



# **PATHOLOGY OF PYELONEPHRITIS, NEPHROLITHIASIS AND CYSTITIS**

HALA KFOURY, MD

# OBJECTIVES

Recognize the predisposing factors for infections of the kidney and urinary tract.

Describe the different types of infections in the kidney and urinary tract.

Recognize the clinicopathological features of acute and chronic pyelonephritis.

Describe the causes of urinary tract obstruction.

Recognize drug induced nephritis

# INFECTIONS OF URINARY TRACT

## **Upper Urinary tract**

Pyelonephritis-

Acute

Chronic

## **Lower Urinary tract**

ureteritis

cystitis

urethritis

# DEFINITION

**Pyelonephritis: one of the most common diseases of the kidney and is defined as inflammation affecting the tubules, interstitium, and renal pelvis.**

# ROUTE OF INFECTION

## Ascending infection

- More than 85% of cases of urinary tract infection are caused by the gram-negative bacilli that are normal inhabitants of the intestinal tract.**

- This is the most common route of infection

## Hematogenous infection

# PREDISPOSING CONDITIONS- ACUTE PYELONEPHRITIS

*Urinary tract obstruction, either congenital or acquired*

*Instrumentation of the urinary tract*

*Vesicoureteral reflux*

*Pregnancy..*

*Gender and age..*

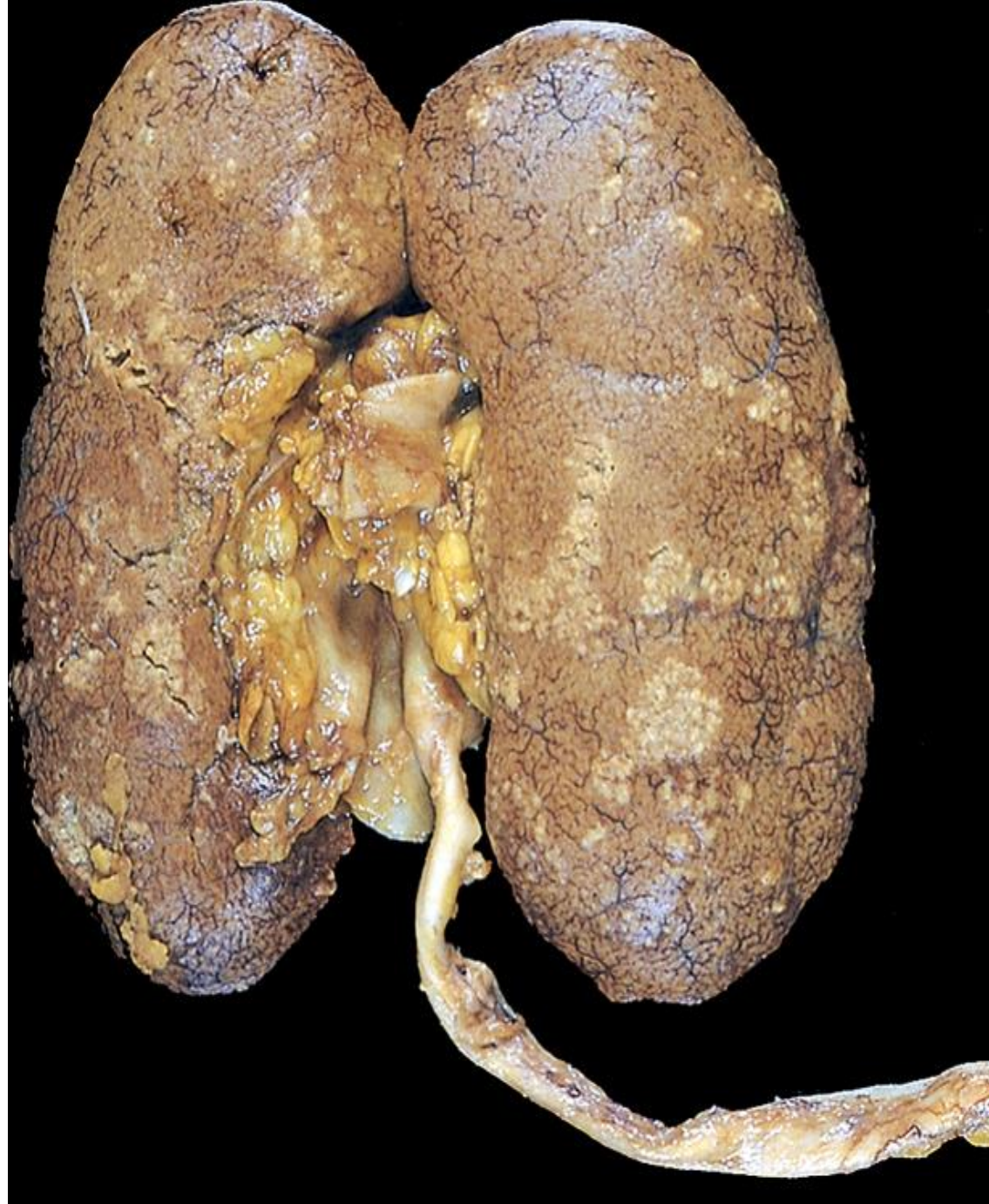
*Preexisting renal lesions, causing intrarenal scarring and obstruction*

*Diabetes mellitus*

*Immunosuppression and immunodeficiency*

# COMPLICATIONS -ACUTE PYELONEPHRITIS

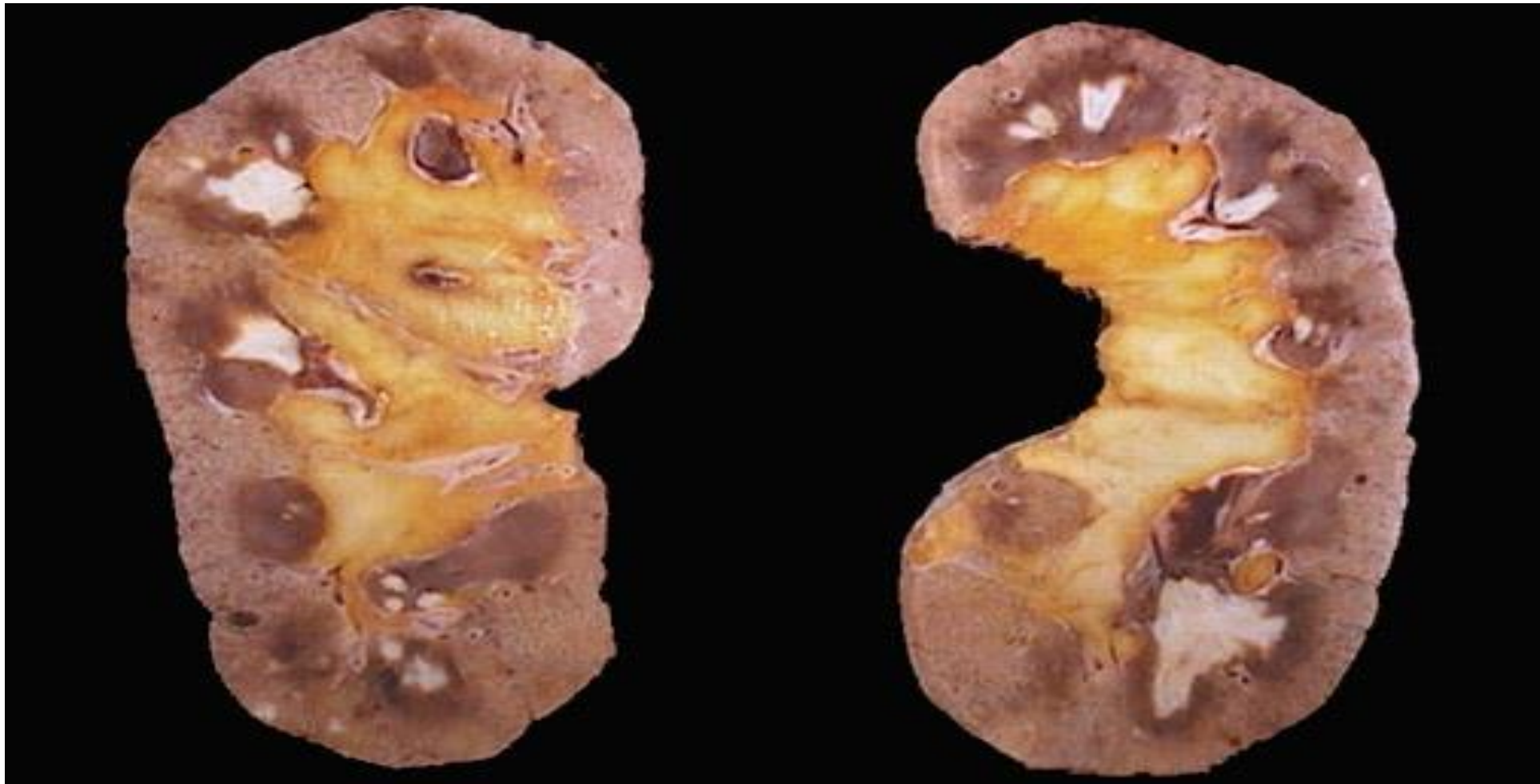
- 1 Papillary necrosis**
- 2 Pyonephrosis**
- 3 Perinephric abscess**



Acute pyelonephritis.  
Cortical surface  
shows grayish white  
areas of  
inflammation and  
abscess formation

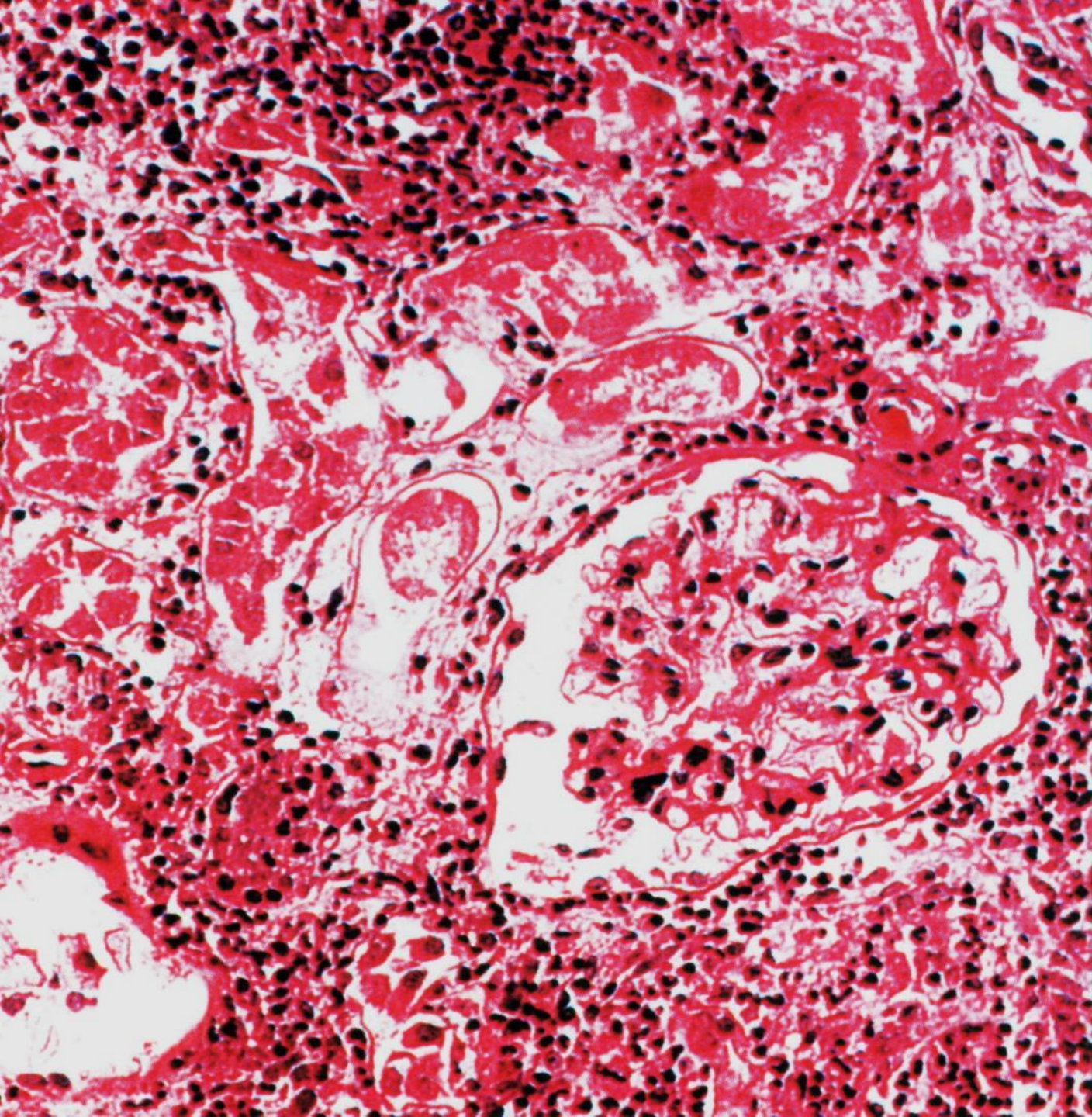


THE PALE WHITE AREAS INVOLVING SOME OR ALL OF MANY RENAL PAPILLAE ARE AREAS OF PAPILLARY NECROSIS

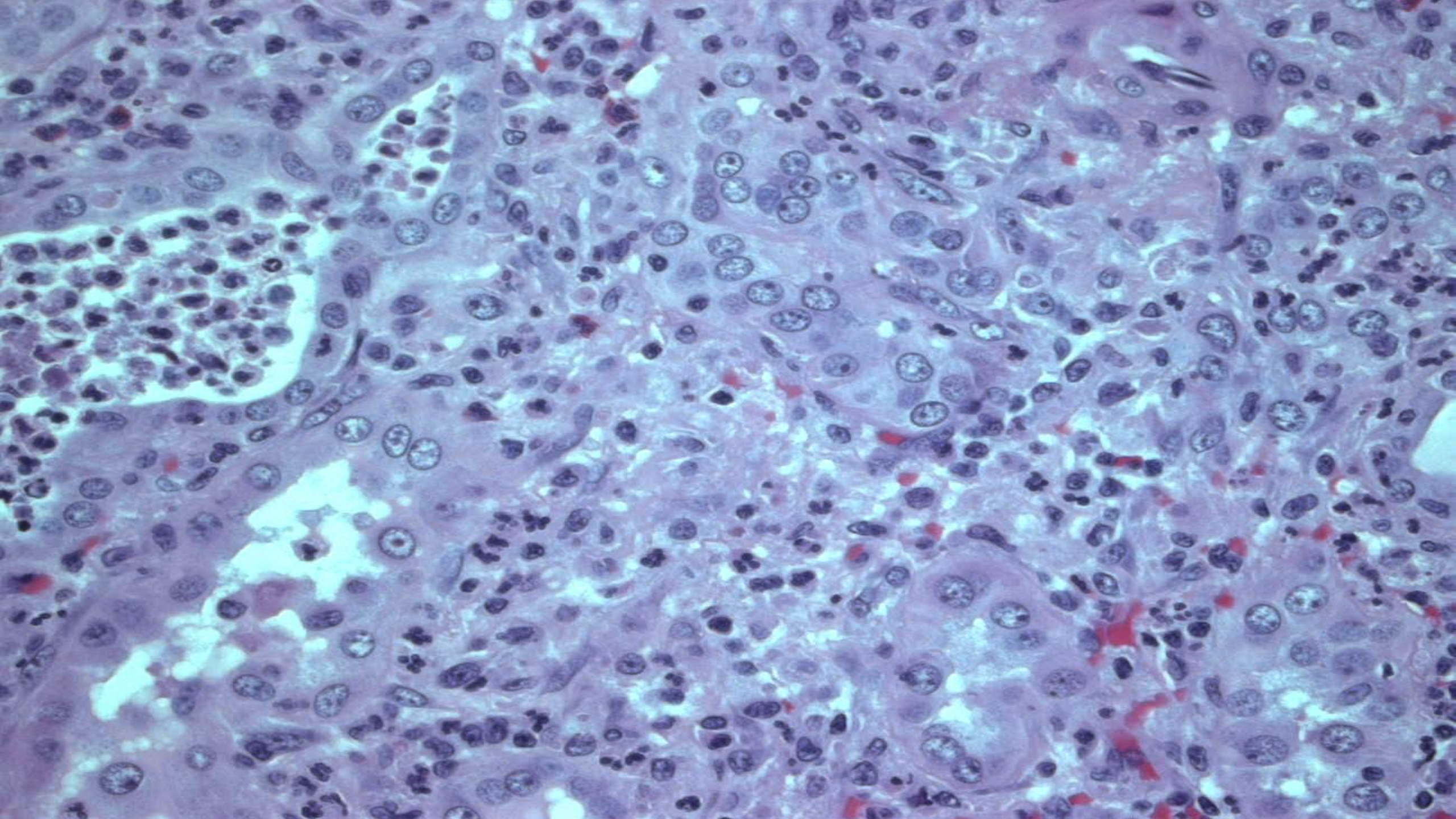


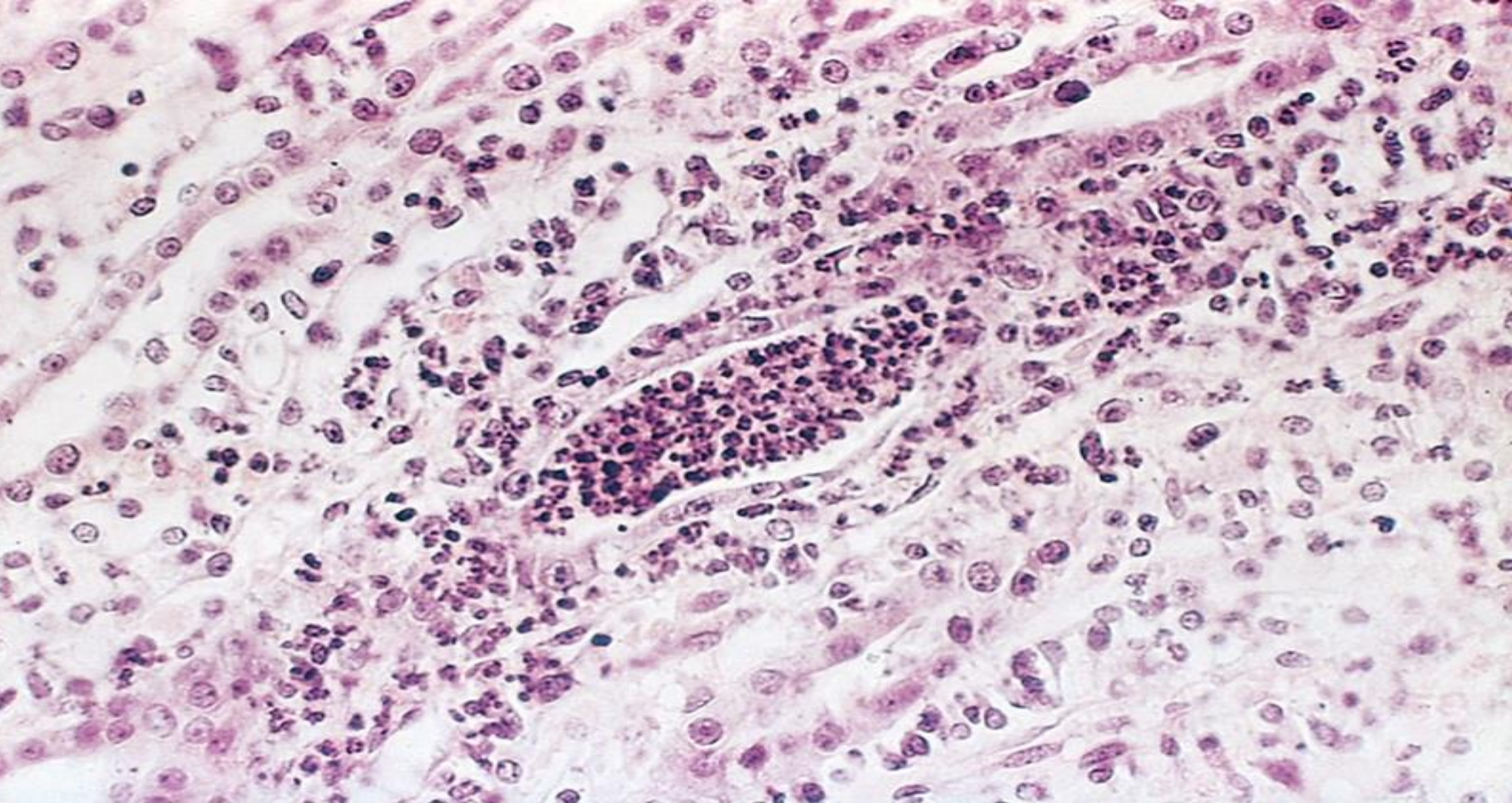


**ACUTE ON  
CHRONIC  
PYELONEPHRITIS  
WITH NUMEROUS  
SEPTIC FOCI  
PRESENT IN AN  
ALREADY SCARRED  
KIDNEY.**



**ACUTE  
PYELONEPHRITIS.  
THERE IS A  
DIFFUSE  
INTERSTITIAL  
INFILTRATE WITH  
POLYMORPHONUCLE-  
AR LEUKOCYTES.**





# CHRONIC PYELONEPHRITIS AND REFLUX NEPHROPATHY

**Chronic pyelonephritis is a disorder in which chronic tubulointerstitial inflammation and scarring involve the calyces and pelvis**

- 1- Reflux nephropathy**
- 2- Obstructive**

# CHRONIC PYELONEPHRITIS-GROSS

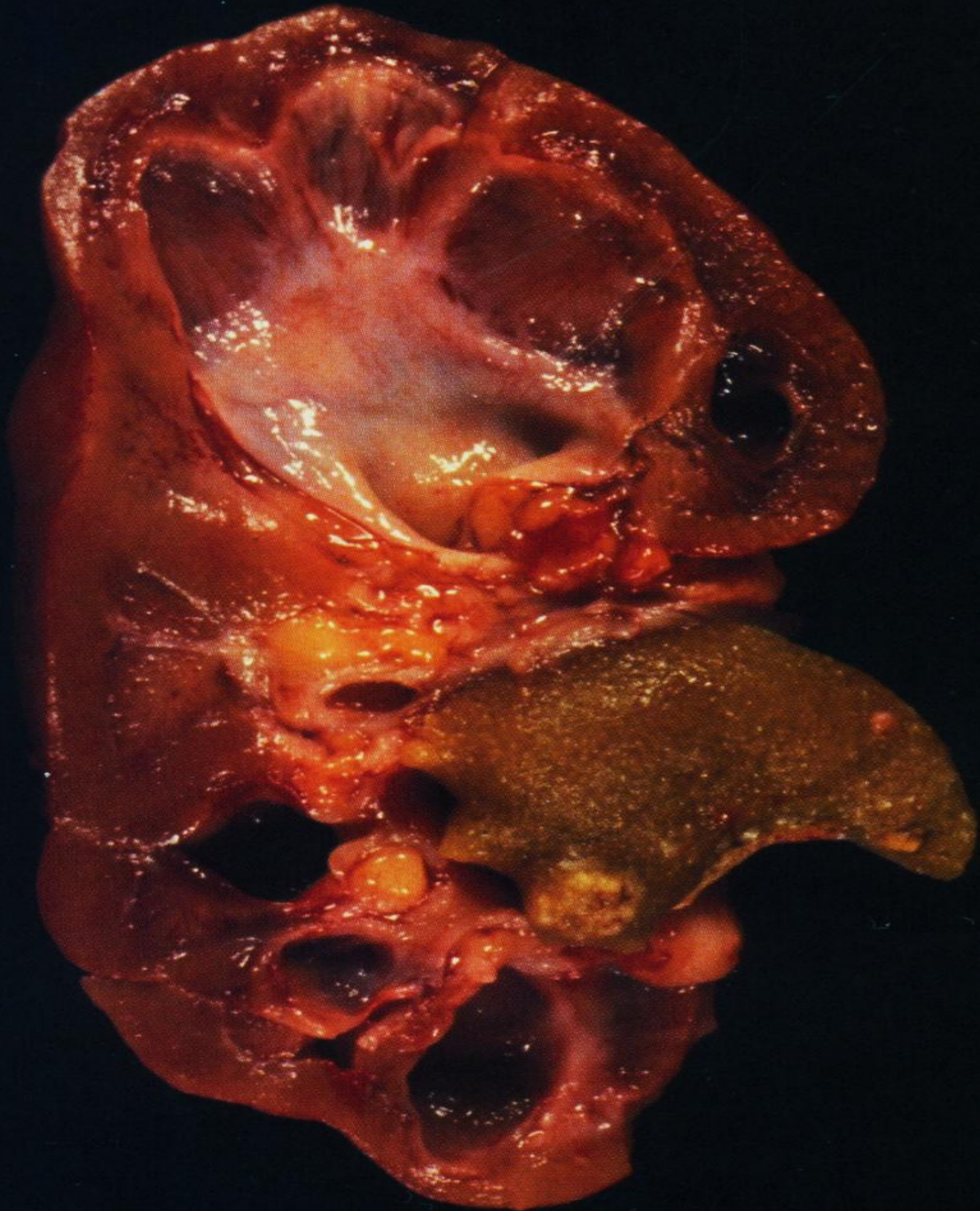
The kidneys usually are irregularly scarred; if bilateral, the involvement is asymmetric.

The hallmarks of chronic pyelonephritis are **coarse, discrete, corticomedullary scars** overlying dilated, blunted, or deformed calyces, and **flattening of the papillae** .



**RENAL TUBERCULOSIS  
SECONDARY TO  
HEMATOGENOUS SPREAD  
OF TUBERCLE BACILLI.**





**STAGHORN CALCULUS IN  
PELVIURETERIC  
JUNCTION.**



A

**A. BILATERAL HYDRONEPHROSIS WITH ACUTE ON CHRONIC PYELONEPHRITIS IN A CHILD DUE TO URINARY TRACT OBSTRUCTION.**



B

**B. Hydronephrosis with thinned renal parenchyma in an adult kidney.**



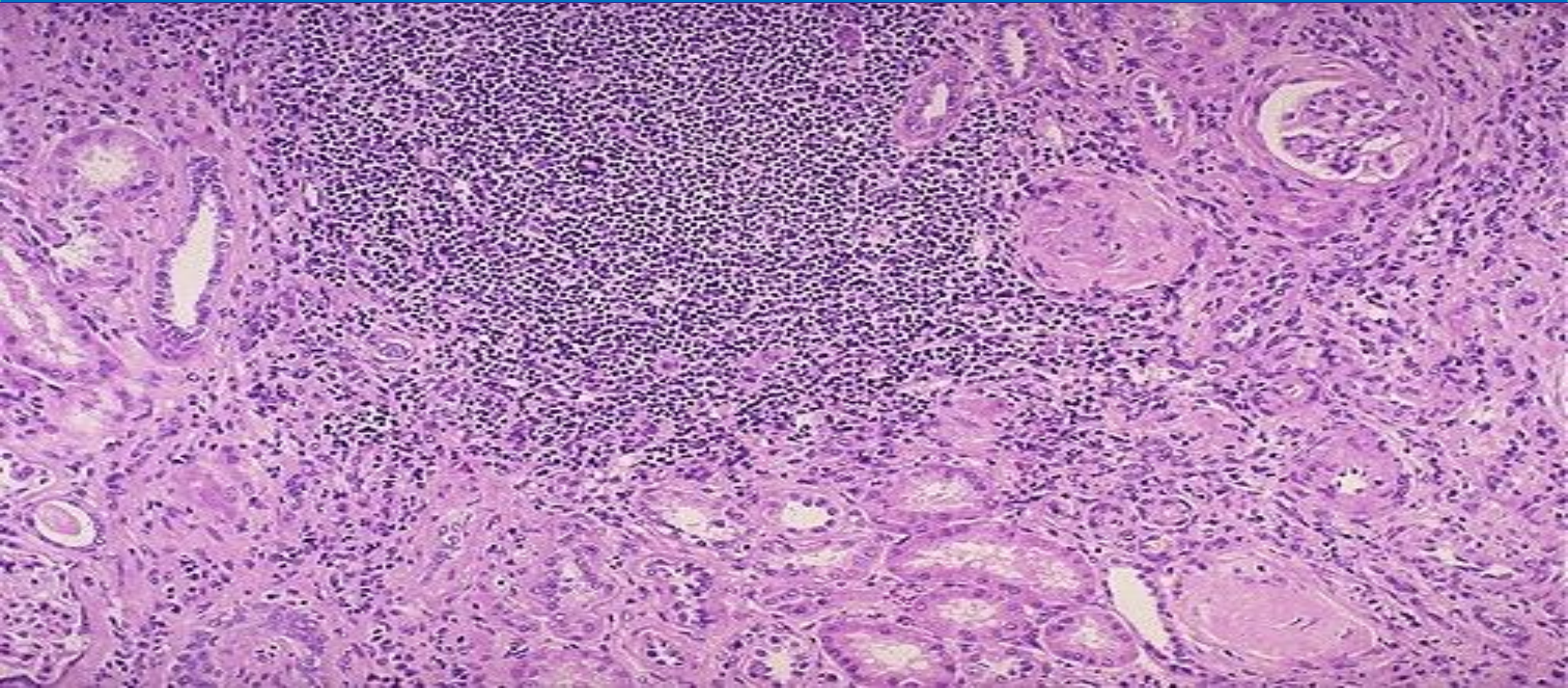
**A. UNSHAPED SCAR OF HEALED PYELONEPHRITIS**

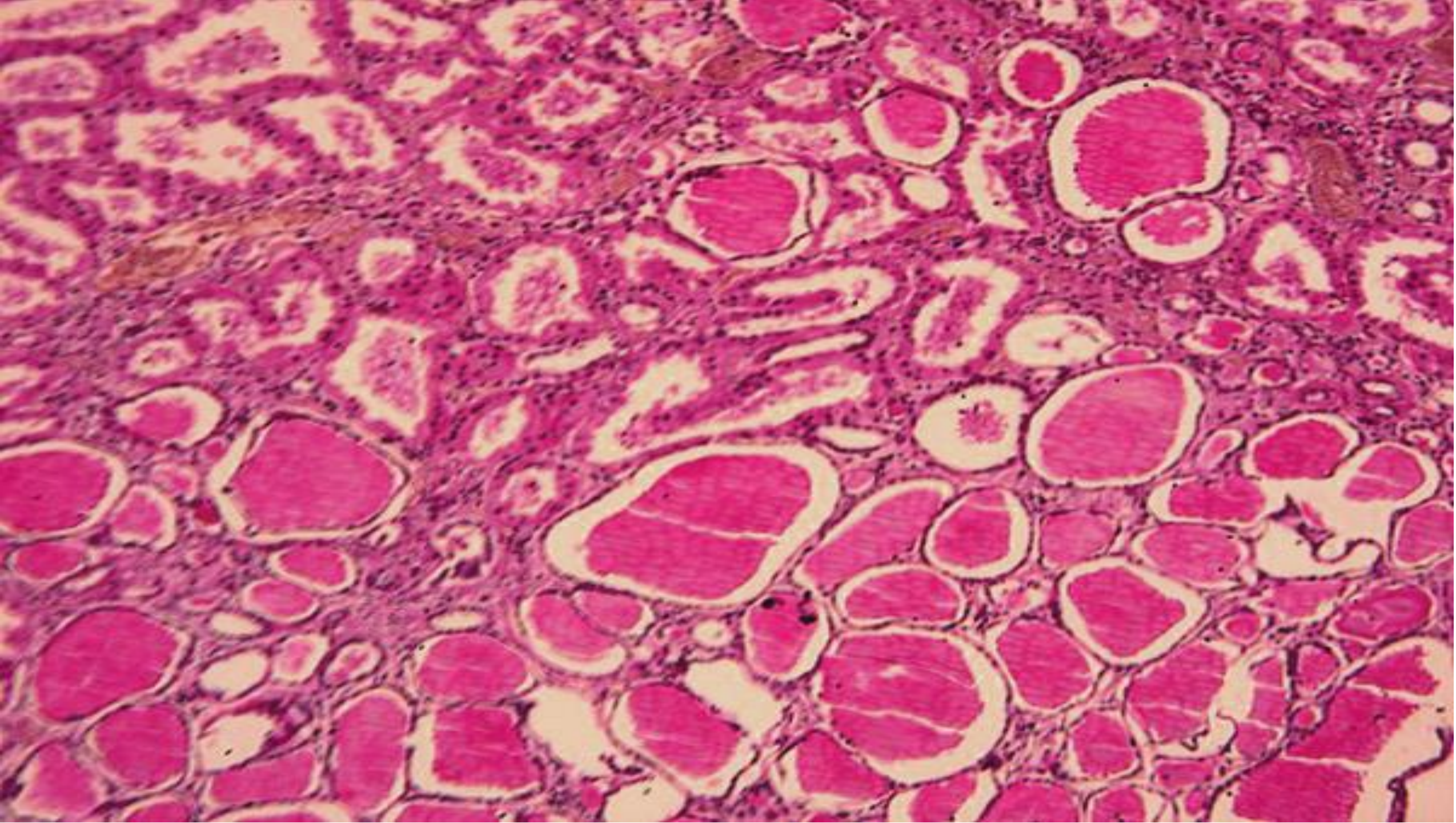


**B. Healed pyelonephritis associated with vesicoureteral reflux has produced scarring of both poles of the kidney with calyceal distortion due to infection of the peripheral compound papillae.**



**Chronic pyelonephritis: collection of chronic inflammatory cells here is in a patient with a history of multiple recurrent urinary tract infections.**





# UROLITHIASIS

## **Types of stones in urinary tract**

CALCIUM OXALATE and PHOSPHATE (70% )

Magnesium ammonium phosphate (15-20%)

(Struvite stone)

URIC ACID & URATE (5-10%)

CYSTINE (1-2%)

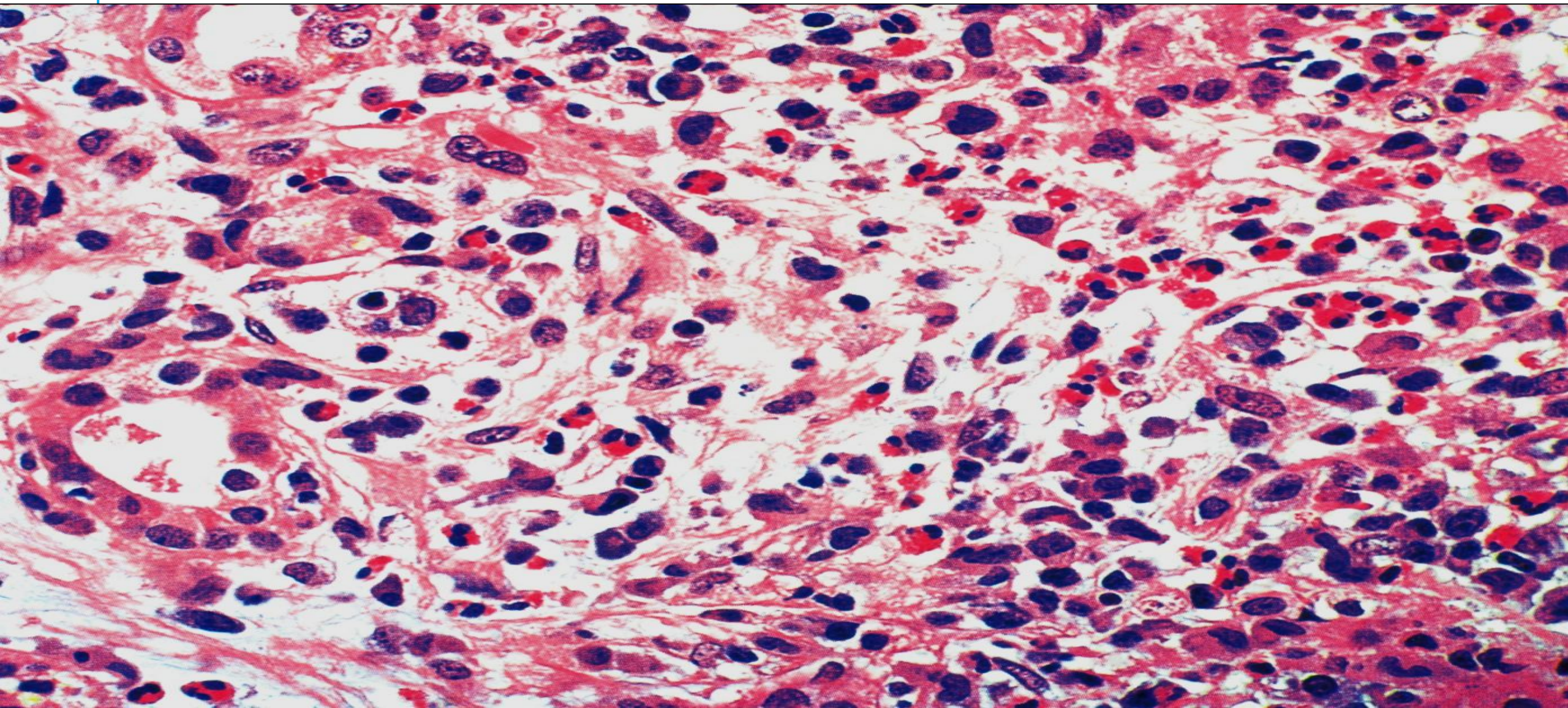
# TUBULOINTERSTITIAL NEPHRITIS

## **Tubulointerstitial Nephritis**

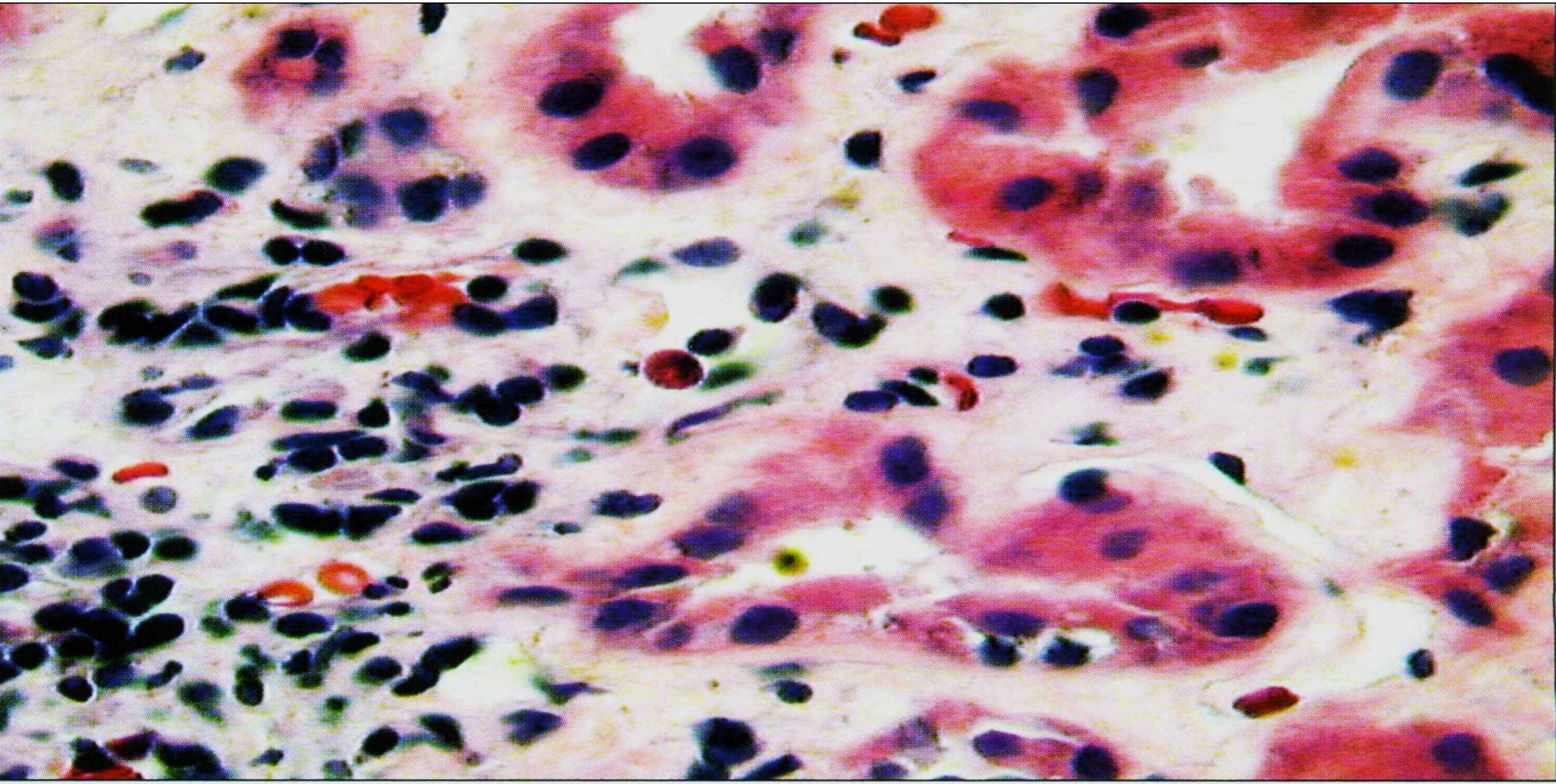
**This group of renal diseases involves inflammatory injuries of the tubules and interstitium that are often insidious in onset and are principally manifest by azotemia**



AIN. THE MONONUCLEAR INFILTRATE IS ACCOMPANYING BY ABUNDANT EOSINOPHILS AND MAY HAVE A GRANULOMATOUS APPEARANCE.



AIN. HIGHER POWER OF TUBULITIS DEMONSTRATING INTERSTITIAL EDEMA AND INVASION OF THE TUBULAR EPITHELIUM BY LYMPHOCYTES.



# DEFINITION-UTI

**UTI:** the finding of microorganisms in bladder urine with or without clinical symptoms and with or without renal disease

**Significant bacteriuria:** the number of bacteria in the voided urine exceeds the number that can be expected from contamination (i.e.  $\geq 10^5$  cfu/ml)

# Clinical features of UTI

## Cystitis

- Frequency
- Urgency
- Dysuria – painful voiding
- Suprapubic Pain
- Cloudy or foul-smelling urine



# SYMPTOMS UROLITHIASIS

- Pain in the lower back part or in the lower abdomen, which might move to the groin. Pain may last from hours to minutes.
- Nausea, vomiting
- Blood in urine
- Burning during urination, foul smell in urine, chills, weakness and fevers for urinary tract infection.



# ACUTE AND CHRONIC CYSTITIS: ETIOLOGY

Women are more likely to develop cystitis

*Tuberculous cystitis* is always a sequel to renal TB

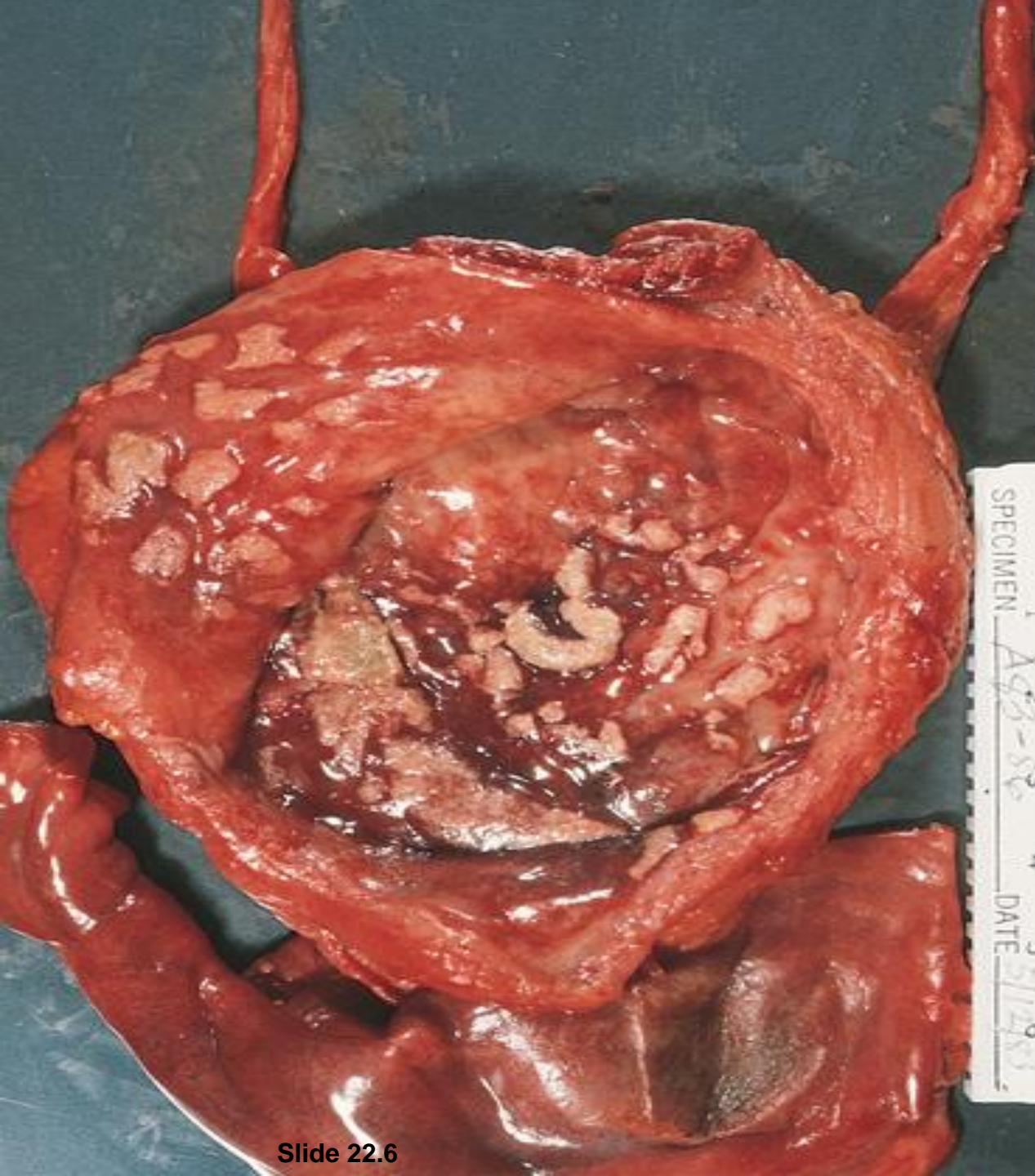
*Candida albicans*

Schistosomiasis (*Schistosoma haematobium*),

*Chlamydia*, and *Mycoplasma* may also cause cystitis.

Predisposing factors include bladder calculi, urinary obstruction, diabetes mellitus, instrumentation, and immune deficiency.

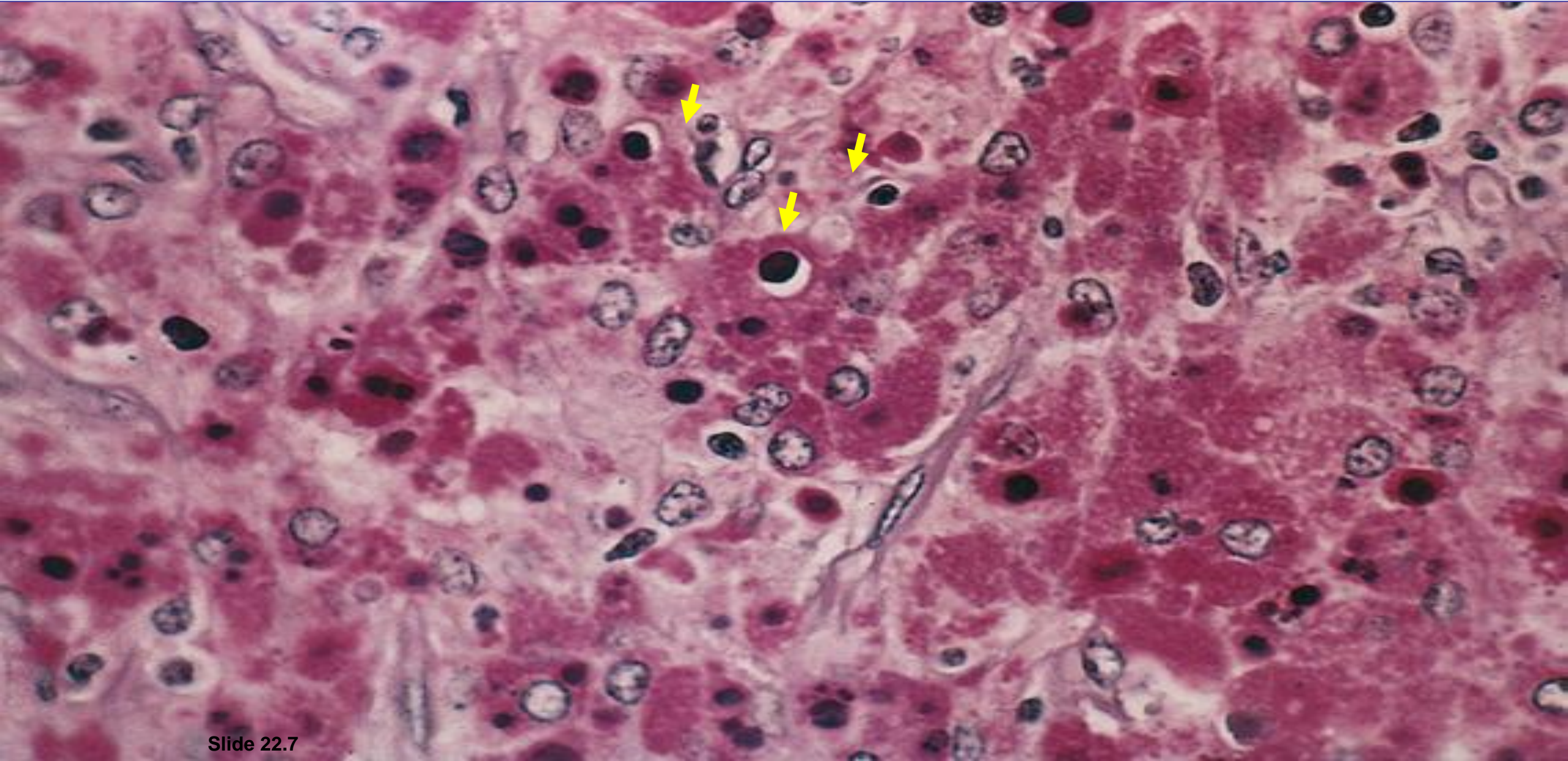
Finally, irradiation of the bladder region gives rise to *radiation cystitis*.



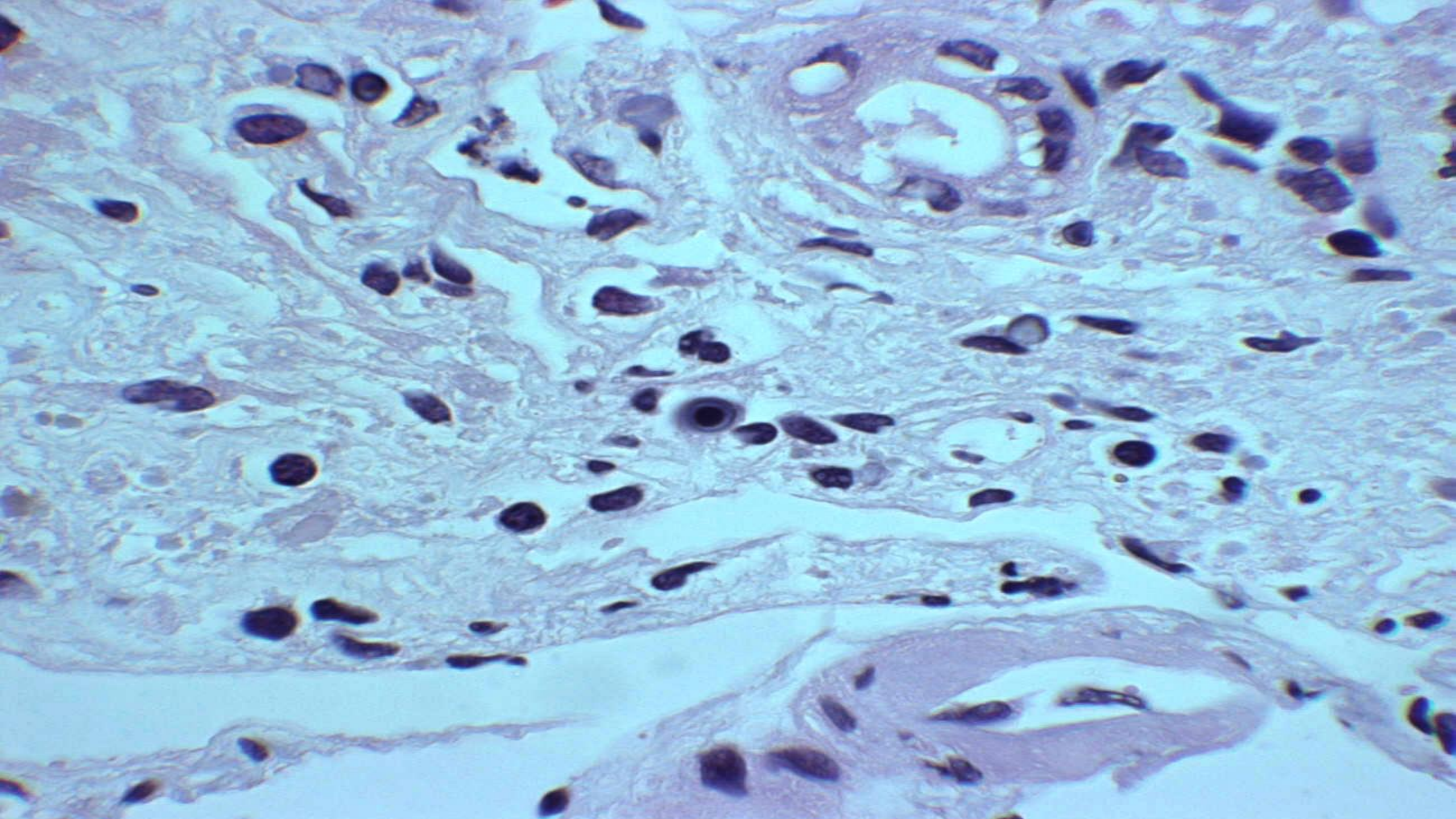
**Cystitis with  
malakoplakia**

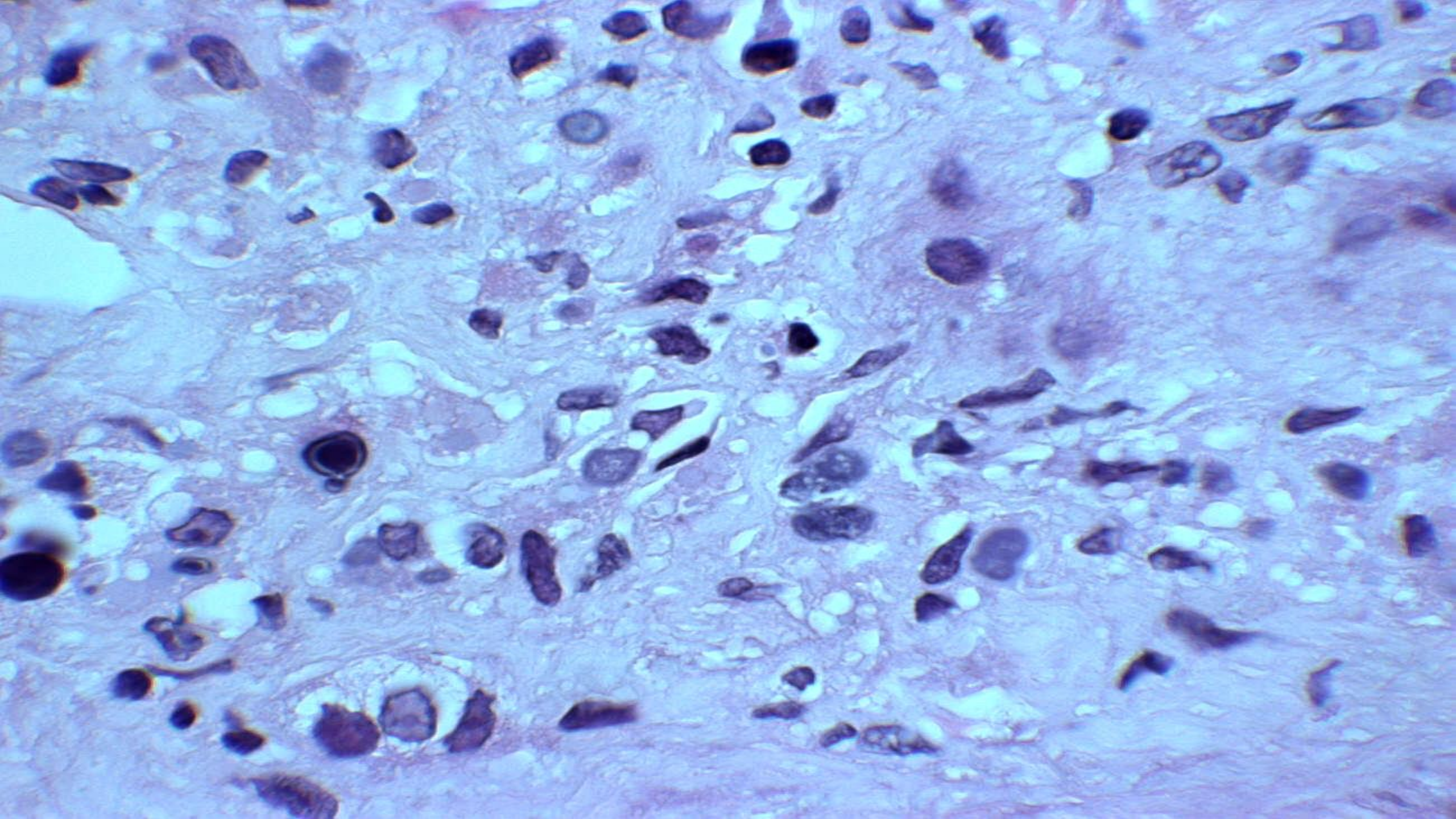
**Peculiar inflammatory  
reaction  
characterized by  
soft, yellow,  
plaques 3-4 cm in  
diameter  
and histologically  
by foamy  
macrophages**

# Cystitis with malakoplakia: Michaelis Gutman bodies

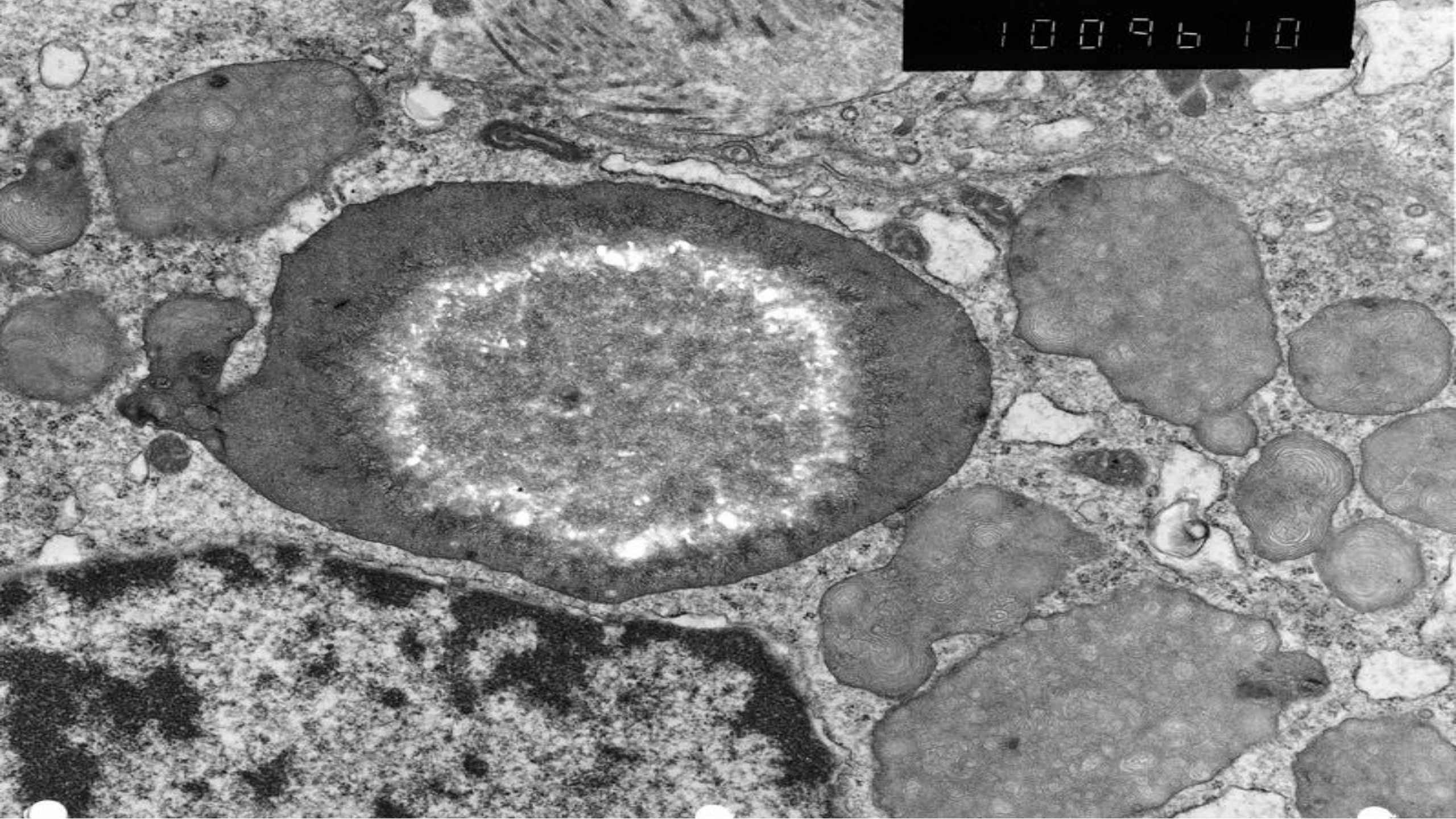


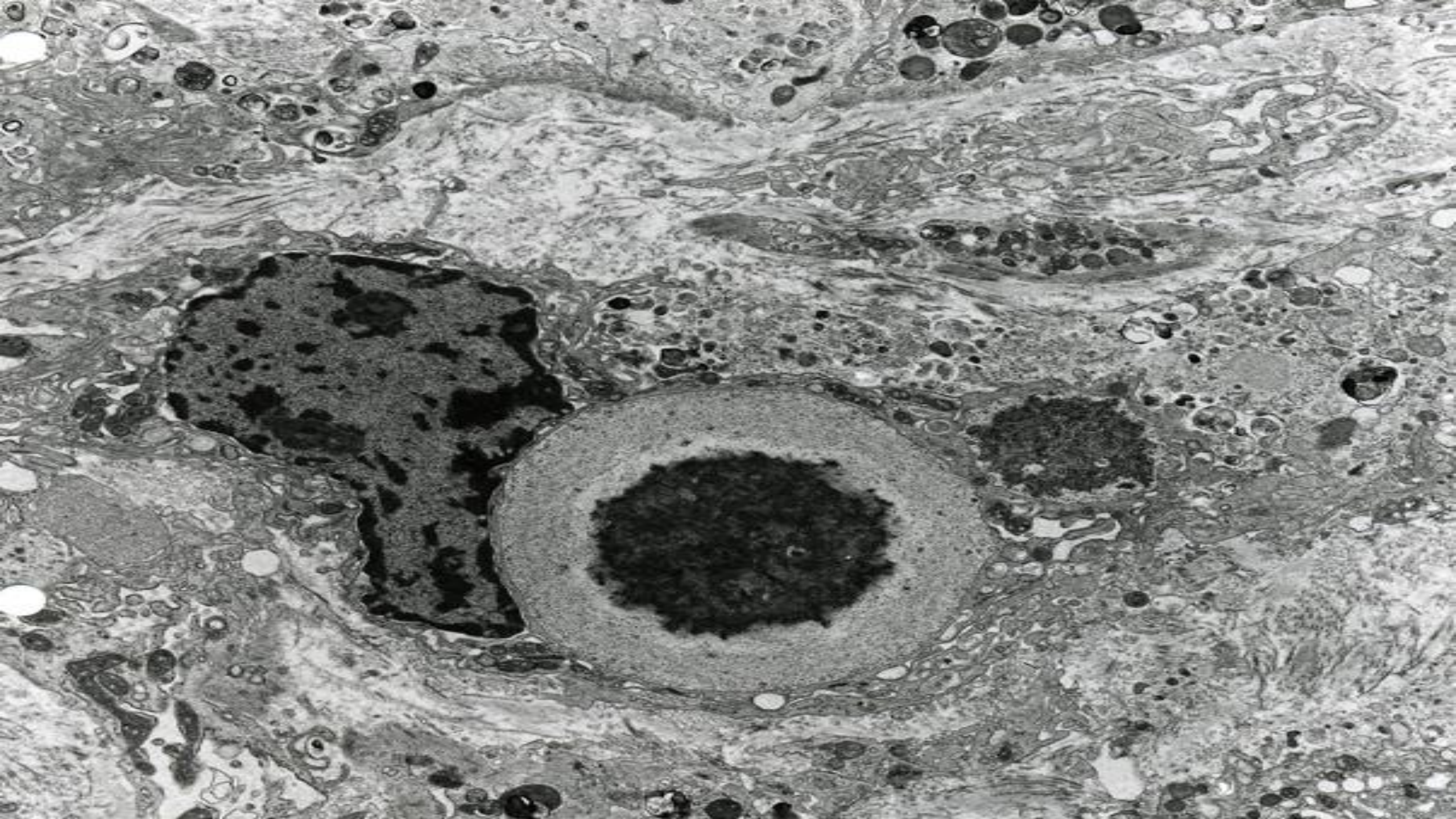




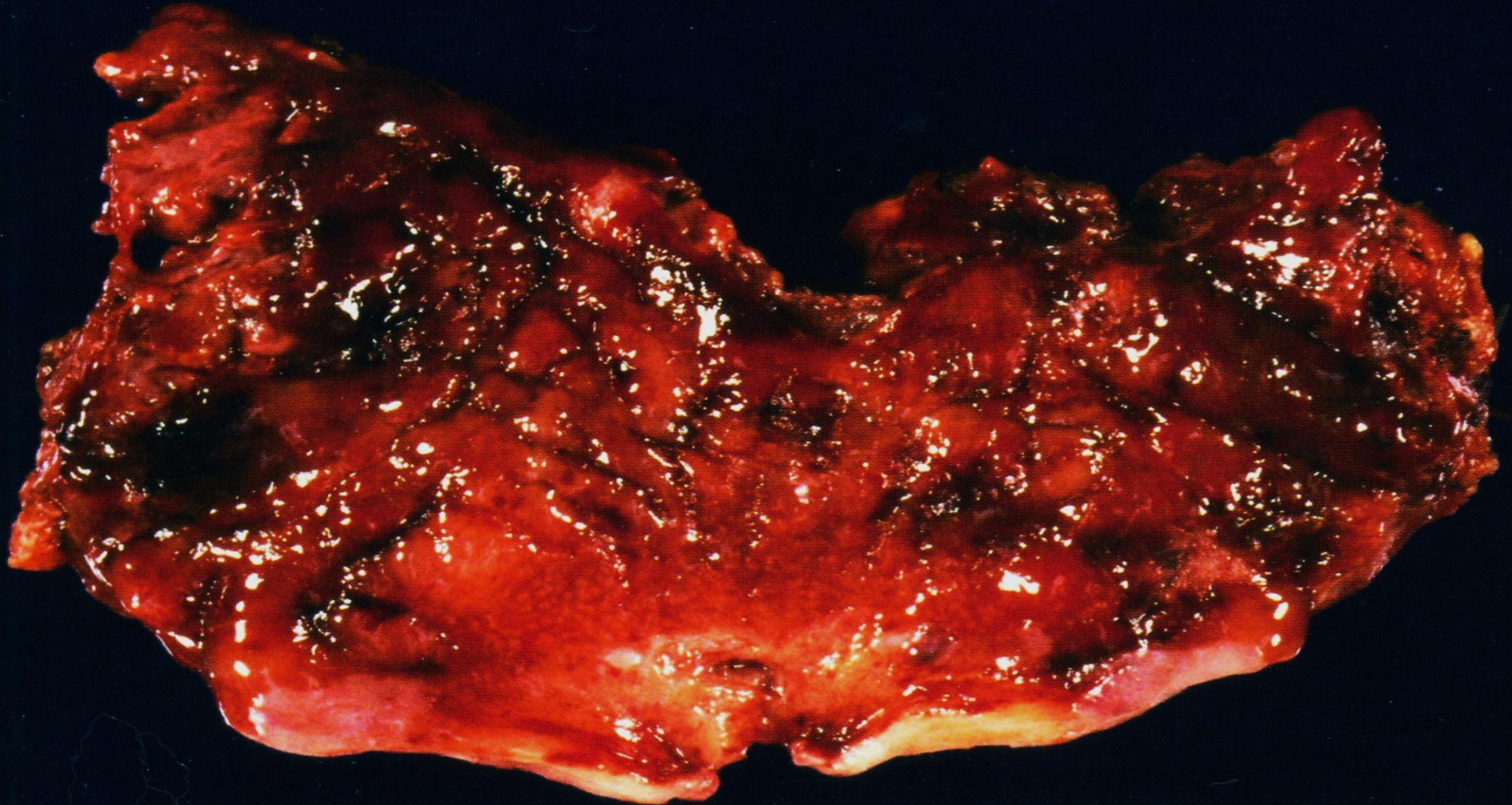


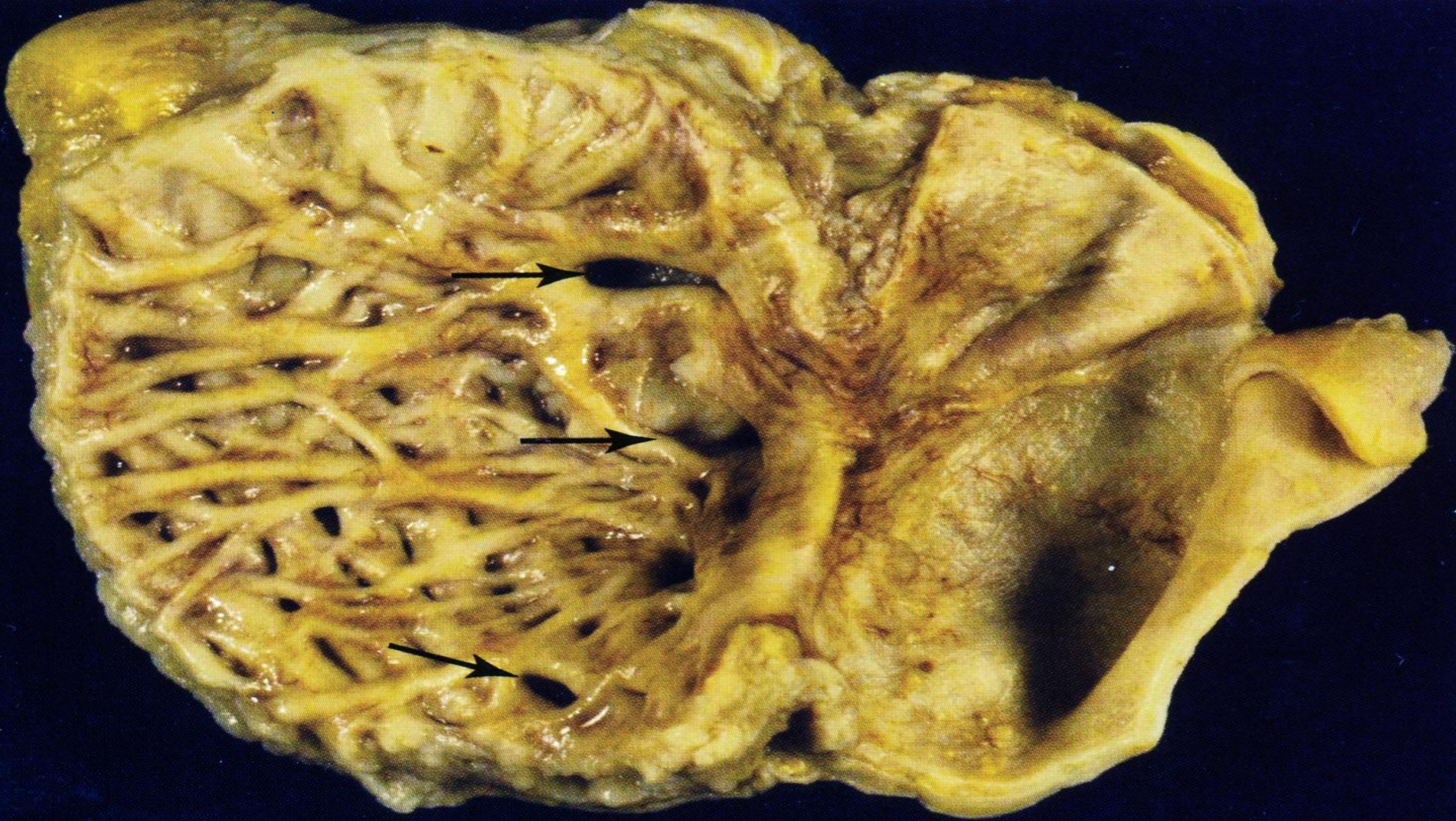
1009610





# ACUTE INFLAMMATION OF THE URINARY BLADDER.







## Homework :

Specify what are the radiopaque and what are the radiolucent calculi.