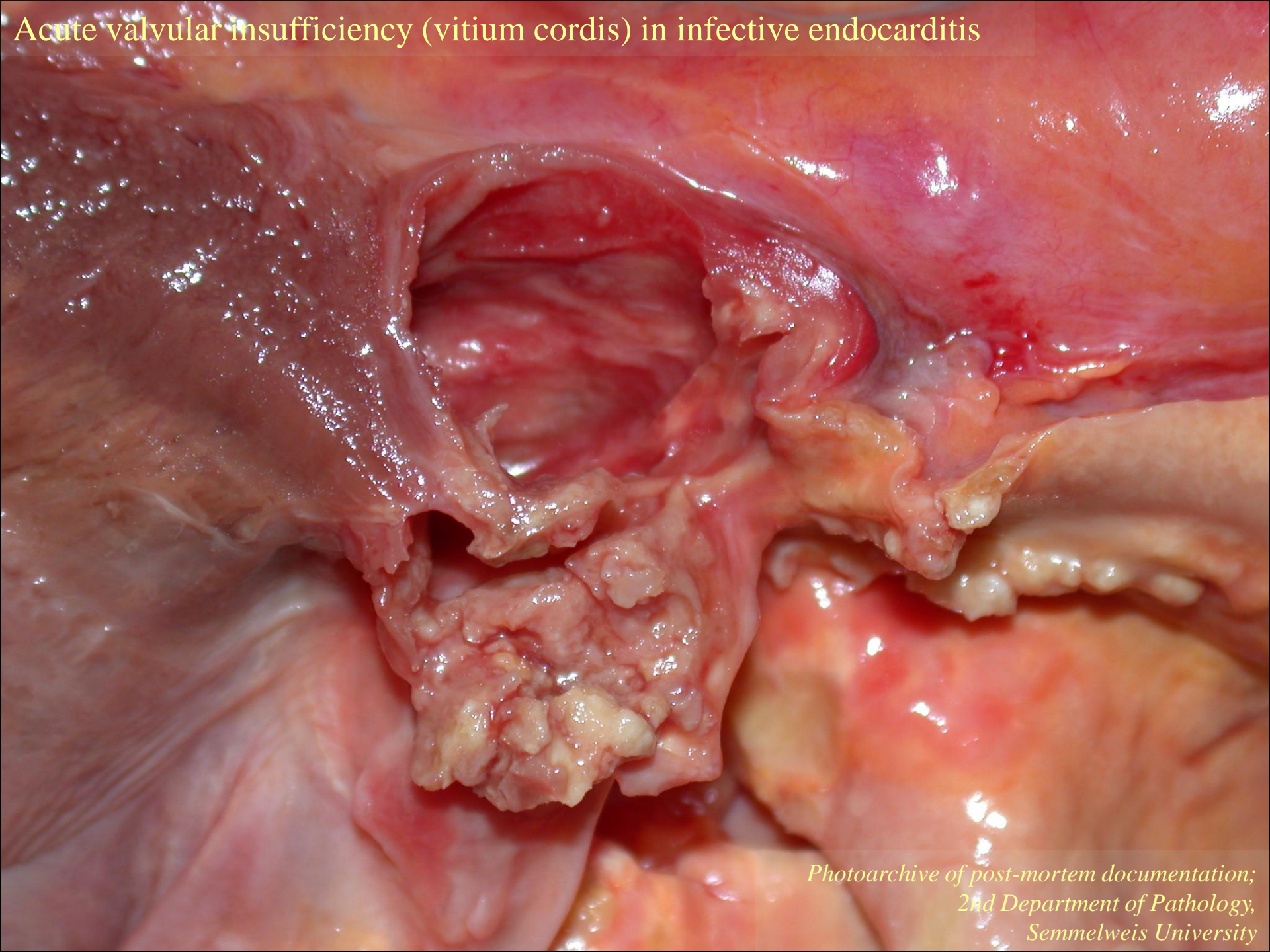


Infrequent form of a valve vitium: *valvula fenestrata*. The hemodynamic effect of this alteration is shown by the left ventricular hypertrophie.



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Acute valvular insufficiency (vitium cordis) in infective endocarditis



*Photoarchive of post-mortem documentation;
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Semmelweis University*

Complications of the vitia

- *Cor pulmonale chronicum*

 - ~ secondary overload on the right ventricle resulting from backward congestion from the diseased left heart: right ventricular dilatation *and* severe muscular hypertrophy

- *Relative valvular insufficiency*

 - ~ severe ventricular dilatation is followed by expansion of the atrioventricular orifice, so the valve cusps are no more capable of covering the enlarged lumen surface

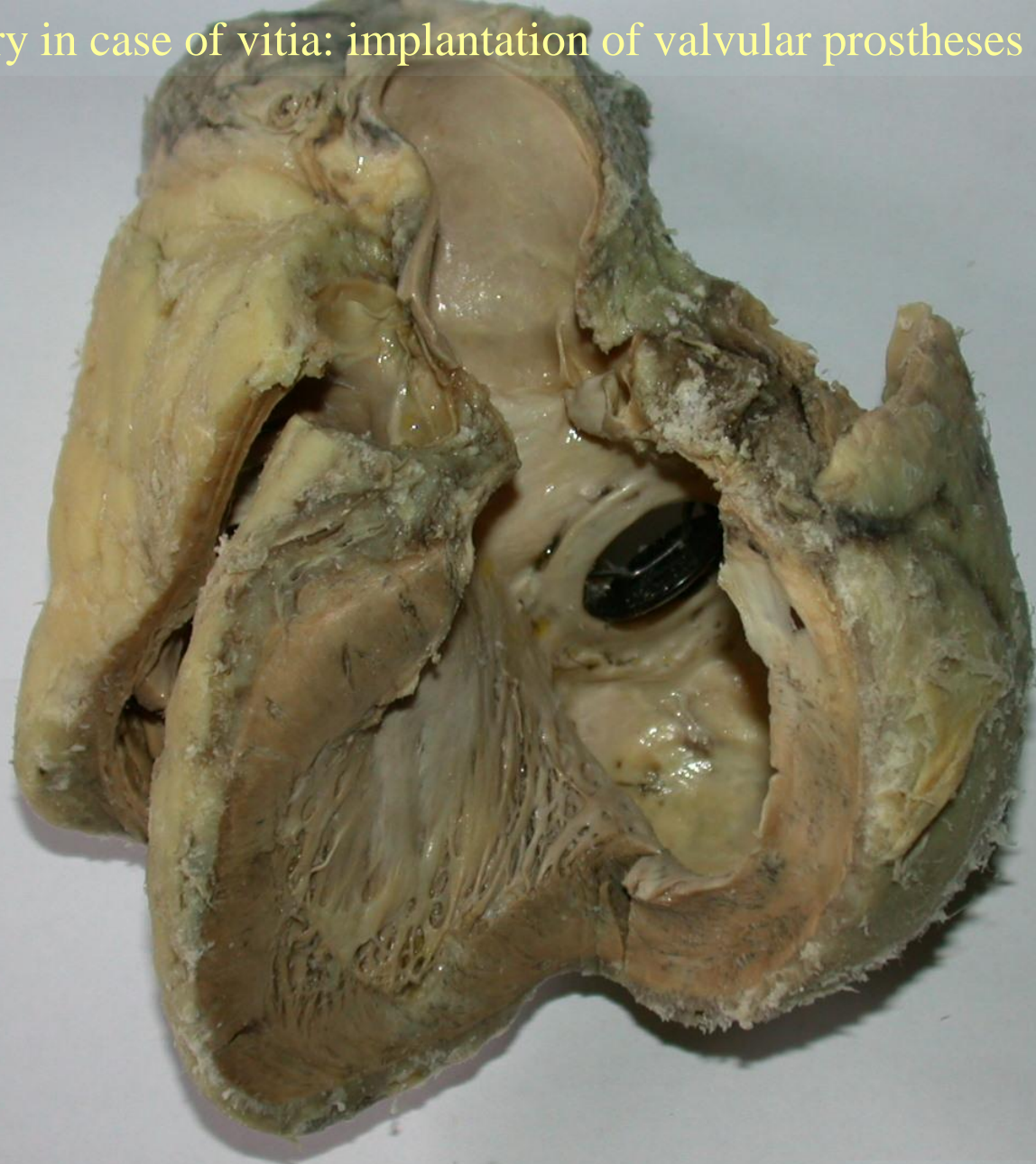
- *Ball thrombus*

 - ~ spherical, free-floating or to the wall loosely adherent thrombus in the dilated atrium or auricula

- *Induratio brunea pulmonum (brown induration of the lungs)*

 - ~ in chronic left heart failure develops long-term congestion and relative hypoxia of lung tissue
 - ~ heart failure cells and interstitial fibrosis

Valvular surgery in case of vitia: implantation of valvular prostheses



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Valvular surgery in case of vicia: implantation of valvular prostheses



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