USMLE Step 1 Session

Pathology 2

5.11.2014, Klub A. Trýba

FB: USMLE @ Masaryk

Petr Vaněk
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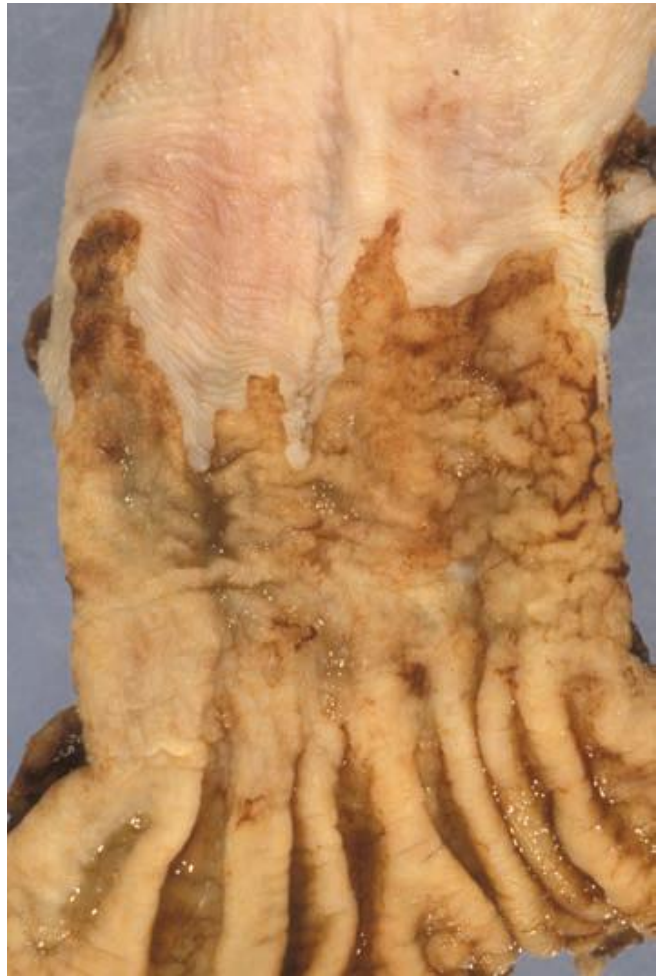
Q1

A 68-year-old man with a history of gastroesophageal reflux disease suffers a massive stroke and dies. The esophagus at autopsy is shown in the image. Histologic examination of the abnormal tissue shows intestine-like epithelium composed of goblet cells and surface cells. There is no evidence of nuclear atypia. Which of the following terms best describes this morphologic response to persistent injury in the esophagus of this patient?



(A) Atypical hyperplasia
(B) Complex hyperplasia
(C) Glandular metaplasia
(D) Simple hyperplasia
(E) Squamous metaplasia

FENDERSON, Bruce A. *Lippincott's illustrated Q & A Review of Rubin's Pathology*. 2nd ed. Baltimore, MD: Lippincott Williams, 2011. ISBN 16-083-1640-8.

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Tissue	Normal	Metaplasia	Stimulus
Airways	Pseudostratified columnar epithelium	Squamous epithelium	Cigarette smoke
Urinary bladder	Transitional epithelium	Squamous epithelium	Bladder stone
Esophagus	Squamous epithelium	Columnar epithelium	Gastro-esophageal reflux (Barrett's Esophagus)
Cervix	Glandular epithelium	Squamous epithelium	Low pH of vagina

http://en.wikipedia.org/wiki/Metaplasia

The answer is C: Glandular metaplasia.

The major **adaptive responses** of cells to sublethal injury are **atrophy**, **hypertrophy**, **hyperplasia**, **metaplasia**, **dysplasia**, and **intracellular storage**.
Metaplasia is defined as the **conversion of one differentiated cell pathway to another**.
In this case, the esophageal squamous epithelium is replaced by columnar epithelium as a result of chronic gastroesophageal reflux. The lesion is characterized histologically by intestine-like epithelium composed of goblet cells.

Squamous metaplasia (choice E) occurs in the bronchial epithelium of smokers, among other examples.
Choices **A, B, and D** are **preneoplastic changes** that are most often described in the uterine endometrium of postmenopausal women.

Diagnosis: Barrett esophagus, metaplasia

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Q2
A 60-year-old man with a history of gout presents with multiple rubbery nodules on his hands (shown in the image).
Which of the following best explains the pathogenesis of this patient’s underlying condition?

(A) Autoimmune relapsing polychondritis
(B) High dietary intake of purine-rich foods
(C) Hypercalcemia and chondrocalcinosis
(D) Impaired renal excretion of uric acid
(E) Increased calcium hydroxyapatite deposition

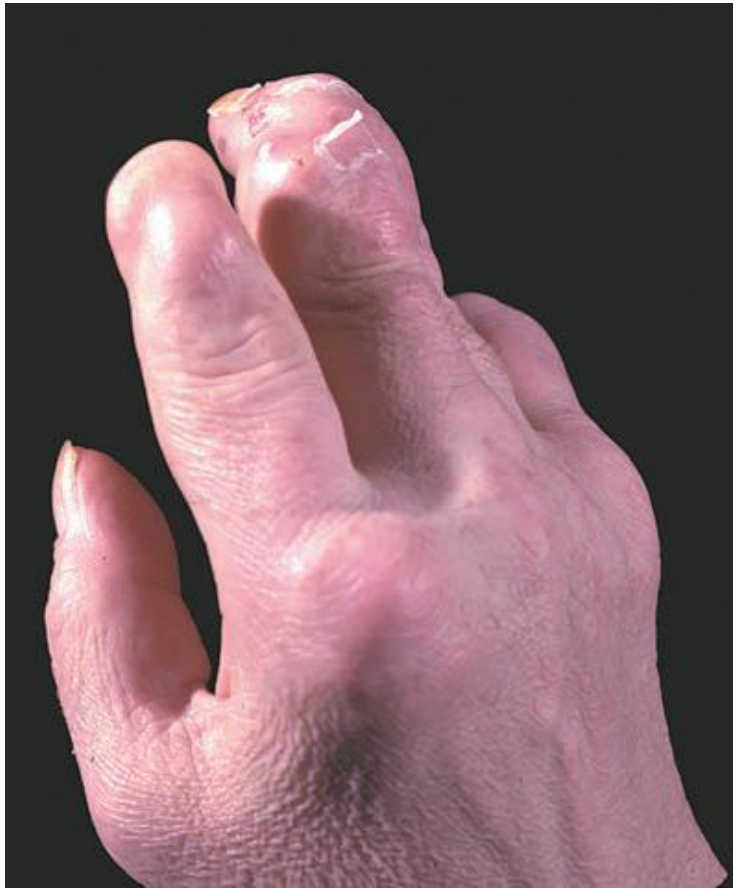

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TABLE 6-6 Synovial Fluid Analysis

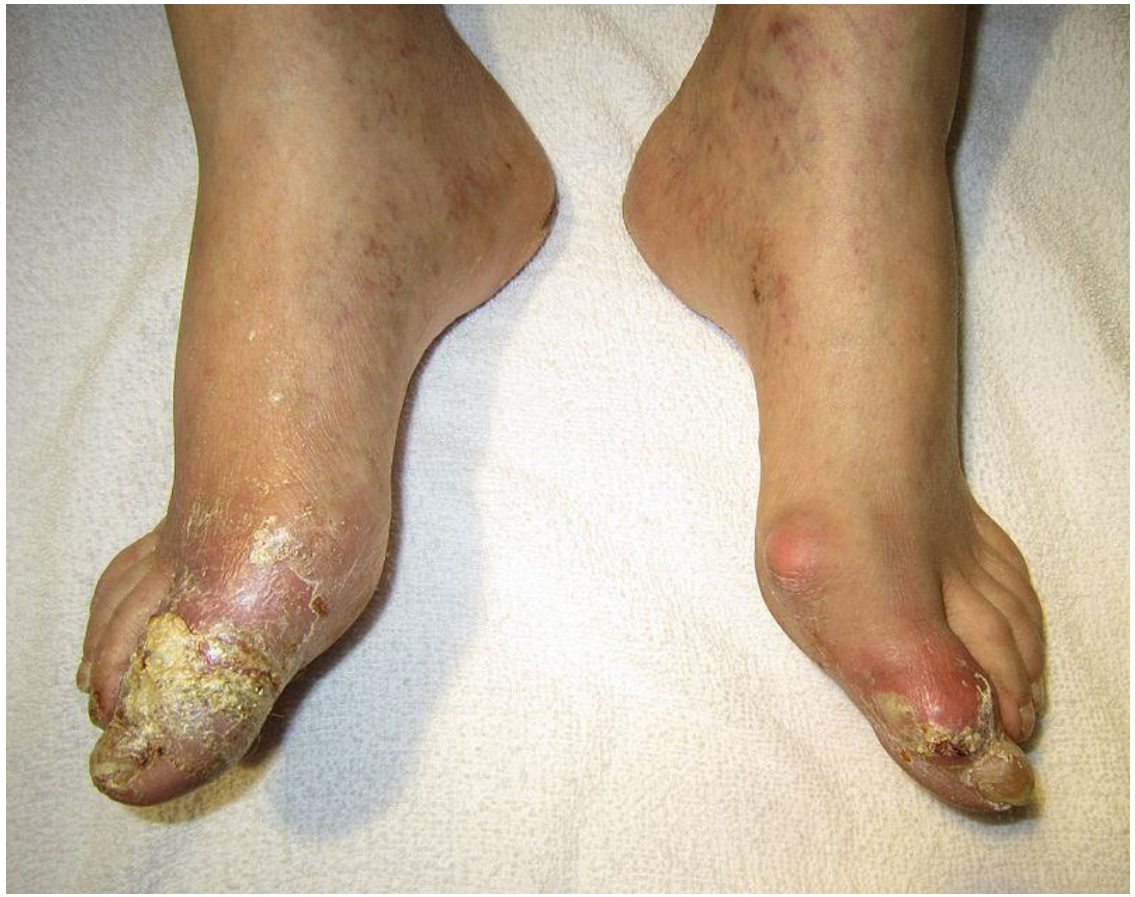
Condition	Appearance of Fluid	WBC/mm^3	PMNs	Other Findings
Normal	Clear	<200	<25%	
Noninflammatory arthritis (OA/trauma)	Clear, yellow: Possibly red if traumatic	<2,000	<25%	RBCs for trauma
Inflammatory arthritis (RA, gout, pseudogout, Reiter's syndrome)	Cloudy yellow	>5,000	50%–70%	Positively birefringent crystals with pseudogout; negatively birefringent crystals with gout
Septic arthritis (bacterial, tuberculosis)	Turbid, purulent	Usually >50,000	>70%	Synovial fluid culture positive for most cases of bacterial arthritis except gonococcal (only 25% are positive)

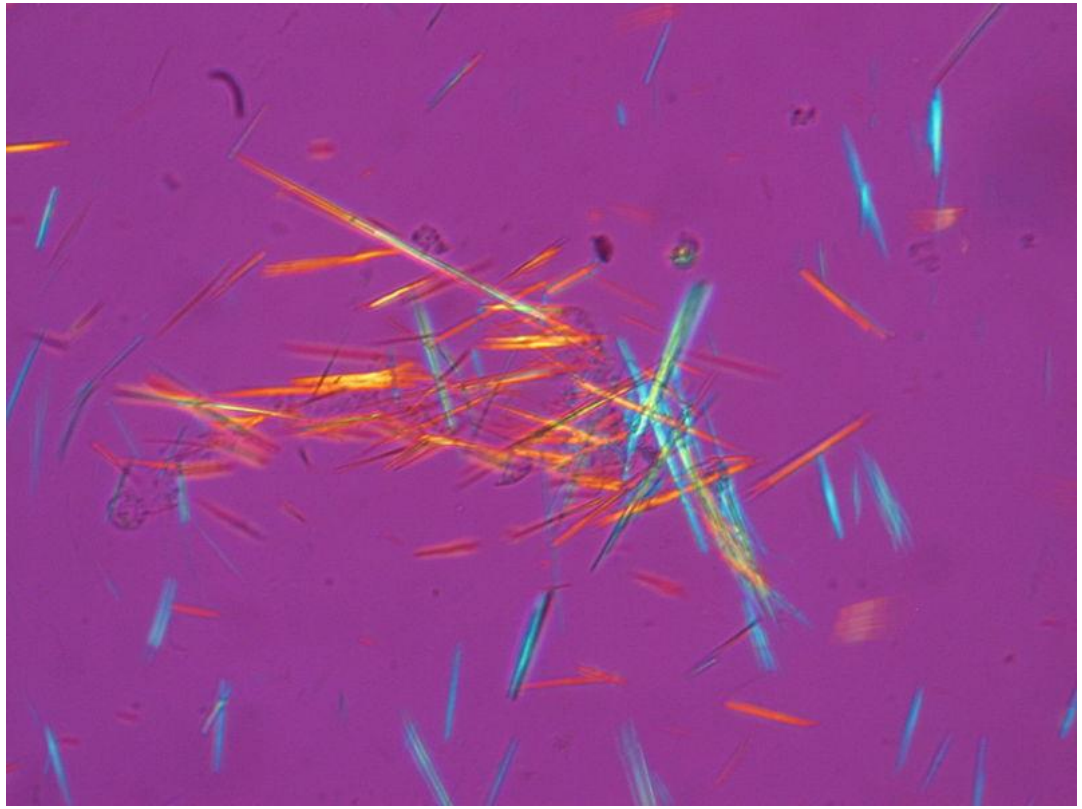
https://www.inkling.com/read/step-up-to-medicine-steven-elizabeth-agabegi-3rd/chapter-6/table-6-6

TABLE 6-7 Major Arthritides

	Osteoarthritis	Rheumatoid Arthritis	Gouty Arthritis
Onset	Insidious	Insidious	Sudden
Common locations	Weight-bearing joints (knees, hips, lumbar/cervical spine), hands	Hands (PIP, MCP), wrists, ankles, knees	Great toe, ankles, knees, elbows
Presence of inflammation	No	Yes	Yes
Radiographic changes	Narrowed joint space, osteophytes, subchondral sclerosis, subchondral cysts	Narrowed joint space, bony erosions	Punched-out erosions with overhanging rim of cortical bone
Laboratory findings	None	Elevated ESR, RF, anemia	Crystals
Other features	• No systemic findings • Bouchard's nodes and Heberden's nodes in hands	• Systemic findings—extra-articular manifestations common • Ulnar deviation, swan-neck, and boutonnière deformity	• Tophi • Nephrolithiasis

https://www.inkling.com/read/step-up-to-medicine-steven-elizabeth-agabegi-3rd/chapter-6/table-6-7





http://en.wikipedia.org/wiki/Gout

The answer is D: Impaired renal excretion of uric acid.

Gout is a heterogeneous group of diseases in which the common denominator is an increased serum uric acid level and deposition of urate crystals in the joints and kidneys. A tophus (shown in the photograph) is an extracellular soft tissue deposit of urate crystals surrounded by foreign-body giant cells and mononuclear cells. **Most cases (85%)** of idiopathic gout result from an as yet **unexplained impairment of uric acid excretion by the kidneys**. When sodium urate crystals precipitate from supersaturated body fluids, they absorb fibronectin, complement, and a number of other proteins on their surfaces. Neutrophils that have ingested urate crystals release activated oxygen species and lysosomal enzymes, which mediate tissue injury and promote an inflammatory response.

A high dietary intake of purine-rich foods (choice B) does not lead to gout, although endogenous overproduction of purines is associated with this condition.

Diagnosis: Gout

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Q3

An 85-year-old man presents with a 3-week history of painful swelling of his right knee. Aspiration of joint fluid returns numerous neutrophils and crystals, which are described as rhomboid and “coffin-like.”

Which of the following is the most likely diagnosis?

(A) Ankylosing spondylitis
(B) Gout
(C) Infectious arthritis
(D) Pseudogout
(E) Rheumatoid arthritis

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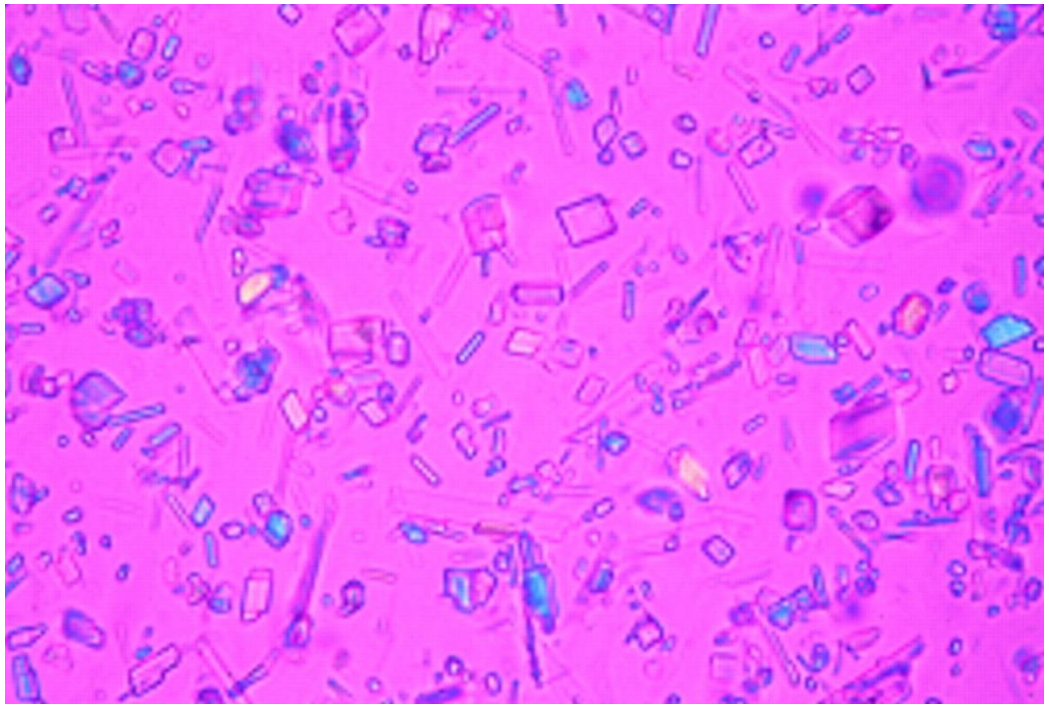
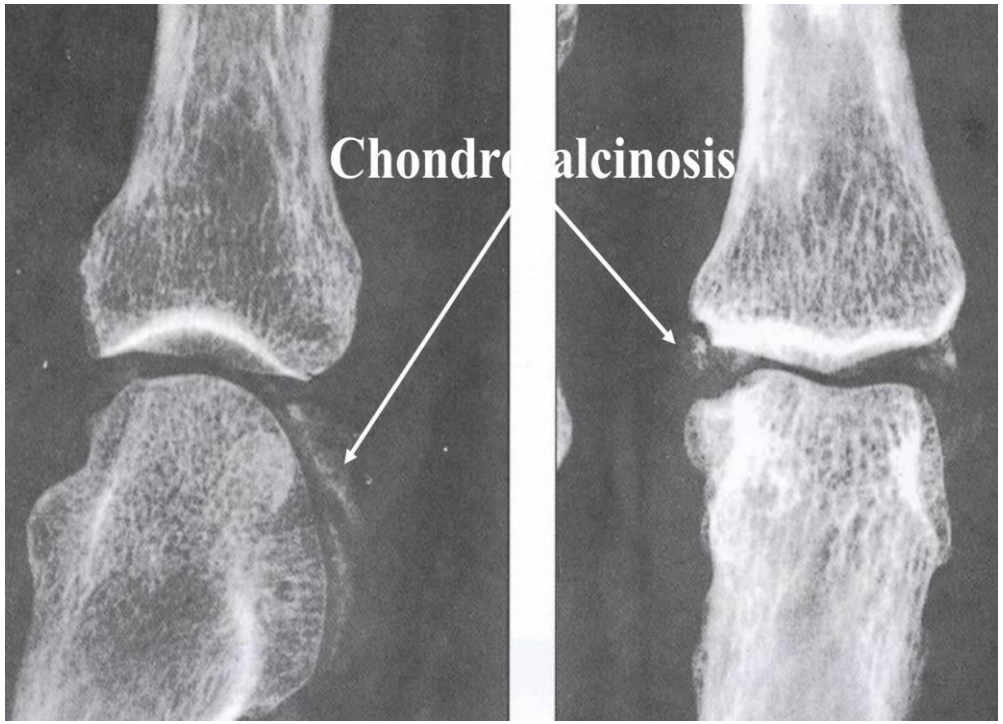


http://nethealthbook.com/arthritis/gout-and-crystal-arthritis/diagnosis-pseudogout/



http://www.tricajuscenter.com/pseudogout-attacks/

The answer is D: Pseudogout(SOO-doe-gout).

Calcium pyrophosphate deposition in synovial membranes (pseudogout), joint cartilage (chondrocalcinosis), ligaments, and tendons. Principally a condition of old age, with half of the population older than 85 years being affected. Pseudogout refers to self-limited attacks of acute arthritis lasting from 1 day to 4 weeks and involving one or two joints. Some 25% of patients with CPPD-deposition disease have an acute onset of **gout-like symptoms**, manifesting as inflammation and swelling of the knees, ankles, wrists, elbows, hips, or shoulders. The synovial fluid exhibits abundant leukocytes containing CPPD crystals.

Gout (choice B) features deposition of urate crystals.
Crystal deposition does not occur in rheumatoid arthritis (choice E).

Diagnosis: Chondrocalcinosis, pseudogout

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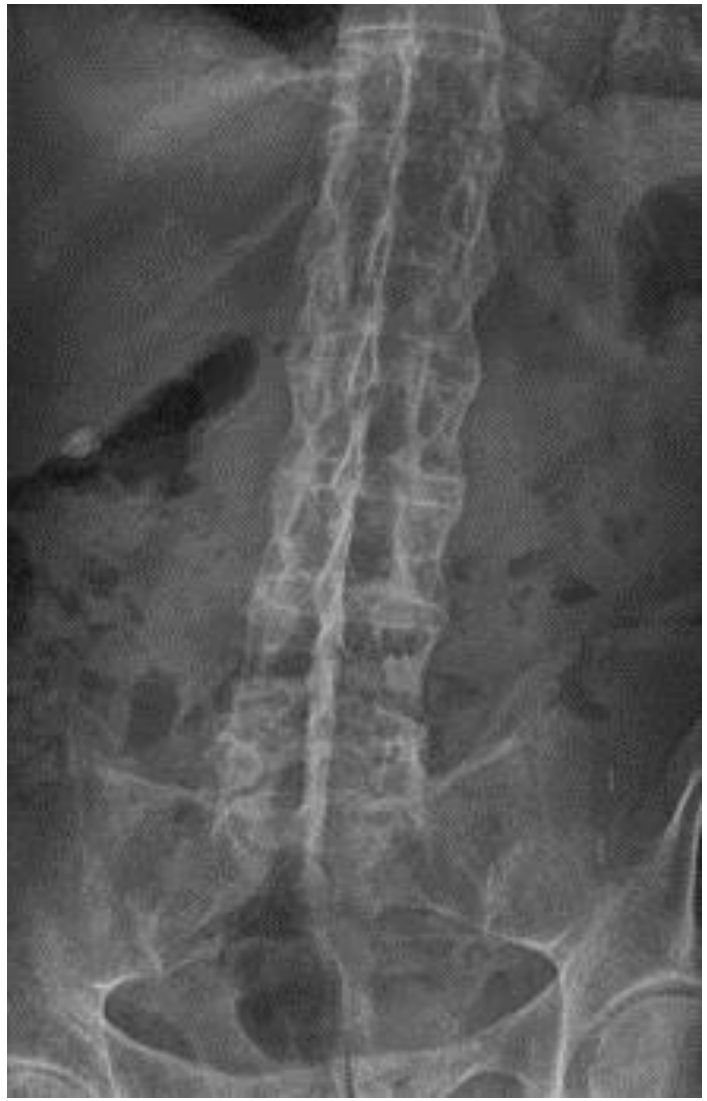

Q4

A 22-year-old man with AIDS complains of persistent cough, night sweats, low-grade fever, and general malaise. A chest X-ray reveals an area of consolidation in the periphery of the left upper lobe, as well as hilar lymphadenopathy. Sputum cultures show acid-fast organisms. Which of the following is the most likely diagnosis?

(A) Bronchopneumonia
(B) Pulmonary abscess
(C) Sarcoidosis
(D) Tuberculosis
(E) Wegener granulomatosis

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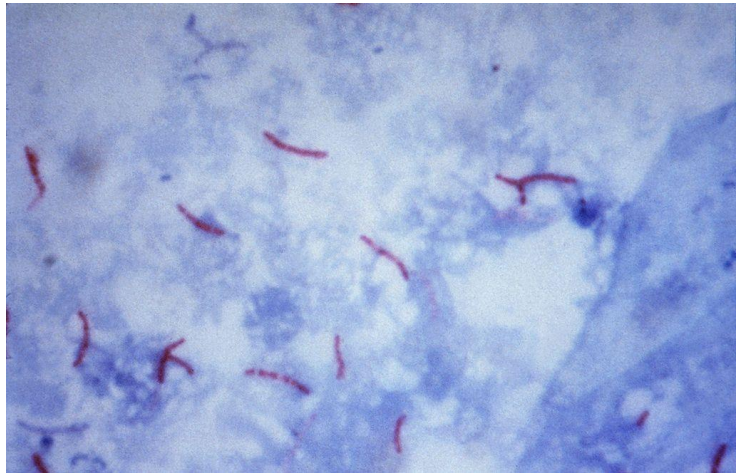
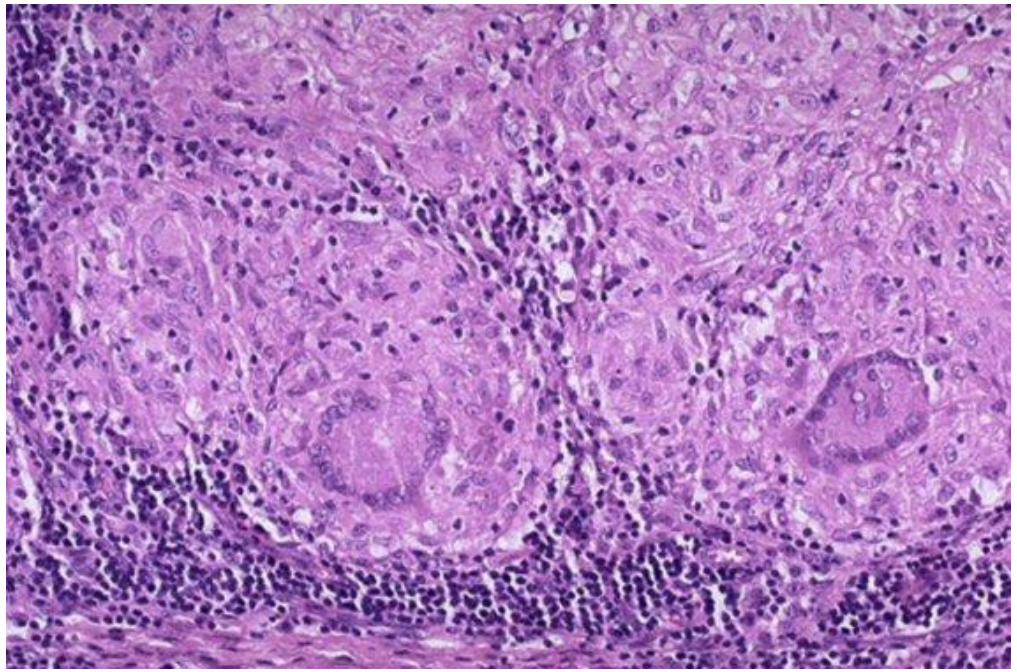
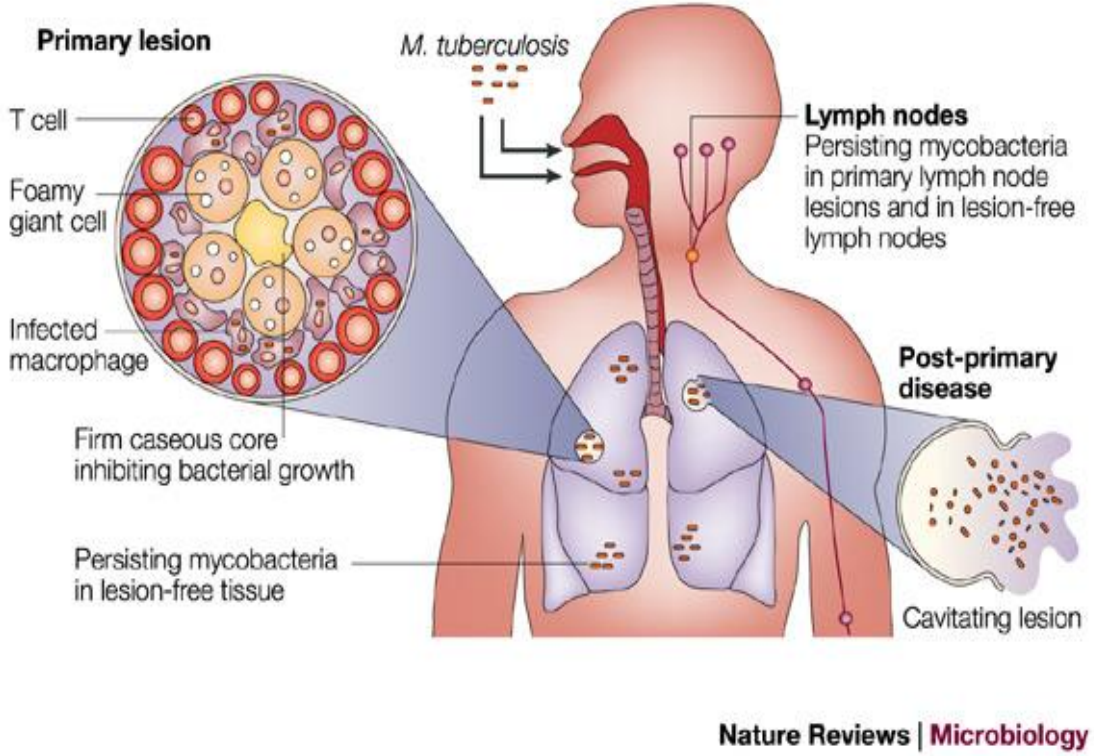


http://en.wikipedia.org/wiki/Ziehl%E2%80%93Neelsen_stain#mediaviewer/File:Mycobacterium_tuberculosis_Ziehl-Neelsen_stain_02.jpg

http://www.nature.com/nrmicro/journal/v1/n2/fig_tab/nrmicro749_F1.html



http://www0.sun.ac.za/ortho/webct-ortho/tb/tb-histology.html



The answer is D: Tuberculosis.

Tuberculosis represents infection with *Mycobacterium tuberculosis*, although atypical mycobacterial infections may mimic it. The Ghon complex includes parenchymal consolidation and enlargement of ipsilateral hilar lymph nodes and is often accompanied by a pleural effusion. The sputum contains *M. tuberculosis*, which is acid-fast in smears stained by the Ziehl-Neelsen technique. After resolution of primary tuberculosis, reemergence may occur (secondary tuberculosis).

None of the other choices feature acid-fast organisms.

Diagnosis: Tuberculosis, *Mycobacterium tuberculosis*

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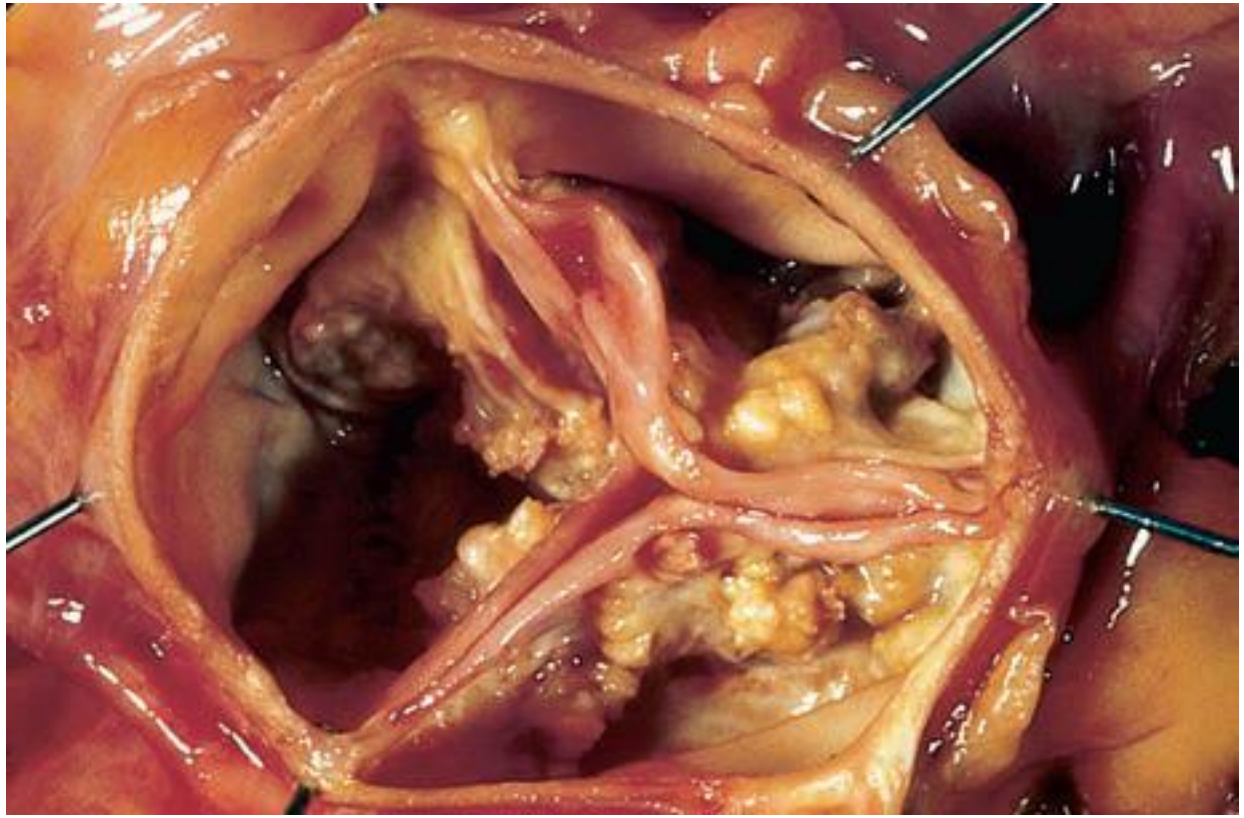
Q5
A 78-year-old man with a history of recurrent syncope undergoes surgery for aortic valve disease. A hard, markedly deformed valve is observed, but the patient expires during surgery. The aortic valve at autopsy is shown in the image.
What is the appropriate diagnosis?

(A) Bacterial endocarditis
(B) Bicuspid aortic valve
(C) Calcific aortic stenosis
(D) Hypertrophic subaortic stenosis
(E) Marantic endocarditis



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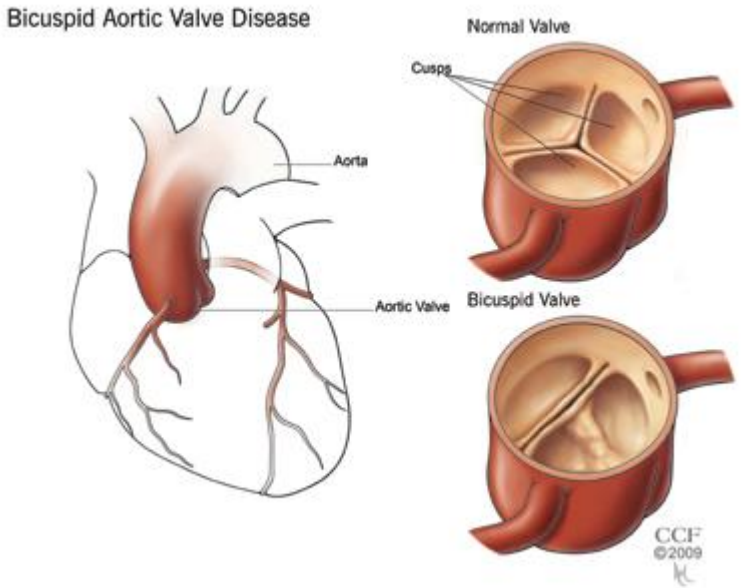
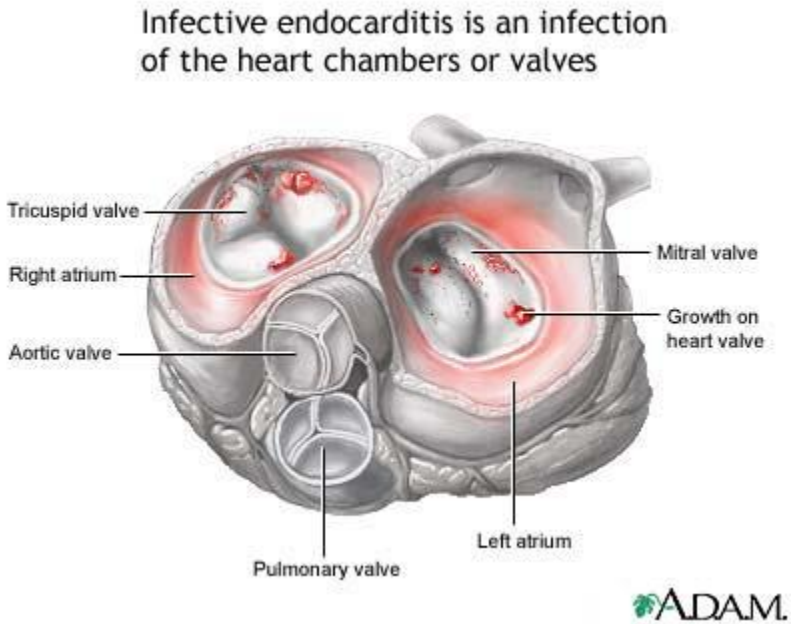


http://my.clevelandclinic.org/services/heart/disorders/valve/bicuspid_aortic_valve_disease



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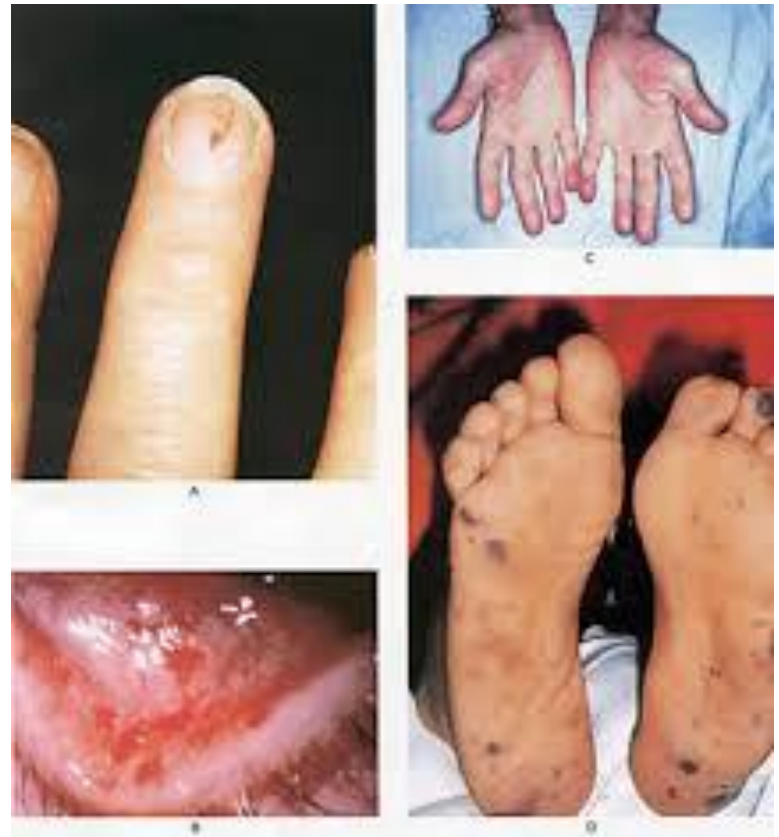

https://www.flickr.com/photos/dokidok/2369768538/

The answer is C: Calcific aortic stenosis.

The aortic valve shows calcific aortic stenosis in a three-cuspid valve in an elderly person. There is no commissural fusion. Calcific aortic stenosis refers to a narrowing of the aortic valve orifice as a result of the deposition of calcium in the valve cusps and ring. There are three main causes of calcific aortic stenosis: rheumatic disease, senile calcific stenosis, and congenital bicuspid aortic stenosis. Calcific aortic stenosis is related to the cumulative effect of years of trauma due to turbulent blood flow around the valve.

Bicuspid aortic valve (choice B) is incorrect because three valve cusps are shown.
Vegetations of marantic endocarditis (choice E) are absent.
Patients with hypertrophic cardiomyopathy may develop subvalvular obstruction of the aortic outflow tract (choice D), but the autopsy specimen does not show this pathology.

Diagnosis: Calcific aortic stenosis

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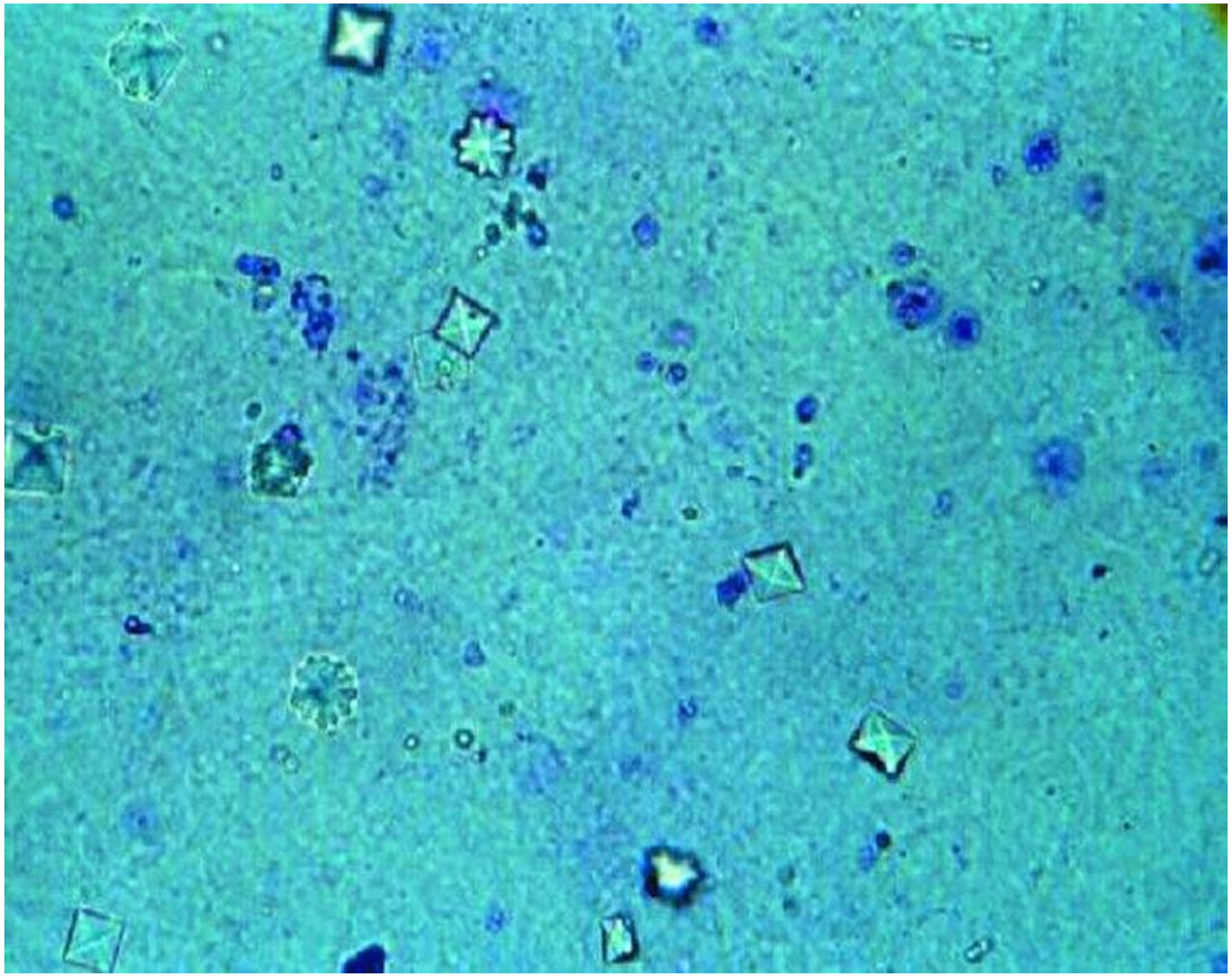
BONUS



Thank you and good luck

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