POLTAVA STATE MEDICAL UNIVERSITY
DEPARTMENT OF SURGERY №2

INFLAMMATORY DISEASES OF THE GENITOURINARY SYSTEM. UROLITHIASIS

Lecture 1

2022

LECTURE PLAN

- Uncomplicated and complicated urinary tract infections
- Acute pyelonephritis, purulent forms, sepsis, gestational pyelonephritis
- Chronic pyelonephritis
- Pyonephrosis
- Paranephritis
- Cystitis
- Infectious inflammatory diseases of the male genitalia
- Genitourinary tuberculosis
- Urolithiasis

URINARY TRACT INFECTIONS

Urinary tract infections (UTIs) *occupy the second place after respiratory viral infections in the morbidity structure. In Ukraine, more than 170 thousand patients with cystitis are registered each year, more than 110 thousand – with pyelonephritis*

Complicated forms of UTI *take their roots on the background of structural and functional disorders of the urinary tract.*

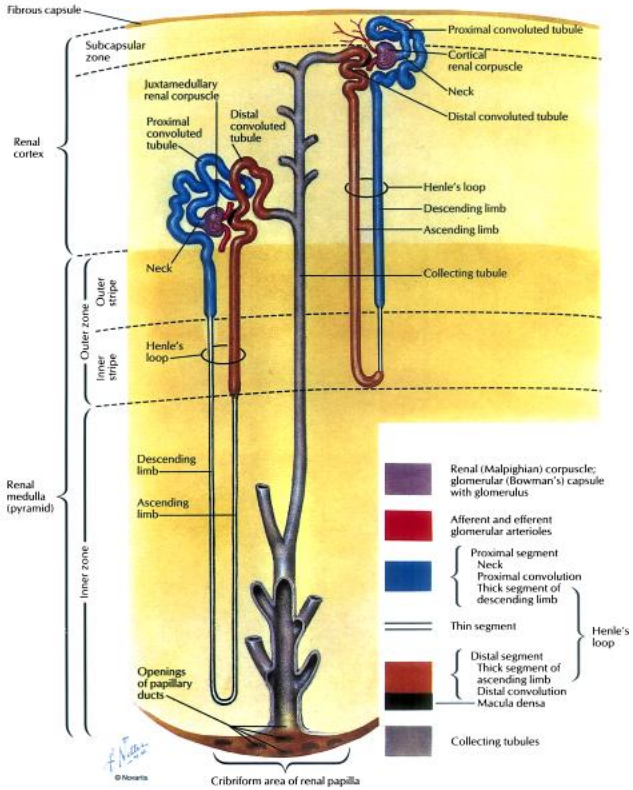
Risk factors for the development of complicated forms of UTI are elderly age, pregnancy, urinary tract abnormalities, diabetes mellitus, the presence of urinary drainage

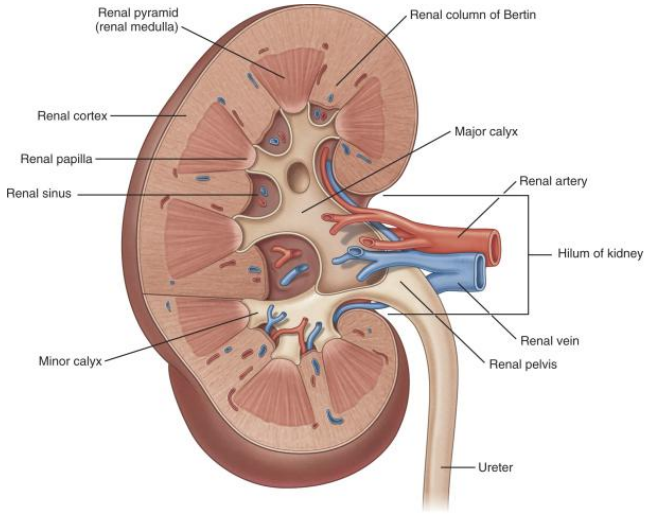
In the structure of hospitalized to urological and nephrological hospitals, patients with pyelonephritis occupy ***50-70%***

Pyelonephritis *is a nonspecific infectious and inflammatory disease of the kidneys with parallel or sequential inflammation of the pelvis, calyces and parenchyma of the kidney (mainly tubular apparatus and interstitial tissue)*

Takes second place after acute respiratory viral infections.
One of the main causes of chronic renal failure (71.5% according to the National Registry of Patients with Chronic Kidney Disease)

A.T.Rosenfield et al., 1979; M.C.Soulen et al., 1989;
L.Dalla Palma et al., 1999





Ways of kidney infecting

● hematogenous

(non-complicated pyelonephritis)

● urogenous

(*complicated pyelonephritis*)

E. coli, Str. pyogenes, Staph. aureus are predominantly isolated from the urine of patients with hematogenous pytelonephritis

Proteus, Ps. aeruginosa, Enterobacter, Klebsiella are predominantly isolated from the urine of patients with complicated (obstructive) pytelonephritis

90% of microbes are intestinal (E. coli, Proteus, Ps. aeruginosa, Enterobacter, Klebsiella)

А.В.Айвазян, А.М.Войно-Ясенецкий, 1985; А.Л.Шабад и др., 1987; Л.П.Саричев, 2009

Pyelonephritis classification:

primary ***complicated***

acute ***chronic***

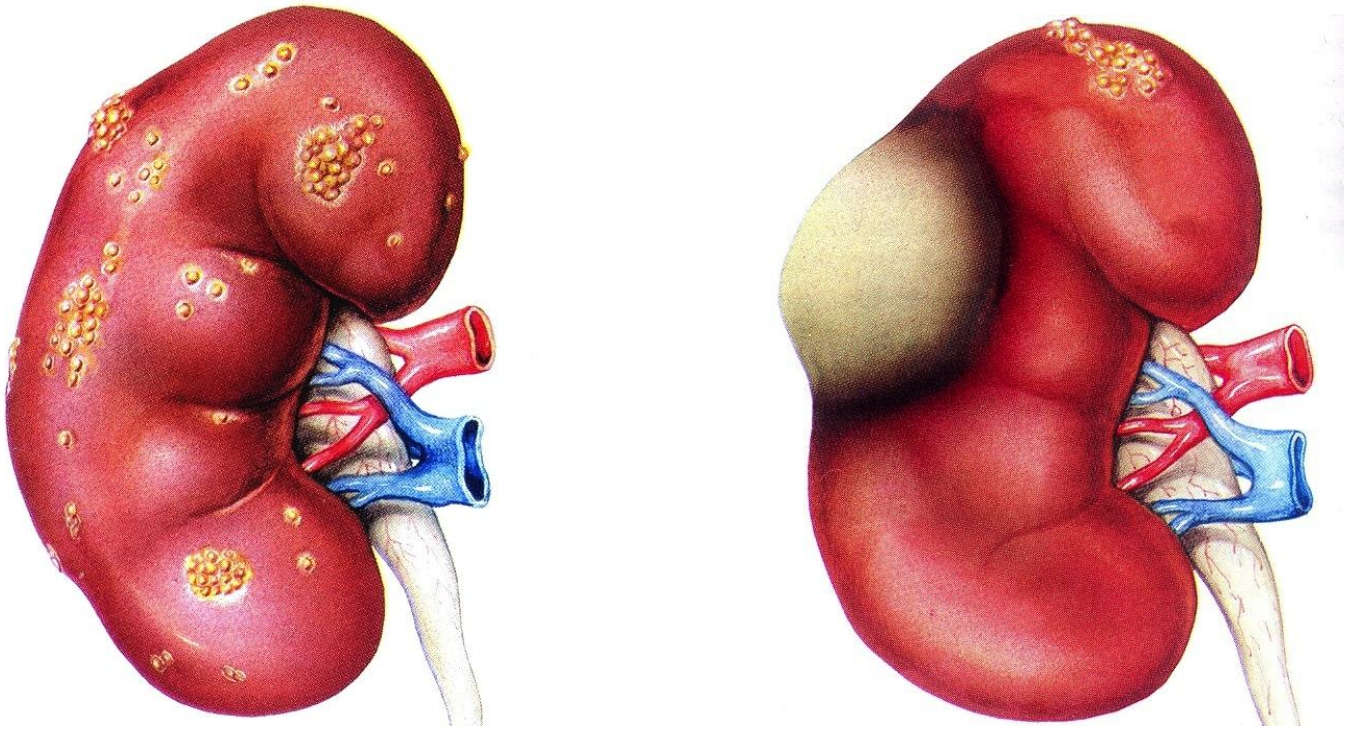
Stages of acute pyelonephritis:

serous ***purulent***

Forms of acute pyelonephritis:

- **apostematous**
(*focal bacterial nephritis*)
- **renal carbuncle**
(multi*focal bacterial nephritis)*
- **renal abscess**

J.R.Thornbury, 1991; L.B.Talner et al., 1994



Apostematous nephritis, forming of carbuncles, renal abscess

In children primary role in pyelonephritis plays:

- *infravesical obstruction;*
- *vesico-uretero-renal refluxes*

In elderly and senile adults high level of morbidity is due to :

- *immunodeficite states (age-related);*
- *urodynamic impairment;*
- *infravesical obstruction;*
- *impairment of intestinal passage*

A.T.Rosenfield et al., 1979; M.C.Soulen et al., 1989; J.R.Thornbury, 1991; L.B.Talner et al., 1994; L.-M.Dembry, 2002

Pyelonephritis complicates pregnancy in 2-17% of women, more often in the 2-3 trimester, and takes the leading place in the structure of extragenital pathology of pregnant women

Provoking factors for gestational pyelonephritis:

- *urodynamic impairment;*
- *distant places of infection;*
- *impairment of intestinal passage*

Patients with **diabetes mellitus** have pyelonephritis as a mutual factor:

"Infection of the kidneys" complicates the normalization of carbohydrate metabolism

In turn, successful treatment of pyelonephritis is impossible without normalization of carbohydrate metabolism

The classic **triad of symptoms** of acute pyelonephritis include:

- *pain in the lumbar region;*
- *fever;*
- *changes in urine (leucocyturia, bacteriuria)*

Causes of transition of serous pyelonephritis to purulent stage:

- *untimely resumption of urodynamics*
- *inadequate antibacterial therapy*

Clinical signs of of transition of serous pyelonephritis to purulent stage :

- *worsening of patients condition;*
- *deterioration of pain in lumbar region;*
- *fever >38,5°C*

The frequency of purulent forms of acute pyelonephritis is 30%

The rate of primary and secondary nephrectomies is up to 40%

Mortality reaches 20% and ranks first in the mortality structure of urological hospitals

The frequency of chronisation of acute purulent pyelonephritis reaches 75% (N. Papanicolaou, R.C.Pfister, 1996; L.Dalla Palma et al., 1999)

FORMS OF UROSEPSIS:

- **Sepsis** is characterized by presence of two or more symptoms (with proven infection)

- **Sepsis from hypotension** (characterized by decrease of systolic arterial pressure below 90 mm Hg. or more than 40 mm Hg. from initial)

- **Heavy sepsis** (with multi-organ failure)

- **Septic shock** (characterized by decrease of systolic arterial pressure below 90 mm Hg. or more than 40 mm Hg. from initial despite adequate resumption volume of liquid)

Roger C. Bone, 1992; V.Nakamura et al., 1996; L.-M.Dembry, 2002

CLINICAL SIGNS OF SEPSIS (SIRS)

Body temperature > 38.5°C or < 35.0°C

Heart rate > 90 beats per minute

Respiratory rate > 20 breaths per minute or arterial CO2 tension < 32 mm Hg or need for mechanical ventilation

White blood cell count > 12,000/mm3 or < 4,000/mm3 or immature forms > 10%

Roger C. Bone, 1992

Diagnostic procedures aim in pyelonephritis is to establish:

- *presence of urodynamical problems*
- *cause of urodynamical problems*
- *stage of pyelonephritis*
- *type of purulent pyelonephritis*
- *type of causative microorganisms*

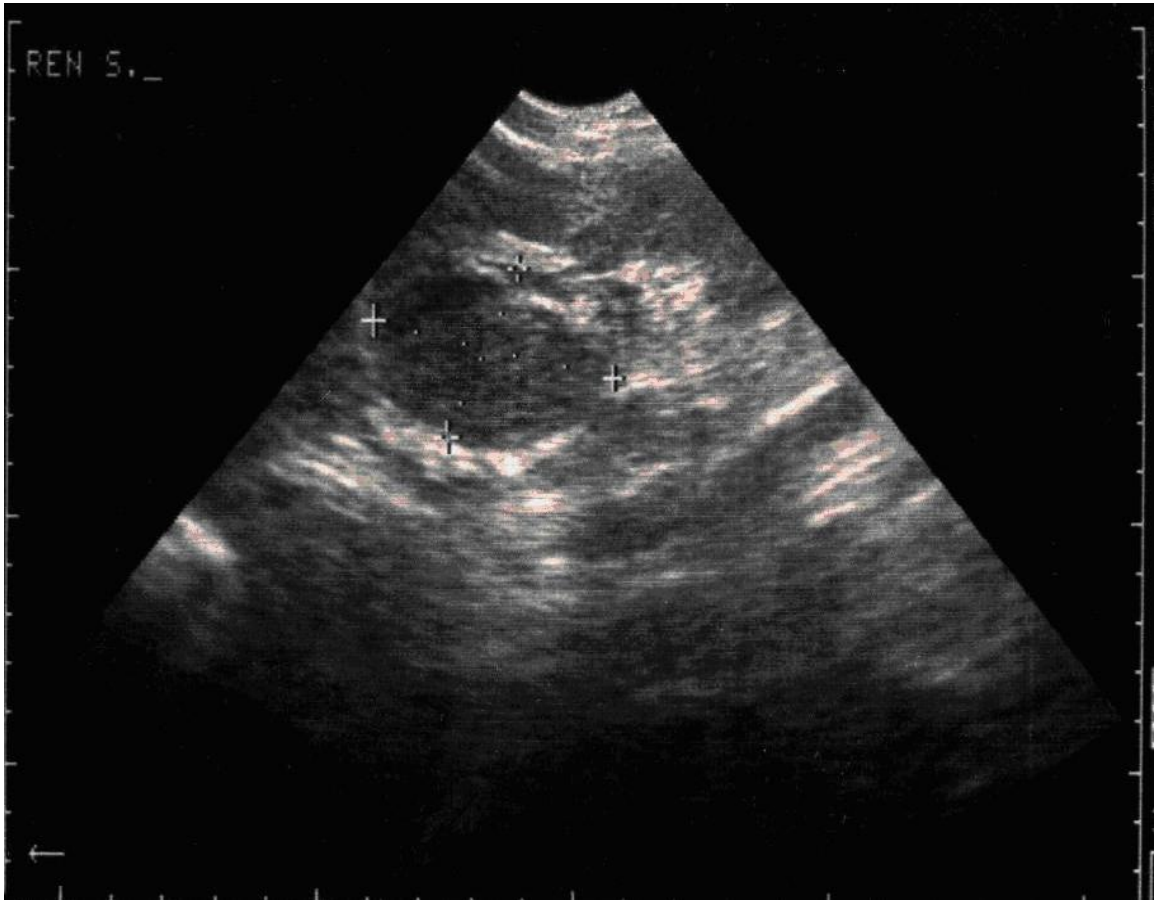
Examination of a patient with acute pyelonephritis begins with ultrasonography

For the purpose of determining the functional state of the kidneys and the cause of urodynamics impairment, a plain KUB and excretory urography is performed

For differential diagnosis those methods should be used:

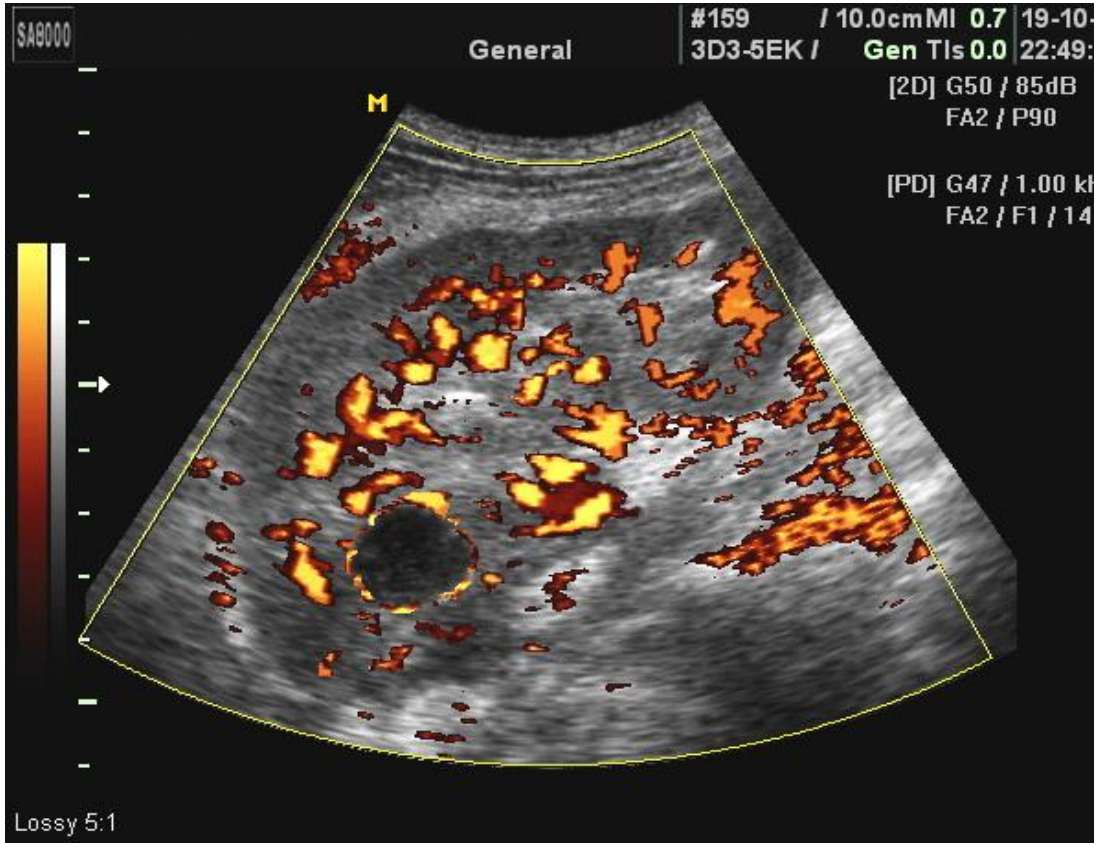
- *Doppler ultrasound*
- *CT with enchansing*
- *MRI*

Kidney abscess
(Ultrasonogram)

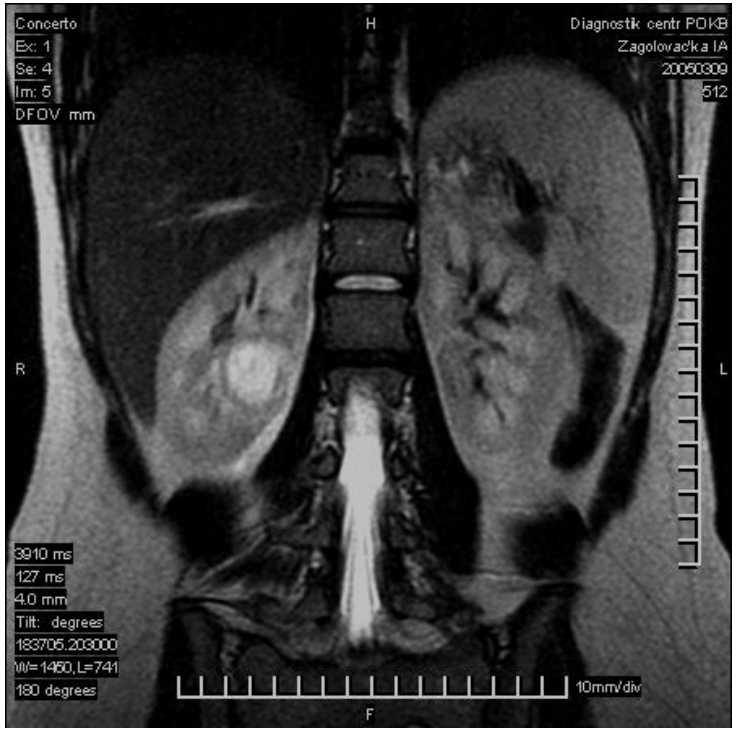


Carbuncle of the kidney
(Ultrasonogram in ED mode)

Kidney abscess
(Ultrasonogram *in DE* mode)



Kidney abscess
(MRI)



Treatment of acute pyelonephritis
begins with the restoration of urodynamics:
- catheterization (internal stenting);
- percutaneous nephrostomy

Indications to some methods of treatment of acute pyelonephritis:
- **conservative treatment** is indicated when the purulent content is absent*;*
- **percutaneous drainage** is indicated when the purulent content is present*;*
- **surgical treatment** is indicated in when there is a spread of inflammation into the paranephrium and percutaneous drainage *is ineffective*

Intravenous antibacterial therapy includes:

- ***Cephalosporins of III- IV generation***

(Ceftriaxone, Ceftazidime 1 g 2 times a day);

- ***Amoxicillin*** *(Amoxiclav 1.2 g 2-3 times a day);*
- ***Aminoglycosides*** *(Gentamicin 80 mg 2 times a day, Amikacin 500 mg 2-3 times a day);*
- ***Fluoroquinolones*** *(Ciprofloxacin 200 mg 2 times a day);*
- ***Metronidazole*** *(Metragil 500 mg 2 times a day)*

After normalization of body temperature patient is ***transferred to oral antibiotics according to the principle of stepwise therapy or uroantiseptics*** *(Nitroxoline 100 mg 4 times a day, Palin 400 mg twice a day, Norfloxacin 400 mg twice a day)*

For the purpose of preventing dysbiosis antibacterial therapy is usually accompanied with antifungal agents (Nystatin in a dose of 500 mg 3 times a day or Fluconazole 50 mg once a day)

Gestational pyelonephritis
Treatment begins with internal drainage of the kidney (catheter-stent)

Treatment of acute pyelonephritis in elderly persons *is carried out taking into account the nature of the disease, short courses of antibiotic therapy are preferred*

Diabetic patients *on the background of hyperglycemia usually have a rapidly developing purulent-destructive forms of acute pyelonephritis, so treatment strategy involves the normalization of carbohydrate metabolism, and should be more active*

PECULIARITIES OF MEDICAL TACTICS

IN ACUTE PURULENT PYLONEPHRITIS:

- **Conservative treatment** *is indicated in apostematous nephrite at absence of urodynamics violations*
- **Minimally invasive (percutaneous) draining** - *kidney abscess*
- **Open surgical interventions** - *kidney carbuncle, kidney abscess, when there is a spread of inflammation into the paranephrium and percutaneous drainage is ineffective*

Inadequate treatment of acute pyelonephritis causes chronic infection of the inflammatory process

Chronic pyelonephritis is characterized by lesions of the tubular device, interstitial tissue, blood vessels, with the development of renal scarring and "wrinkling" of the kidney

Renal scarring is complicated by nephrogenic hypertension and chronic renal failure

PYONEPHROSIS

Pyonephrosis – *terminal stage of purulent destructive process with total replacing of parenchima with connective tissue*

In contrast to infected hydronephrosis, when function of the kidney is partially preserved, in pyonephrosis it is completely absent

Treatment is surgical *- nephrectomy*

PARANEPHRITIS

Paranephritis – *infectious inflammatory process in paranephral fat (acute and chronic)*

Primary paranephritis *(20%) develops in absence of renal diseases due to infecting of paranephral tissue from distant purulent foci (furuncles, abscesses, osteomyelitis and others)*

Secondary paranephritis *(80%) develops as complication of purulent processes in kidneys*
Treatment: *in the stage of exudative inflammation – conservative, in paranephral abscess stage – surgical draining*

CYSTITIS

acute *chronic*

EPIDIDYMITIS, ORCHITIS, ORCHOEPIDIDYMITIS

acute *chronic*

URETHRITIS

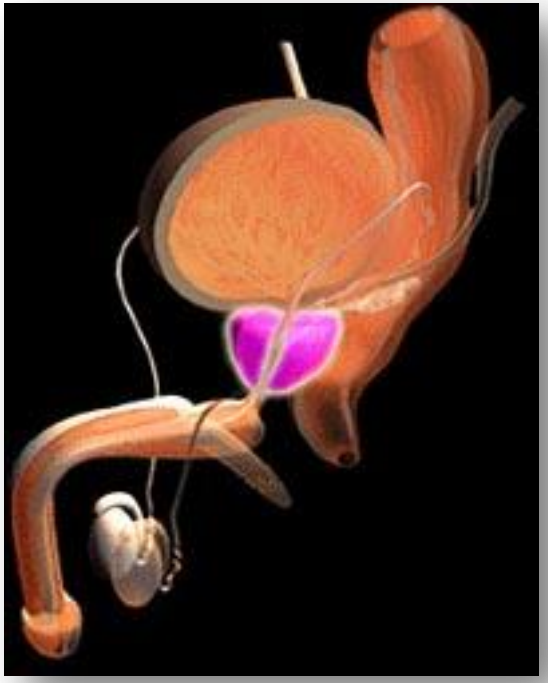
acute *chronic*

PROSTATITIS

acute *chronic*

PROSTATITIS

ACTUALITY



Every third man between the ages of 25 and 50 can suffer from chronic prostatitis!

Classification of prostatitis

Acute bacterial prostatitis
Chronic Bacterial prostatitis
Chronic Abacterial prostatitis
((syndrome Chronic Pelvic pain)

- inflammatory

- noninflammatory

Asymptomatic prostatitis with Inflammation

Treatment of prostatitis

- ***Renewal of microcirculation in prostate*** *(antinflammatory, bioregulating therapy – diclofenac, vitaprost rectal suppositoria)*
- ***Prostate draining*** *(massage, physiotherapy)*
- ***Stabilization of immune violations*** *(immunocorrective therapy)*
- ***Antibacterial*** *(urogenital infection liquidation)*
- ***Symptomatic therapy*** *(painkillers)*

UROGENITAL TUBERCULOSIS

About 1 billion of people are infected by M.tuberculosis
Annually 10 million people become ill.

Absolute majority of cases *– repeated activation of tuberculosis infection many years after primary infecting*

Infecting of urinary system *is usually hematogenous spread of pulmonary infection*

Urogenital tuberculosis *occupies the first place (25%) in extrapulmonary tuberculosis*

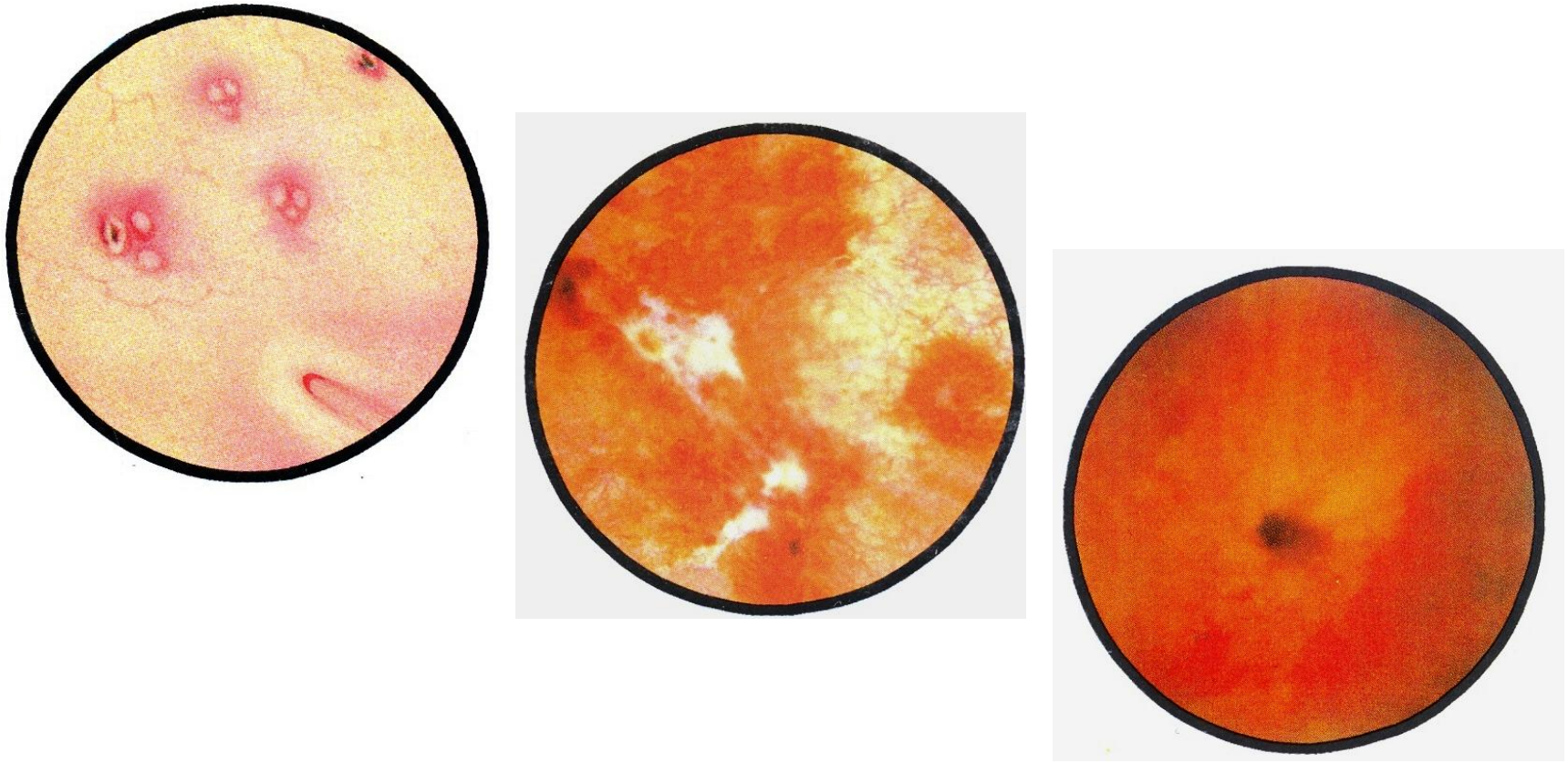
Pathognomonic symptoms of urogenital tuberculosis

- *Tuberculosis of any localization in the anamnesis*
- *Tuberculosis of any localization in the family*
- *Asymptomatic microhematuria*
- *Asymptomatic (abacterial) leukocyturia*
- *Dysuria (microcyst)*
- *Absence of effect from nonspecific antibacterial therapy*
- *Positive Mantoux test (formation of papule within 62 hours with a diameter> 5mm)*
- *Positive bacterial analysis of urine*
- *Positive biological method (detection of Pirogov-Langhans cells in histological material)*

CLINICAL AND X-RAY CLASSIFICATION OF KIDNEY TUBERCULOSIS

- stage I - **Non-destructive tuberculosis** *(infiltrative)*
- stage II - **Primary destruction** *(papillitis or single caverns up to 1 cm)*
- stage III -**Limited destruction** *(caverns of large size that occupy one segment)*
- stage IV - **Polycavernous tuberculosis**

X-ray signs of kidney tuberculosis



Cystoscopic signs of tuberculosis of the bladder

Treatment of urinary tuberculosis

- ***Specific antibacterial therapy:***

- streptomycin, kanamycin, rifampicin, ciprofloxacin

- isoniazid (tubazid)

- ethambutol

- ***Tissue therapy (aimed to prevent the scarring of the urinary tract):***

- wobenzyme

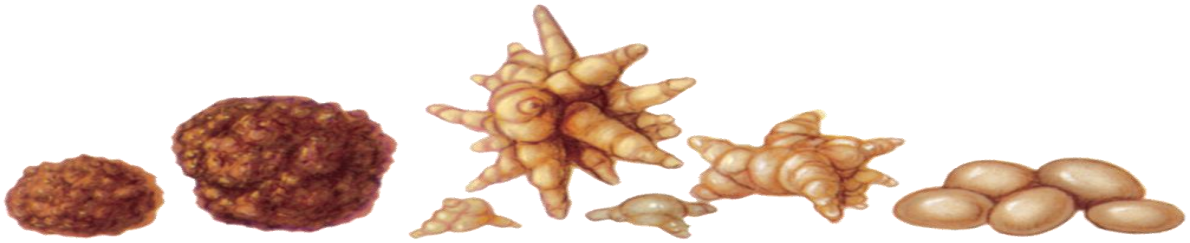
- serrata

- aloe

- ***Operative treatment***

UROLITHIASIS

Urolithiasis is a combination of anatomical, biochemical and physiological changes in the body that cause stone formation. Urolithiasis occupies the second place after UTI among all urological pathologies. Men get sick 2-3 times more often than women. The average risk of calculus formation throughout life is 5-10%. Patients with urolithiasis occupy 25-45% of urological hospitals population. In a number of regions (Syria, Iran, Pakistan, Saudi Arabia) the disease is endemic, indicating that the importance of environmental factors in its pathogenesis is significant



STONE COMPOSITION

Oxalates - (70-85%) *consist of calcium salts of oxalic acid (dense, black-gray stones with a thorny surface)*

Phosphate stones - (5-15%) *consist of calcium salts of phosphoric acid (smooth, sometimes slightly rough, of a soft consistency, white or gray)*

Urates - (2-18%) *consist of salts of uric acid (yellow-brown color, smooth, firm consistency)*

Cystine stones - (1-2%) *are formed from the sulfur compound of the amino acid cystine (yellowish-white, soft consistency, with a smooth surface)*

STONE FORMATION THEORIES

1856 - The theory of catarrh of the pelvis (the role of infection in the onset of urolithiasis

1884 - Theory of the matrix (desquamation of the epithelium with subsequent impregnation with calcium salts in catarrh of the pelvis)

1890 - The crystalloid theory (pathological crystallization of urine)

1900-1910 - Colloid theory (with a decrease in the number of protective colloids - albumins, globulins and hyaluronic acid, pathological crystallization occurs)

1989 - Proteolysis-ion theory (with a decrease in proteolytic urine activity, a protein matrix forms and the pH of the urine changes, leading to sedimentation of urinary salts)

ETHIOLOGY

- **Hereditary predisposition (in 55% of patients, the relatives suffered from the urolithiasis)**
- **Anomalies of the urinary tract (that lead to the violation of urodynamics - horseshoe kidney, stricture of PUJ, doubling and kidney dystopia, ureterocele, infravesical obstruction)**
- **Endocrine disorders (hyperparathyroidism)**
- **Inflammatory diseases of the urinary tract**

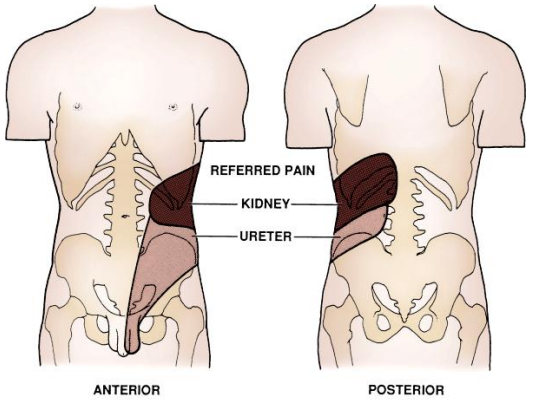
SYMPTOMS

- Paroxysmal pain in the lumbar region (renal colic)
- Passage of stones in anamnesis
- Hematuria
- Leucocyturia
- Dizuria

RENAL COLIC

- ✓ *Due to acute violation of urodynamics*
- ✓ *It is acute, paroxysmal*
- ✓ *It is accompanied by irradiation of pain along the ureter:*

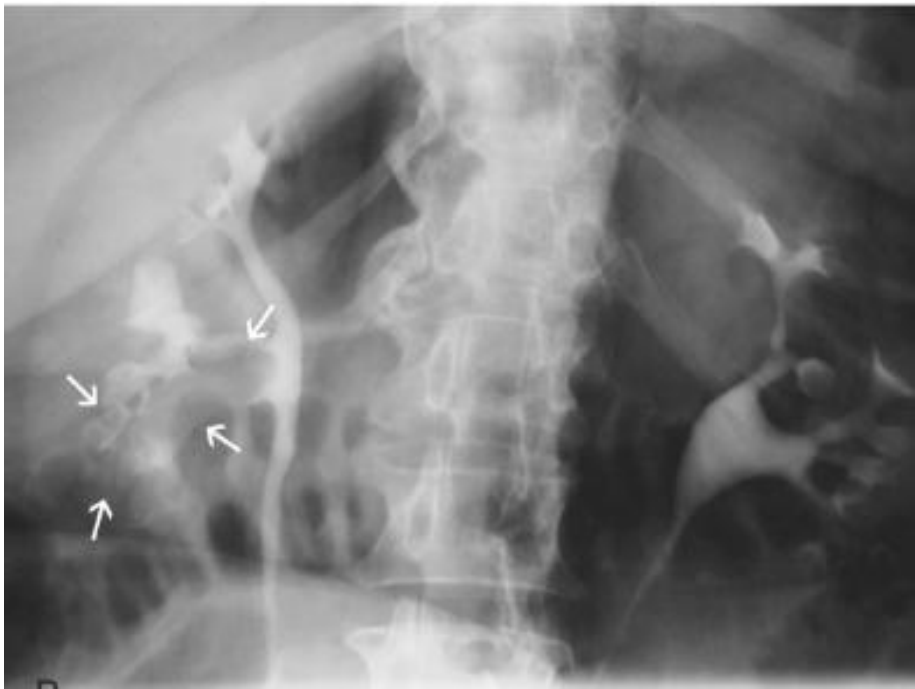
- into the lower quadrant of the abdomen
- in men - in the scrotum
- in women - in the labia major

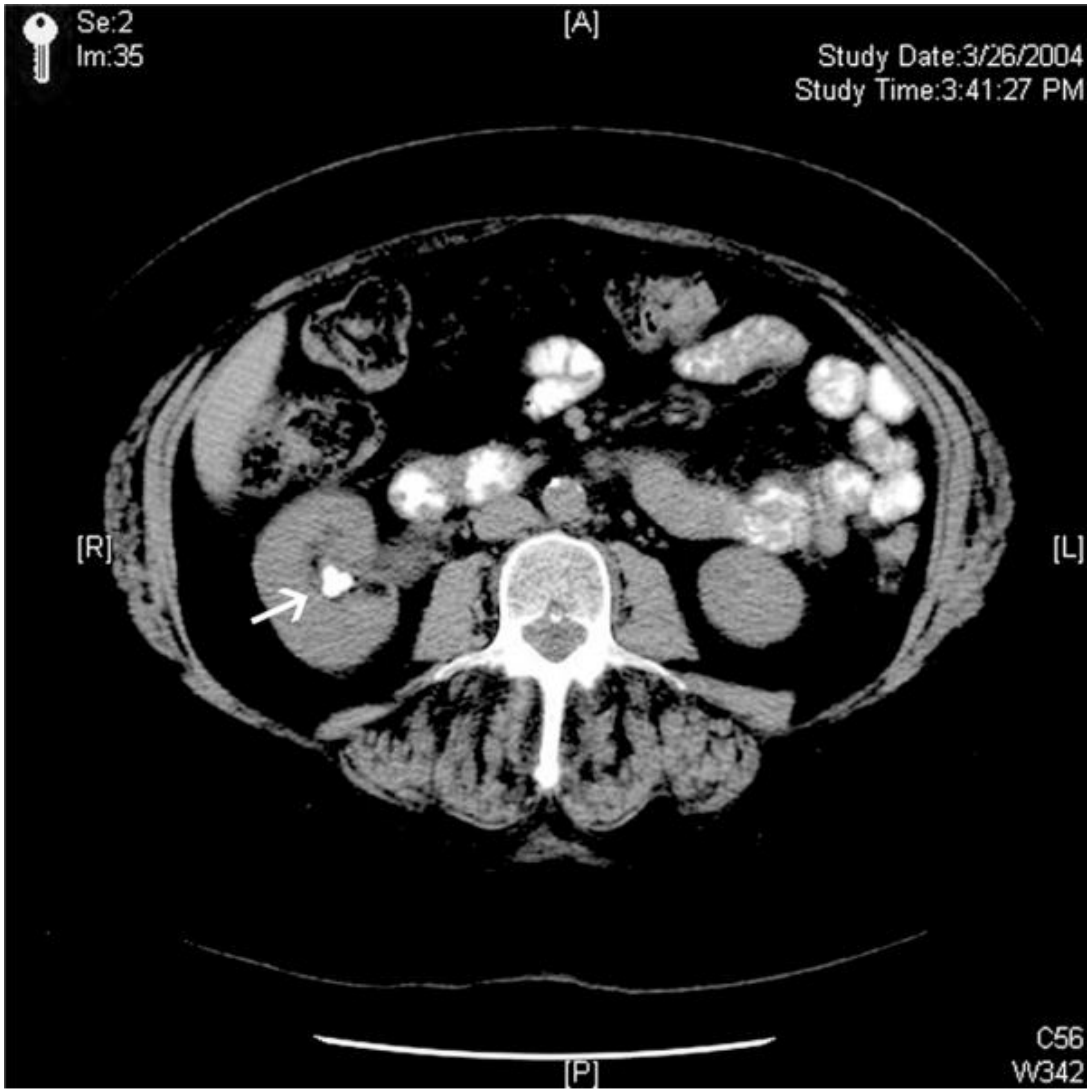


DIAGNOSIS

- ✓ Urinalysis
- ✓ Ultrasound
- ✓ Excretory urography
- ✓ CT scan
- ✓ MRI
- ✓ Cystoscopy, nephroscopy

DIAGNOSIS

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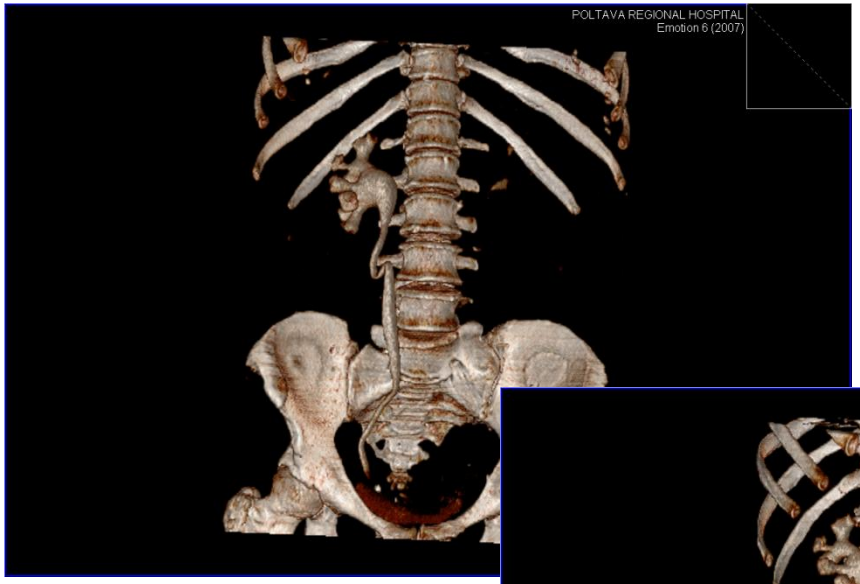
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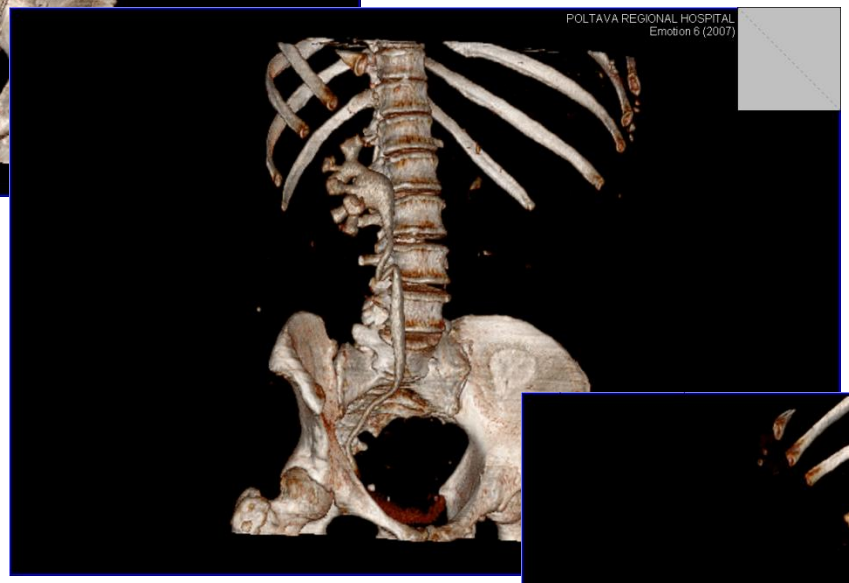
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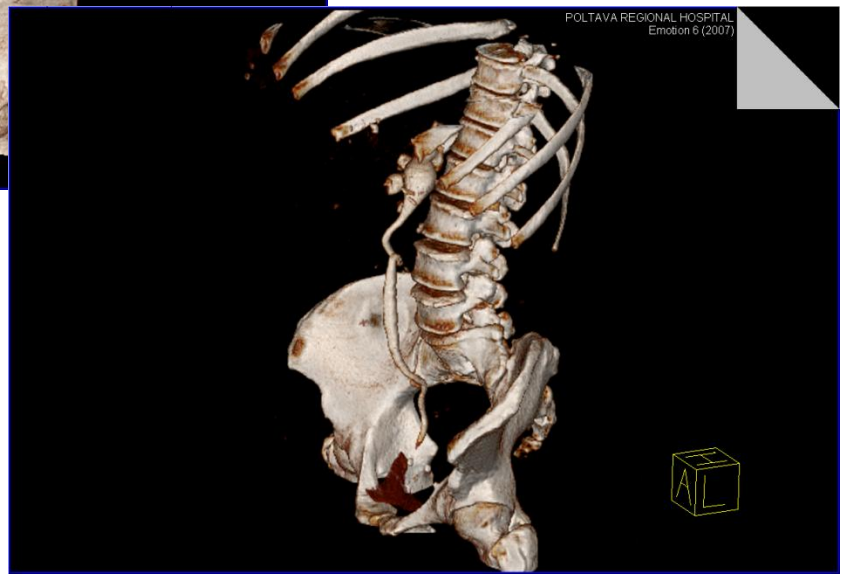
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DIFFERENTIAL DIAGNOSIS

- Acute appendicitis
- Perforated ulcer of the stomach and duodenum
- Acute pancreatitis
- Ectopic pregnancy
- Radiculitis

TREATMENT

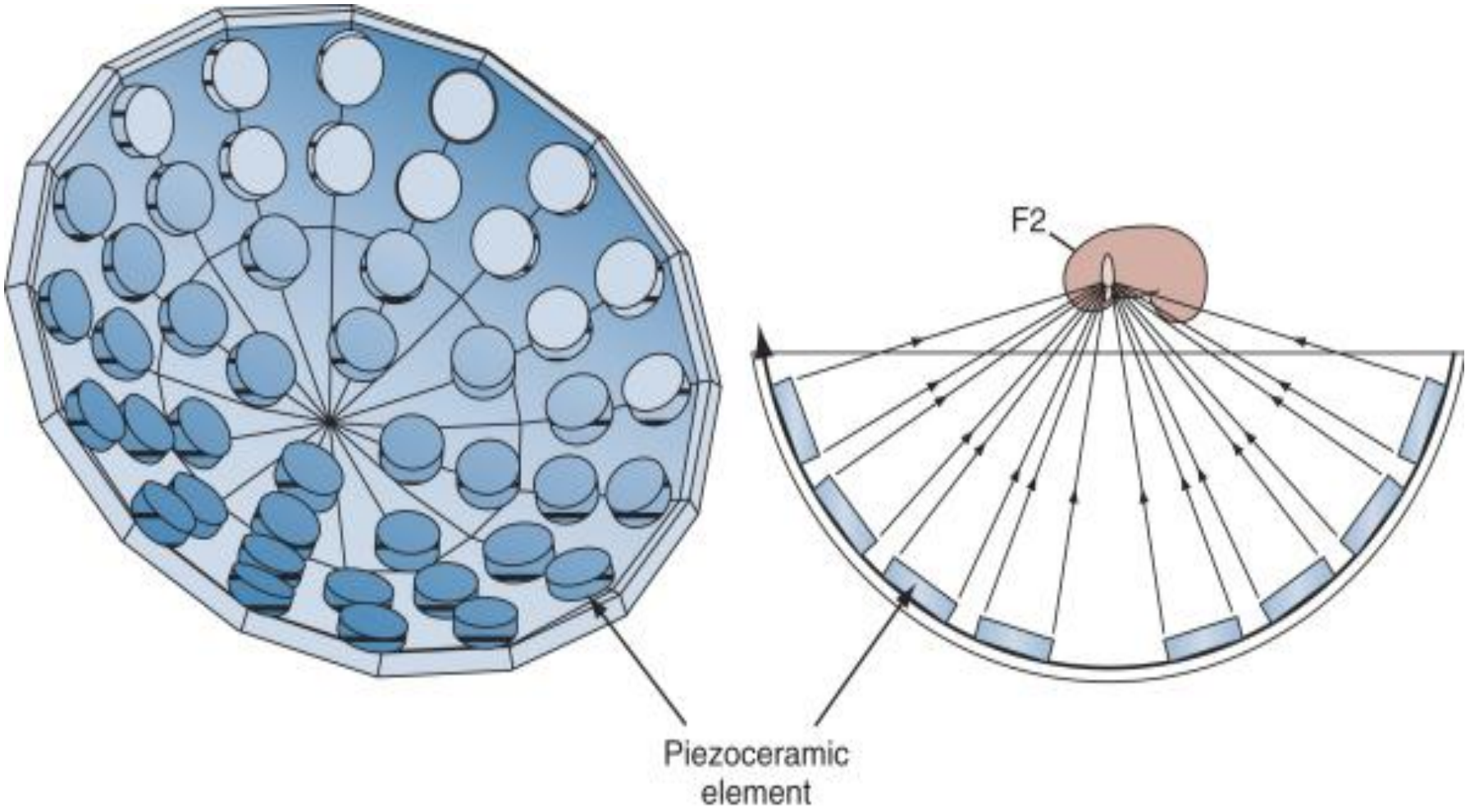
- ✓ **Conservative** - concrements of ureters up to 5 mm (antispasmodics, herbal diuretics, with urate stones – alkalizing therapy)

- ✓ **Minimally invasive** (extracorporeal shock wave lithotripsy, contact lithotripsy from retrograde and antegrade approaches, ureterolitoextraction)

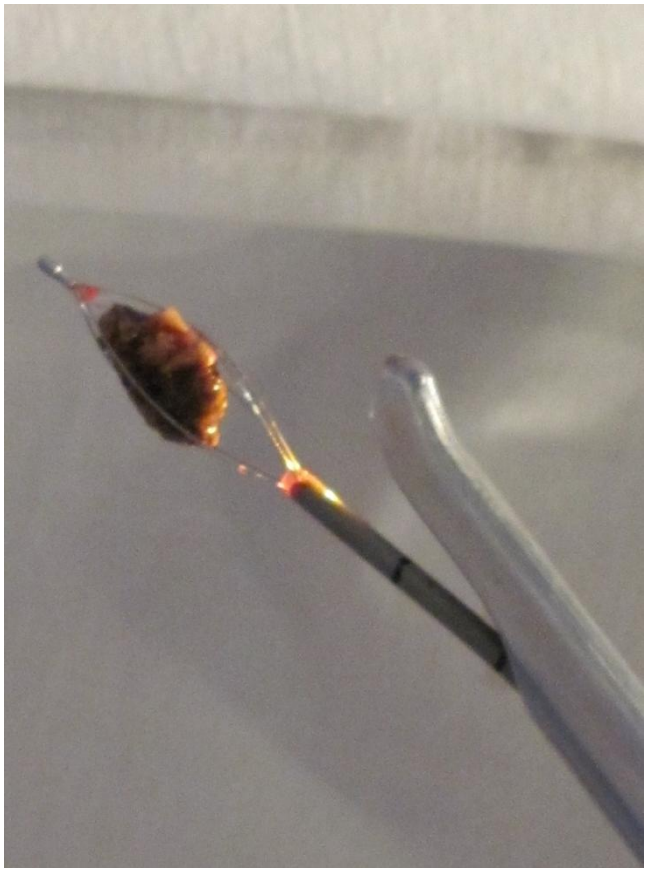
- ✓ **Surgical** (pyelolithotomy, ureterolithotomy)

- ✓ **Metaphylaxis**

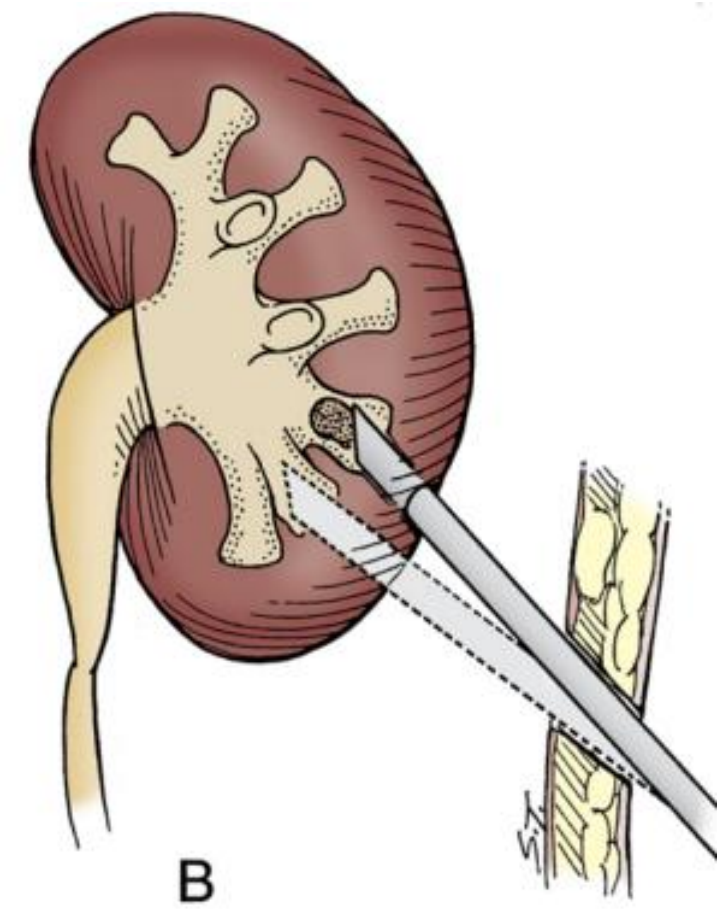
EXTRACORPOREAL SHOCK-WAVE LITHOTRIPSY



URETEROLITHOEXTRACTION



LASER LITHOTRIPSY



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