

KIDNEY AND URINARY TRACT PATHOLOGY

MALE GENITAL TRACT PATHOLOGY

PYELONEPHRITIS

- combined inflammation of the tubules, interstitium, calyces and renal pelvis
- focal disease

Two forms :

- **acute** : associated with urinary tract infection
- **chronic** : bacterial disorder + other factors

Bacteria can reach the kidneys :

- through the blood-stream (*hematogenous infection*)
- from the lower urinary tract (*ascending infection*)

Acute pyelonephritis

- always result of a bacterial infection
- diagnosed by leukocytes casts in the urine

Gross examination :

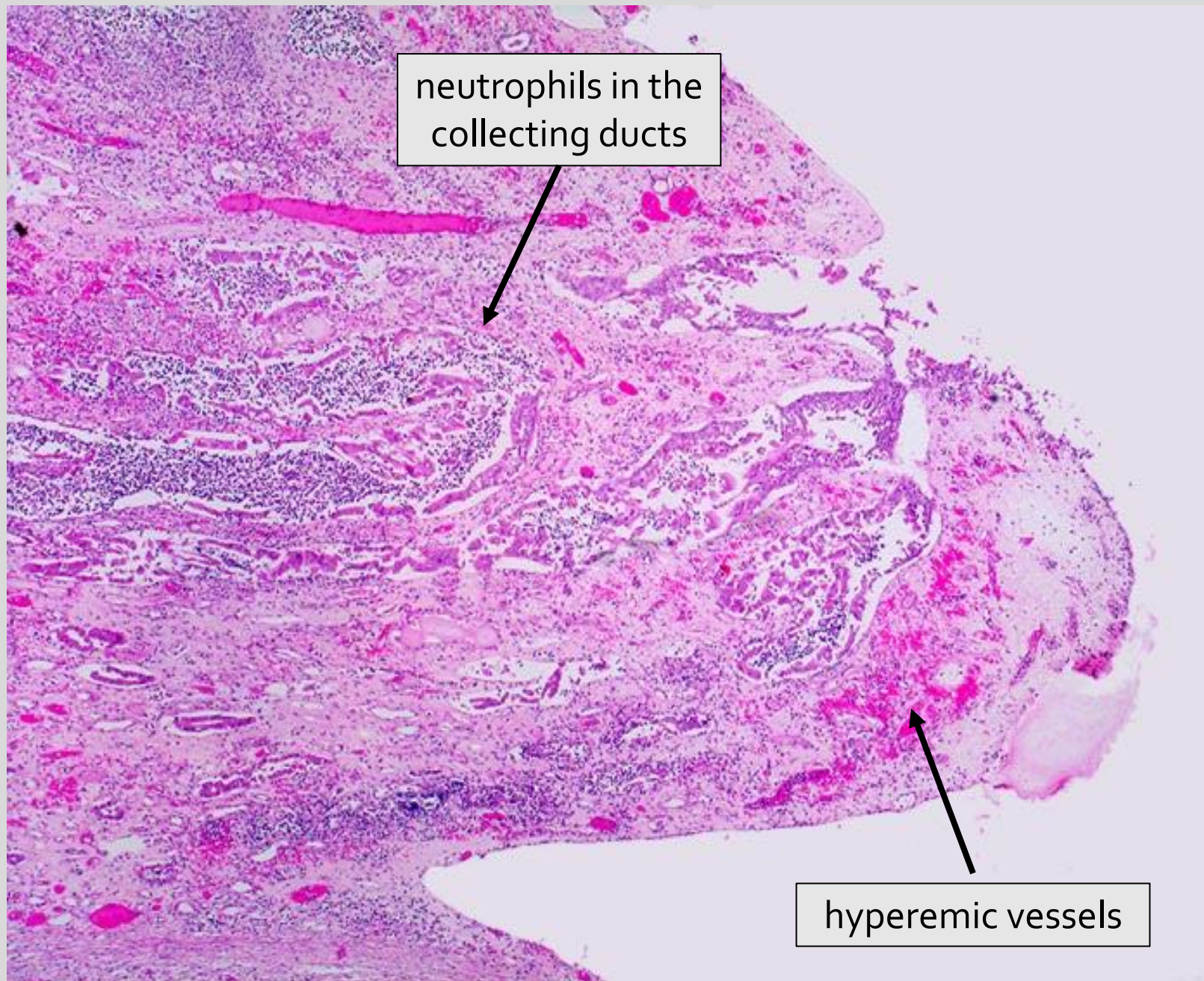
- small abscesses on the subcapsular surface, or
- large, wedge-shaped areas of suppuration
- blunted papilla, thinned cortex – possible

Microscopically :

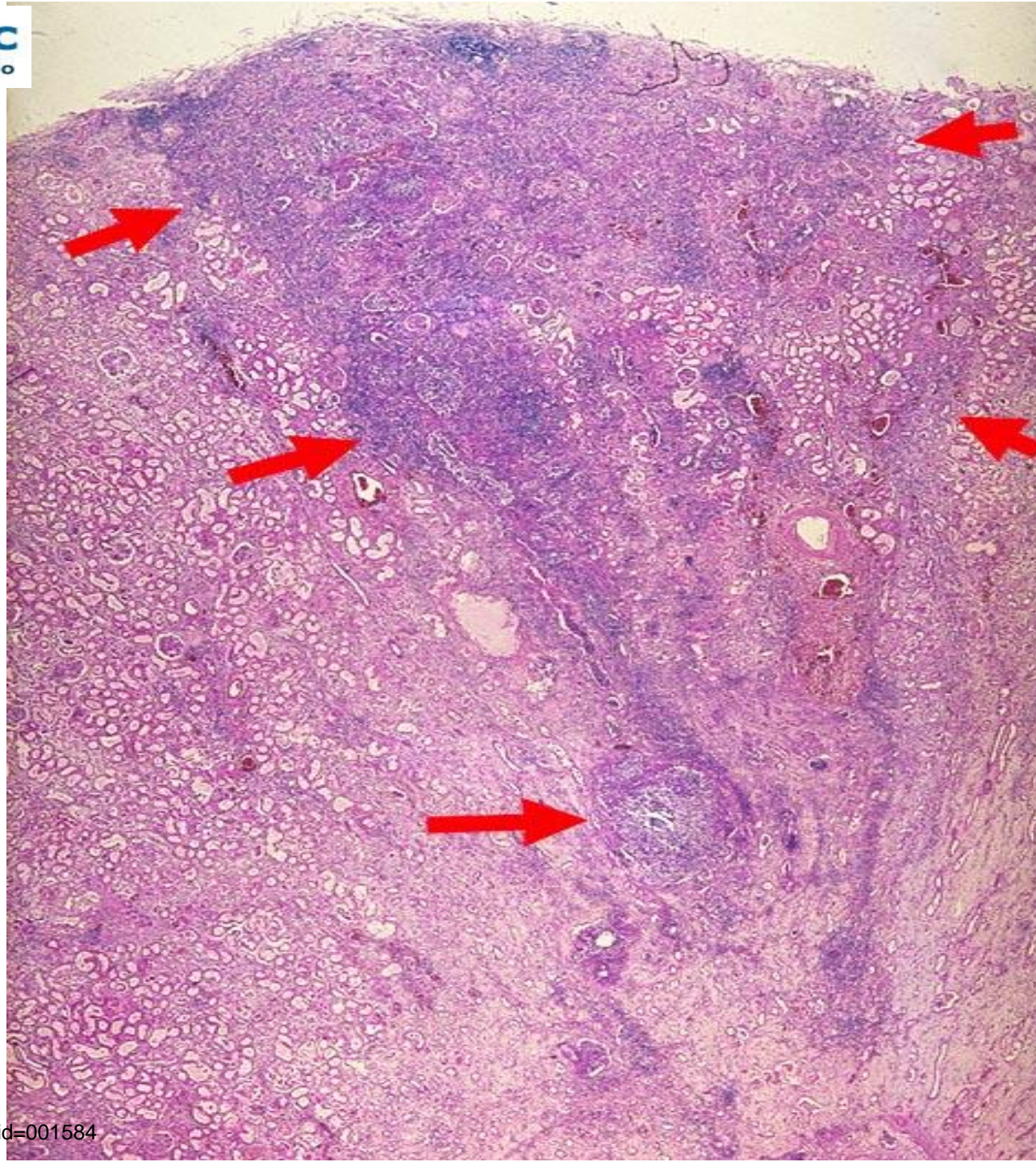
- patches of acute inflammatory processes
- destruction of the parenchyma – possible

Acute pyelonephritis



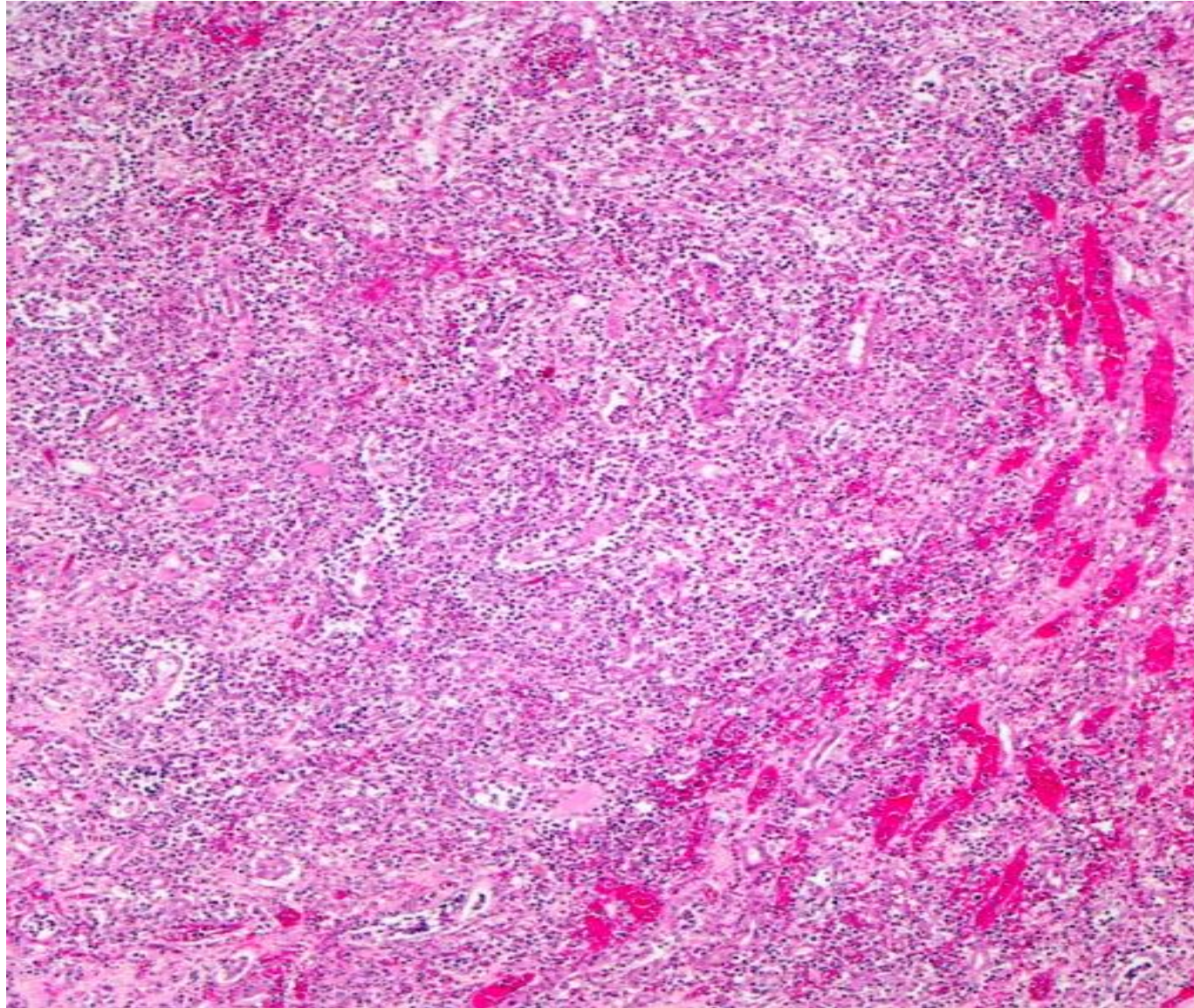


Acute pyelonephritis

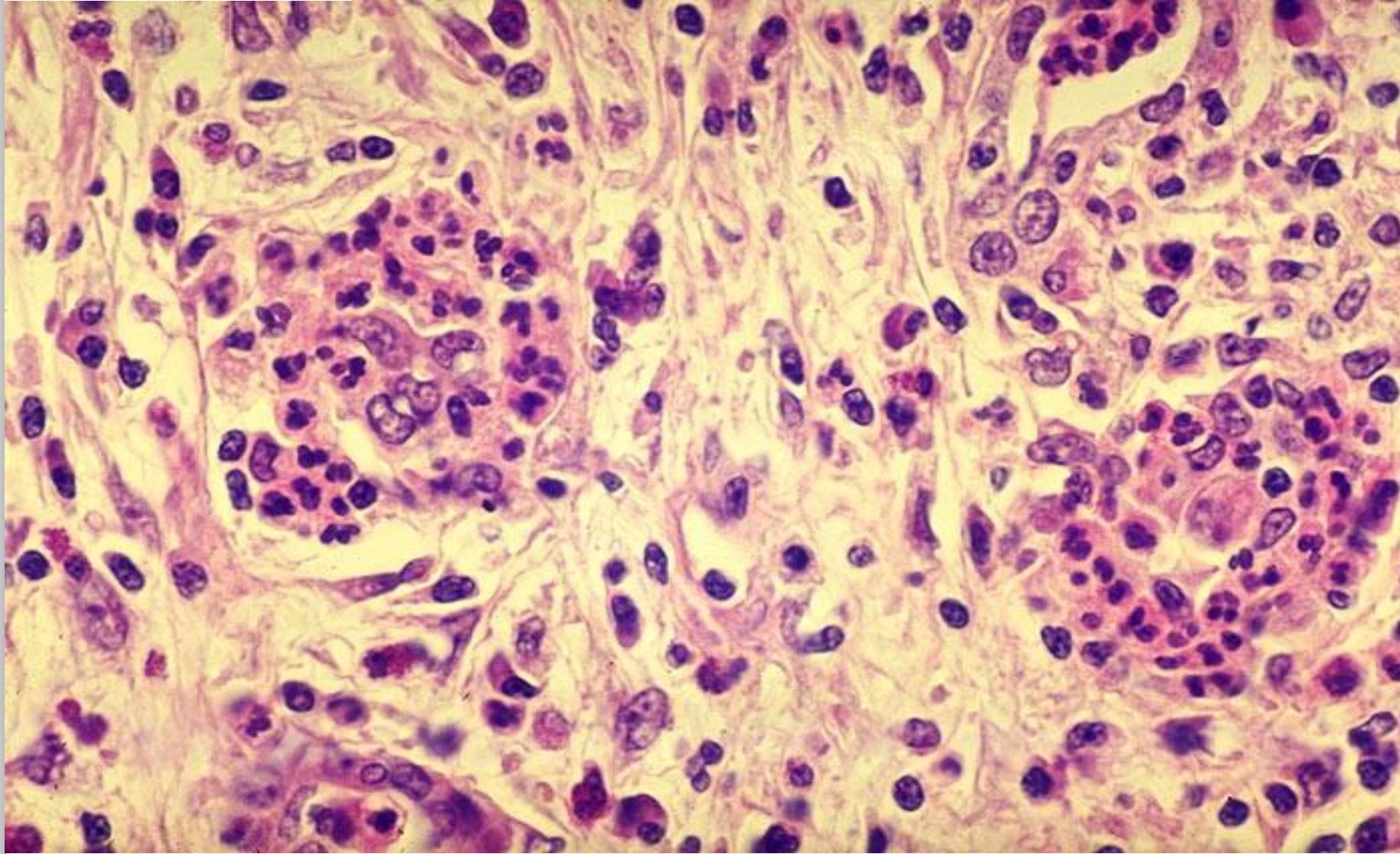


Many neutrophils are seen in the tubules and interstitium in a case of **acute pyelonephritis**. The neutrophils can collect in the distal tubules and be passed in urine as WBC casts.

Focal & discontinuous destruction of kidney parenchyma (as a wedge, between red arrows).

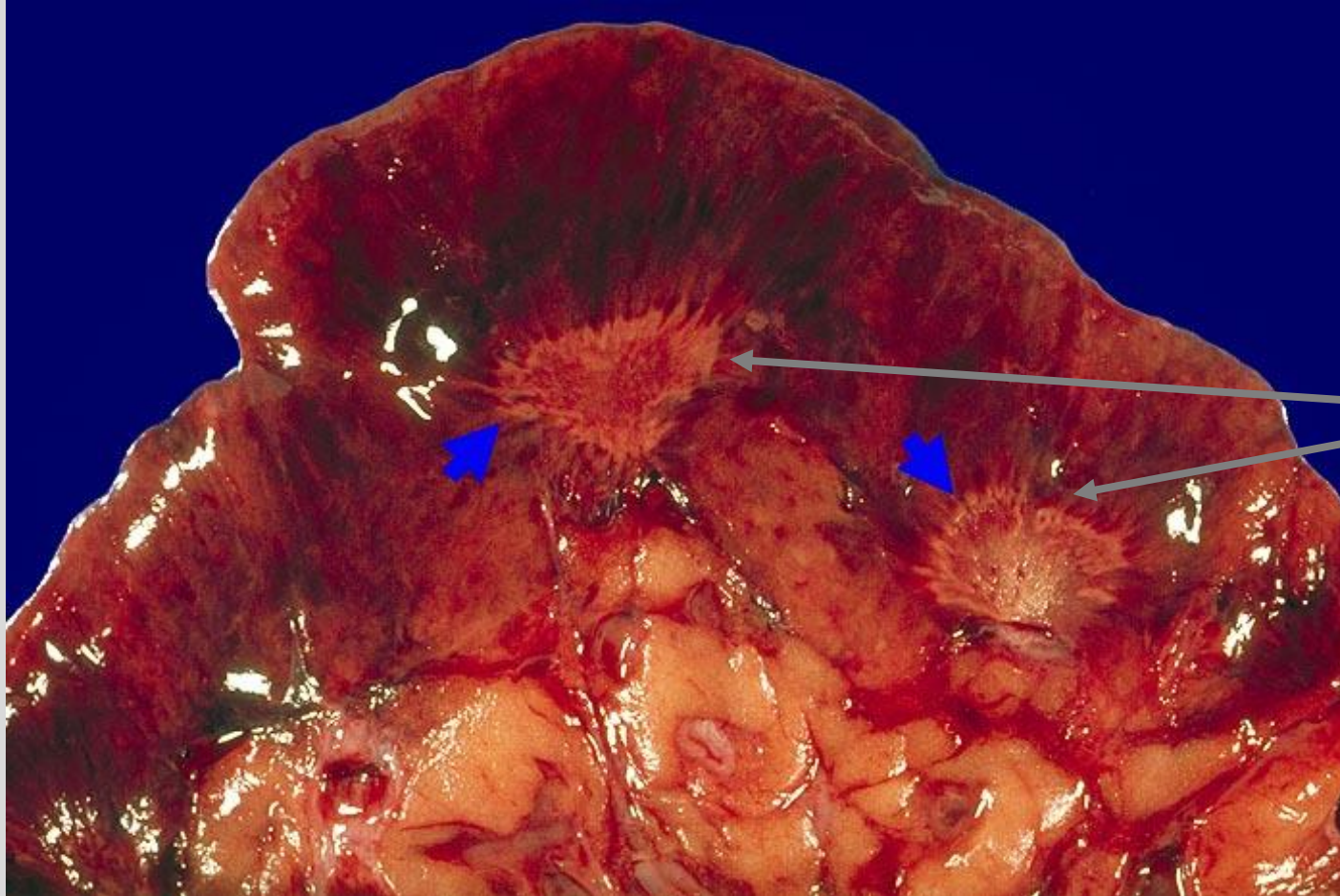


Acute pyelonephritis.
Interstitial neutrophils in
large number, with loss
of tubules.



Acute pyelonephritis: destruction of tubules.

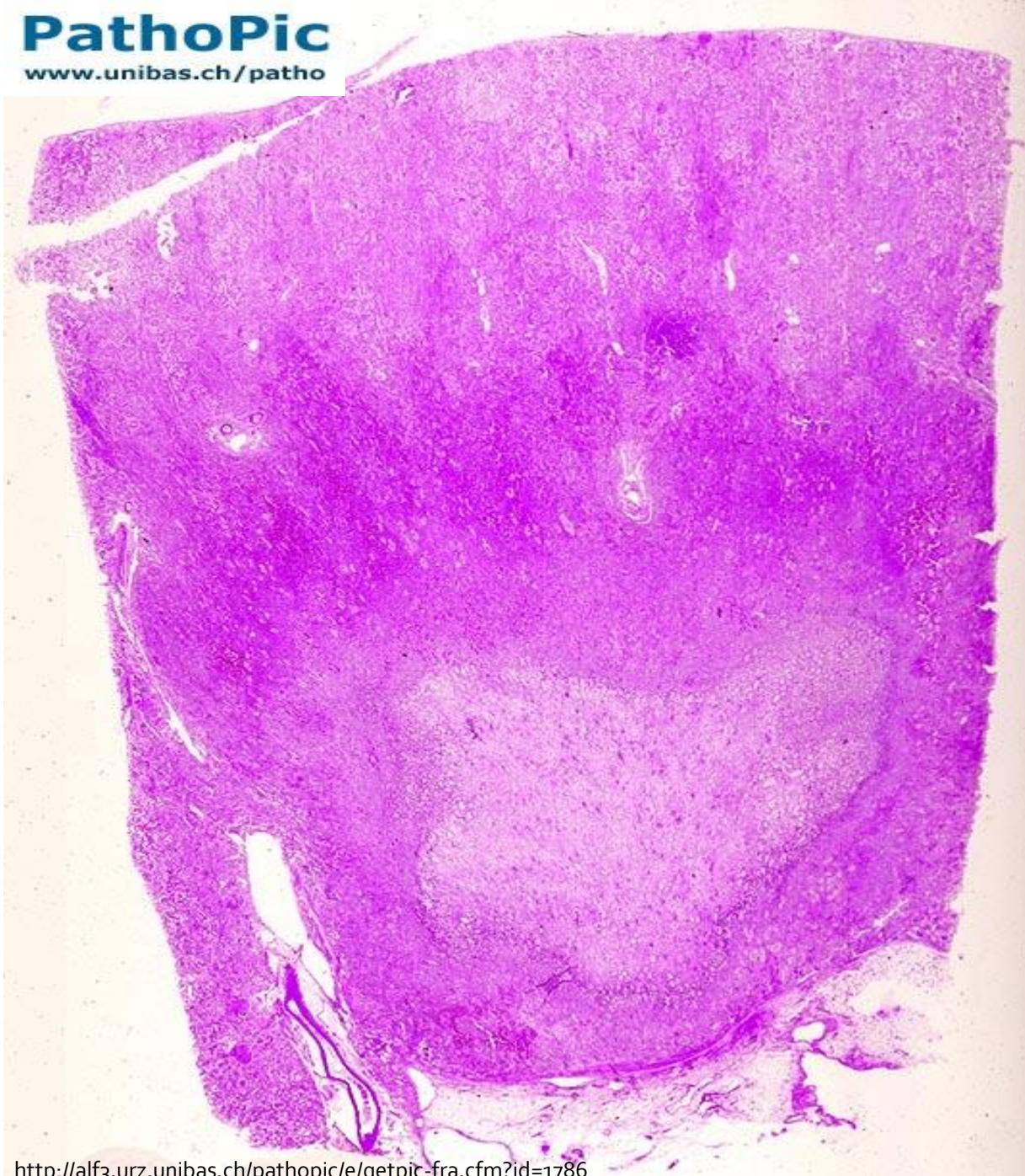
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Acute pyelonephritis

Complications :

- papillary necrosis
 - in elderly diabetics with urinary obstruction
- pyonephrosis
- perinephric abscesses



Papillary necrosis, microscopy:

Pale zone: necrosis.

Bluish rim: leukocytes.



Pyonephrosis
gross: pus
within renal
pelvis.



Perinephric
abscesses, gross.

Chronic pyelonephritis

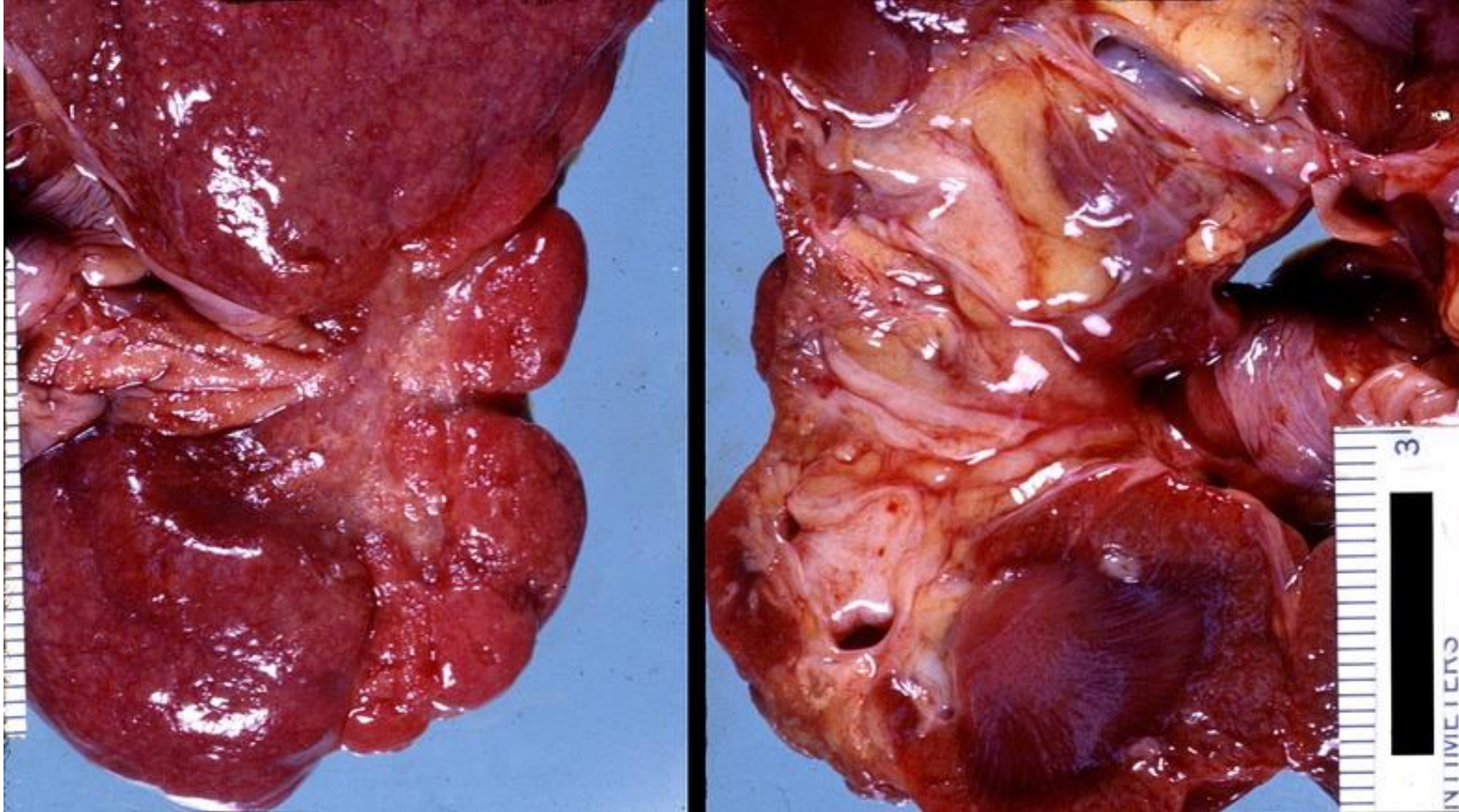
- chronic tubulointerstitial disorder with
 - gross, irregular, asymmetric scarring
 - deformation of the calyces and parenchyma

Divided into :

- cases with mechanical obstruction (*obstructive uropathy*)
 - obstruction + infection
 - hydronephrosis
- cases without mechanical obstruction (*reflux nephropathy*)
 - associated with vesicoureteral reflux
 - discrete scars causing indentations on the renal surface



**Chronic
pyelonephritis:**
irregular,
asymmetric
scarring, deforming
parenchyma &
calyces

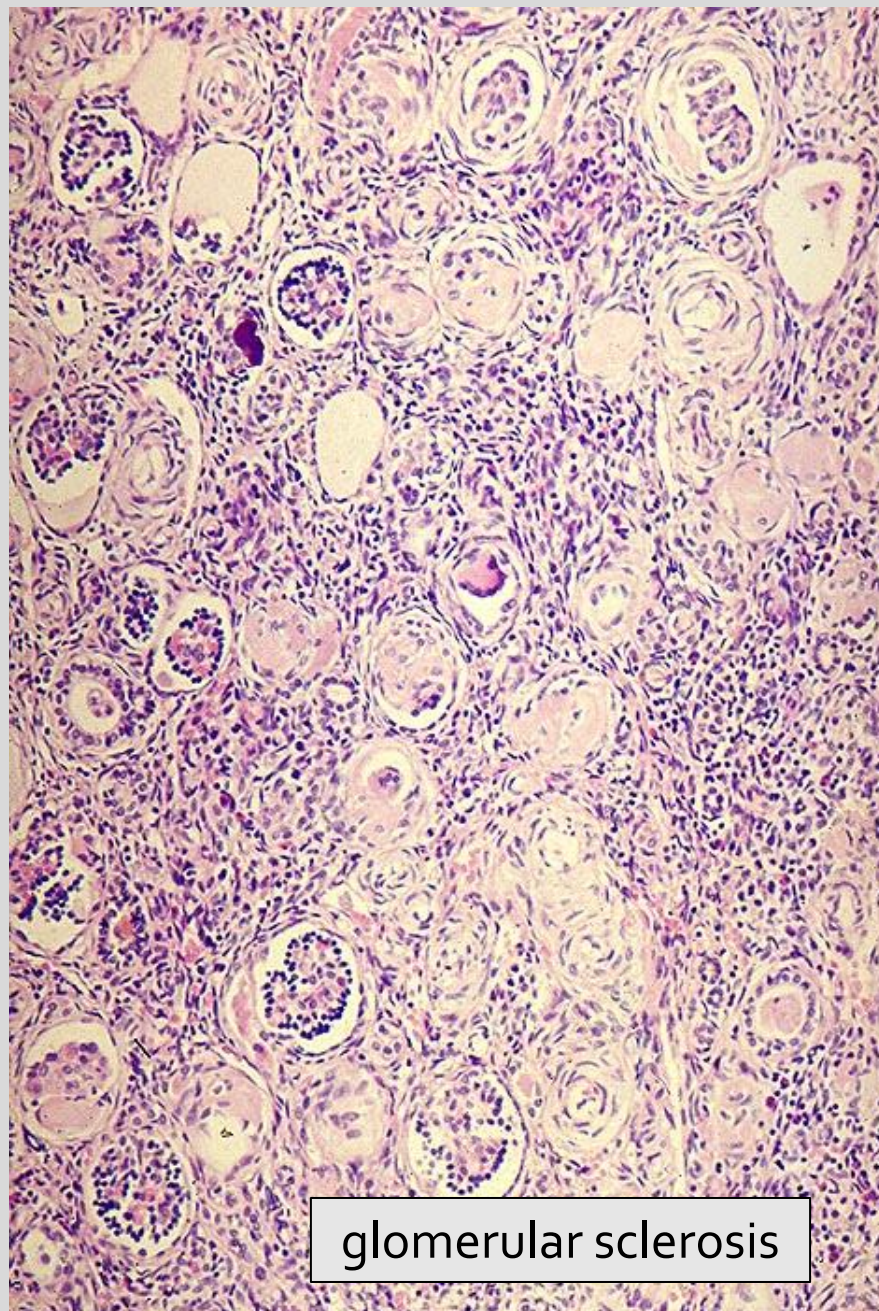


Chronic pyelonephritis: calyces of the kidney poles are expanded & associated with scars that cause an indentation of the renal surface (reflux nephropathy)

Chronic pyelonephritis

Microscopic changes :

- **tubules :**
 - atrophy, admixed with hypertrophy
 - dilated tubules, with hyaline casts => "*thyroidization*"
- **interstitium :**
 - inflammation, fibrosis
- **glomeruli :**
 - periglomerular fibrosis, complete sclerosis, or uninvolved
- **vessels :**
 - hyaline arteriolosclerosis (small arteries and arterioles)
 - obliterative endarteritis (arcuate and interlobular vessels)



Chronic pyelonephritis



RENO-URINARY TUBERCULOSIS

- secondary to an active extra-renal tuberculous site
- appears by hematogenous spread
- progresses through the stages of :
 - caseation
 - loss of tissue
 - ulceration
 - hydronephrosis

Appearance :

- few yellowish opaque tubercles in the cortex
- caseous masses of varying size
- hydronephrotic cavities with thick creamy material



progression



Tb pyelonephritis – miliary type

Tiny, whitish, innumerable tubercles within cortex, adipose substitution (of parenchyma) in hilum.

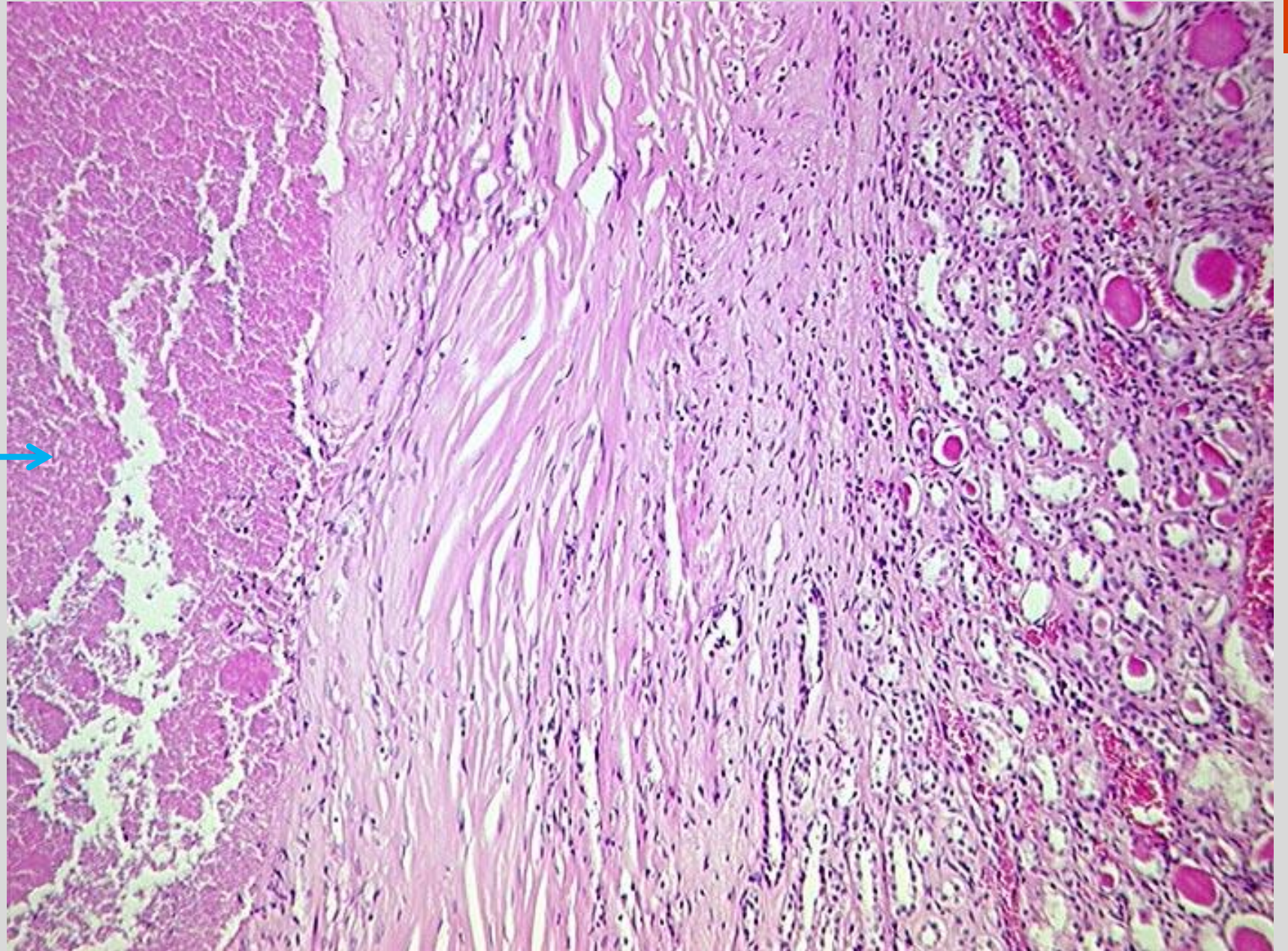
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Renal tuberculosis

ulcer-cavernous stage;
pyonephrosis-like lesion, when
dystrophic calcifications occur, this
aspect is known as a "cement" or
"putty" kidney (gross & US).

Kidney tb:
caseous necrosis



HYDRONEPHROSIS

- dilatation of the renal pelvis and calyces, caused by **obstruction**
- causes flattening of the papillae and atrophy of the cortex

Grossly :

- slight to massive enlargement
- in advanced cases, cortex thinning and thin-walled cystic structures

Clinical :

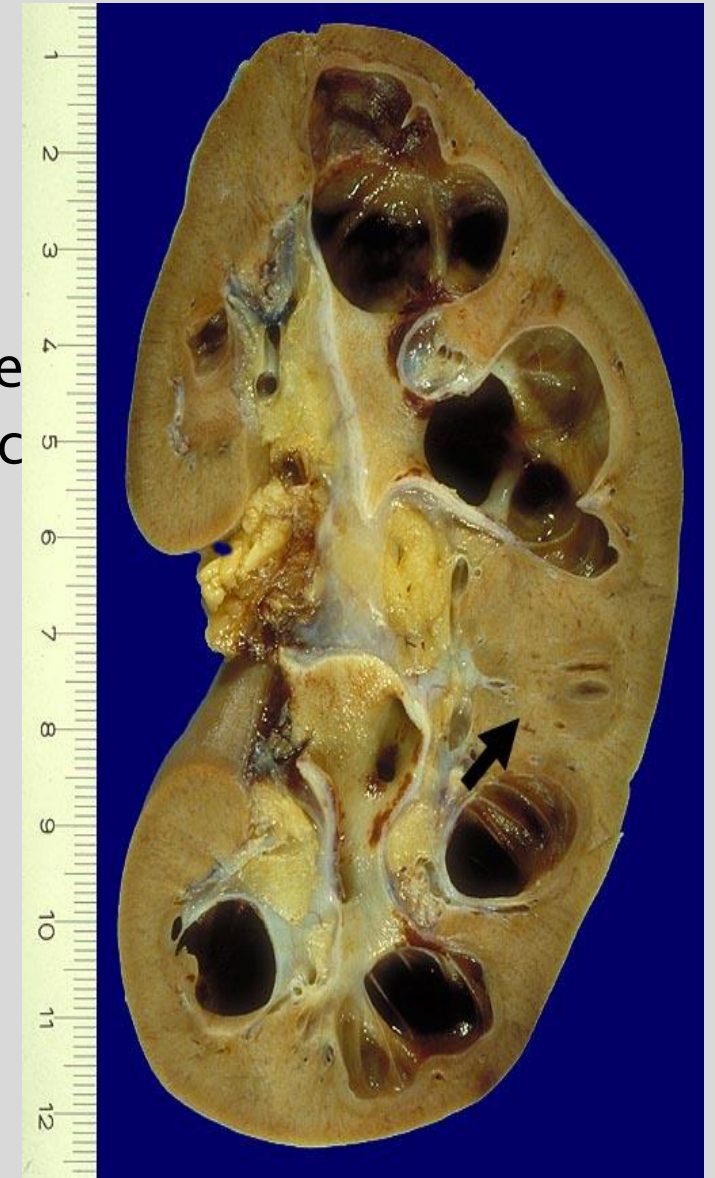
- if *unilateral* :
 - lack of symptoms, often missed
- if *bilateral* :
 - complete obstruction : acute renal failure
 - incomplete obstruction : chronic renal failure



Hydronephrosis



Hydronephrosis:
cortex thinning until complete
atrophy and thin-walled cystic
structures



UROLITHIASIS

- accumulation of calculi in the pelvis or the calyces

Can manifest as :

- **hematuria**, if the mucosa is eroded
- **renal colic**, with the passing of a stone into the ureter
- **hydronephrosis** and **pyelonephritis**, in obstructive cases

Treatment :

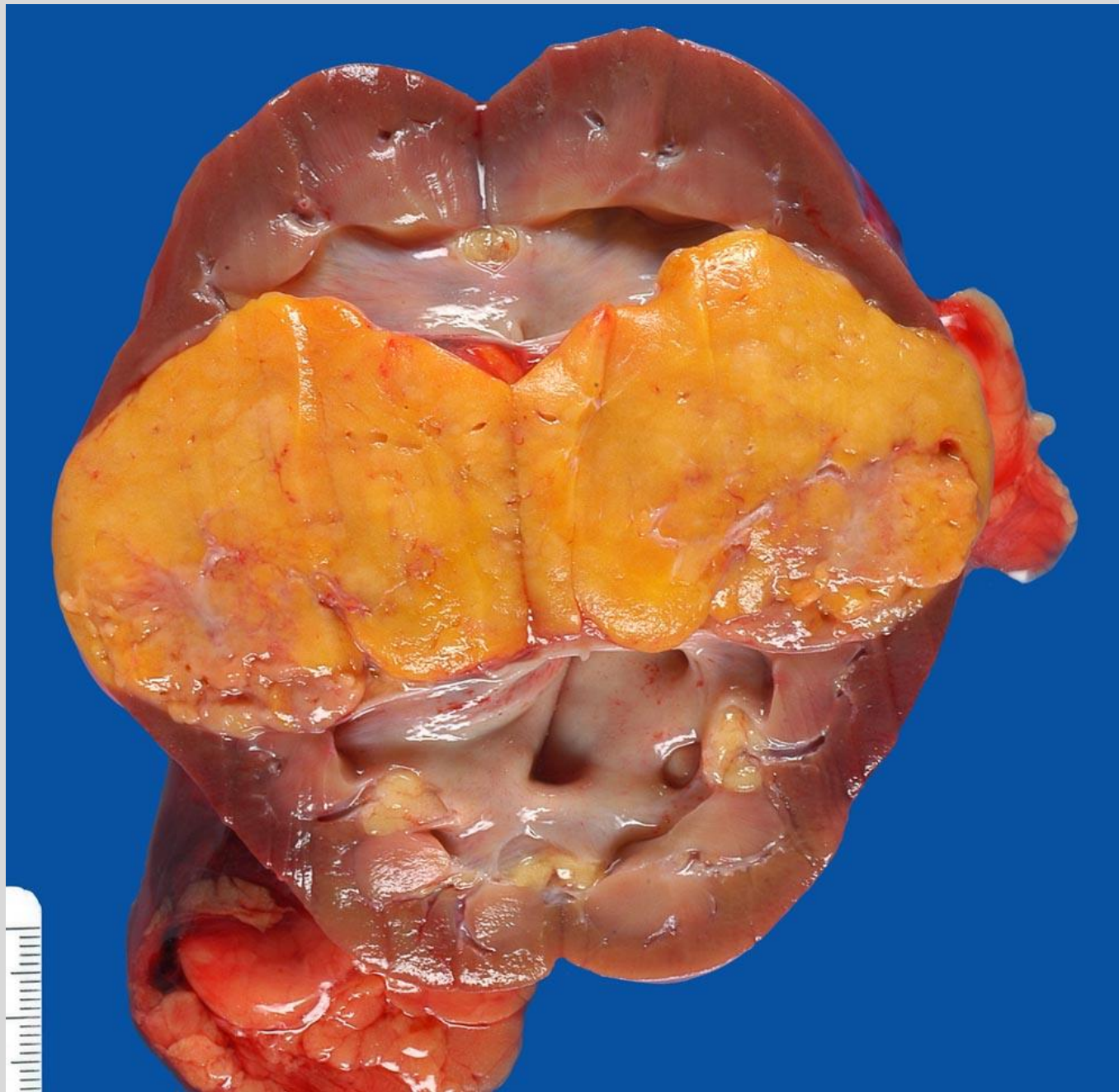
- surgical removal
- ultrasonic disintegration (*lithotripsy*)
- endoscopic removal



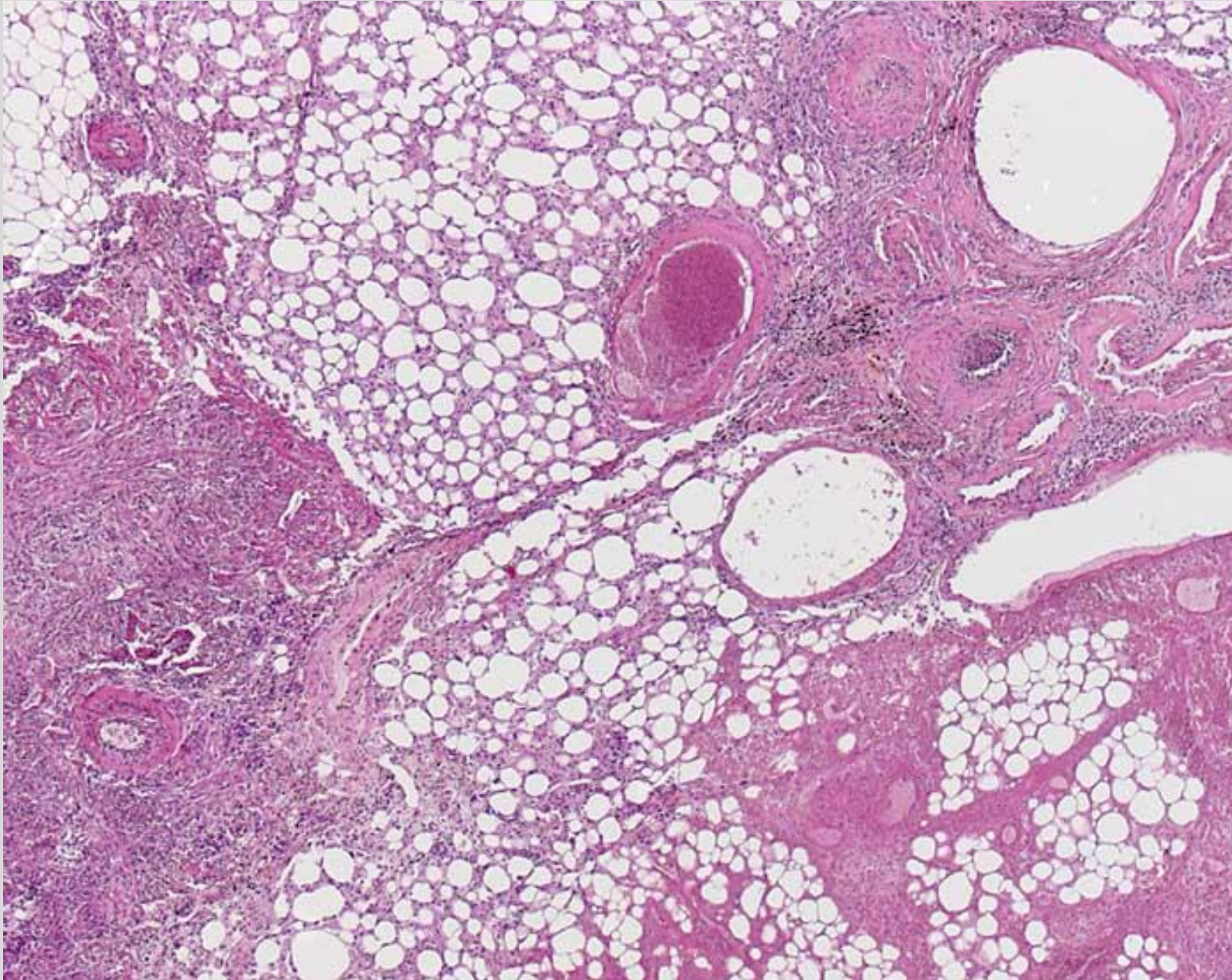
Urolithiasis +
hydronephrosis

BENIGN RENAL TUMORS

- **Angiomyolipoma**
 - strong association with tubular sclerosis
 - grossly :
 - yellow, bosselated, resembling renal cell carcinomas (RCCs)
 - well encapsulated
 - no necrosis
 - microscopically :
 - admixture of benign adipose tissue, smooth muscle and thick-walled vessels
- **Hemangioma, lipoma, fibroma and leiomyoma**



Angiomyolipoma – tumor
resembling fat



Angiomyolipoma

MALIGNANT RENAL TUMORS

Renal cell carcinoma (Grawitz tumor)

- derived from the epithelial cells of the renal tubules
- 90% of the renal cancers
- most common sign : *hematuria*
- 40% survival rate at 5 years
- frequently associated with paraneoplastic syndromes (*hyperparathyroidism, erythrocytosis, and hypertension*)
- treatment limited to complete surgical removal

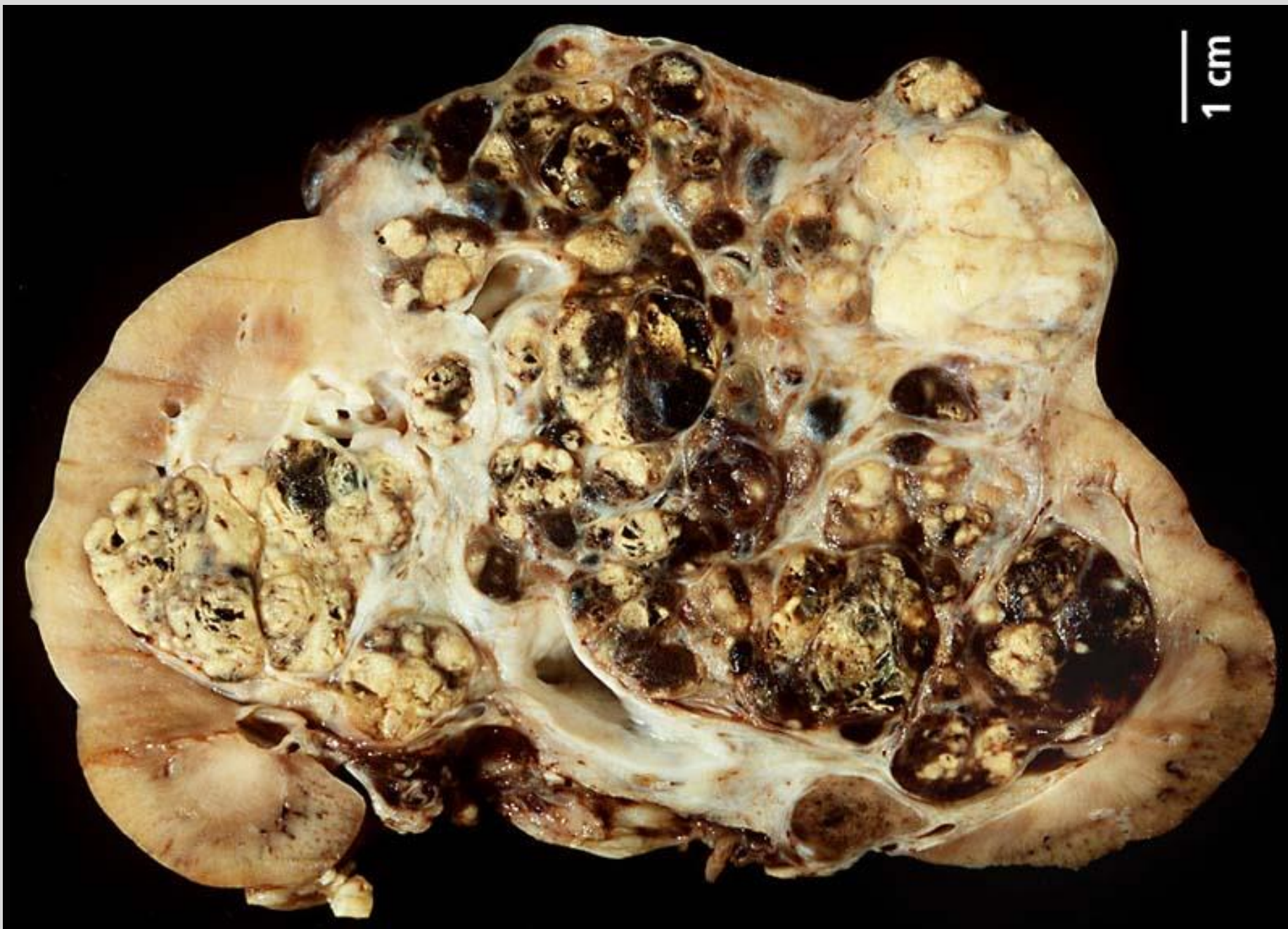
Renal cell carcinoma

Gross appearance :

- usually solitary, spherical mass (3-15 cm)
- yellow orange white with areas of *hemorrhage* and *necrosis*
- some entirely solid, others focally cystic with sharp margins

Microscopic appearance :

- neoplastic cells with *clear cytoplasm*
- little cellular or nuclear pleomorphism (anaplastic variants occur)
- variable histologic patterns : solid, trabecular, tubular etc



Renal cell carcinoma

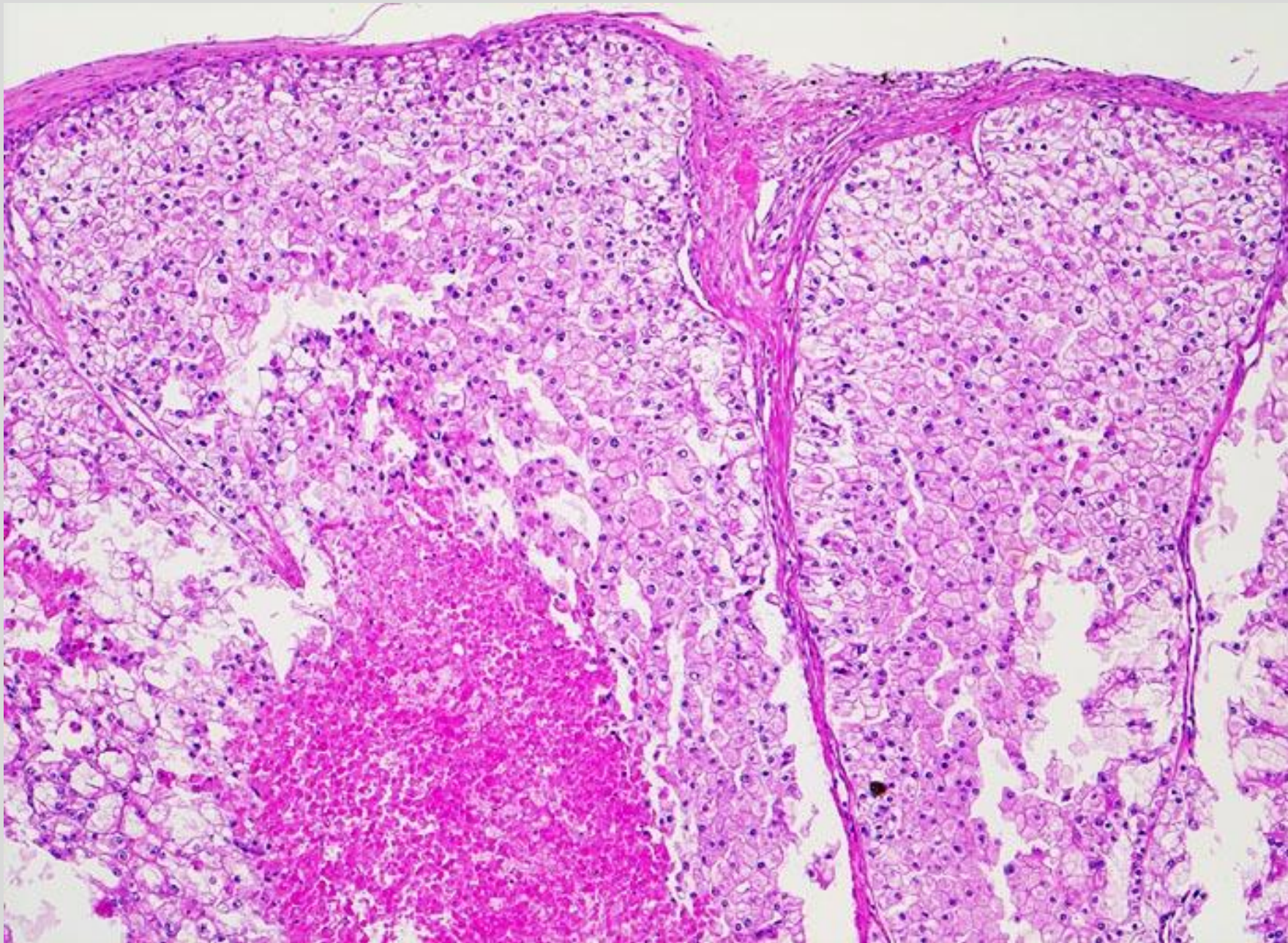


Renal cell
carcinoma
penetrating
the capsule

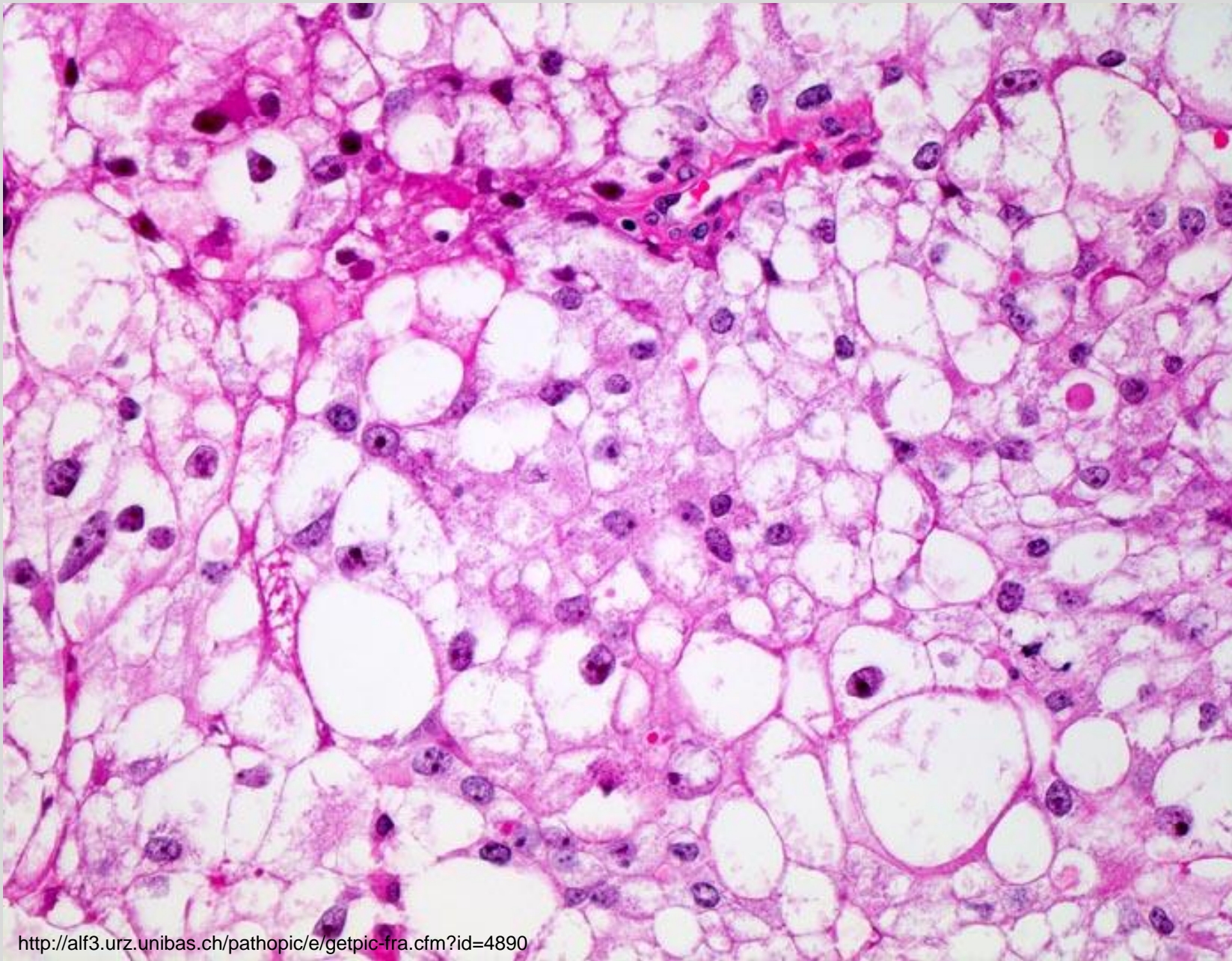
1cm



Renal cell carcinoma invading the renal vein (arrow).



Clear cell renal cell carcinoma



<http://alf3.urz.unibas.ch/pathopic/e/getpic-fra.cfm?id=4890>

**Kidney: clear cell
renal carcinoma,
Alveolar pattern of neoplastic
cells with clear cytoplasm,
delimited by slender / thin
vascular stroma.**

Nephroblastoma (Wilms tumor)

- tumor comprised of mesenchymal and epithelial embryonal elements
- common in very young children (before the age of 4 years)

Gross appearance :

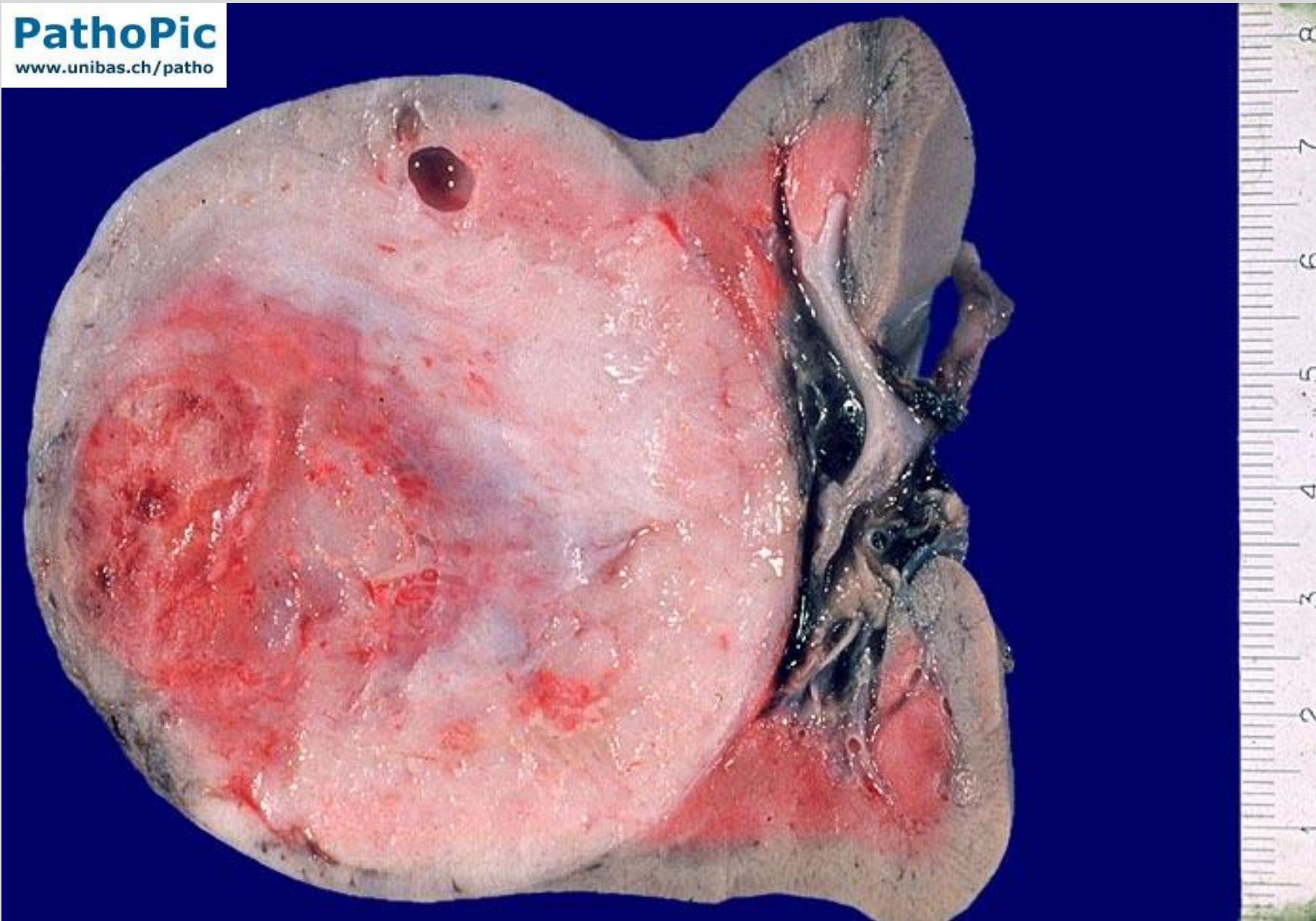
- large, bulging, pale tan cut surface
- enclosed within a rim of renal cortex and capsule

Histologically :

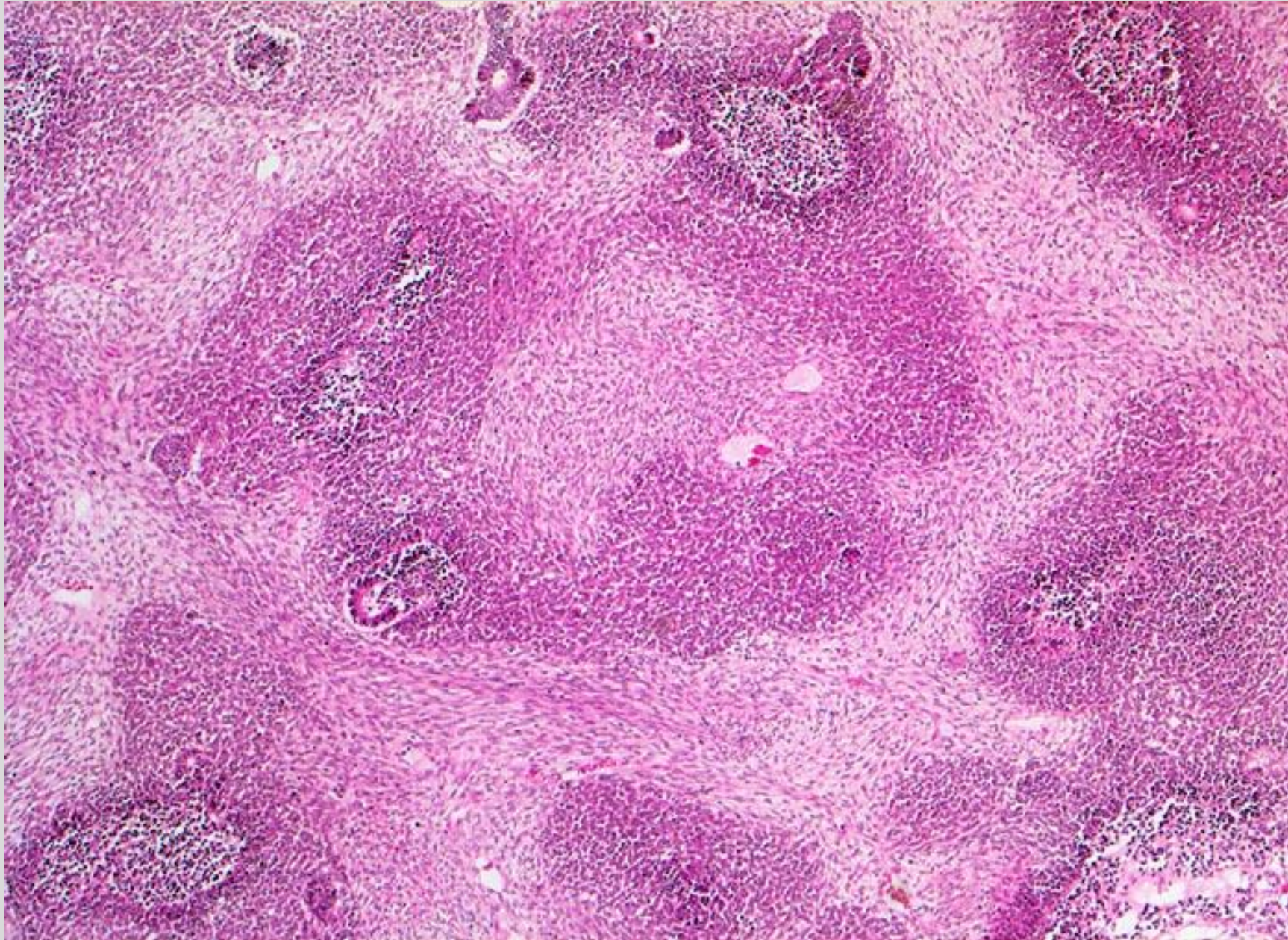
- three types of normal tissue :
 - *metanephric blastema*
 - *immature stroma* (mesenchymal tissue) : undifferentiated spindle cells
 - *immature epithelial elements* : small tubular structures



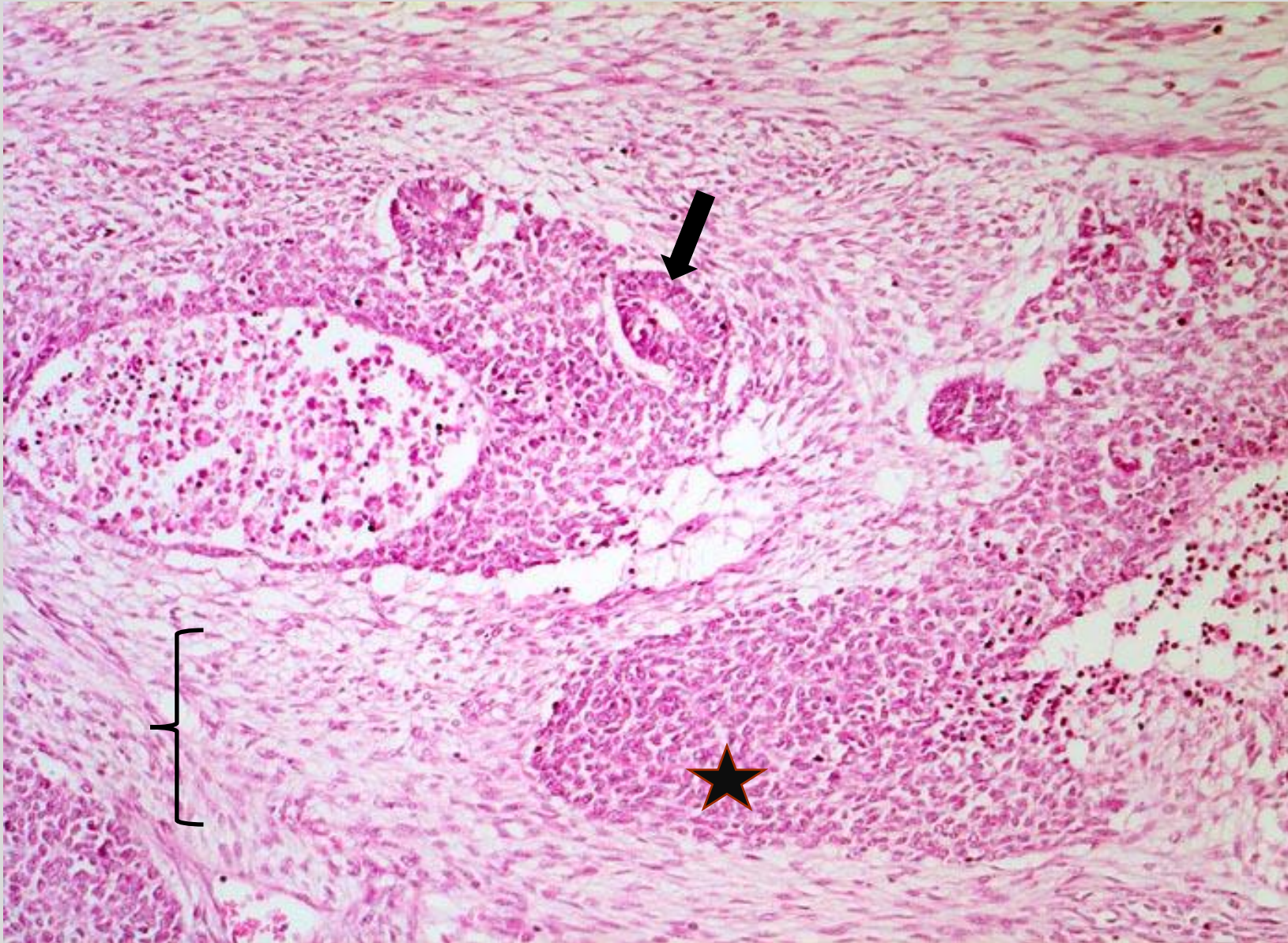
Nephroblastoma -
nephrectomy with an
adherent ileum



Nephroblastoma: gross, expansive, large, bulging mass, with a pale - hemorrhagic cut surface, enclosed within a rim of renal cortex.



Nephroblastoma –
triphasic tumor



**Nephroblastoma /
Wilms tumor:** triphasic
on microscopy

1. Immature
epithelium / tubes
at the arrow
2. Blastemal cells –
star
3. Immature
mesenchyma /
stroma - brace

<http://alf3.urz.unibas.ch/pathopic/e/getpic-fra.cfm?id=5180>

Urothelial carcinoma

- originating in the urothelial epithelium of the renal pelvis and calyces
- hematuria often present

Grossly :

- usually papillary tumors

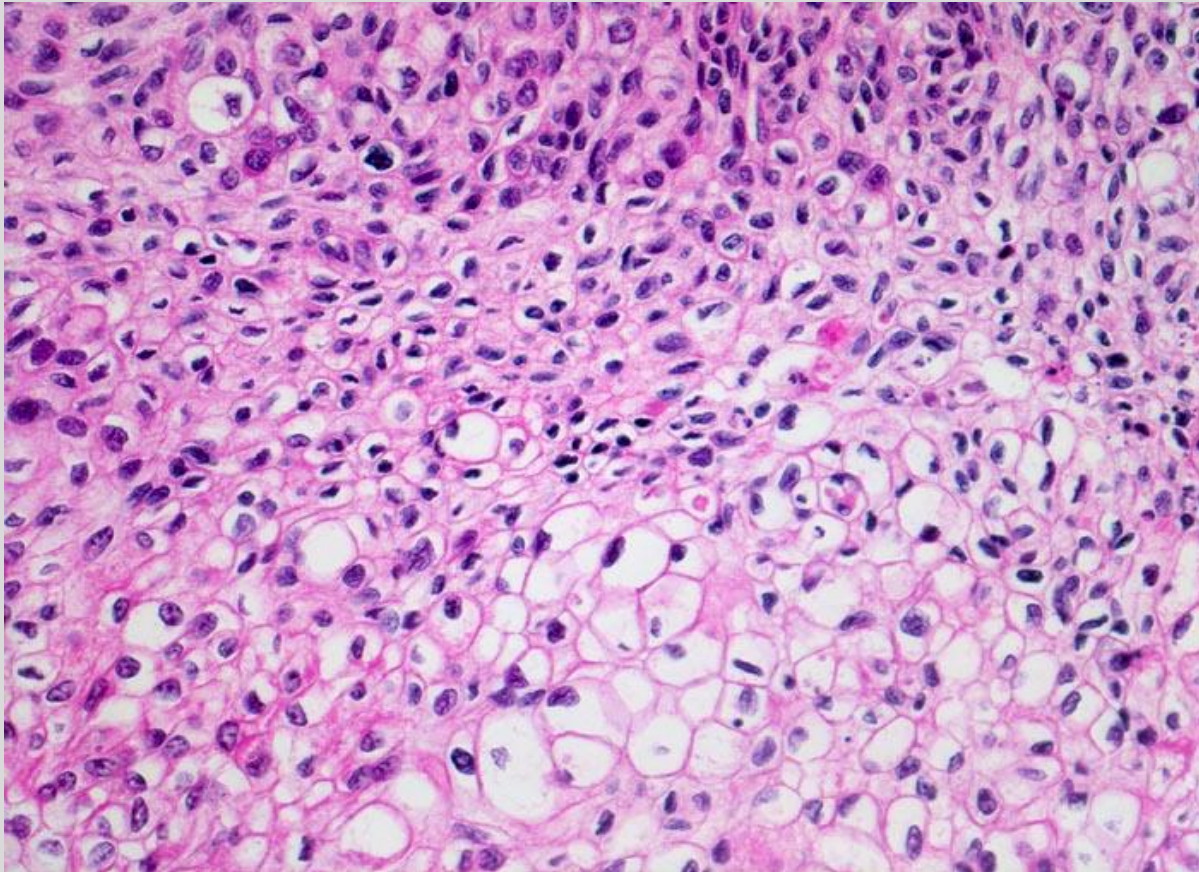
Histologically :

- counterparts of those found in the urinary bladder

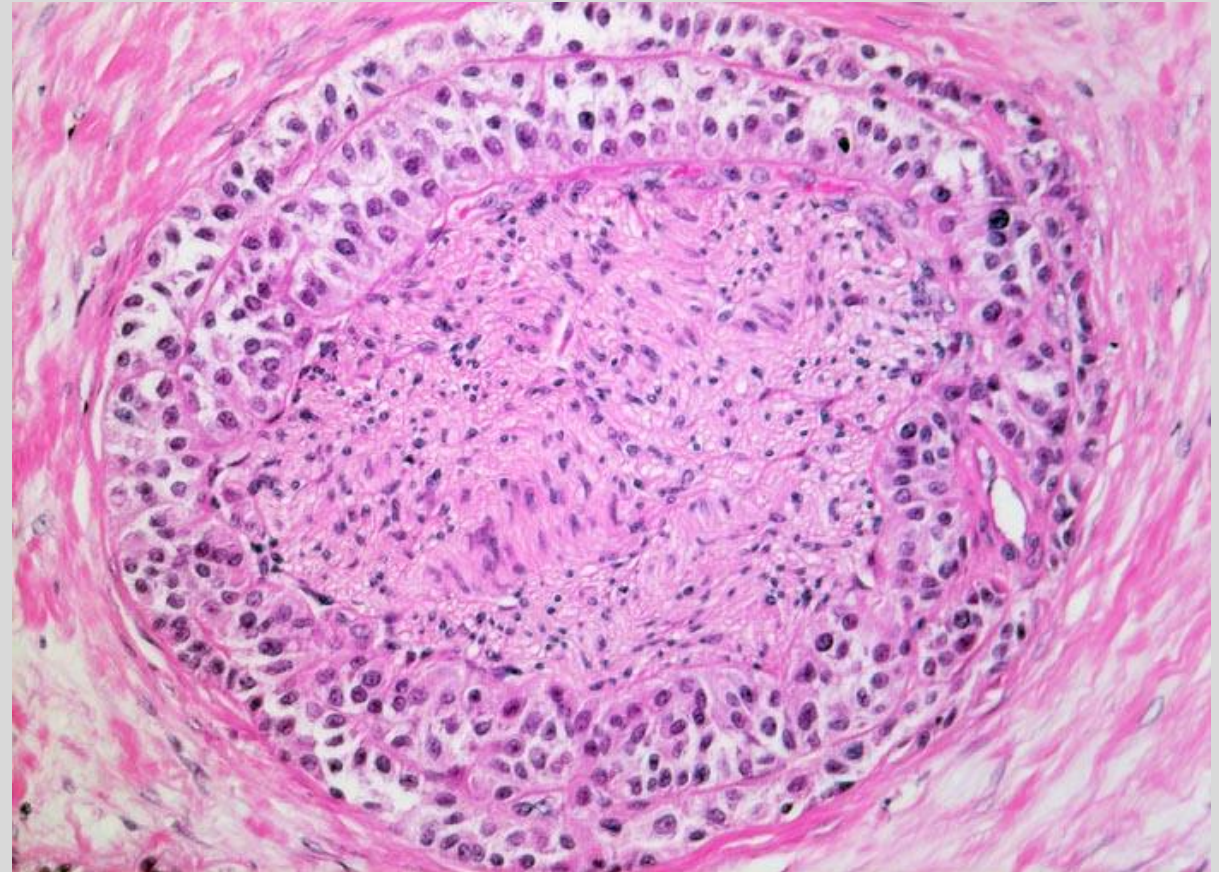


Urothelial carcinoma
of the renal pelvis &
upper calyx. The kidney
has been opened to
expose the irregular
whitish friable neoplasm.

Urothelial carcinoma



poorly differentiated: clear cell change



nerve sheath invasion

CYSTITIS

- inflammation of the urinary bladder
- a common disorder encountered in practice
- secondary to infection & risk factors: age and sex, bladder outlet obstruction, diabetes mellitus, immunodeficiency radiation therapy or chemotherapy
- can be acute or chronic

Acute cystitis

Special forms :

- hemorrhagic
- suppurative
- ulcerative

Chronic cystitis

Special forms :

- cystitis follicularis
- eosinophilic cystitis
- chronic specific cystitis -> tuberculosis



Acute hemorrhagic
ulcerative cystitis



**Chronic
cystitis,
gross**

<http://alf3.urz.unibas.ch/pathopic/e/getpic-fra.cfm?id=008369>

URINARY BLADDER NEOPLASMS

- mainly epithelial (98% - transitional cell neoplasms)
- **PRIMARY: 98% are epithelial tumors, urothelial cells as histogenesis**
- **a spectrum from benign papillomatous lesions, carcinoma *in situ*, invasive and metastatic urothelial cell carcinomas (to lungs, brain, bones)**

Types of *primary malignant tumors* :

- **papillary urothelial / transitional cell carcinoma** (most frequent)
 - squamous cell carcinoma
 - adenocarcinoma
 - mesenchymal tumors
- } rare

Metastatic tumors :

- especially by direct extension (from cervix, prostate, colon)
- some from remote distance (melanoma, carcinomas of the stomach, breast, lung)



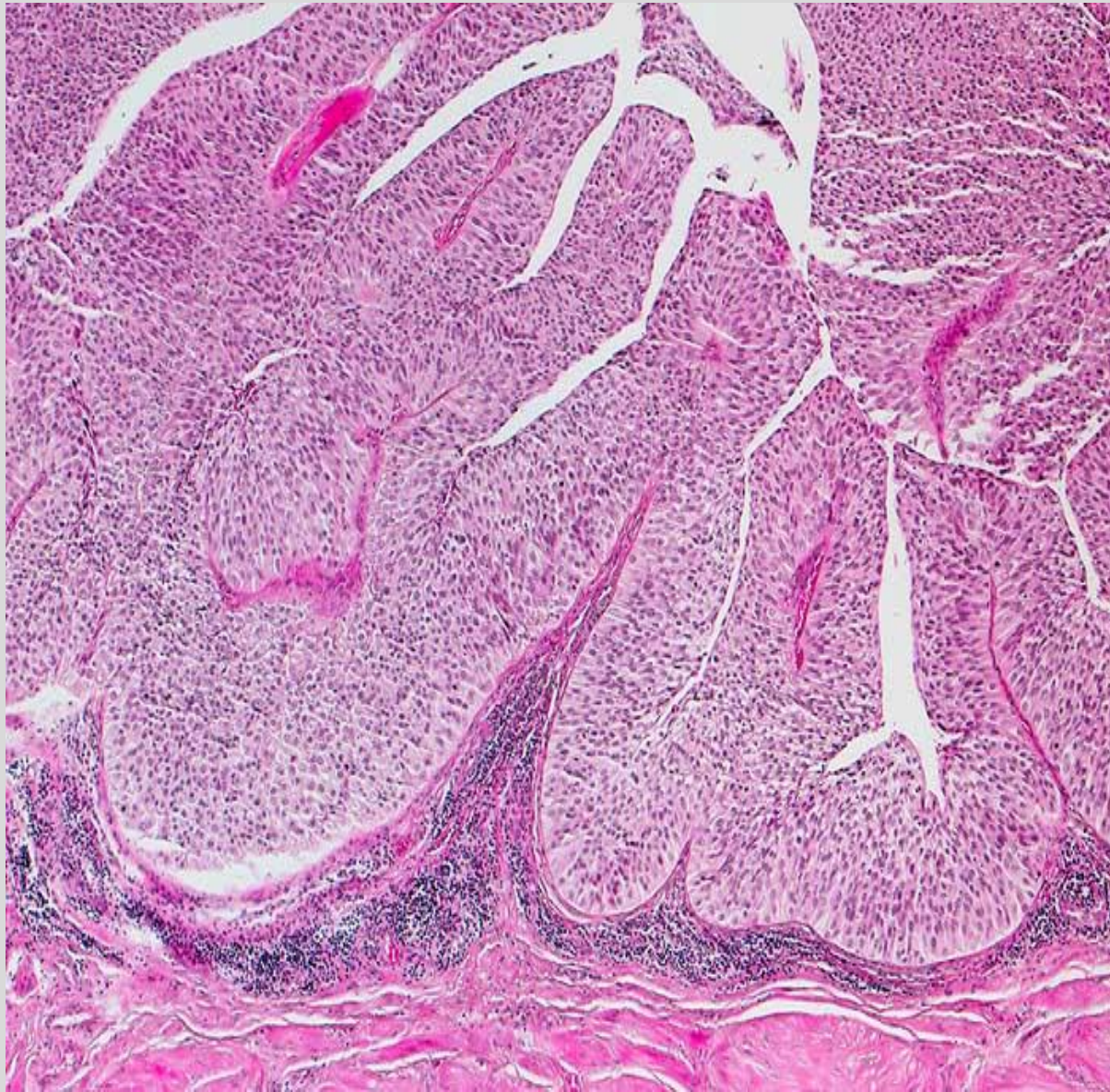
Squamous cell carcinoma of
the urinary bladder

PAPILLARY UROTHELIAL CARCINOMA

- papillary and exophytic – usually more differentiated
- infiltrating – usually more anaplastic

WHO grading :

- **Grade 1**
 - papillary projections lined by urothelial cells with minimal nuclear pleomorphism and mitotic activity ; limited fusion of the papillae
- **Grade 2**
 - intermediate histo- and cytologic features, between grade 1 and 3
- **Grade 3**
 - significant nuclear pleomorphism, frequent mitoses, fusion of the papillae
 - squamous differentiation, bizarre cells often found



<http://alf3.urz.unibas.ch/pathopic/e/getpic-fra.cfm?id=006542>

Endoscopic specimen, gross



<http://alf3.urz.unibas.ch/pathopic/e/getpic-fra.cfm?id=009501>

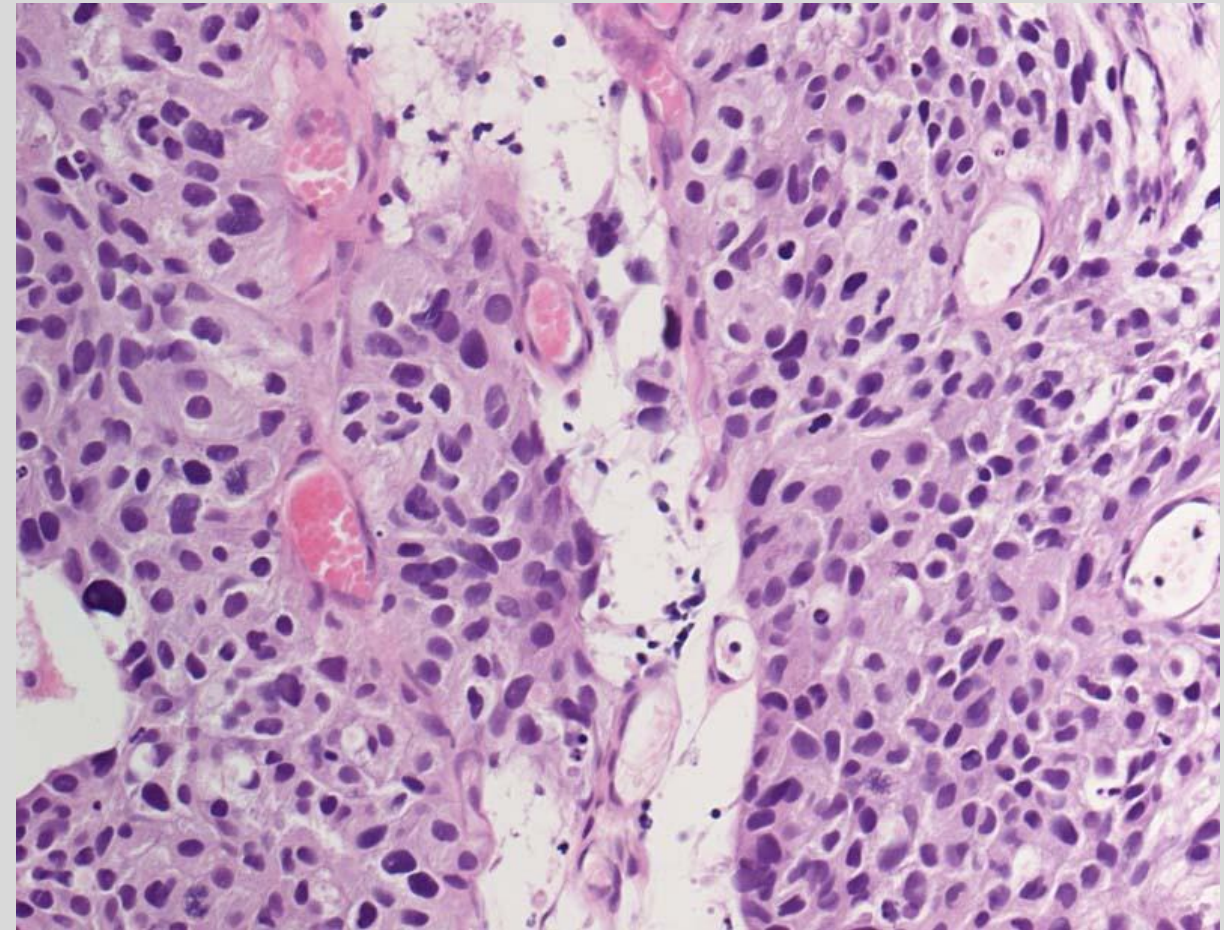
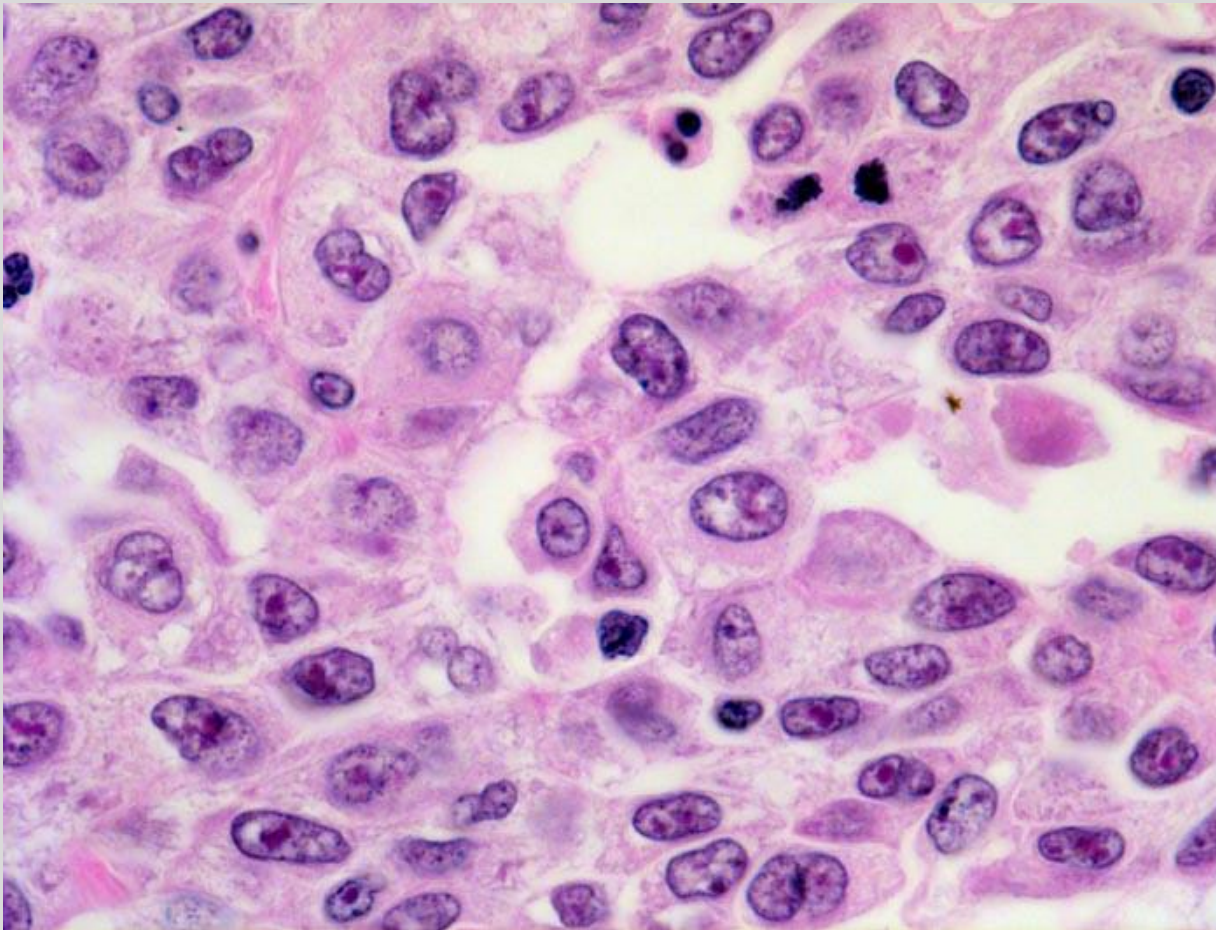
Low-grade (G1) urothelial carcinoma of the bladder



High-grade urothelial carcinoma of the bladder



High-grade (G3) urothelial carcinoma of the bladder





High-grade
urothelial carcinoma
of the bladder



KIDNEY AND URINARY TRACT PATHOLOGY

MALE GENITAL TRACT PATHOLOGY

ORCHITIS

- acute or chronic inflammation of the testis
- frequently in association with inflammation of the epididymis
- related to infections

Acute orchitis

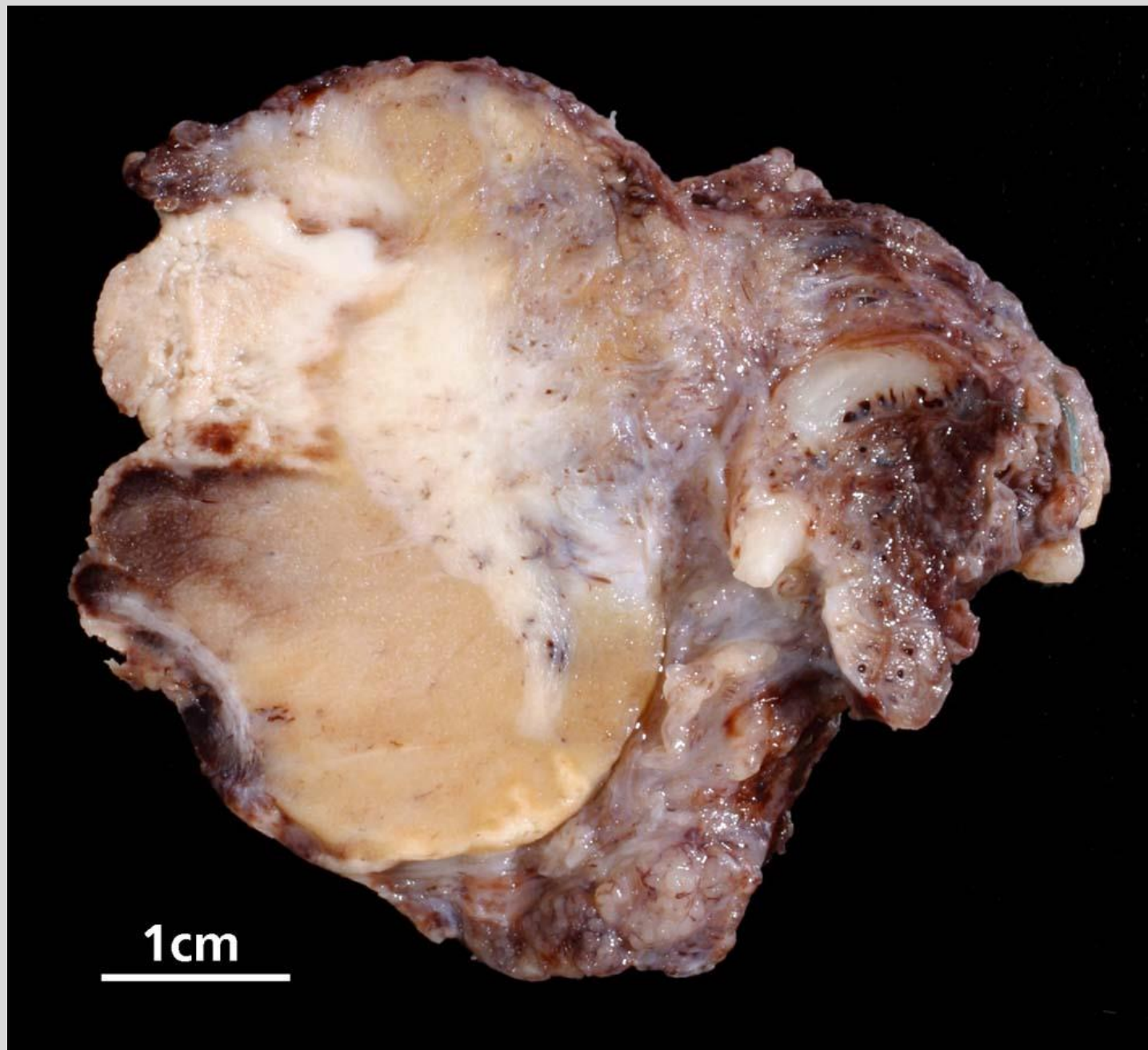
- *mumps orchitis* - most common viral form

Gross :

- congestion, edema

Microscopy :

- inflammatory cells in the interstitial connective tissue, extending adjacent structures
- can be followed by fibrous scarring (leading to sterility)



Orchitis and epididymitis

Chronic orchitis

Nonspecific granulomatous orchitis :

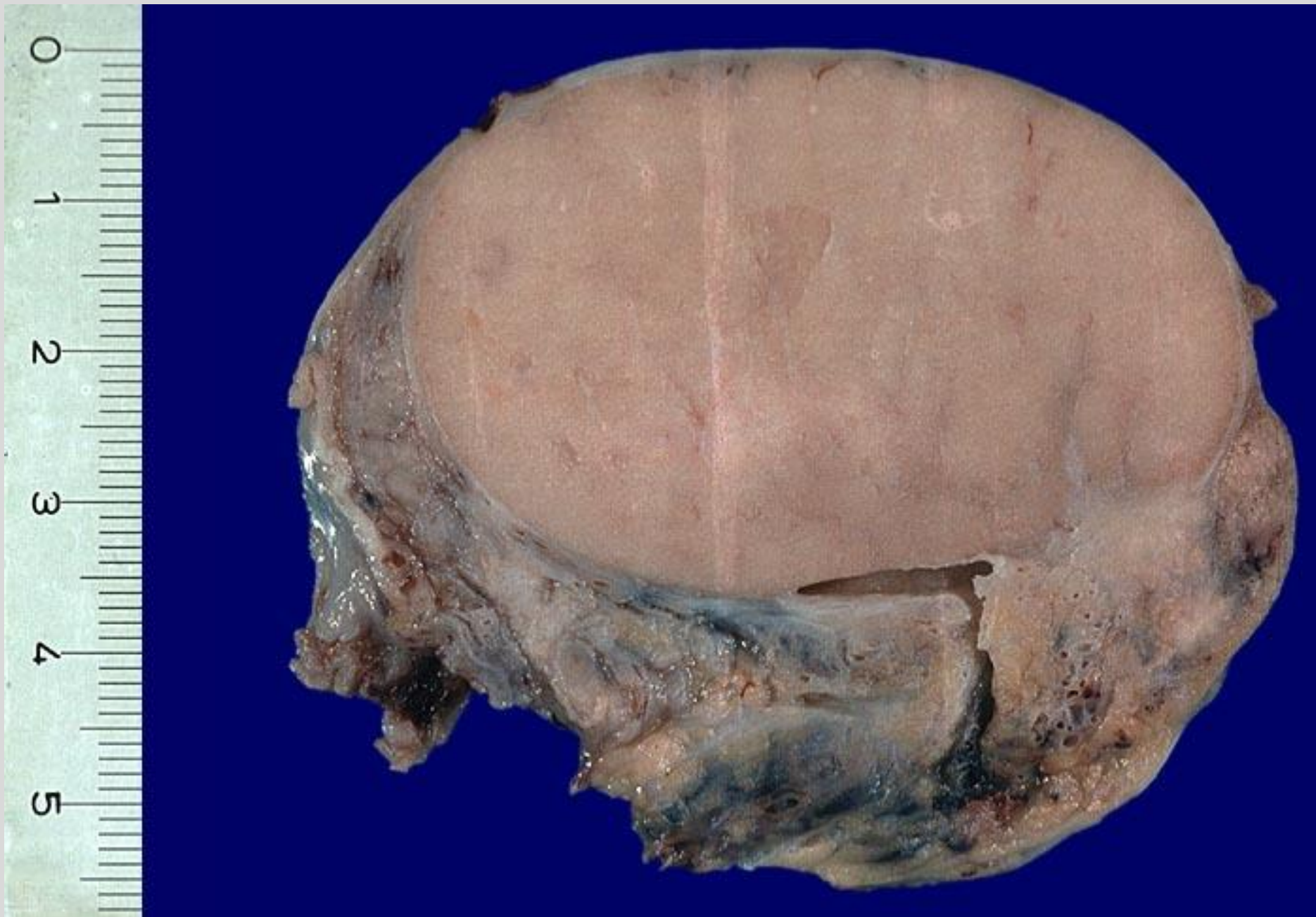
- moderately tender painless mass
- non caseating granulomas withing spermatic tubules and the inter-tubular connective tissue

Tuberculotic orchitis (specific) :

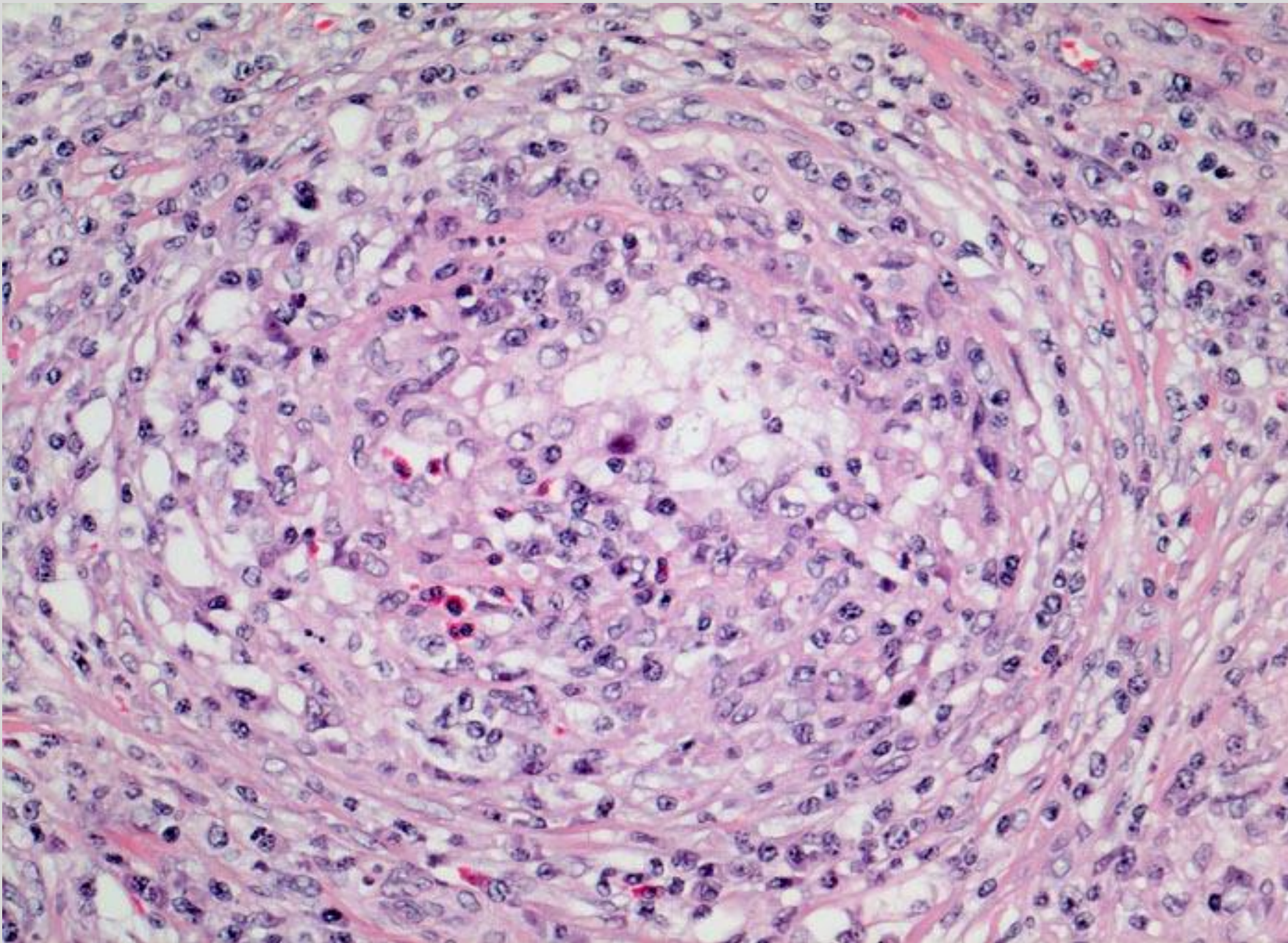
- swollen, sausage-like shaped epididymis
- tubercle follicles with caseating necrosis

Syphilitic orchitis (specific) :

- production of gummas
- diffuse interstitial chronic inflammation



Nonspecific
granulomatous
orchitis



Nonspecific
granulomatous orchitis

TESTICULAR TUMORS

- rare, but occurring in children and young adults
- two major categories : *germ-cell tumors* (90-95%) and *non-germinal tumors* (derived from stroma or sex cord)

Seminoma

Gross findings :

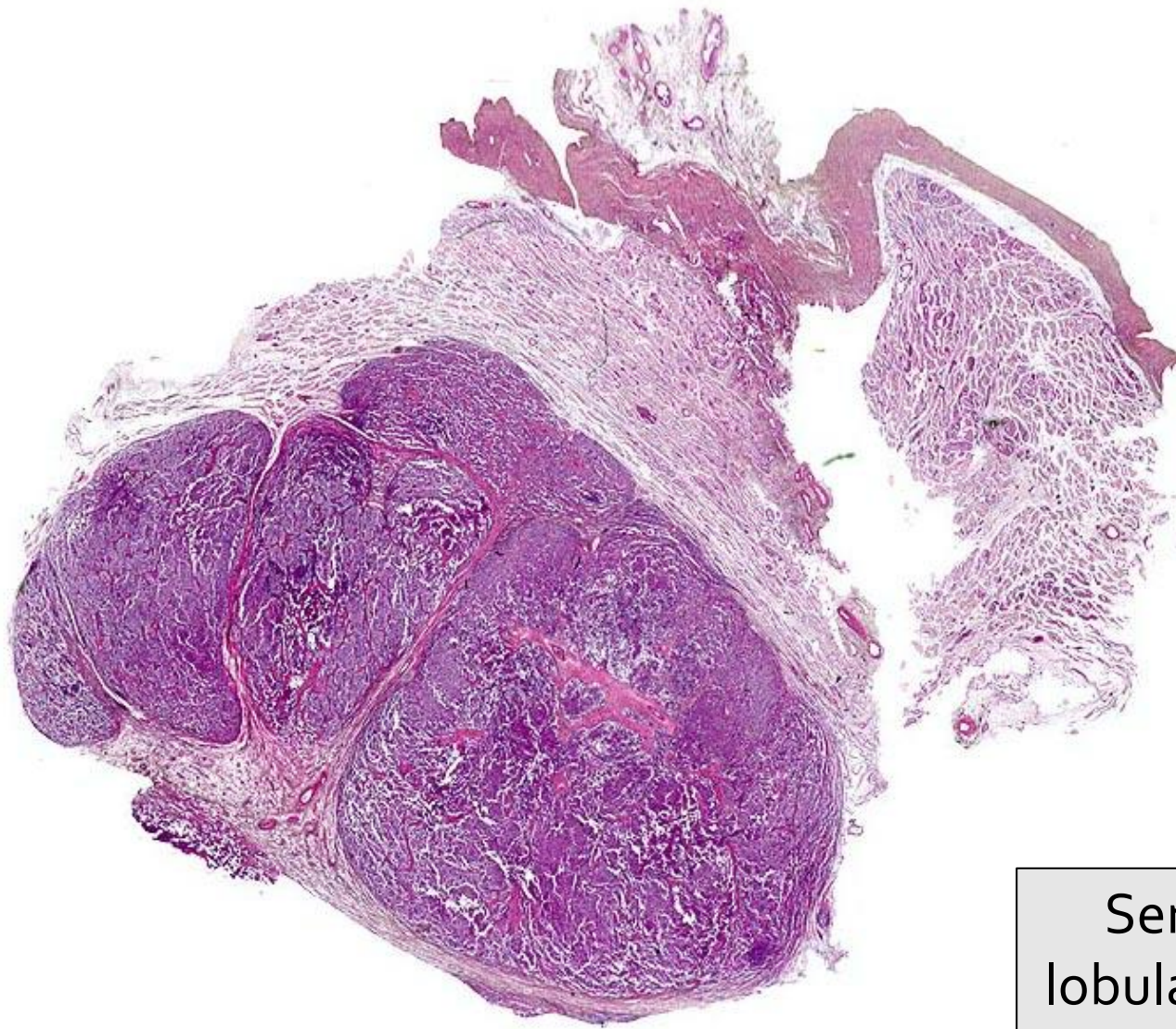
- homogeneous, gray-white, lobulated cut surface

Microscopically :

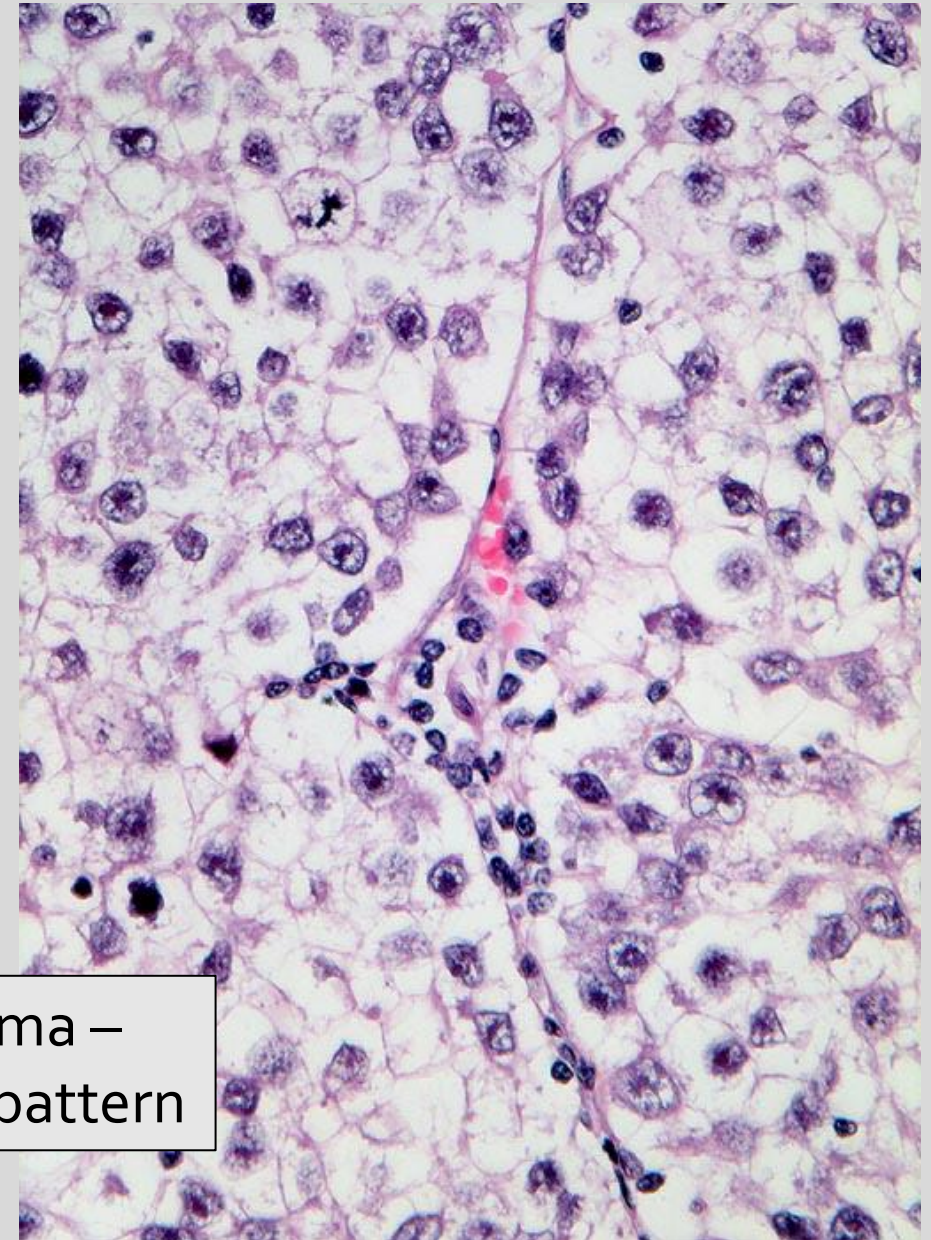
- uniform large cells (distinct cell membrane, clear cytoplasm, central hyperchromatic nucleus) arranged in
 - sheets, forming poorly demarcated lobules by delicate septa of fibrous tissue
- infrequent mitoses



Seminoma



Seminoma –
lobulated pattern



Embryonal carcinoma

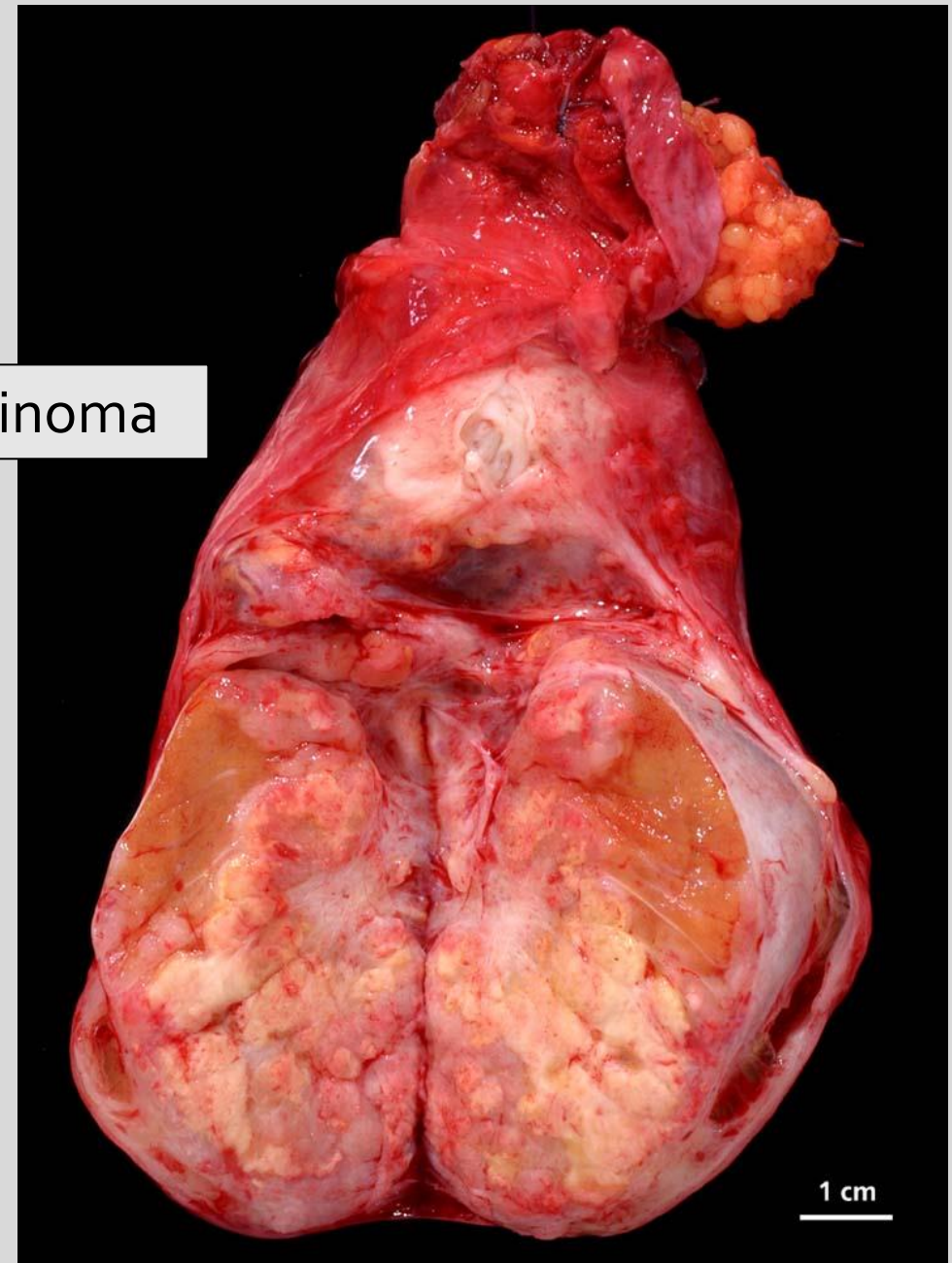
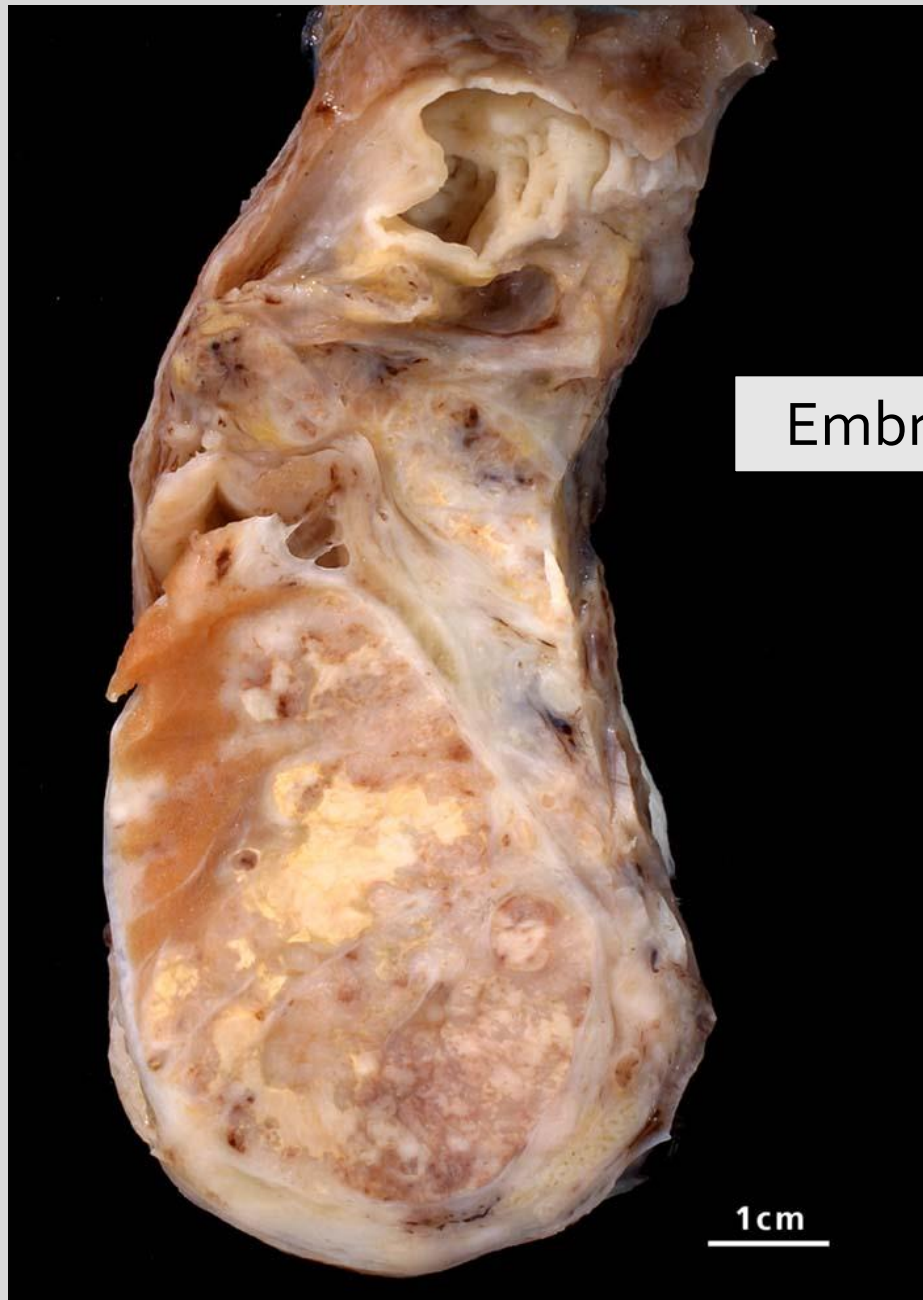
Gross findings :

- variegated, poorly demarcated mass
- punctuated by foci of hemorrhage or necrosis
- smaller than seminoma
- extension through epididymis or albuginea is frequent

Microscopically :

- large neoplastic cells of epithelial appearance, with indistinct cell borders, atypia, growing in
 - glandular, alveolar, tubular patterns
- frequent mitotic figures

Embryonal carcinoma



Embryonal carcinoma

trabecular pattern

vascular invasion

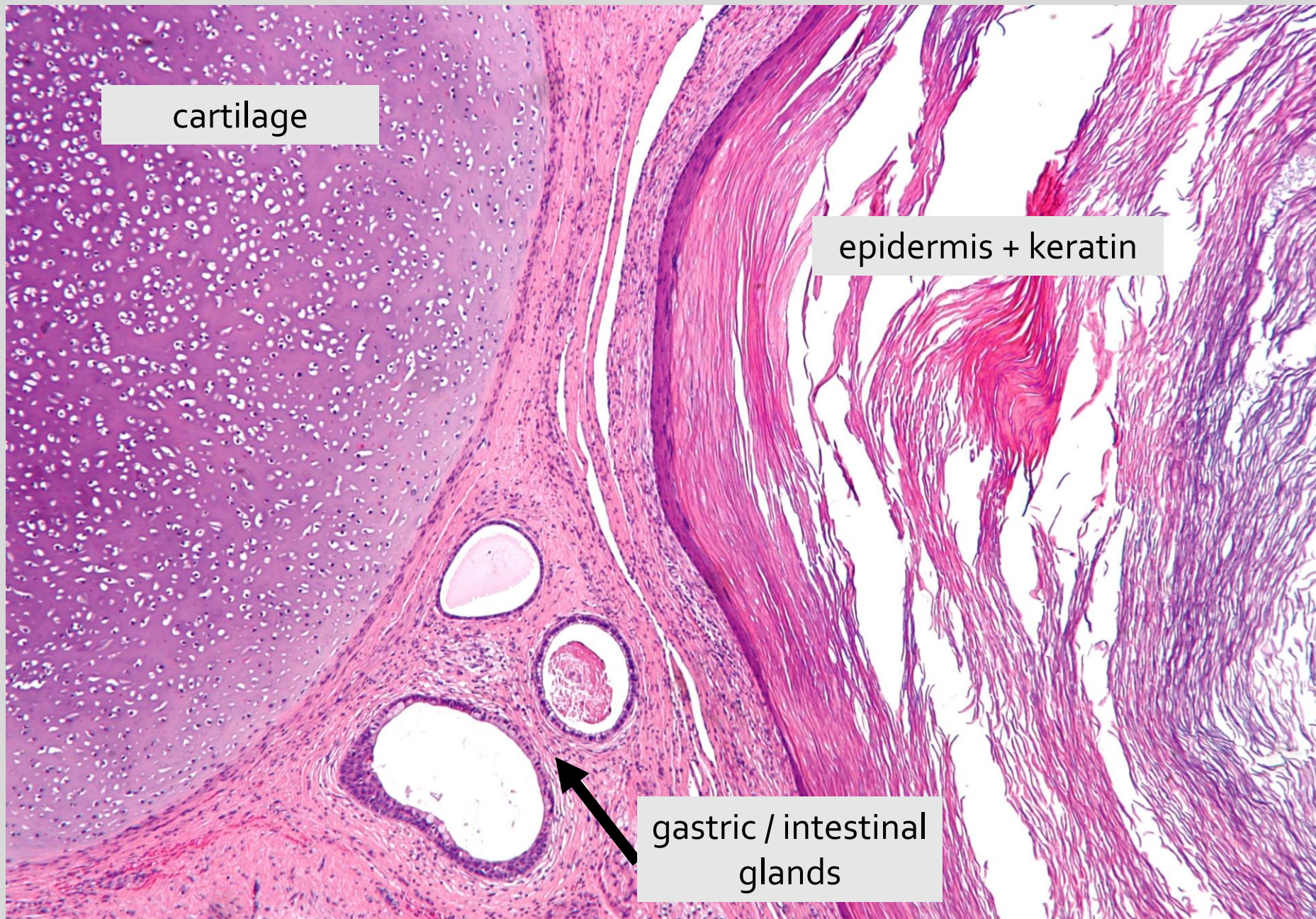
Teratoma

Gross findings :

- large, heterogenous appearance
- solid areas interspersed with cysts

Microscopically :

- *mature teratomas*
 - differentiated cells or organoid structures originated from all 3 germ cell layers
- *immature teratomas*
 - elements from all 3 germ cell layers, incompletely differentiated and without any organoid arrangement
- *teratomas with malignant transformation*



cartilage

epidermis + keratin

gastric / intestinal
glands

Mature teratoma

PROSTATITIS

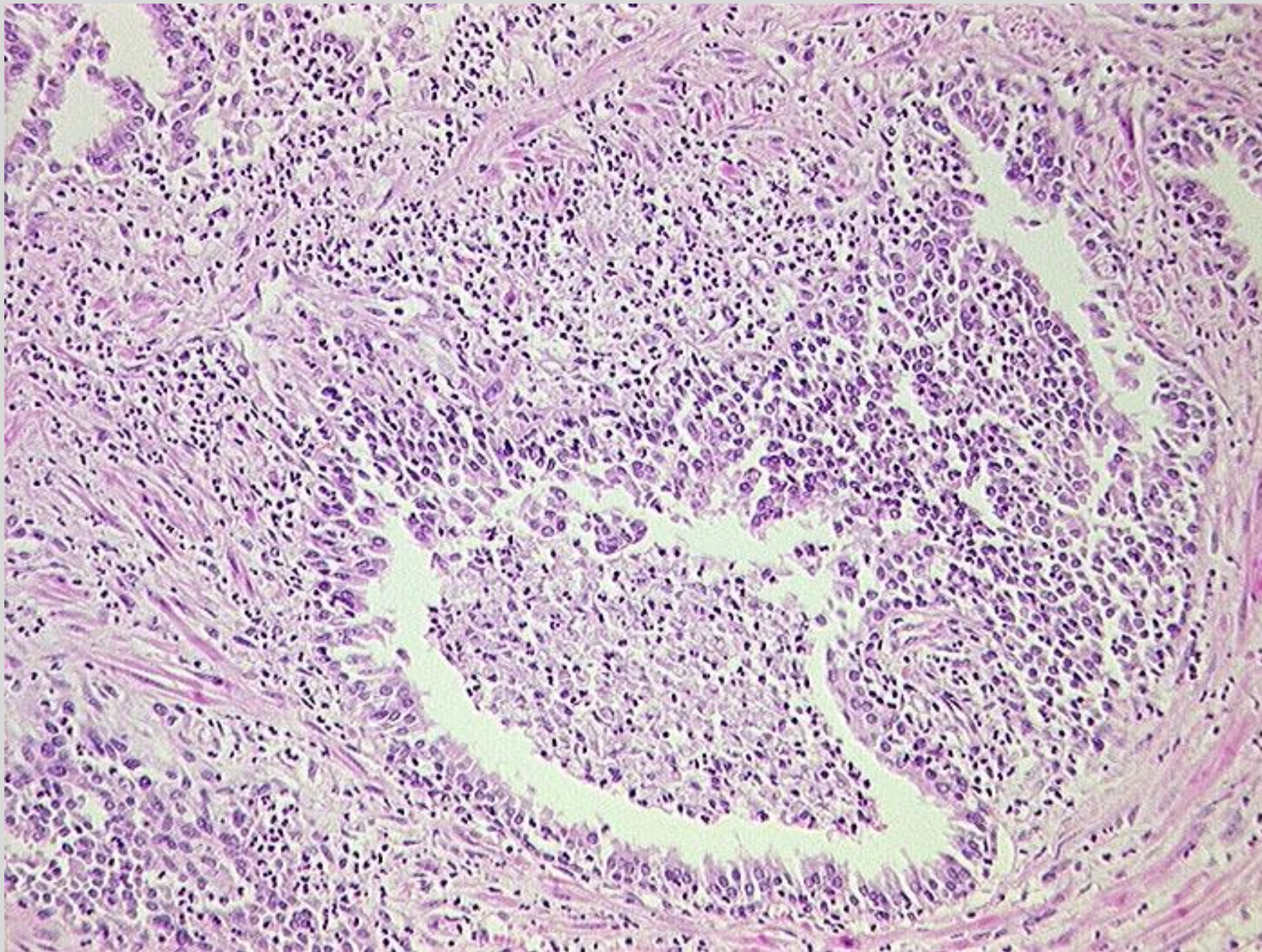
- inflammation of the prostate, following the reflux of the infected urine into the gland

Acute prostatitis

- caused by gram-negative bacteria (especially *E. coli*)

Histological findings :

- disseminated or coalescent abscesses
- suppurative necrosis
- interstitial edema
- vascular congestion



Acute prostatitis

Chronic prostatitis

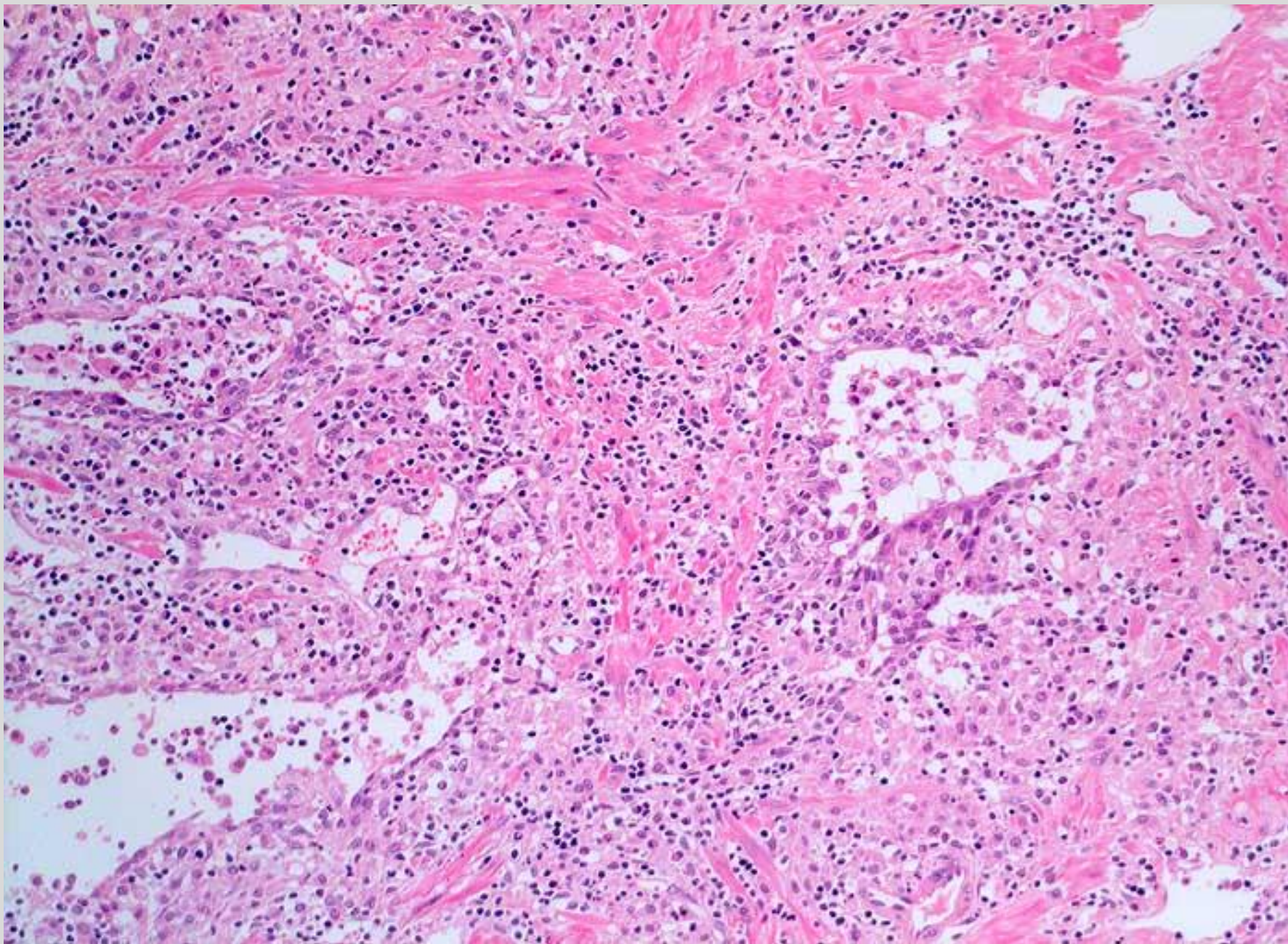
- often of insidious onset
- may follow an acute episode
- may undergo subsequent fibrosis with urethral obstruction

Non-specific form :

- aggregates of numerous lymphocytes, plasma cells and macrophages

Specific form :

- mainly *tuberculous prostatitis*
 - with caseating granulomas



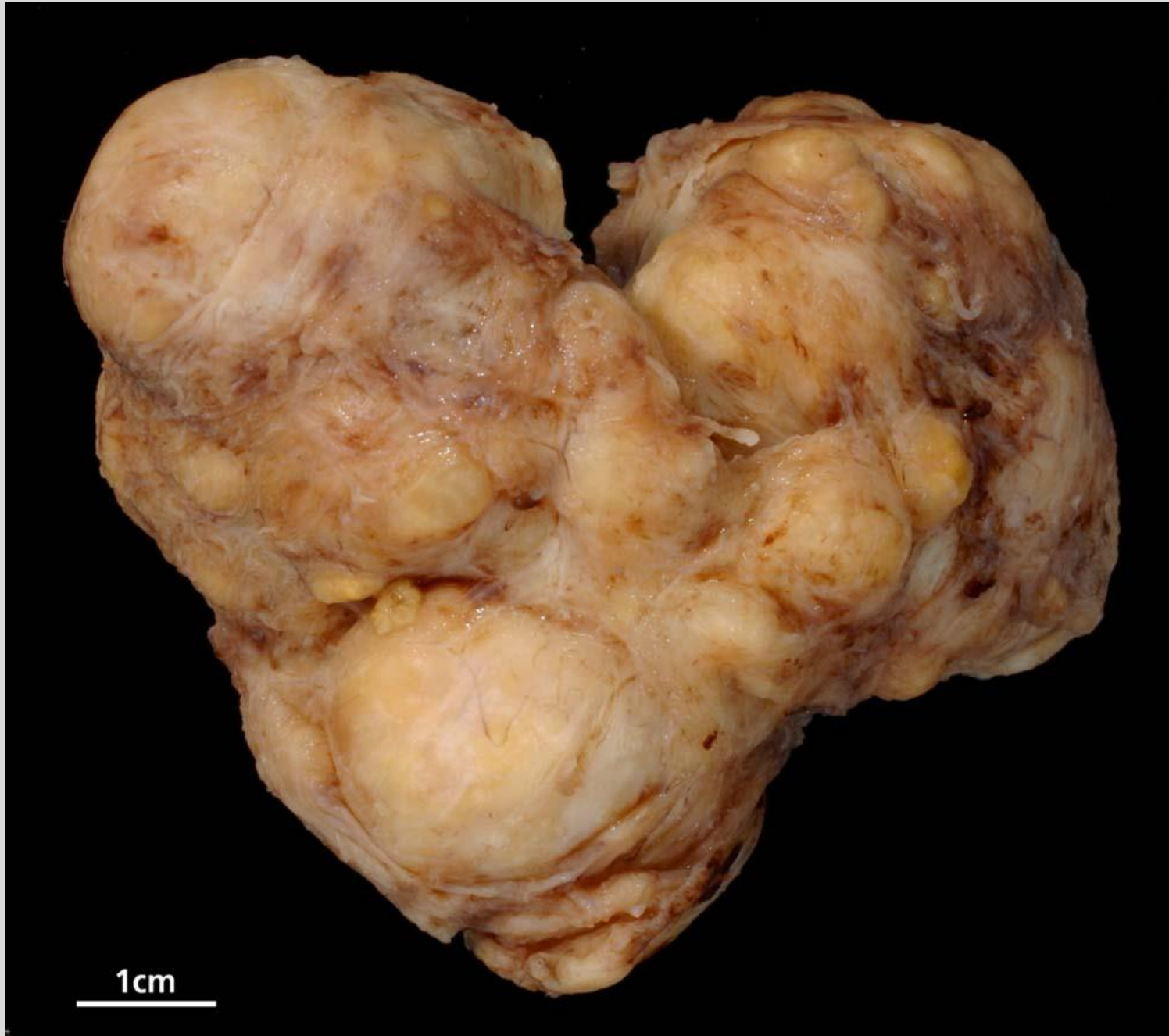
Chronic prostatitis

NODULAR PROSTATIC HYPERPLASIA

- the formation of large nodules in the periurethral region of the prostate
- involving both the glandular tissue and the fibromuscular stroma

Gross findings :

- nodules with mainly *glandular proliferation* :
 - yellow-pink
 - sponge-like consistency, with milky white prostatic fluid
- nodules with mainly *fibromuscular proliferation* :
 - pale-gray
 - tough, without fluid



Nodular prostatic
hyperplasia

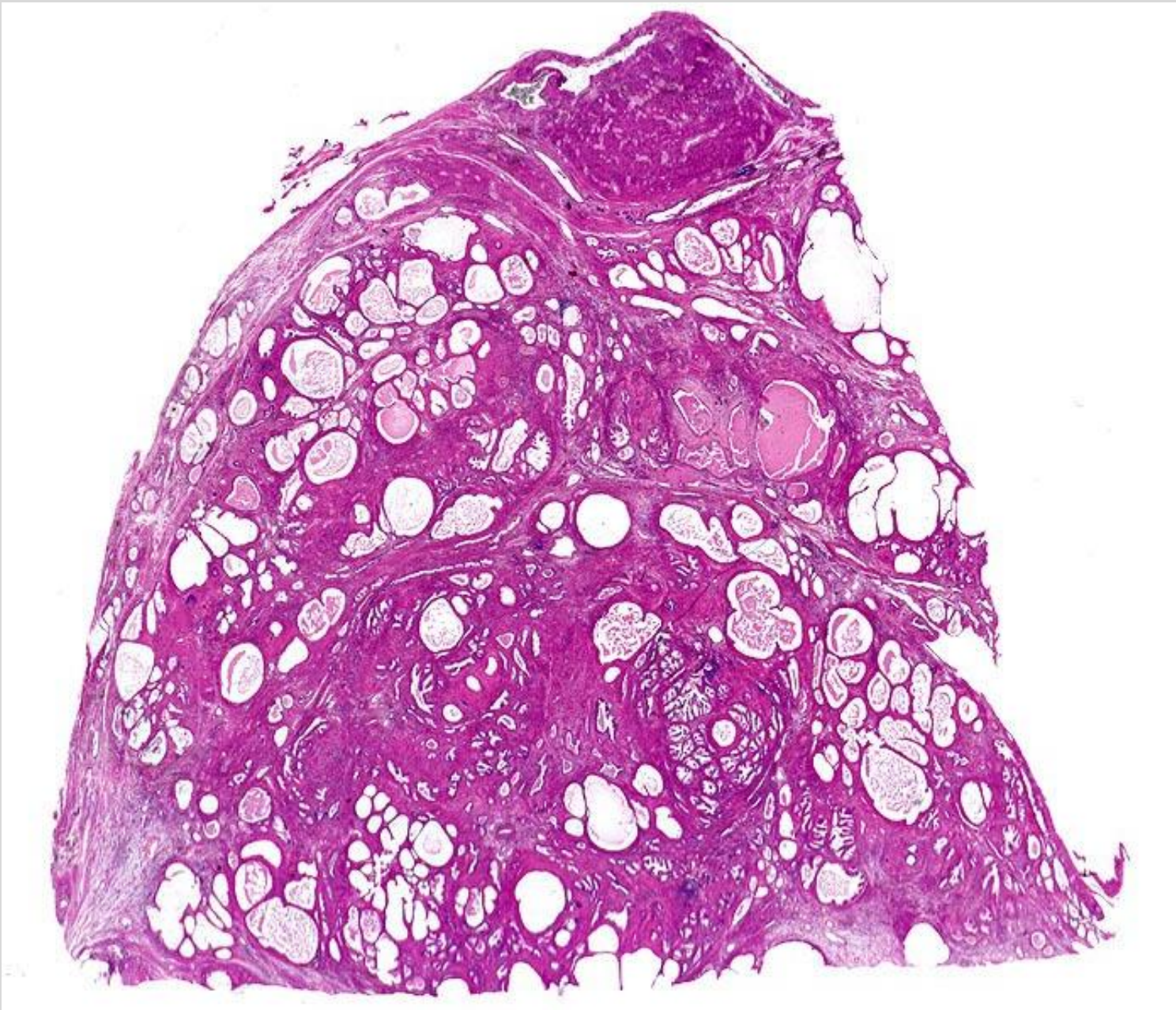


Nodular prostatic
hyperplasia

NODULAR PROSTATIC HYPERPLASIA

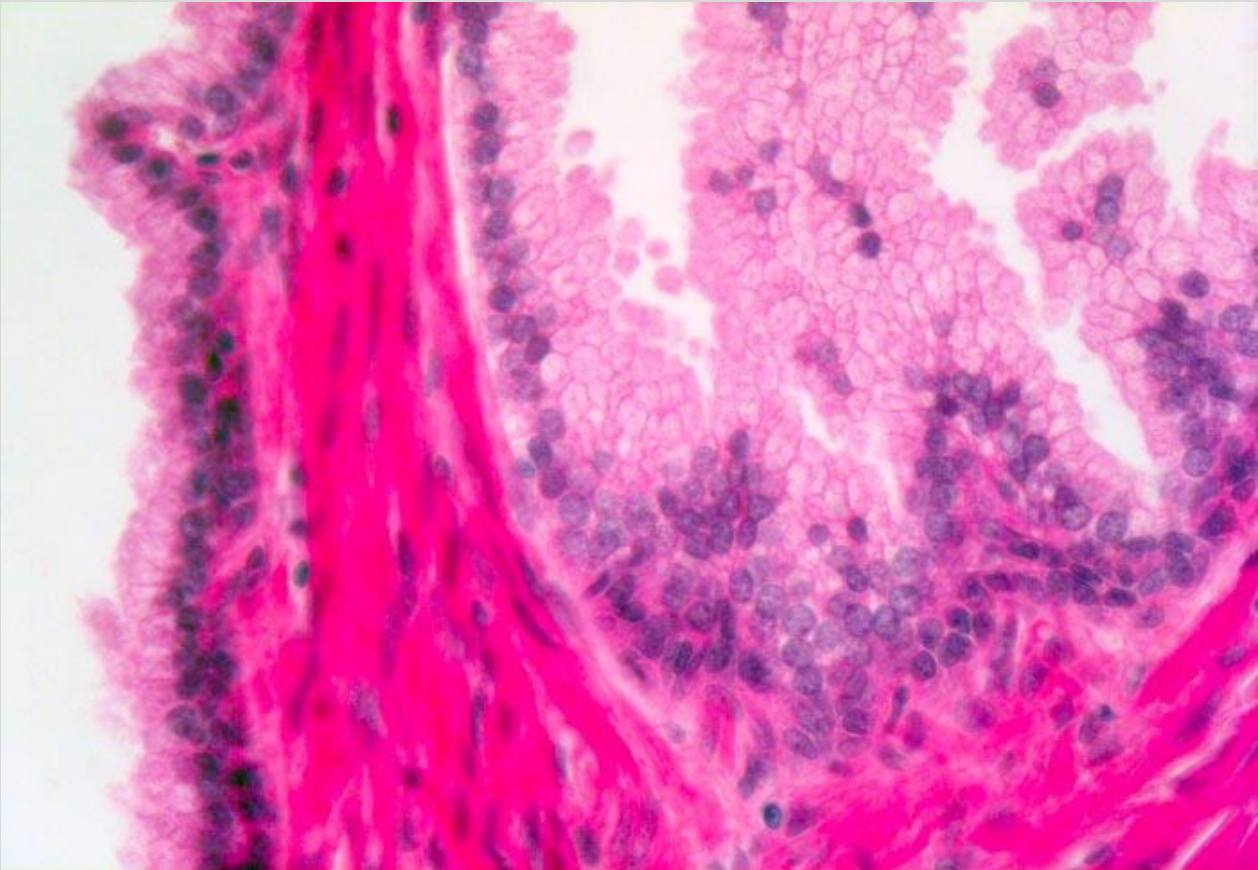
Microscopic findings :

- nodularity produced by :
 - glandular proliferation (adenoma)
 - +/- glandular dilatation (cysts)
 - fibro-muscular proliferation of the stroma (fibroma, leiomyoma)
 - glandular structures lined by **two** cellular layers :
 - *inner columnar*
 - *outer flattened*
 - on an intact basement membrane
- } fibroleiomyoadenoma
(most common)

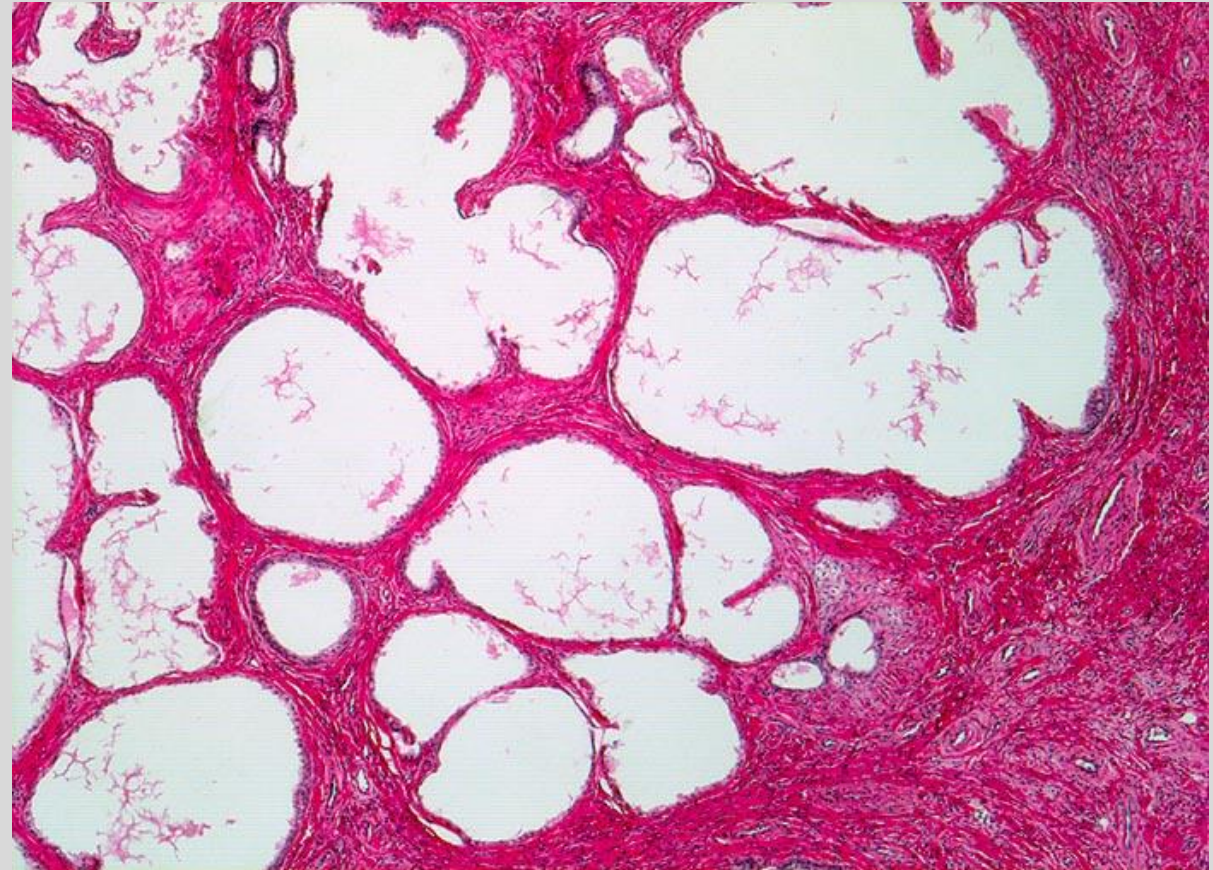


Nodular prostatic
hyperplasia

Nodular prostatic hyperplasia



papillary strands, lined by two cell layers



nodules with glandular dilatation

NODULAR PROSTATIC HYPERPLASIA

Complications :

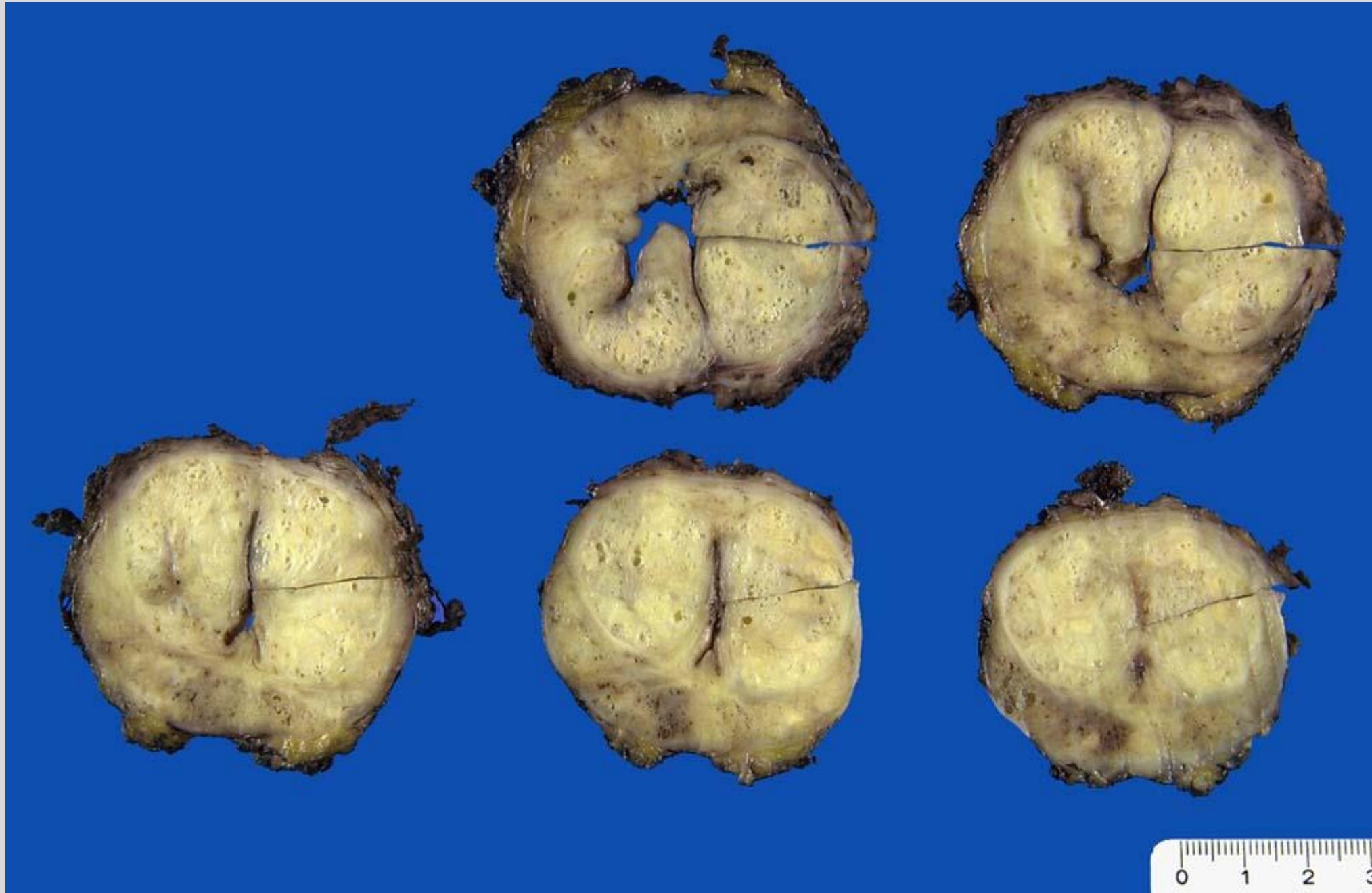
- *compression* of the urethra with difficulty in urination
- *cystitis, pyelonephritis*
- *secondary changes in the bladder* : hypertrophy, diverticulum formation, stones
- *hydronephrosis*

PROSTATE CANCER

- disease of elderly men
- responsiveness to castration and exogenous estrogens

Gross findings :

- multicentric tumor, usually located in the peripheral (posterior) zone of the gland
- irregular, yellow-white, indurated subcapsular nodules
- often invasive, involving seminal vesicles and the base of the urinary bladder



Prostate
cancer



Prostate
adenocarcinoma


PROSTATE CANCER

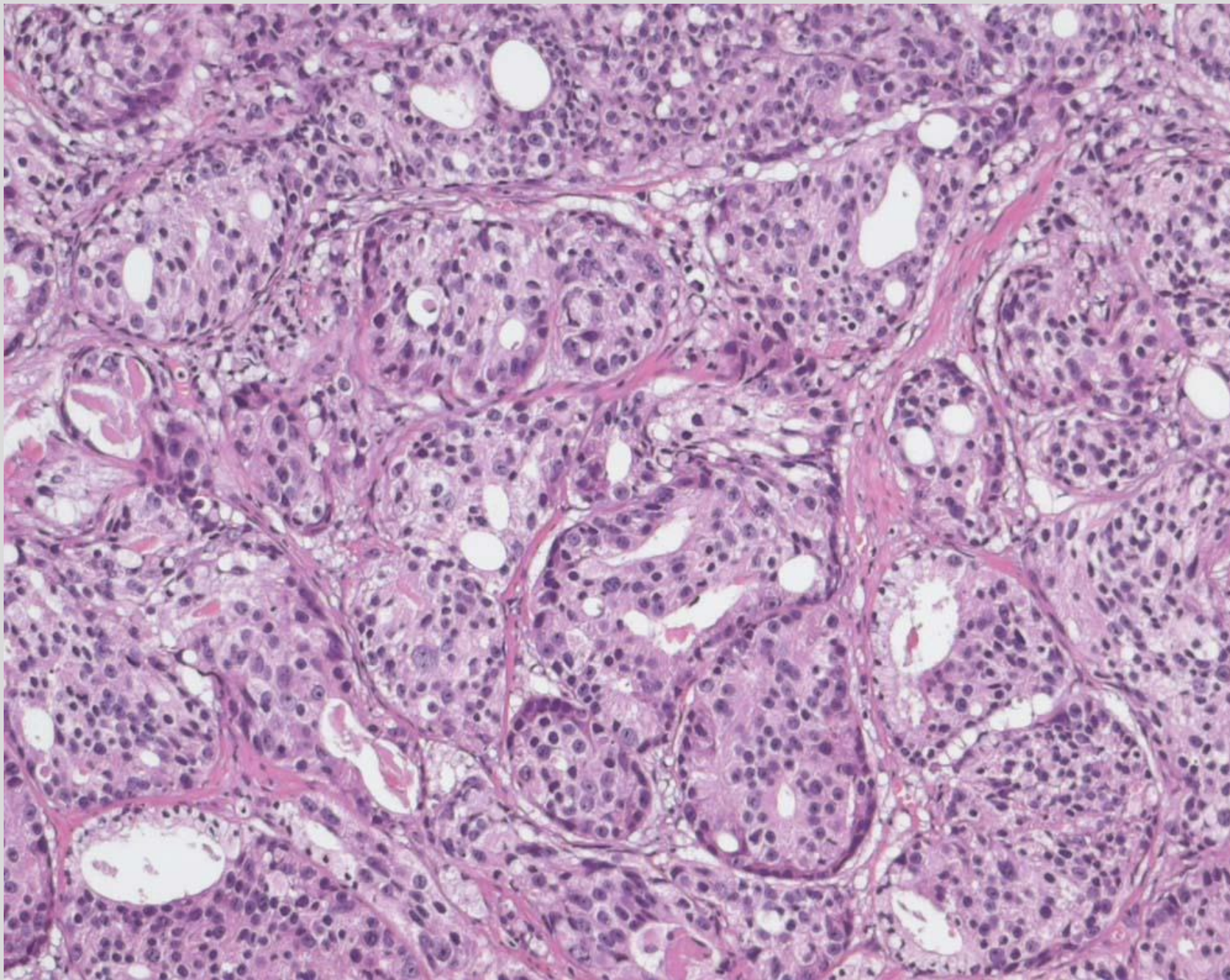
- mostly *adenocarcinomas* (98% of primary prostatic tumors)

Microscopic findings :

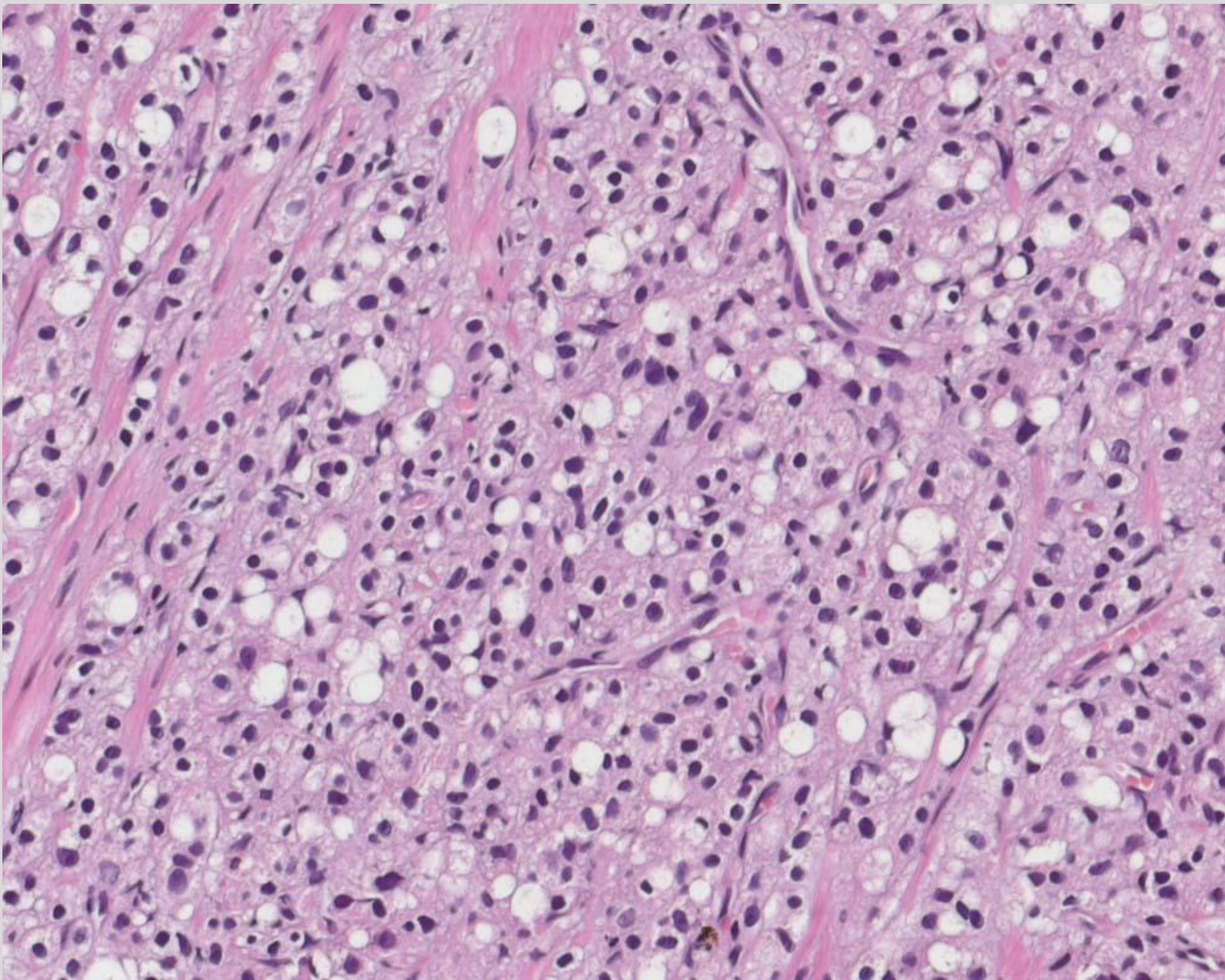
- small to medium sized glands, lacking organization
 - lined by a **single** layer of cuboidal cells
- stromal infiltration

the most employed criterion
to establish the diagnosis

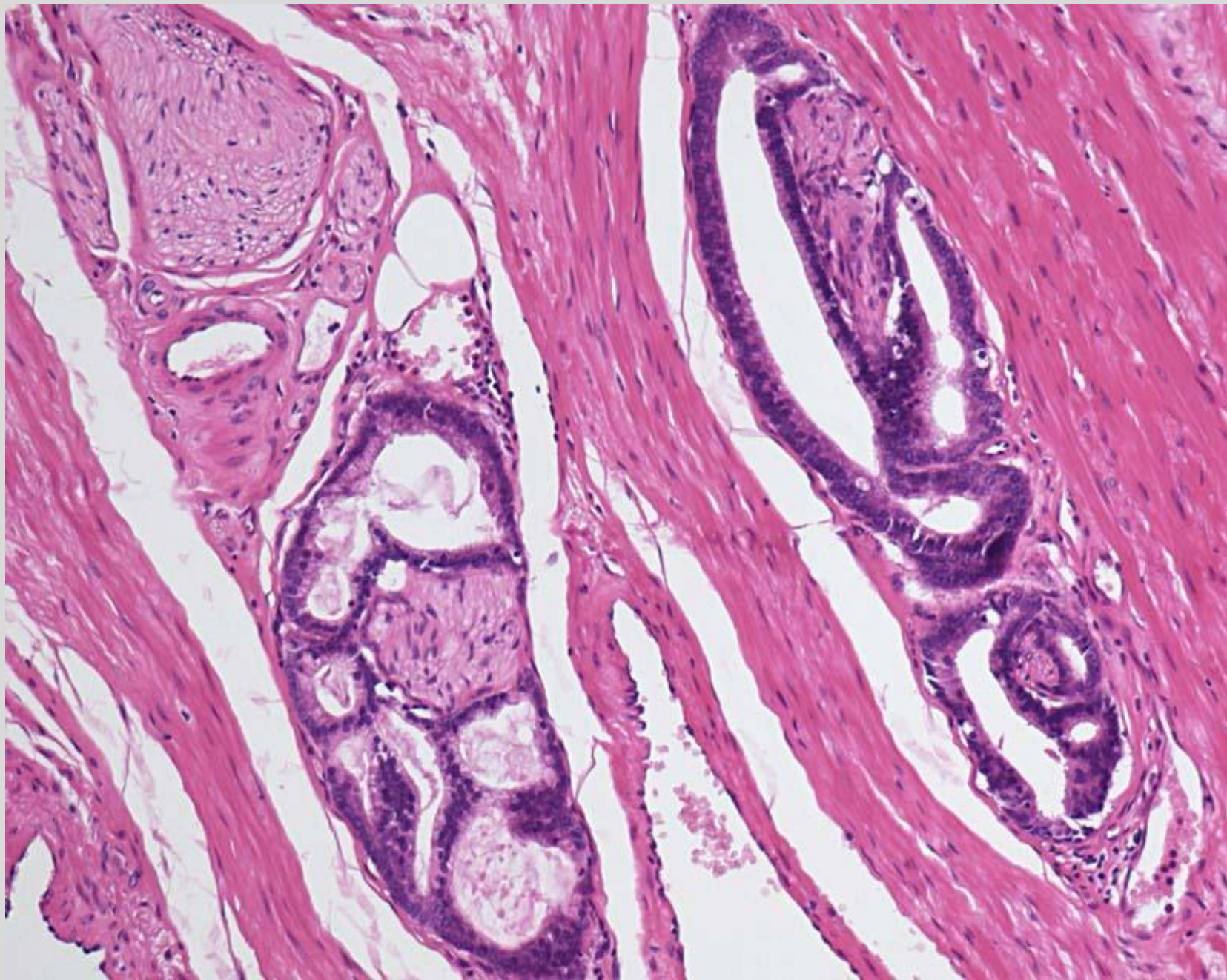




Prostatic
adenocarcinoma
– Gleason 4



Prostatic
adenocarcinoma
– Gleason 5



Prostatic
adenocarcinoma –
perineural invasion

PROSTATE CANCER

Progressive loss of differentiation of prostatic adenocarcinoma, is given by :

- increasing variability of gland size and configuration
- papillary and cribriform patterns
- rudimentary (or no) gland formation, with solid cords of tumor cells

The most widely used grading system is the **Gleason grading system**.