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Department of Urology

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TOPICAL ISSUES OF MODERN UROLOGY

Educational manual

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The study guide contains a list of knowledge and practical skills that must be mastered by foreign students of the IV year of the international faculty in the discipline "Urology".

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CONTENT

PREFACE

The development of urology is associated with the success of surgery, a branch of which urology remains to this day. Includes conservative urology and surgical treatment. The beginning of the history of urology in our country dates back to 1904, when, on the initiative of S.P. Fedorov, urology began to stand out as an independent discipline, and since 1923 this process was consolidated by a government decree on the opening of departments of urology in the medical institutes of the country. Over the years, urology has grown into a coherent, theoretically substantiated and practically formalized discipline.

Urology has evolved from a narrow specialty into a multifaceted and constantly evolving branch of medicine covering a wide range of problems. It includes conservative urology and surgical treatment of diseases of the kidneys and their vessels, urinary tract, male genital organs, including in children, as well as such new problems as the use of hemodialysis in the treatment of patients with chronic and acute renal failure, remote and contact destruction of urinary stones.

The main issues in urology is the initial development of the anatomical structure of the genitourinary organs and their topography. Knowledge of the physiological basis of the kidneys of the upper and lower urinary tract, both in normal and pathological conditions.

Of paramount importance for the diagnosis of urological diseases is the knowledge of clinical symptoms and laboratory diagnosis in various diseases of the genitourinary system. Of particular importance is the development of X-ray anatomy, which is essential not only for the diagnosis of diseases of the urinary organs, but also for the correct interpretation of data obtained from ultrasound and computer examination. These methods are of great importance for the diagnosis of urolithiasis, anomalies in the development of the urinary organs in both adults and children.

The manual includes questions related to acute and chronic renal failure, its pathogenesis, diagnosis, treatment with modern methods.

The inclusion of issues of tuberculosis of the genitourinary system in the manual is argued. The issues of the epidemiology of the disease, etiopathogenesis, clinic and diagnostics are considered. Considerable attention is paid to the issues of treatment and rehabilitation of patients.

Separately, the issues of infrequent traumatic injuries of the prostate gland and seminal vesicles, the clinical manifestations of which are latent, are raised. Diagnosis of such conditions is difficult, and treatment is lengthy and can leave disabling conditions behind.

The team of authors tried to make the manual original and modern, informative enough to bring maximum practical benefit not only to medical university students, but also to interns and urologists.

The manual "Topical issues of modern urology" is designed for foreign students form of education, studying in the specialties " Medicine". The aim of this manual is to update the knowledge of the anatomy and physiology of the urinary system, to master the principles and methods of ultrasonic radioisotope and X-ray diagnostics of diseases in patients, as well as to acquire knowledge on the clinical interpretation of the data obtained and methods of treatment. The educational manual was created in accordance with the work program of the discipline "Urology" on the topic «Anatomy and physiology of urogenital system. Anomalies of urogenital system. Semiotic of urological diseases», "X-ray, radionuclide, thermographic, ultrasound and instrumental methods of examination of urological patients" 31 hours.

In the manual, of the illustrative material a link to the source is added. Tasks for test control can be used during extracurricular and classroom training.

ANATOMY AND PHYSIOLOGY OF THE URINARY AND MALE REPRODUCTIVE SYSTEM

Learning goal: to restore knowledge of the anatomy and physiology of the organs of the genitourinary system. Combine the manifestations of diseases of the genitourinary system with violations of the physiology of these organs. To study the features of the physiology of the organs of the genitourinary system. To teach students to assess the violations of the physiology of the organs of the genitourinary system in diseases. To teach methods of restoring the physiological state in various diseases of the genitourinary system.

List of skills: know the basic concepts, master the tactics of diagnosis and treatment of diseases of the genitourinary system (methods of palpation and percussion of the kidneys, ureter, bladder, prostate, methods of urine research and their diagnostic value, functional renal tests). Taking anamnesis. Palpation of the kidneys, bladder. Ultrasound research.

Glossary of terms:

Anatomy is a section of biology and specifically morphology that studies the structure of the body, organisms and their parts at a level above the tissue level.

The kidney is an organ of the human excretory (urinary) system.

The ureter is a hollow tubular organ that connects the kidney to the bladder.

Anuria is a lack of urine flow into the bladder. In this pathological condition, diuresis is no more than 50 ml per day.

Nocturia- pathological urge to urinate at night is called.

Pollakiuria - the need for repeated urination, subject to the release of a normal or reduced daily volume of urine.

Hypostenuria - low urine density indicating impaired renal concentration

Prostatorrhea - discharge from the urethra during urination or during defecation of prostatic juice.

Uropathy is a structural or functional obstruction to the normal flow of urine.

Renography is a method for examining renal function using radiopharmaceutical

drugs administered intravenously.

Cryptorchidism is not prolapse of the testicle into the scrotum.

Achalasia of the ureter is a pathology of the development of the ureter, which is one of the stages of neuromuscular dysplasia.

Anatomy and physiology of urogenital system.

Anatomy and physiology of the urinary and male reproductive system.

Human anatomy refers to the biological sciences that study the origin, development, external and internal structure, functional characteristics of a living person. Human anatomy aims at describing the shape, macroscopic structure, topography of organs, taking into account the sexual, individual, structural characteristics of the organism, as well as phylogenetic and ontogenetic moments of development. The study of the human structure is carried out from the standpoint of the whole organism. Anatomy also draws on the data of anthropology, the science of man. Anthropology examines in a person not only age, sex and individual characteristics, but also racial, ethnic, professional, studies social influence, finds out the factors that determine the historical development of a person. Thus, biology considers humans from an evolutionary perspective.

Human anatomy is of great practical importance for medicine. Anatomy, together with histology (the science of tissues), physiology, biochemistry and other disciplines, forms the basis of theoretical knowledge in the preparation of a doctor. Prominent physiologist I.P. Pavlov noted that only after knowing the structure and functions of organs, we can correctly understand the causes of diseases and the possibility of their elimination. Without knowledge of the structure of a person, it is impossible to understand the changes caused by the disease, to establish the localization of the pathological process, to carry out surgical interventions, and, therefore, to correctly diagnose diseases and treat patients.

The term "Anatomy" comes from an ancient Greek word that translates as - dissect, dismember. Anatomy is a science that studies the structure of an organism, its organs, tissues, cells. Physiology is a science that studies the functions of the whole

organism, individual cells, organs and their systems. These sciences are closely related.

The human body consists of cells, tissues, organs and systems. In the whole organism, the allocation of an organ system is purely conditional, since functionally all systems are interconnected.

The organ system is a collection of many organs developing from a common primordium, performing a common function and topographically interconnected.
One of the body systems is the urinary apparatus, which performs the function of removing dissolved toxic substances unnecessary for the body; regulates the chemical composition of the blood. The processes of urination are closely related to blood flow through the kidney. Other organs also participate in the excretion of metabolic products: lungs (excretion of carbon dioxide, a certain amount of volatiles and water vapor); skin, in particular, sweat glands (excretion of water, salts, some organic substances), intestines (excretion of some salts in the feces).

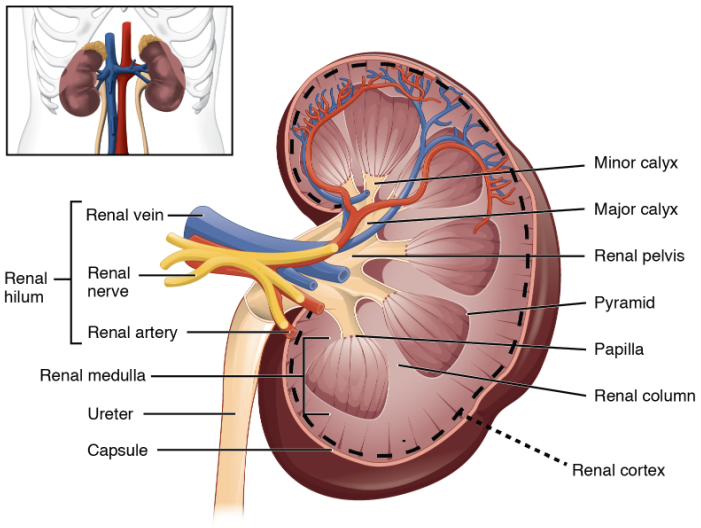
Pic. 1. Urinary organs. Kidney.
https://medis.org.ua/ua/uzi/pochek/

The kidney is the organ where urine is produced. The end products of protein metabolism in the body in the form of urea, uric acid, creatinine, products of incomplete oxidation of organic substances (acetone bodies, lactic and acetoacetic acids), salts, endogenous and exogenous toxic substances dissolved in water, are

mainly removed from the body through the kidney. A small part of these substances is excreted through the skin and mucous membranes. Therefore, the kidneys, along with the lungs emitting carbon dioxide, are the main organ through which the cleansing of the final and unnecessary metabolic products is carried out. Without the delivery of nutrients from the outside, the body can exist for a long time, without excretion it dies in 1-2 days. The remarkable structure of the kidney is adapted so that only substances unnecessary to the body penetrate through the biological membranes into the urinary tract. In the kidney, at the capillary level, a close relationship has developed between the blood vessels and the urinary tubules.
Excretions, which are in the blood in low concentrations, penetrate through the vascular wall into the urinary tubules.

External structure. The kidney is a paired bean-shaped organ. Its length is 10-12 cm, width is 5-6 cm, thickness is 3-4 cm, weight is 120-200 g. The left kidney is slightly longer than the right kidney and sometimes carries more weight. The color of the kidneys is often dark brown. The outer edge is convex, the inner one is concave. On the inner edge there are depressions where the gates of the kidney are formed, leading to its sinus. Bowls, bowls, ureter, artery, vein and lymphatic vessels are located in the gate and sinus. If we consider the ratio of the vessels, pelvis and ureter, then the vein is located in front, then the artery and pelvis. All these formations are enclosed in fatty and loose connective tissue of the renal sinus.
The upper pole of the kidney is sharper than the lower one; its anterior surface is more convex than the posterior one.

A section of the kidneys shows that they consist of medulla and cortical substance of different density and color; the medulla is denser than cortical, somewhat bluish-red, cortical - yellowish-red; these differences depend on the unequal blood supply.
The cortex is located outside and has a thickness of 4 - 5 mm. The medulla forms 15 - 20 pyramids, with a wide base facing the cortex, and with a narrow part (apex) up to the renal sinus. When 2 - 3 tops of the pyramids merge, a papilla is formed, which is surrounded by a small renal calyx.



Pic. 2. Internal structure.

https://www.nicepng.com/ourpic/u2w7w7u2q8q8w7e6_kidney-functions-internal-structure-of-human-kidney-kidney/

There is no equal border between the cortical and medulla. Part of the cortical substance penetrates into the medulla between the pyramids in the form of pillars, and the medulla penetrates into the cork substance in the form of its radiant part. The interlayers of the cortical substance located between the radiant parts consist of a coiled part. The radiant and coiled parts form a cortical lobule.

A lobule of the kidney is a part of the cortex, the corresponding base of the medulla and is clearly distinguished in children.

Blood vessels and urinary tubules are involved in the formation of the cortex and medulla.

The renal artery with a diameter of 7 - 9 mm starts from the abdominal aorta and at the hilum of the kidney is divided into 5 - 6 branches heading to its upper, lower poles and central part. The interlobar arteries penetrate into the kidney substance between the pyramids, which end at the base of the pyramids with arc arteries. Arc arteries are located on the border of the cortical and medulla. Two types of vessels are formed from the arcuate arteries: some are directed into the cortex in the form of interlobular arteries, others - into the medulla, where blood capillaries

are formed to supply blood to the nephron loops. Interlobular arteries are divided into bringing arterioles, which pass into vascular glomeruli with a diameter of 100-200 microns. Vascular glomeruli represent a network of blood capillaries that perform functions not of tissue exchange, but of excretion filtration. The blood capillaries of the glomerulus collect at its gate into the efferent arteriole. The efferent arteriole of the glomerulus has a smaller diameter than the efferent artery. The difference in arteriole diameters contributes to the maintenance of high blood pressure in the capillaries of the glomerulus, which is a prerequisite in the process of urination. The outgoing vessel of the glomerulus is divided into capillaries, which form dense networks around the urinary tubules and only then pass into the venules. Venous vessels, with the exception of the vascular glomerulus, which bring arterioles and efferent arterioles, repeat the branching of arteries.

The second important element of the kidney is the urinary system - the nephrons. The nephron begins with a blind extension, a double-walled glomerular capsule, which is lined with a single layer of cubic epithelium. As a result of joining the capsule of the glomerulus and the vascular glomerulus, a new functional formation is formed - the renal corpuscle. There are 2 million renal Taurus. From the capsule of the glomerulus, coiled tubules of the 1st order begin, passing into the descending part of the nephron loop. The ascending part of the nephron loop passes into the tortuous canal of the 2nd order, which flow into the straight tubules. The latter are collective tubes for many second-order convoluted tubules. The straight tubules in the medulla flow into the papillary ducts, which form an ethmoid field at the apex of the papilla.

Thus, the blood vessels, urinary tubules, and the surrounding connective tissue form the kidney substance. From this it follows that the cortical substance consists of interlobular arteries, bringing arterioles, efferent arterioles, renal Taurus, capillaries and loops of urinary tubules, straight and collecting tubes.

In each renal corpuscle, 0.03 ml of primary urine is released per day. Its formation is possible at a blood pressure of about 70 mm Hg. Art. At a blood pressure below 40 mm Hg. Art. urination is impossible. With a huge number of renal corpuscles,

primary urine is formed about 60 liters per day; it contains 99% water, 0.1% glucose, salt and other substances. From the primary urine, which has passed through all parts of the urinary tubule, water and glucose are reabsorbed into the blood capillaries. The final urine with a volume of 1.2-1.5 liters per day through collecting tubes is poured into the small cups of the renal pelvis.

Age features. In a newborn, the boundaries of the lobules are better visible. Until the moment of birth and after it the first months, the formation of new nephrons still continues. In relation to body weight per unit of kidney surface, children have more glomeruli than adults. Despite this, the filtering capacity of the glomeruli is lower than that of an adult, which is due to the smaller volume of the glomeruli and the thicker epithelium of the renal capsule. Tubular reabsorption is also reduced. By the age of 20, the growth of the kidney mass ends due to an increase in the size of the renal corpuscles and the length of the urinary tubules.

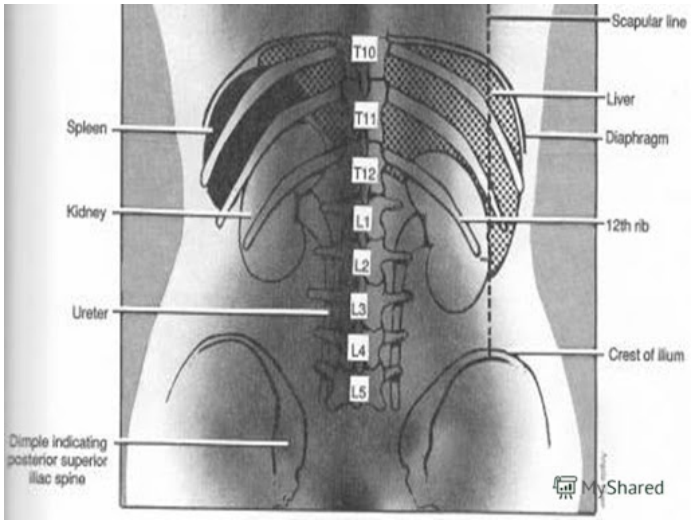
Kidney membranes.

A fibrous capsule grows with the cortical substance of the kidney, from which the delicate connective tissue interlobular layers, invisible to the naked eye, begin. In addition to connective tissue fibers, the capsule contains a poorly expressed layer of smooth muscles. Due to their slight reduction, the interstitial pressure of the Kidney is maintained, which is necessary for filtration processes.

The kidney is enveloped in a fat capsule, consisting of loose connective tissue, where fat is deposited with excess nutrition. The fatty capsule of the kidney is better developed on its posterior surface and has a certain value in keeping the kidney in the lumbar region. When losing weight, when the fat in the fat capsule disappears, kidney mobility (vagus kidney) may occur.

The outermost shell is the renal fascia, which is a two-layer lamina. The anterior and posterior leaves of the renal fascia at the outer edge and the upper pole of the kidney are connected, and at the bottom, in the form of a sheath, they continue along the ureter to the bladder. On the inner edge, fascial sheets in front and behind the vessels in 70% of cases are connected to the sheets of the other side.

The kidney is held in a niche in the lumbar region, formed by the psoas major muscles, the square muscle and the lumbar part of the diaphragm; membranes of the kidney, which have numerous connective tissue fibers connecting the renal fascia, fat capsule and fibrous capsule; kidney blood vessels, and positive intraperitoneal pressure.



Pic. 3. Topography.

https://download.videohelp.com/vitualis/med/kidneys_diagram_post.htm

The kidneys are located in the retroperitoneal region on the sides of the spine. Syntopy and skeletotopy of the right and left kidneys are different. The upper pole of the left kidney is at the level of the XI thoracic vertebra, the lower - between the II and III lumbar vertebrae. The XII rib crosses the left kidney at the hilum, which is a good guideline for surgical access to the kidney. The right kidney is 3 cm lower than the left one.

The upper end of the kidney is in contact with the adrenal gland. The right kidney is adjacent to the liver and the descending part of the duodenum, and its lower end to the right bend of the small intestine. The left kidney touches the stomach, spleen, and the descending colon. The mesentery root of the transverse colon crosses the kidney in the middle.

Age features. In a newborn, the kidney is relatively larger than in an adult, it has a more round shape with clear boundaries of 14 lobules. The kidney of a newborn

is located one vertebra lower than that of an adult. The internal structure is characterized by the fact that the sinus and cortex are poorly developed, the medulla of the kidney is well developed. The renal Taurus lies under the capsule. The convoluted tubules are poorly developed, the nephron loops do not extend beyond the cortex. The kidney goes through three stages of enhanced growth: at the 1st, 7th and 14th year of life.

Embryogenesis. In the first month of embryo development, paired genital and urinary ducts appear on the posterior wall of the body, communicating the secondary body cavity with the cloaca. The reproductive ducts are involved in kidney development. In the embryo, the appearance of a pre-kidney, a primary kidney and a final kidney occurs sequentially. Each kidney develops independently of each other from an unsegmented mesoderm. These kidneys in the embryonic period reflect only the development of the urinary organs. The pre-bud functions at the 3rd week of embryonic development for 40 - 60 hours. It is represented by 8 - 10 protonephridia (urinary tubules), which open at one end into the body cavity, and the other into the mesonephral ducts. A semblance of a renal capsule appears in the wall of protonephridia, into which a loop of a blood capillary growing on the abdominal part of the aorta is immersed. A kidney of a similar structure exists in lower aquatic animals.

The middle kidney appears on the 3rd - 4th week of embryonic development and functions for 12 - 15 days. There are about 20 urinary tubules (nephridia). Most urinary tubules lack support with a secondary cavity, and those that retain this support have cilia at the orifice of the opening. By oscillating, they direct the urine flow into the reproductive duct. The urinary tubules have a deeper capsule, where the vascular glomerulus is located.

The development of the final kidney occurs, starting from the second month of embryonic development, from metanephrogenic tissue located in the pelvic region at the site of the transition of somites into the lateral plates. From the terminal part of the genital duct, a blind protrusion of the future ureter and pelvis arises. Blind protrusion of the mesonephral (Wolf) duct grows into the bud of the final kidney.

From the blind end of the ureter in the thickness of the metanephrogenic tissue, the pelvis, calyxes and collecting tubules of the renal medulla develop. At the same time, tubules lined with high epithelium appear in the metanephrogenic tissue; the tubules growing up turn into a capsule of the kidney glomeruli. Then comes the process of connecting the tubules with collective tubules, which are derivatives of the mesonephral duct.

Abnormalities in kidney development are more common in the form of renal fusion.

Phylogenesis. Embryonic development in vertebrates, pre-buds, middle and final buds actually repeat the phylogenesis of excretory organs. In lower worms, which do not have a secondary body cavity, the tissues contain urinary tubes (protonephridia), which remove metabolic products and germ cells outside.

In higher worms and leeches, in connection with the development of the secondary body cavity, each segment has urinary tubes - metanephridia, which open at one end into the body cavity, and at the other end to its surface and remove metabolic products and germ cells. Such urinary tubules function throughout life in cyclostomes, fish, and amphibians.

Starting with the reptile class, the permanent excretory organ is the final kidney. In many animals, the pyramids and lobules are separated from each other by deep grooves.

Urinary organs. Pelvis. The final urine is poured into small cups, representing the outgrowths of the pelvis that enclose the papilla of the kidney. Two or three small cups merge into large cups, and they, in turn, form the renal pelvis and pass into the ureter. Small, large calyces and pelvis are located in the renal sinus. The pelvis is located behind the blood vessels of the kidney. Its shape is quite varied. The ampullar pelvis has one wide cavity and short cups. The long pelvis is small, and the cups are elongated. The branched pelvis consists of 2 - 3 cavities, communicating with the long calyx.

The wall of the pelvis and cups consists of mucous, muscular and connective tissue membranes. The muscular layer at the base of the small calyces is better

developed than in other regions, and forms the sphincter. Due to the contraction of the muscular membrane of the bowl, a portion of urine with a volume of 2 - 3 ml accumulates, which is thrown into the ureter.

The ureter is a paired tubular organ that connects the renal pelvis with the bladder. The length of the ureter is 30 - 35 cm, the diameter is uneven; at the place of discharge from the pelvis, at the entrance to the small pelvis and when passing through the wall of the bladder, it is 3 - 4 mm, and between these narrowings its diameter reaches 9 mm. The ureter consists of mucous membranes, muscular and external connective tissue membranes. The muscular layer has circular and longitudinal layers. In the ureter, the abdominal part, the pelvic part and the intramural part located in the wall of the bladder are distinguished. The abdominal part is located behind the parietal leaf of the peritoneum in front of the fascia and psoas muscle. The right ureter in the initial section is covered by the descending part of the duodenum, on the left it is located under the root of the mesentery of the sigmoid colon. At the level of the ilio-sacral joint, the abdominal part of the ureter passes into the pelvic.

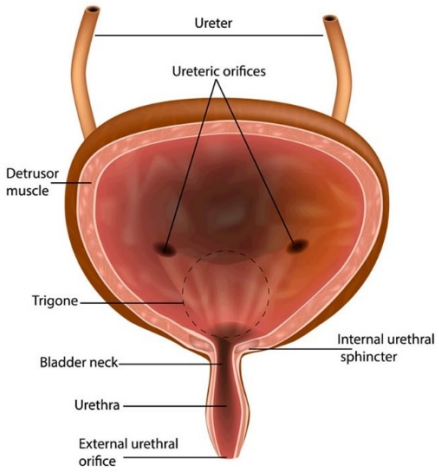
In the pelvis, the ureter lies behind the peritoneum and runs parallel to the internal iliac artery, crossing the outflow duct in men, and then flows into the posterior wall of the bladder. In women, the pelvic part of the ureter is located behind the ovary, medial to the obturator artery and behind the uterine artery, being at the base of the wide uterine ligament, and then, descending parallel to the uterus, bends around part of the vagina in front and enters the bladder. Consequently, surgical access through the vagina is possible to the pelvic part of the ureter. The intramural part of the ureter is 2 to 2.5 cm long and runs from the back to the front and medially through the back wall of the bladder. It ends with a hole covered from the side of the bladder cavity from above by a fold of the mucous membrane. The fold acts as a semilunar valve and passes a portion of urine only from the ureter to the bladder; retrograde flow of urine into the ureter is impossible. In the ureter, three bends and three constrictions are distinguished: at the site of the transition of the pelvis into the

ureter, at the transition of the abdominal part to the pelvic and before entering the wall of the bladder.

Age features. The ureter is long and tortuous, grows rapidly and at the end of the 2nd year of life its length doubles. The final length of the ureter is established up to 30 years. The diameter of the ureter in children is relatively smaller than that of an adult, it has not quite clearly defined narrowing sites.

Function. Urine moves along the ureter due to the peristalsis of its muscular membrane. The wave of contractions is repeated 1 - 5 times per minute at a speed of 2 - 3 cm per minute.

The bladder is a saccular organ with an apex; below the apex to the place where the ureters enter the bladder, the body is secreted, from the mouth of the ureter to the beginning of the urethra - the bottom.



Pic. 4. The bladder.

https://www.hartmanndirect.co.uk/advice-centre/incontinence/symptoms/overactive-bladders

The wall consists of mucous, muscular and connective tissue membranes. The posterior wall is covered by the parietal leaf of the peritoneum. The mucous membrane is covered with transitional epithelium. The own connective tissue layer of the mucous membrane is well developed and is represented by loose tissue, which, when the bladder is emptied, easily folds into folds. These folds are usually mistaken for the folds of the submucosal layer, but in reality the submucosal layer is absent in the bladder. There are also folds of the mucous membrane near the orifices of the

ureters. On the contrary, the urethral tongue protrudes to the inner opening of the urethra, connected to the comb of the urethra. The cystic triangle represents the part of the bottom of the bladder, bounded from above by the openings of the ureters (base of the triangle) and between them by the inter-ureteric fold and the internal opening of the urethra (apex of the triangle). In the area of the cystic triangle, the mucosa is smooth and contains crypts, sometimes mistaken for glands.

Normal bladder mucosa does not absorb urine at all. Three layers are conventionally distinguished in the muscular membrane: two longitudinal (external and internal) and circular. The outer longitudinal and circular layers reach a more significant development. In the area of the bladder triangle, the muscle layers are tightly fused with each other and with the mucous membrane. On the front wall, the longitudinal muscle layer is connected in men with the symphysis, on the back wall - with the prostate gland, in women - with the front wall of the vagina and the urethra. The smooth muscles of the bladder at the beginning of the inner opening of the urethra form a sphincter. In this case, the muscle bundles cover the bottom of the bladder triangle, then along its lateral sides they reach the opening of the urethra and are thrown over the front wall of the canal in the form of a loop. In women, the internal sphincter is fused to the anterior wall of the vagina, so a ruptured vagina often causes damage to the sphincter and impaired urination. The closure of the urethra occurs when the muscle loop contracts. In this case, the front wall of the urethra is pressed against its posterior wall, as well as against the cystic tongue. The sphincter contracts reflexively without the participation of human consciousness.
On the outer surface of the bottom of the bladder, there are rectal-vesicular muscles, representing an independent bundle, which in men passes from the back wall of the bladder to the rectum, and in women to the uterus and vagina. This muscle also contains striated fibers.

The connective tissue layer surrounds the bladder from all sides, forming peri-vesicular tissue. The venous and nerve plexuses are located in the peri-vesicular tissue. The back wall of the bladder, especially when it is filled, is covered with a serous membrane.

From the apex of the bladder in the direction of the navel, the median umbilical ligament departs, representing a reduced urinary duct. The ligament is covered by the peritoneum, which forms the fold of the same name.

The pubic-vesicular, lateral, and medial ligaments are part of the tapus fascia. They contain muscle bundles.

Topography. The bladder is located in the pelvis behind the symphysis. An empty bladder can be palpated in men only through the rectum, and in women through the vagina. The floor of the bladder is located on the fascia and muscles of the perineum. In women, due to a wider and lower perineum than in men, the bladder is also lower. The filled bladder penetrates between the transvesical fascia and the parietal sheet of the peritoneum of the anterior abdominal wall. If urine overflows, the tip of the bladder can reach the navel.

Age features. In children, the bladder through the Lesser pelvic cavity is located in the abdominal cavity and has a fusiform shape. The bottom of the bladder is absent, and the triangle of the bladder is vertical, descending into the pelvis only with the development of the pelvic cavity, which ends by the period of puberty. Due to the high standing of the bladder in girls, it does not come into contact with the uterus and vagina, and in boys, with the rectum.

The mechanism of urination. The urinary reflex occurs when the pressure in the bladder cavity exceeds 15 cm of water column. With this pressure, the nerve endings of the afferent fibers are irritated, which, as part of the pelvic nerves and hypogastric nerves, transmit impulses to the sacral segments of the spinal cord. From the spinal cord, response impulses are sent to the muscle of the bladder wall, causing it to contract. After emptying the bladder, the parasympathetic center is inhibited, and the sympathetic center is excited. As a result, the tone of the bladder wall weakens and the sphincter contracts.

In the reflex of urination, a certain role is played by the lower segment of the rectus abdominis muscle, which is in contact with the anterior wall of the bladder. With the contraction of the rectus abdominis muscle, the bladder is compressed, the pressure in it increases, and the urinary reflex occurs faster.

In a person, the urge to urinate occurs when the voluntary sphincter of the urethra is closed. In men, due to the structural features of the perineum and the more powerful development of sphincters, urinary retention is possible for a longer time than in women.

Embryogenesis. The bladder develops in the second month of the embryonic period from part of the cloaca and allantois. The cloaca is located at the tail end of the body and is a depression where the genital and urinary ducts and the intestinal tube open. Then the niche of the cloaca is divided by a frontal septum, connecting with the membrane that covers the cloaca. As a result, the cloaca is subdivided into the anterior urogenital sinus and the posterior rectal sinus. With the separation of the sinuses, the membrane breaks and the corresponding holes are formed. Allantois is connected to the urogenital part, which consists of the apex, middle part and bottom. The top of the allantois becomes viscous, the middle part and the bottom form the bladder.

Anomalies. A common abnormality is the junction of the bladder with the umbilical opening or eversion of the bladder by the mucous membrane (ectopia). This anomaly reflects the peculiarity of the development of the bubble. There is also a connection of the bladder with the vagina or rectum.

Phylogenesis. In aquatic animals, amphibians, reptiles, cloaca, birds, and some mammals, the bladder is absent and the ureters open into the cloaca. A similar picture of the structure of the urinary system and cloaca is observed in higher mammals only in embryogenesis at the second month of development. The absence of a bladder in the above animals is probably due to the peculiarity of protein metabolism, when the final metabolic product is not only the formation of urea, but also uric acid. Uric acid crystallizes easily, in contrast to urea, which can be dissolved for a long time. In the presence of a bladder, these animals would easily form conglomerates of uric acid. This was probably one of the reasons that contributed to the reduction of the bladder. Only in mammals, in which urea is synthesized from ammonia, it is easy and long to keep in a dissolved state, a bulky bladder has formed. In mammals, the cloaca disappears, and in males between the

genital sinus and the canal of the copulatory organ, a connection appears in the form of an urethra, through which urine flows and the germ cells pass.

The female urethra acts only as a urine outlet. In men, not only urine passes through the urethra, but also seminal fluid.

The spongy part is 12-14 cm long and corresponds to the spongy body. It begins with a bulbous expansion, where the ducts of two bulbous-urinary glands open, which secrete protein mucus to moisturize the mucous membrane and dilute the seminal fluid. The pea-sized bulourethral glands are located in the depth of the deep transverse muscle of the perineum. The urethra of this part starts from the bulbous expansion, has an equal diameter of 7-9 mm and only in the head passes into a fusiform expansion, called the scaphoid fossa, which ends with a narrowed external opening. In the mucous membrane of all parts of the canal, there are numerous glands of two types: intra-epithelial and alveolar-tubular. Intra-epithelial glands are structurally similar to goblet mucous cells, and alveolar-tubular glands are shaped like flasks, lined with cylindrical epithelium. These glands secrete secretions to moisturize the mucous membrane. The basement membrane of the mucous membrane is fused with the spongy layer only in the spongy part of the urethra, and in other parts with the smooth muscle layer.

When considering the profile of the urethra, two curvatures, three extensions and three constrictions are distinguished. The anterior curvature is in the root area and is easily corrected by lifting. The second curvature is fixed in the perineal region and bends around the pubic fusion. Dilation of the canal: in the prostatic part - 11 mm, in the bulbar part - 17 mm, in the scaphoid fossa - 10 mm. Narrowing of the canal: in the area of the internal and external sphincters, the canal is completely closed, in the area of the external opening, the diameter decreases to 6-7 mm. Due to the extensibility of the canal tissue, if necessary, it is possible to insert a catheter up to 10 mm in diameter.

Currently, medicine has defeated many previously incurable ailments. New technologies come to the aid of man.

Removal of both kidneys in animals or a sharp impairment of kidney function in humans leads after a short period of time (6-7 days) to irreversible changes. This occurs due to the poisoning of the body with metabolic products that accumulate in large quantities.

There are three alternative methods of replacement therapy for this condition: peritoneal dialysis, hemodialysis and kidney transplantation. For temporary replacement of kidney function (in case of poisoning, kidney surgery), an apparatus called an artificial kidney has been created. With its help, those metabolic products that are usually excreted from the body by the kidneys are removed from the blood. The operation of an artificial kidney is based on the principle of dialysis (separation of colloids from truly dissolved substances) and ultrafiltration through a thin semi-permeable partition. Cellophane spirally wound in the form of a tube serves as such a membrane. Blood flows in a cellophane tube, and around it there is a saline solution similar in composition to Ringer's solution and heated to 37 degrees Celsius. A number of substances dissolved in the blood passing through the cellophane tube diffuse into the saline solution. In this way, in 1 hour it is possible to remove from the blood from 6 to 16 g of urea from a person.

A woman's urethra is 3-4 cm long and 7-11 mm in diameter. The canal is slightly curved, as it passes through the urogenital diaphragm of the perineum, located under the symphysis. In the place where the channel passes through the perineum, there is an external sphincter, subordinate to human consciousness. The anterior wall of the canal is fused with the angular ligament of the symphysis, and the posterior wall is fused with the anterior wall of the vagina. The canal has mucous, muscular and connective tissue membranes. The mucous glands are located in the mucous membrane of the canal. The external opening of the urethra opens on the eve of the vagina, above the entrance to it. The muscularis membrane forms the internal sphincter.

The male urethra is about 18 cm long; most of it passes predominantly along the spongy body. The canal begins in the bladder with an internal opening and ends at the head. The urethra is subdivided into prostate, membranous, and spongy parts.

The prostate part corresponds to the length of the prostate gland and is lined with transitional epithelium. In this part, a narrowed place is distinguished, according to the position of the internal sphincter of the urethra, and below the expanded part 12 mm long. On the back wall of the expanded part, a seed tubercle is located, from which a ridge formed by the mucous membrane departs up and down. There is a sphincter around the orifices of the ejaculatory ducts, which open at the seminal tubercle. In the tissue of the ejaculatory ducts is the venous plexus, which acts as an elastic sphincter.

The membranous part is the shortest and narrowest part of the urethra; it is well fixed in the urogenital diaphragm of the pelvis and has a length of 18-20 mm. The striated muscle fibers around the canal form the external sphincter, subordinate to human consciousness. The sphincter, in addition to the act of urination, is constantly reduced.

A cellophane tube is connected to two cannulas, one of which is inserted into an artery and the other into a vein.

By connecting an artificial kidney 2-3 times a week, it is possible to maintain the life of patients with impaired renal function for many years (or until the function of their own kidneys is restored).

The world's first human kidney transplant was performed in 1933 by the Soviet surgeon Yu. Yu. Voronov. Since then, hundreds of thousands of kidney transplants have been performed in the world, which has helped save the lives of hopelessly ill people.

UROSEMIOTICS AND DIAGNOSIS OF DISEASES OF THE GENITOURINARY ORGANS

The main symptoms of urological diseases are

1) pain with characteristic localization and irradiation
2) disorders of urination,
3) quantitative and qualitative changes in urine
4) pathological discharge from the urethra and changes in semen.

Analysis of the listed symptoms in most cases allows you to focus on a particular diagnosis and then there is a need to confirm its correctness.

Painful sensations. Pain is one of the most common symptoms of urological diseases. It occurs to varying degrees in most of these diseases. In some cases, pain is the reason for seeking medical help, in others it takes a bi-secondary place in the clinical picture of the disease. Therefore, it is necessary to compare them with other symptoms in order to explain them correctly.

Pain in various urological diseases differs by localization, nature of occurrence, irradiation, intensity, duration, frequency or constancy, accompanied by phenomena.

Pain in diseases of the kidneys, renal pelvis and peri-renal tissue.

Pain in the lower back and hypochondrium with renal diseases is often one-sided, which, according to the nature of these diseases, in most urological patients, in contrast to therapeutic kidney diseases, which are usually bilateral. Sometimes pain is noted on both sides despite the fact that only one kidney is affected. In such cases, the pain on the healthy side can be of a reflex nature, which is more common in the city with urolithiasis. Sometimes the pain is associated with compensatory hypertrophy of the healthy kidney. Pain can sometimes be more pronounced on the healthy side than at the site of the lesion. The pain is sharp and dull, occurs suddenly or gradually, is constant or paroxysmal. Pain in renal diseases differs by their irradiation towards the abdomen along the ureter and into the genitals. The most characteristic type of pain syndrome in renal diseases is renal colic, which occurs when a sudden obstruction of the outflow of urine from the renal pelvis, acute

obstruction of the ureter as a result of the passage of calculus, conglomerate of crystals, purulent clot or ureteral flow. The passage of the calculus leads to a spastic contraction of the muscular wall of the ureter, which causes its complete obstruction, urinary retention in the renal pelvis and an increase in pressure in the renal capsule. Stretching which causes severe pain.

An attack of renal colic always begins suddenly. It is most commonly caused by driving on a shaky road or strenuous exercise, but it can occur at rest, such as during sleep.

An attack of renal colic is usually short-term, but more often takes on a protracted character with short remissions, lasts for several days nearby. The pain usually begins with the back in the lumbar region, and from there spreads forward, in the hypochondrium, along the ureter towards the bladder, genitals, to the inner surface of the thigh. On the contrary, if there is an obstacle in the lower third of the ureter, then the pain begins in the iliac region and spreads towards the kidney to the bottom. In such cases, pain in the genitals can be much more intense than in the area of the kidney.

The pain is usually accompanied by frequent urge to urinate and cramps in the urethra. This is one of the great features. Often during renal colic, the urine turns red as a result of the admixture of blood. As for microhematuria, it always occurs.
Renal colic is often accompanied by irritation of the adrenal plexus. Patients always constantly complain of nausea and vomiting.

Also, repeated urge to stool. The second patients have a picture of dynamic intestinal obstruction. Palpation often reveals a slight tension of the abdominal wall in the hypochondrium or along the ureter on the diseased side. This is a typical course of renal colic. However, it does not always pierce typically. A number of these signs of renal colic may be erased or absent. So, in some cases, the typical irradiation of pain is not observed. In others, when the kidney is turned off (block), there are no changes in urine. On the other hand, a number of diseases that are located in the vicinity of the kidney may have a course with a similar clinical picture, more often the same stormy one. All this raises the question of the need for a diligent

differential diagnosis between renal colic and other diseases so that there are no diagnostic errors, since the latter can lead to serious consequences. The most common mistake is made when differentiating between acute appendicitis and renal colic. According to VA Gorash, out of 450 patients with urolithiasis, 150 appendectomy was performed.

Among urologists there is an opinion that the presence of scars after appendectomy in the right iliac region is a symptom of nephrolithiasis.

In order to end the differentiation between acute appendicitis and renal colic, chromocystoscopy should be performed. In the presence of renal colic, a dysfunction of the diseased kidney is usually found. It is possible to notice a contraction of the orifice of the ureter without urine flow. It is possible to see gross hematuria.
A plain radiograph can reveal the presence of a shadow of a calculus at the level of the kidney or along the ureter.

The most important differential diagnostic sign of simultaneously having a therapeutic effect is novocaine blockade. It is possible to produce it in the lumbar region, but safely and simply in the spermatic cord in men or in the round ligament of the uterus in women according to Lorin-Epstein. A decrease or complete disappearance of pain indicates the presence of renal colic. Novocaine blockade of the spermatic cord has no effect on pain in acute appendicitis. It should always be remembered that the doctor may be led down the wrong path by having a history of nephrolithiasis.

A new attack of pain on the right can be regarded as a repeated attack of pain associated with renal colic. It is clear what this can lead to, if in fact the patient has acute appendicitis.

In renal colic and acute cholecystitis, the possibility of a diagnostic error is manifested by the localization of pain in the right hypochondrium and an acute onset, and concomitant nausea and vomiting. As a rule, there are no typical symptoms for renal colic and the presence of typical symptoms for hepatic colic indicates the presence of osannoe. The pain begins in the right hypochondrium and radiates to the back, scapula, and right shoulder. Dyspeptic symptoms are sharply expressed. There

are no changes in urination. Jaundice of the sclera is more common. With bimanual palpation, the greatest pain in patients with hepatic colic is observed in the hypochondrium, and in renal colic closer to the lower back. In some cases, an enlarged painful gallbladder is felt. When tapping along the costal arch, soreness is noted in the lumbar region, the resulting pain is explained by renal colic in cases of acute cholecystitis, there is a very frequent tension of the muscles of the anterior abdominal wall, a positive symptom of St. George's Musia (phrenicus symptom). High leukocytosis is noted. Acute inflammation of the uterine appendages can lead to an error on the part of the doctor as a consequence of the localization of pain, their irradiation towards the lower back of urinary disorders. However, it is not difficult to make a correct diagnosis. The pain usually spreads to the entire abdomen, the pain radiates not to the renal region, but to the sacrum region. The onset of pain is not as sudden as with renal colic. There are no temporary cuts and no increase in pain. They are kept at the same level or are constantly growing. Vaginal examinations make it possible to clarify the diagnosis of the disease.

Diagnostic difficulties can arise in cases of covered perforated gastric ulcer or duodenal ulcer. Interrogation of the patient makes it possible to establish the presence of sudden pain characteristic of a breakthrough vulnerability: a “blow with a dagger” in the epigastric region. In most patients, it is possible to identify a long ulcerative history.

Even in the presence of a covered ulcer, the anterior abdominal wall is very significantly strained by the Shchetkin-Blumberg symptom. Absence or decrease in the zone of renal dullness. X-ray can reveal gas under the dome of the diaphragm. The presence of vomiting, paroxysmal pain, flatulence, delayed urge are the cause of the second diagnostic error - a patient with renal colic is diagnosed with intestinal obstruction. However, this mistake is very easy to correct, with renal colic, no disturbances in the discharge of gases and feces are observed. There is no abdominal asymmetry, peristalsis is visible, Valya's symptom. Sometimes perinephric blockade clarifies the diagnosis.

It should be noted that the diagnosis of renal colic alone is not sufficient. He does not reveal the essence of the disease, but speaks only of damage to the kidney or ureter. The diagnosis should cover the cause of renal colic.

Most often, renal colic occurs with the migration of calculus. However, it can be observed with a blocking kidney, tuberculosis, renal neoplasms, kidney infarction. Accordingly, there are many causes of renal colic. In renal colic that pierces with hematuria, it is of great importance for the diagnosis to find out the sequence of the appearance of pain and blood in the urine. This makes it possible to reveal: colic depends on the passage of blood clots, or these two phenomena are parallel. In the presence of calculi, pain always precedes bleeding, since it is the result of the passage of calculus that has already begun. In tuberculosis, tumors, etc. Diseases, hematuria is usually preceded by pain, which causes the passage of a large clot through the ureter.

Such provocative moments as movement, running, physical activity are characteristic of urolithiasis. With tuberculosis, tumors, colic usually occurs at rest. Pain such as renal colic occurs in patients with intermittent hydronephrosis. During colic attacks, the kidney enlarges. The attack ends simultaneously with the release of the amount of urine after which, of course, it is not possible to probe the kidney. In addition to colicky pain, the patient may experience dull pain in the lumbar region in the hypochondrium relative to the side of the lesion.

Dystopia of the kidneys in most cases does not cause pain. They are most often found with a horseshoe kidney and is explained by the fact that the isthmus connecting the lower poles of both kidneys compresses the formation located anterior to the spine. The diagnosis is confirmed by palpation and urography.

Particular attention should be paid to pain in the area of a healthy kidney (up to renal colic). This is due to reno-renal reflux. Sometimes the pain is of a compensatory nature after nephrectomy, which causes great anxiety in the patient.

Sometimes patients complain of pain in the kidney that occurs during the act of urination. This may be due to the presence of vesicoureteral reflux. Pain in the kidney area can occur with the so-called “perihepatic primary hematoma”. It can

appear as a complication in some kidney diseases - acute, chronic nephritis, pyelonephritis, adrenal diseases, as well as in hemorrhagic diathesis, aortitis, etc. Sometimes it is not possible to establish the cause of the hemorrhage. This complication is characterized by a triad of symptoms - pain, signs of intestinal obstruction and internal bleeding, which can cause a number of errors. The pain is always sudden. They are sharp, sharp, and sometimes cause fainting. Oliguria is constantly observed, more often hematuria. This is a very fluid disease, but it is necessary to remember about it.

Pain in diseases of the ureters. With a disease of the ureter, pain is localized along its trajectory. To identify localization according to the course of the ureter, it was suggested to do palpation at some points. Three ureteral points are described: the upper ureteral points to the left and right of the navel. The middle ureteral points are located on the horizontal, which connects both anterior-superior spines of the iliac bones at the site of its intersection with vertical lines that go to the joints of the internal and two external thirds of the pupar ligaments. These points can be identified as follows: a line is drawn from the navel to the middle of the pupar ligament, the middle ureteral point is located according to the border of the lower and middle third of this line. The lower urinary points are accessible by palpation through the vagina or rectum.

Pain in the bladder area. Most often, pain in the bladder area is reflected in nature and is associated with diseases of the kidneys, prostate gland, and urethra. Pain in the bladder area can be constant, independent of the act of urination, or periodically arising in connection with urination. In the latter case, they can be felt before the onset of urination and can be explained by the filling of the bladder and stretching of its walls. They can begin during or after urination, which is of great diagnostic value.

The pain that occurs in the bladder, especially in children, radiates to the glans penis. Therefore, if a child complains of pain in the glans penis (in the absence of ballanoposthitis, phimosis), he must be examined and the usual cystography confirms the diagnosis.

Pain in the bladder area can be the result of acute urinary retention as a result of the inflammatory process of the vesicular tissue, paracystitis.

Pain in the bladder associated with urination is characteristic of various forms of cystitis, for tuberculosis.

In patients with cervical cystitis, pain is associated with the end of urination, and lasts some time after it ends. This is due to tenesmus, a convulsive contraction of the sphincter of the bladder, which continues after the last portion of urine is removed from the bladder and injures the inflammatory mucous membrane.

In severe forms of inflammation of the mucous membrane of the bladder, pain can always be constant, since the intervals between urination are reduced to several minutes.

Pain in diseases of the prostate gland. Pain of a constant nature in the perineum with irradiation to the anus, sacrum, groin, along the seminiferous tubules indicates pathology from the side of the prostate gland. Sharp pain in the same area, which forces the patient to take certain positions. The patient cannot even sit. In chronic prostatitis, the pain is aching in nature, dull pulling in nature.

Adenoma of the prostate is painless, up to the appearance of urinary retention. If prostate cancer pain may appear as a result of tumor growth and compression of nerve trunks. It should be remembered that for any pain associated with the prostate gland, the patient needs to conduct a rectal digital examination.

Pain in the urethra. They are more often reflected in nature and depend on diseases of the kidneys, bladder and prostate gland. But the pain that occurs during sexual arousal and during the passage of urine currents, plus purulent discharge indicate pathology from the urethra.

For example, a stone fell from the upper urinary tract and got stuck in the lumen of the urethra, the patient feels sudden pain. The act of urination is usually interrupted. On palpation, it is possible to determine the calculus in the hanging section of the urethra.

Violation of urination and urine production. A healthy person excretes up to 1.5 liters of urine per day. The amount of urination ranges from 4 to 7 times a day.

The bladder is emptied completely. However, the urge to urinate due to the filling of the bladder can be suppressed even if a significant amount of urine has collected in the bladder.

Bladder capacity is a purely physiological concept. It is generally accepted that the capacity of the bladder turns out to be the amount of urine at which it appears in the emptying of the bladder, there is an urge to urinate. It can occur with a volume of 250-300 ml (normal), and due to some pathology, a person does not feel the need to urinate even in the case when urine reaches 500 ml or more (prostate adenoma, acute myelitis, tumor spinal cord).

Under normal conditions, there is harmony between the activity of the detrusor and the activity of the sphincter of the bladder - the tension of the detrusor and the activity of the sphincter of the bladder - the tension of the detrusor is accompanied by relaxation of the sphincter. Without this coordinated activity, normal urination is impossible. If during the contraction of the detrusor sphincter spasm occurs, then urination is impossible. If a person has a significant weakening of the sphincter, then urinary incontinence can be observed.

Frequent total urination disorders are associated with damage to the brain, spinal cord and nerve plexuses of the small pelvis.

Diseases of adjacent organs can cause urinary disturbances in different ways:

1) as a result of compression of the urinary tract

2) as a result of changes in the conditions of blood circulation in the small pelvis

3) by reflex.

Thus, an example of a reflex urinary disorder is postoperative urinary retention, which is observed especially after intervention on the pelvic organs.

Basically, the violation of urination depends on the disease of the bladder, prostate and urethra.

Under normal conditions, a person excretes an average of 200 to 300 ml of urine with each act of urination. At night, she does not get up at all before urinating, or she may wake up once. In a number of pathological conditions, the amount of urination increases significantly, the intervals between them are reduced and,

accordingly, decreased. The amount of urine excreted with each urination. The impression is that the person's bladder capacity is decreasing. This frequent urination is called pollakiuria. We have seen a patient who urinated 148 times a day. In total, 1200-1500 ml of urine is secreted per day. In some pathological conditions, the amount of urine that is excreted by the kidneys can increase significantly. It can reach several liters.

Considering that the bladder does not increase in volume, the patient will need to urinate 10-15 times a day. Such frequent urge to urinate is not associated with impaired urination, but are a consequence of an increase in urine output - polyuria.
In some pathological conditions, the rhythm of urination is normal during the day, and frequent at night. Frequent urge to urinate at night is termed nocturia. To find out that the patient does not have polyuria, but pollakiuria, should be done by questioning, to establish its nature: constant, daytime, night. In each case, we are talking about different diseases.

Nocturia is a characteristic symptom of prostate adenoma: daytime pollakiuria indicates functional disorders (cystalgia, nephrosis of the bladder), constant pollakiuria about organic lesions (cystitis, tuberculosis).
In some pathological conditions, it is not possible to suppress the urge to urinate or it is very difficult to do it. Such urges are called imperative or imperative urges.
In most cases, but not always, imperative can be combined with pollakiuria. In a number of patients, an imperative urge may be common manifestations of violations of the act of urination. The rhythm of urination may be normal. This indicates manifestations of a functional impairment of the sphincter.

The two fundamentally opposite urinary disorders are urinary incontinence and urinary retention.

If you complain of urinary incontinence, you should always clarify whether there is incontinence or only incontinence. Under urinary incontinence, one should know such a condition in which, due to the urgent urge to urinate or because of their frequency, the patient is not able to hold it until he reaches the toilet, or until he is

given a duck. In case of urinary incontinence, the latter is excreted externally, regardless of urination without urge. Urinary incontinence can be real or not.

By false urinary incontinence, it is necessary to understand the constant discharge (later) of urine externally, regardless of the act of urination, but the cause of the birth or acquisition of urinary tract pathology. Such effects include ureteral extraphy, epispadias, ectopia of the ureteral opening in the presence of vesicovaginal fistulas.

With real urinary incontinence, there is no violation of the anatomical integrity of the urinary tract, there are no defects in their wall, but urine for one reason or another is not retained in the bladder, it flows out involuntarily. It can be observed with an increase in intraperitoneal pressure (when laughing or coughing), physical exertion during movement, and can also occur only at night during sleep, when there is no control from the cerebral hemispheres.

A special type of urinary incontinence is the so-called paradoxical ishuria. It occurs as a result of prolonged urinary retention. The bladder gradually expands. The tone of his muscle wall is practically reduced to zero. The detrusor is unable to contract and expel urine from the bladder. Urine continues to flow from the kidneys, and it seeps through the urethra in drops. Thus, when urine is released, it is delayed. The opposite of urinary incontinence is urinary retention. The latter can be complete or partial. Under a partial delay, such a condition is envisaged when the patient independently performs an act of urination, but does not completely empty the nasal bladder. After each urination, a certain amount remains in the bladder cavity, which is called residual urine. Its amount can range from a few ml to hundreds of ml or more. The latter can be detected using a catheter inserted into the bladder cavity after urination. The second method is the method of urography (intravenous). The presence of a shadow of urine on the x-ray indicates the presence of residual urine. And if the residual is more than 100 ml, then it can be found percussion under the pubis.

Complete urinary retention can be acute or chronic. With a complete delay, the patient does not urinate on his own. Most often, it occurs against the background

of partial urinary retention. Complete urinary retention can also occur when the emptying of the bladder during urination was complete before.

An attack of complete urinary retention is accompanied by severe pains in the lower abdomen, radiating into the penis. A sharply distended bladder appears above the pubis. Palpation of the bladder is painful. The duration of an attack of acute urinary retention is different. It can last from several hours to several days. Sometimes acute urinary retention is delayed so much that it becomes chronic.

Lack of urination is not always a symptom of urinary retention. In some cases, the patient cannot release urine because it is not there - the bladder is empty.

The termination of the urinary function of the kidneys is called anuria.

The latter is of several types:

1) prerenal
2) arena
3) renal
4) subrenal
5) reflex (A.I. Mayants).

Prerenal arises with cardiovascular insufficiency, thrombosis of the renal vessels, thrombosis and ligation of the lower vein ice, compression of the renal vessels.

Arenal anuria of the kidneys - elimination of a single kidney.

Subrenal anuria, which is called “subvesical urinary retention”, depends on the violation of the patency of the ureters as a result of their lumen or external compression.

Anuria is a symptom - acute renal failure that occurs as a consequence of various shockogenic effects arising from impaired renal circulation. During shock, there is a sharp decrease in blood circulation in the kidney.

Depending on the type of shockogenic effect, there are:

1) acute renal failure (post-traumatic)
2) hemolytic
3) toxic,

4) infectious

5) arising from a violation of water-electrolyte balance.

(AI Mayants) also highlights "hysterical anuria".

A decrease in the amount of urine oliguria occurs as a result of the same reasons as anuria. The patient may complain of liquid urination, and lead the doctor to an error. The daily amount of urine in the range of 500 ml should suggest oliguria in the patient.

Violation of the act of urination (difficult) has a name - dysuria. Pollakiuria - the most common type of urination disorder (cystitis, cystalgia) is frequent urination during the day and at night, which is associated with a particular pathology (adenoma, prostatitis, chronic urinary retention). Polyuria - the patient excretes 4-3 liters or more instead of the usual 1200-1500 ml of urine. In the literature there are observations when a patient excreted as much as 30 liters of urine per day. Polyuria can be physiological. In such cases, it is episodic or seasonal. When taking a lot of fluids. Polyuria can be pathological - as a compensatory mechanism due to the loss of the contrast ability of the kidney.

Persistent polyuria is observed in patients with chronic renal failure.

Changes in urine. The general analysis of urine includes the identification of color, transparency, reaction, specific gravity, protein content, and uniform elements. The color of a healthy person's urine ranges from light yellow to orange-yellow. It is due to the presence of physiological dyes in her, mainly urochrome. The color of urine can change with the use of drugs (pyramidon, phenylin, santonin, etc.), or food (beets, carrots).

Impurities of blood - hematuria gives urine a red color or the color of meat slops. With prolonged standing, such urine has a reddish-brown tint. Hematuria can be caused by diseases of the kidneys (tumors, polycystic) affected vessels (thrombosis of the artery, veins) urolithiasis, as well as damage to the bladder, urethra, prostate gland and sometimes malignant hypertension. Hematuria of renal origin is characterized by the color of the entire portion of urine when a 2 or three glass test is carried out. The presence of blood clots is characteristic of extrarenal

hematuria. Prolonged hematuria should suggest that it is caused by either glomerulonephritis, tumor, or tuberculosis. Short-term hematuria is more typical for vascular lesions of the kidneys, urolithiasis. Localization of pain in the kidneys in the lower back, and in the lower abdomen is characteristic of diseases of the bladder) can, to some extent, indicate the place of the pathological process.

Hematuria of extrarenal origin can occur in connection with hemorrhagic diathesis of various etiologies (blood disease, taking anticoagulants).

Hematuria is distinguished: real or not real.

With real hematuria, urine is stained due to the slowing down of hemoglobin (septic abortion, transfusion of various blood groups).

With false hematuria, the color of urine depends on a large number of fresh red blood cells and a small amount of hemoglobin. Changes in urine color are also observed with urinary diathesis: brick-red in the presence of urates, and milky white in the presence of phosphates. Freshly released urine is normally clear. When standing, she develops a cloudy cloudiness, which consists of urinary tract mucus and alkaline phosphates.

The reaction of urine is normally slightly acidic. When eating food rich in proteins, the urine reaction is acidic, and with a carbohydrate diet alkaline. In a healthy person, urine pH, depending on the diet, ranges from 4.5 to 8. The urine reaction depends not only on the diet, but also on urinary diathesis, the state of the urinary tract, etc.

The specific gravity of urine in a healthy person depends on the amount of fluid taken, and as a result of an increase in urine output: the more urine is excreted, the lower its specific gravity and vice versa. Normally, the specific gravity is 1012-1025. decrease in the specific gravity (hypostenuria) in advanced stages of the disease due to various reasons.

Reflecting the concentration ability of the kidneys, the specific gravity at the same time may change due to the presence of protein or sugar in the urine. So every 3.3% of protein increases the specific gravity of urine by 0.001, that is, by one division of the urometer, and 1% of sugar by 0.004, that is, by four divisions. An

increase in specific gravity can also be observed with loss of water (diarrhea, vomiting) and the release of radiopaque substances.

Proteinuria (protein in the urine) occurs in all kidney diseases. Normally, 30-50 mg of protein is released per day. However, with physical exertion, palpation of the kidneys, proteinuria can increase by 2-3 times.

In kidney disease, proteinuria can range from 10 to tens and hundreds of ppm.

If diseases of the lower urinary tract are detected. In these cases, the protein concentration usually does not exceed 0.099-0.165%.

Protein must be determined not only in morning urine, but also during the day. Physical activity affects its increase. We use the so-called orthostatic test. The absence of protein in the portion of urine that is received in the "lie down" position and its appearance after exercise indicates extrarenal causes of proteinuria. The phenomenon of pus in urine, pyuria, is the result of various kinds of inflammatory processes in the kidneys, urinary tract, and in the genitals of men.

To identify the source of inflammation, there is a two to three glass test. Initial pyuria occurs when pus is in the first glass. If pus is in the first and the other glass, this indicates terminal pyuria. (Tell about the three-glass sample).

Sometimes pyuria can be the only symptom of any disease (Tb, pyelonephritis).

Sometimes more or less accurate data on the number of leukocytes can be judged by the Addis-Kakovsky test. In daily urine, the number of erythrocytes, leukocytes, cylinders is found. Normally, leukocytes are 2-4 mil, erythrocytes are 1 mil, cylinders are up to 20 thousand.

Subsequently, the Amburge test is used. According to this method, urine is collected in 3 hours, 10 ml is taken from it and centrifuged. Then take 1 ml of the precipitate is shaken, and one drop of this precipitate is placed in a hemocytometer to count the formed elements in 1 mm3. The number of cells in 1 mm is multiplied by 1000 (the drop is taken from 1 ml) and divided by 10 (the sediment is obtained from 10 ml of urine). The number of cells in 1 ml will be multiplied by the amount of urine excreted by the patient in 3 hours and divided by 180 (the number of minutes

for which urine is collected), the number of cells excreted by the kidneys with urine in 1 minute will be obtained. The normal number of leukocytes excreted in the urine in 1 min is 2500, erythrocytes is 1000.

A very significant symptom is the detection of active leukocytes or Sterngheimer-Malbin cells. Usually these cells appear with pyelonephritis. These are large cells, their nucleus is much deeper, the protoplasm is granular and is in a state of Brownian motion.

In addition, cylinders are found in the urine sediment - the so-called cylindruria. Distinguish between real and not real. False cylinders include urate salt, myoglobin pigment and bacteria. These include hyaline granular and waxy cylinders. For urological diseases, the presence of granular and waxy cylinders in urine is uncharacteristic; only hyaline cylinders can be found.

Discharge from the urethra. Spermatorrhea - loss of semen without erection, without orgasm and without characteristic ejaculatory impulses.

Prostatorrhea - discharge from the urethra during urination or during defecation of prostatic juice.

Discharge of blood from the urethra - urethrorrhagia.

Aspermatism - despite sex drive and erection, there is no ejaculation of semen during intercourse, while spermatogenesis is not a violation.

Oligospermia - insufficient volume of sperm in the ejaculate

Azospermia is the absence of sperm in the ejaculate.

ANOMALIES IN THE DEVELOPMENT OF THE URINARY AND MALE REPRODUCTIVE SYSTEM

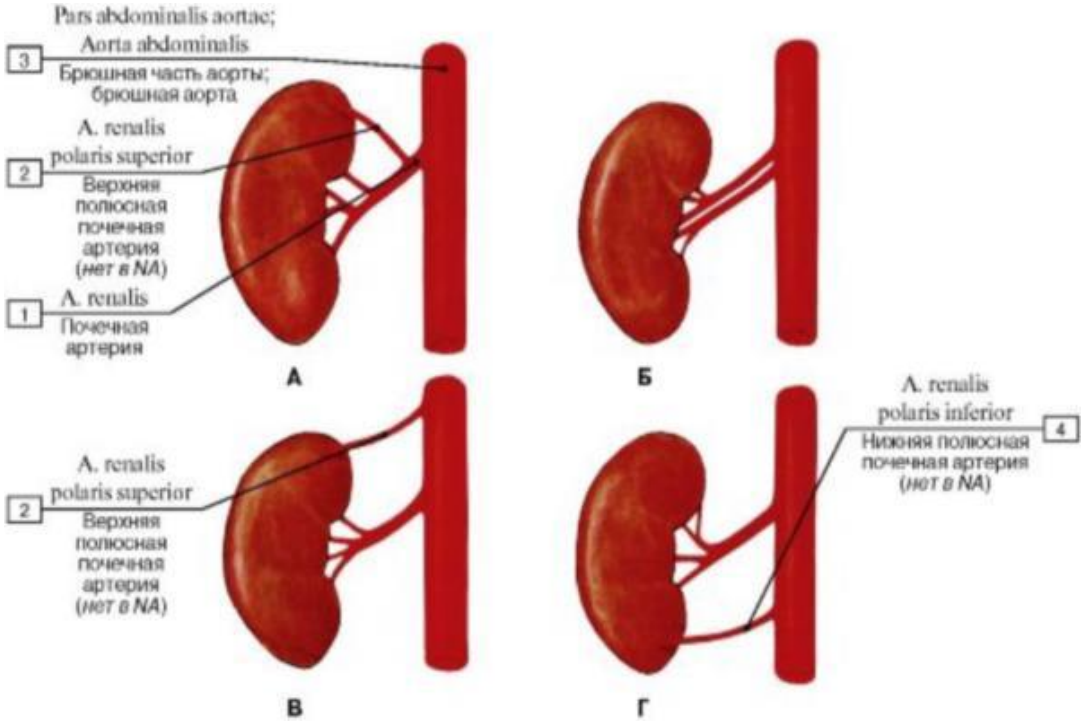
Abnormalities of the organs of the genitourinary system. Urologists began to notice significant deviations from the norm on the part of the organs of the genitourinary system for a long time. This was especially noticeable among the kidneys and ureters. It is because of this that attention was first paid to just this section of the urinary system. Then the first work began to determine not only the location of the kidneys, but also their functional viability and how this affects the function of the other kidney, the presence of extrarenal diseases (hypertension) and the like. Despite this, not very long ago, the first classifications of these anomalies of the genitourinary system began to appear. A little more than a century ago, or rather in 1910, the classification by I. Delmas and P. Delmas was published, which gave an assessment mainly of anomalies of the ureters. In 1914, I. H. Dzirne proposed his classification. It concerned the changes that were observed on the part of the kidneys. In fact, for the first time it was said that the kidneys may be in places (outside the norm), may not be quite developed (hypoplasia), fused with their edges, of some unusual shape, or completely one kidney may be absent (aplasia). Subsequently, S.M. Fedorov (1923), then N.N. Sokolov (1928) indicate the presence of changes not only on the part of the kidneys, but also on the side of the renal pelvis, and cystic degenerative changes in the kidneys. For the first time, Marion drew attention to the fact that renal vascularization significantly affects the further fate of the kidney.

With the development of science, modern technologies, using angiography, ultrasound, computed tomography and the like, scientists managed to systematize the results obtained, combine them into a single set and offer them for practical use in everyday practice. This makes it possible to correctly assess symptoms, syndromes and approach them with different methods of treatment, prevent complications, help doctors of other specialties (cardiologists, therapists, anesthesiologists treat patients better and more efficiently.

In 1987, M. A. Lopatkin and A. L. Shabad proposed a classification of anomalies of the kidneys and upper urinary tract. This classification is still used by urologists. The classification suggests changes in the kidneys. This includes: abnormalities in the number of kidneys, complete and incomplete doubling of the kidneys (SM Weigert-Meer), location, fusion (one and two-sided), morphological changes (polycystic, multicystic), and the like. Our everyday observations indicate that people sometimes have such uropathies that cannot manifest themselves in their entire life, so the person lives and does not even know that she may have deviations from the norm on the part of the genitourinary system. This continues until the infection joins and causes the inflammatory process. During the examination, for the first time in her life, certain changes (abnormal) in the urinary system (especially) are revealed. But there are such congenital anomalies that do not allow a person to live, and if you do not intervene in his life in a timely and correct manner, then the child dies in the first days of his life. For its own reason, all uropathies from the genitourinary system are primarily associated with various main causes, which are distinguished into the following main groups: The first group is associated with blood vessels. This primarily concerns the arteries that supply blood to the kidneys. Observation shows that quite often there is an additional artery in addition to the main renal artery.

Which can be the size of the main artery or much smaller and it departs from the aorta at the level of the lower pole of the kidney and provides blood supply to the kidney, depending on the caliber. It can supply blood to the kidney area from 2%, to almost a third of the kidney. A person does not know that she has such an anomaly, but during examination or surgery, urologists find it and if it is not noticed in time, then, as a rule, significant bleeding is observed. Thus, if an additional artery interferes with the removal of calculus from the kidney, then in order to correctly solve the problem with it, it is necessary to squeeze it and see how the color of the kidney changes to the corresponding pole. If its area is gray, then only the fate of this artery should be correctly decided - to bandage it or not to touch it at all. The

fact is that the larger the area of blood supply to the additional artery, the worse for the kidney. If the artery is ligated, the kidney may die (nephrectomy).



Pic. 5. Renal artery.

http://jakvylikuvaty.pp.ua/11066-dodatkova-nirkova-arterya-nayblsh-poshirena-anomalya-nirok.html

Abnormal vessels always cause additional causes for disturbed blood supply, which leads to a number of changes in the kidney and the appearance of hypertensive syndrome, as well as hypertension. In such a kidney, zones appear that are easily accessible to infections and for the first time inflammatory processes (pyelonephritis) appear, which make it possible to diagnose a vascular anomaly. It should be noted that the number, length, size of the openings of the vessels may be different. So with an abnormal location of the kidney (lumbar, iliac), as a rule, short ureters are observed, and a sufficiently large number of short arterial vessels. Considering that there may be aneurysms in these vessels, it is clear that for the first time a person may have bleeding (total gross hematuria). The above mentioned vessels can be both on one side (more often) and on both sides.

The veins of the kidneys are equally important. The fact is that they are closely related to the inferior vena cava. There may be several of them, and this is exactly what during the operation (especially nephrectomy from the right), it is possible to damage the veins of even not large caliber. This leads to massive bleeding, which is very difficult to manage. Short veins, high pressure due to pressure in the inferior vena cava lead to blood loss and even death. The vessels of the kidneys can be located in such a way that an additional artery is placed next to the central artery, which can be placed in such a way that it interferes with the outflow of urine in the region of the pelvic-ureteral segment. A gradual portioned outflow of urine leads to stagnation of urine, its accumulation, there is pressure on the cups, causing them to expand. This is how the initial stage of hydronephrosis (hydrocalicosis) begins to form. Over time, the amount of urine accumulates, the pressure on the kidney parenchyma increases, it begins to decrease, become thinner, and as the final stage, the kidney turns into hydronephrosis, that is, the bag is filled with urine. Kidney function disappears. Its volume increases significantly, it deforms the corresponding lumbar zone and is determined by palpation as a tumor-like formation. Sometimes there are compatible arterio-venous factors, which are very difficult to diagnose, but there are causes that may first manifest themselves clinically with hypertension or bleeding. Unfortunately, quite often additional vessels (especially veins) are not isolated, but in large numbers. Significant changes in the side of the pelvic-ureteric segment require the need to operate on patients with the restoration of free passage of urine in the future. To date, the technique of surgical intervention has been quite well improved, which makes it possible to restore the function of the kidney, to prevent its death for many years. The fact is that additional vessels sometimes cross with the ureters, block their lumen, and in that place the normal wall of the ureter is disturbed due to impaired blood supply and the muscles change into sclerosed scar tissue. Conservative therapy in this case is disinterested and it is only necessary to operate on the patient. According to A. V. Ayvazyan, A. M. Voino-Yasenetskiy (1988), the formed strictures have different anatomical structures.

The first is the stricture of the ureter due to changes in the tissues of the perineal pelvis for no more than 1.0-1.5 cm.

The second is stricture due to hyperplasia of the muscle layer.

The third is stricture only due to scar tissue that replaces the muscles.

All this made it possible for M.A.Lopatkin (1995) to express the opinion that hydronephrosis in its development goes through three stages. The first stage is initial, the second is early, the third stage is terminal. Just at an early stage, hydronephrosis is most often diagnosed and then surgical intervention is most effective (V.S. Karpenko, M.S. Vukanovich, 1974).

Attention should be paid to the fact that congenital anomaly of the vessels located in the upper pole of the kidney mainly passes through the renal parenchyma and pinches the calyx neck. Violation of blood supply especially to the upper pole of the kidney may first manifest itself as hypertensive syndrome (Karpenko V.S., Pereverzev A.S., 1984).

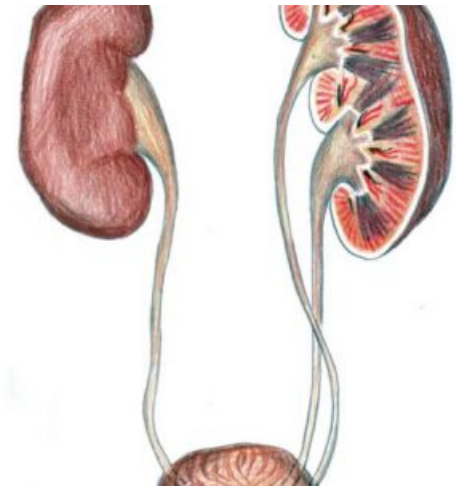
As for the kidneys themselves, attention is drawn to the fact that there are such a large number of anomalies, because of this, scientists have classified them into several groups:

I. 1) by quantity - aplasia (absence) of one kidney may not manifest itself in any way if the contralateral kidney functions well. Considering the fact that the kidney actually works in two, it enlarges (hypertrophies), which can sometimes be misleading for an inexperienced urologist. To avoid this, X-ray studies should be used: intravenous urography, radioisotope (renography), ultrasound or angiography.

2) In addition, there are (most often) incomplete or complete doubling of the kidney.

In this case, according to the Weibert-Meer law, an intersection between the ureters passes near the bladder. So the ureter from the upper half of the kidney is rooted in the bladder below, and the ureter of the lower part of the kidney passes above the previous one along the back wall of the bladder. But in more than 80% of cases, kidney duplication is incomplete. That is, the visible parts of the ureter are in the upper, middle or lower third of the ureter. Which part of the ureter functions worse, then a hydronephrotic transformation is formed earlier in the corresponding

part of the kidney. There are not isolated cases when double kidneys are observed on both sides.



Pic. 6. Doubling of the kidney

https://seleznev.com.ua/chto-takoe-udvoennaya-pochka-i-na-skolko-eto-opasno/

3) An additional third kidney is extremely rare. It has its own renal pelvis, vessels and a short ureter. Most often it occurs in the iliac region or in the pelvis.

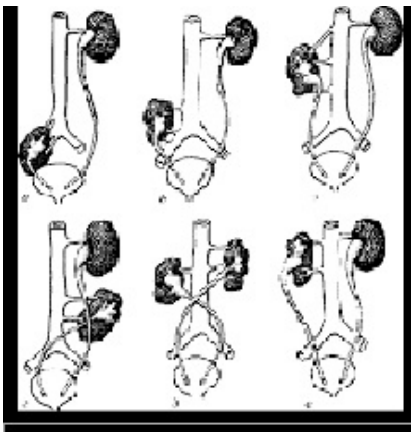
Abnormalities in the location of the kidneys. Displacement of the kidney from its anatomical place is considered as its dystopia. Most often it is found in the lumbar, iliac, pelvic regions. In contrast to the displacement of the kidney, even with lumbar dystopia, a very short ureter and its vessels are observed. There is no way to move such a kidney. Therefore, they do not touch it if there is no inflammatory process in it (pyelonephritis), or it does not manifest itself as the cause of hypertensive syndrome. It is very important to know where the dystopic kidney is located in the pelvis. This is more common in young women. So with a gynecological examination, a gynecologist can diagnose a tumor. It is necessary to clearly know about such anatomy, since a young woman needs to become pregnant and give birth to a child. To avoid kidney injury, it is most likely necessary to operate in a timely manner. The placement of the kidney in the chest cavity is rare. It is a find during chest fluoroscopy. It is perceived as a tumor and can operate on the

patient by mistake. Sometimes dysphagia from the kidney is considered for the diaphragmatic keel and other diseases of the gastrointestinal tract.

Cross-renal dystopia is sometimes observed. When from the right kidney ectopia of the orifice of the ureter into the left wall of the bladder and vice versa.

What are the forms of kidneys that urologists encounter in their daily practice. They are: fused as one - and bilateral. if the fusion is one-sided and both kidneys are next to each other, with the fused inner surfaces, then in such cases they are called biscuit-like. It doesn't happen often. Most often, especially in men, both fused kidneys are observed with their edges. Then we are talking about the presence of a horseshoe kidney. Most often, fusion is the lower poles. Between them there must be an isthmus, which, according to Albarran (1889), can constrict the ureter and cause the formation of hydronephrosis. It should be noted that the isthmus is located anti-vascular rarely retro-vascular. It was this that gave some scientists the right to believe (R. M. Fronshtein, 1928) that the isthmus compresses the vessels (aorta and inferior vena cava), which leads to weakness of the legs and their numbness. Despite this placement of the horseshoe-shaped kidney, almost never any of the authors have indicated such symptoms. In this case, the pelvic-ureteric segment does not have significant anatomical changes and is usually placed in the front (with surgery from above). But such a horseshoe-shaped kidney has an independent large number of short vessels (arteries and veins) in the upper and lower edges. A kidney like this is often exposed to infection. Then, in one of its sectors, inflammatory processes with destruction are rapidly developed. Urologists are forced to operate and perform heminephrectomy. It should be noted that if the isthmus is represented by connective tissue and fibrous tissue, then its intersection and dilution of the kidneys passes unnoticed for the patient. Another thing is when the isthmus is wide, formed by the renal parenchyma, then you should carefully look where the demarcation line is determined between the two parts in order to cut off the isthmus. Unfortunately, erroneous cutting leads to the formation of a fistula, conservative treatment of which will be unsuccessful. The fact is that if even a small piece of kidney tissue remains,

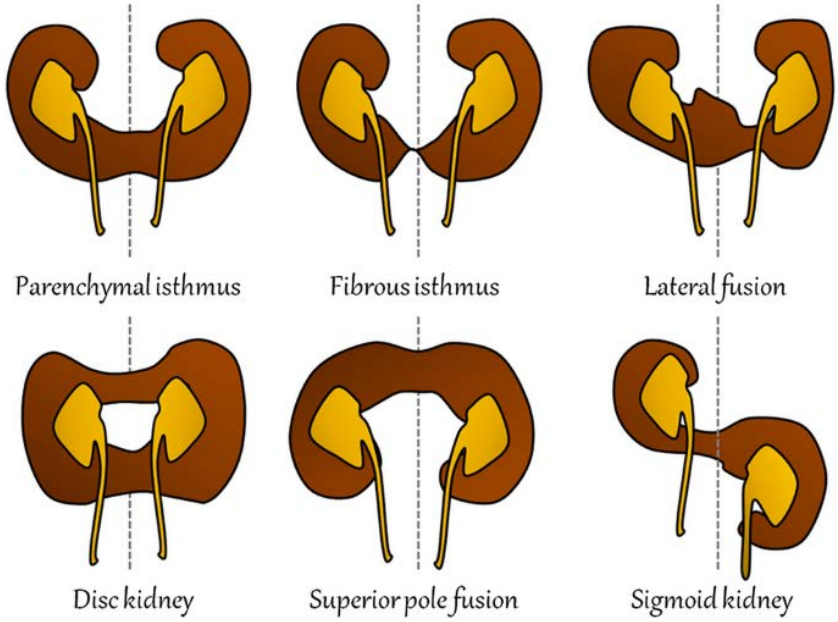
which produces urine, then there is no hope of success. It is imperative that the patient be operated on again to remove the left lobe of the kidney isthmus.



Pic. 7. Distopia of the kidneys

http://urology-kyiv.com/anomaliyi-nyrok/

Another type of kidney anomaly is the fusion of the ends of the kidneys (one on top and the other on the bottom), such a kidney is called S-shaped or L-shaped (if one of the kidneys is fused in a transverse view). In general, it is noticed that abnormal kidneys have urinary calculi much more often, infection develops and tumors form. Kidney abnormalities are not only characterized by this. As a rule, their unusual formation is accompanied by changes in the structure of the kidneys. So quite often rudimentary or dwarf buds are found. They have sufficiently developed vessels, ureter, pelvis, but all this is in a reduced state. It is necessary to distinguish dwarf kidneys from hypoplastic and shriveled ones. The first does not have its developed system and the veins themselves are no more than 3-3.5 cm in diameter. They can cause hypertensive syndrome, and it is very difficult to find them even with retrograde pyelography. It is difficult to find such a hypoplastic kidney among the perinephric tissue even with surgery.



Pic. 8. Fusion with the ends of the kidneys.

http://urology-kyiv.com/anomaliyi-nyrok/

Multicystic kidneys are a formation from a parenchyma completely replaced by cysts of sufficiently large sizes. The patient always lives off the contralateral healthy kidney. The diagnosis can be made only by an aortogram indicating the absence of arteries and renal parenchyma.

Unlike a multicystic kidney, polycystic disease is always bilateral. Instead of a parenchyma, cysts of different sizes are seen, closely spaced. Some people have hemorrhages, so the imagination develops as if these are "grape twigs". If with multicystic kidneys a person can live for several decades at the expense of a healthy kidney, then with polycystic kidney he lives much less. More often women suffer from polycystic kidney disease. Moreover, the appearance of back pain, rapid fatigue, and then the appearance of hypertension are explained by hard work, care, social problems, and the like. Only a detailed examination can make a correct diagnosis. According to M.O. Lopatkin (1995), polycystic disease quickly leads to renal failure. He identifies three stages in the development of this irreversible process. The first stage is compensatory with minor back pain, general weakness, and for the first time, changes in urine are observed. The second stage - dry mouth, headache, fatigue, nausea and hypertension are added subcompensation. The third

stage is decompensation, which is characterized by nausea, vomiting, headaches, the amount of urea in the blood rises significantly, creatinine goes off scale for the level of 900-1000, the level of potassium ions is 6-6.8 and more. In this case, everything is done to free the blood from urinary impurities. The diagnosis is made taking into account the history of the disease, radioisotope and ultrasound examination. In addition, sometimes paracaval cysts, calyx and pelvic cysts are diagnosed, until the cyst breaks into the cavity of the calyx or bowl, it does not manifest itself in any way, and only when changes appear on the side of urine, a targeted examination of patients begins. The presence of a cyst, which is firstly no more than 2-3 cm in diameter; secondly, single; thirdly, it does not interfere with the outflow of urine, requires dynamic observation from the urologist.

A simple (solitary) cyst with sizes of 5 cm or more, and if it also violates the renal parenchyma, constantly increases, then it is best to puncture it, remove the contents and pour a sclerosing substance (alcohol) into it. If there are signs of suppuration of a cyst or cyst in polycystic disease, then lumbotomy is performed with ignipuncture (puncture) of suppurative cysts. Nephrectomy is not possible. Ignipuncture should be followed by anti-inflammatory and antitoxic therapy.

Classification of abnormalities observed from the ureter. With regard to anomalies of the ureters, it should be noted that most often there are doubled changes. Sometimes the bifurcation of the ureters coincides with the bifurcation of the kidney. Then each part (upper and lower) has its own separate ureters, which are directed downward into the bladder. Along the way, these ureters are either split (ureter fissus) or single-handedly reach the bladder (ureter duplex). If such completely split ureters enter the bladder, then one of them is somewhat shorter in the bladder wall, which may be the cause of vesicoureteral reflux. The reflux of urine reaches the kidney and causes pain in the corresponding side of the lower back. In addition, along with urine, an infection from the bladder enters the kidneys, which is the cause of the inflammatory process (pyelonephritis). There are cases when the ectopia of the eye is on the opposite wall of the bladder, or the eye can open in the urethra, perineum, vulva, and occasionally in the rectum. Such ectopia occurs in

women much more often than in men. Separately, it should be noted that the ureters are quite often located between large vessels (aorta and vein), retrocavally. They can have diverticula, congenital kinks, strictures, which leads to impaired urodynamics and the occurrence of pyelonephritis and even hydronephrosis (ureterohydronephrosis).

A special anomaly is a violation of urodynamics throughout the entire ureter, or in a separate part of it. Then the ureter is adynamic, wide (resembles intestinal). Such a violation of urodynamics also leads to the occurrence of pyelonephritis, renal failure, and the like. According to MA Lopatkin (1971), the above described changes can be in violation of nervous regulation and a decrease in the number of muscles of the ureter. They called this condition "neuromuscular dysplasia of the ureter." At the same time, the staging of the development of such a pathology has been recommended. They identified three stages: the first stage - achalasia of the ureter; the second stage is megaureter; the third stage is ureterohydronephrosis. The very staging of this process indicates which treatment to choose at different stages of the development of this pathology. Firstly, they begin to treat conservatively even in childhood. Only in the absence of success, then in adulthood, more often (almost always) patients are operated on.

Another pathology on the part of the ureters is the prolapse of its entire wall into the bladder cavity (ureterocele). A similar ureterocele can prolapse into the urethra (especially in girls), occlude it, and cause acute or chronic urinary retention. In these cases, there are mainly dysuria, hematuria and quite significant back pain. Sometimes it is mistakenly regarded as ishuria paradox (urinary retention during incontinence). For a long time, this pathology has not been clinically detected. The first signs of it appear at the beginning of the disturbance of urodynamics. A large number of abnormalities are associated with the occurrence of vesicoureteral reflux (VER) such as ureterocele, bladder diverticula, and the like. It is necessary to diagnose MRS in children as early as possible (it then begins), to carry out dynamic observation and as soon as signs of the presence of an inflammatory process, hydrocalicosis appear, then the patient must be operated despite his age.

Among the anomalies of the bladder, the first place can be considered the exstrophy of the bladder, that is, the sick child does not have the front wall of the bladder. When viewed at the site of the urinary, a dome-shaped formation of red is determined in the suprapubic region. Over time, this surface of the mucous membrane is scarred, overgrown with polypoid formation. The posterior surface of the bladder is constantly wet due to urine that is constantly excreted and poured out. In this regard, urine causes maceration, which constantly disturbs the child. If the child is not operated on in a timely manner, then quite quickly the infection affects the kidneys, accompanied by an inflammatory process, and subsequently renal failure, ending in a lethal case. Such people do not live long. They don't all survive 18-22 years. Infection, the formation of urolithiasis are the main causes of tragic cases

Pic. 9. Bladder exstrophy

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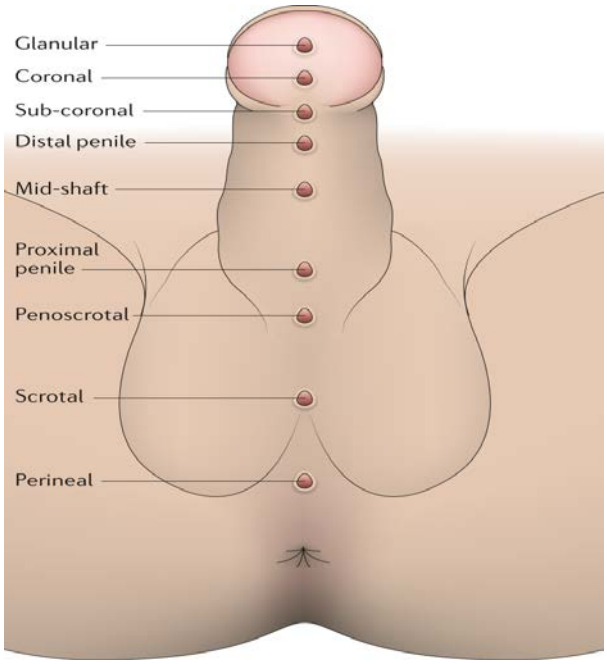
It should be noted that formations such as congenital bladder diverticula are not uncommon. They are single and multiple. Their sizes are so large that more urine is collected in them than in the bladder. All this interferes with urination, leads to

the formation of residual urine, chronic inflammation (cystitis), and subsequently to tumor growth. In all these cases, only surgery helps. For example, in children with bladder exstrophy, cystectomy is performed, followed by transplantation of the ureter into the ampulla of the rectum, and today they use the creation of artificial bladders from the large or small intestine. This is, firstly, more aesthetically pleasing, and secondly, there is less chance of a kidney infection. Operation for a bladder diverticulum involves repelling the diverticulum, hermetic suturing of the bladder wall, and restoring normal urination. Almost never bladder exstrophy is isolated. It is always accompanied by changes on the side of the urethra. Among them are congenital contracture of the bladder neck (Marion's disease). It is observed quite rarely and its essence lies in the fact that the fibrous tissues formed in the embryonic state of boys in the submucous layer, which wrap the bladder neck, which does not make it possible for urination. Treat only with an operative method. The second reason is congenital urethral valves. They are of three types: the first is cup-shaped (from the seed tubercle); the second is funnel-shaped (goes from the seminal tubercle to the neck of the bladder); the third is transverse above or below the seed tubercle (classification of MA Lopatkin).

As for other anomalies of the urinary tract, the most severe, but unfortunately, the most common are EPI - and hypospadias. That is, such boys lack the front wall, the entire or partially the genital organ is small bent towards the mountain and difficult or sometimes impossible urination. Epispadias happens: the head of the genital phallus; stem epispadias of the genital phallus (throughout the entire organ); total epispadias (the wall is absent throughout the entire organ and even affects the sphincter of the bladder). Treatment depends on the type of epispadias. So bighead epispadias are not operated on, and all others are treated only by surgery. Success depends on the timing of treatment and the qualifications of the operating urologist. It should be noted that if the defect of the urethral wall is on the posterior surface, then we are talking about hypospadias. She is capitate. This is the easiest type of hypospadias. With him, the urethra is not very shortened. Penile deformation does not occur. The outer opening of the urethra is located under the head of the penis.

This placement of the hole does not interfere with urination, and the absence of significant deformation does not interfere with intercourse. Such patients do not need special treatment. The second type is when the external opening of the urethra opens in the middle of the urethral canal. The urethra is reduced, the deformation of the penis is quite significant. The peripheral part of the urethra is narrowed, short.

Difficulty urinating, intercourse is also difficult. Such (stem) hypospadias is corrected only by surgery. The most difficult for the patient, as well as for the doctor, is the wicket and perineal hypospadias. These boys actually have no urethra, the cavernous bodies are underdeveloped. The penis has actually turned into a "ring" with its head towards the gate. The child has to urinate while sitting. Dysuria, splashing urine, urinary incontinence, the inability to perform sexual intercourse, will make him socially defective, cause a depression, that is, in fact, the patient will become disabled. This is what requires doctors to diagnose the pathology in a timely manner and operate on the child even before he goes to school. Multi-stage surgery, difficult, long-term, but can be successful and over the years people lead a normal family life.



Pic. 10. Hypospadias

https://www.talmudology.com/jeremybrownmdgmailcom/2021/5/9/yoma-30-penile-malformations

Among the genital organs, anomalies, unfortunately, are not as rare as doctors would like. This primarily concerns the organs of the scrotum in boys. The fact is that about 5-8% of children have defects on the side of the testicles.

In the first place are boys with one testicle, which is called monorchism. Ultrasound and angiographic examinations should be used to confirm the presence of only one testicle. It should be remembered that there is true monorchism, and there is not true monorchism. Maybe so - one testicle is in the bag, and the second did not descend (very often) and lingered in the abdominal cavity. You cannot palpate and see him. This is called cryptorchidism. The threat lies in the fact that a malignant tumor (seminoma) can grow from the testicle that has not descended to the scrotum in 100% of cases. If this testicle is not found and removed, then basically it will manifest itself as a tumor somewhere in 20-25 years. It very rarely happens that a boy has missing testicles - anorchism. On the contrary, with three or more testicles, we are talking about polyorchism. In this case, the third (less developed) testicle should be removed so that a tumor (always malignant) does not arise. Unlike cryptorchidism, the testicle can leave the canal and remain under the skin of the thigh, iliac zone, perineum. In this case, we are talking about testicular ectopia. Due to the fact that such a testicle has a long spermatic cord, it can be operated by moving it into the gate. The forecast is favorable.

Another anomaly on the part of the penis is not so rare. This is the presence of a short bridle. This interferes with the opening of the head of the penis in children, and in adults during intercourse it tears and this is accompanied by bleeding. Treat only by surgery. The forecast is favorable.

ACUTE RENAL AND CHRONIC FAILURE

Learning objectives: To teach students to diagnose in a timely manner, provide primary care and treat acute renal failure (ARF), clearly define the indications and contraindications for extracorporeal hemodialysis in ARF,

Skill List: Know the symptoms of nephrologic disease. To navigate in the indicators of the general analysis of the cut, the general analysis of urine, functional renal tests. Be able to interpret isotope renography data. be able to diagnose and treat chronic renal failure (CRF), determine the doctor's tactics in combining CRF with pregnancy and gynecological diseases, diagnose and treat neurogenic hypertension.

LIST OF CONDITIONAL ABBREVIATIONS

ARF-acute renal failure.

EU-excretory urography.

CT computed tomography.

MRI magnetic resonance imaging.

PET Positron Emission Tomography.

RRG-radiorenography.

Ultrasound-Ultrasound examination.

CRF-chronic renal failure.

CPS-calyx-pelvis system.

Glossary of terms:

Anuria is a lack of urine flow into the bladder. In this pathological condition, diuresis is no more than 50 ml per day.

Oliguria - a decrease in daily urine output to 500 ml.

Hemodialysis is a method of extrarenal blood purification in acute and chronic renal failure.

Peritoneal dialysis - the basis of peritoneal dialysis is the ability of the peritoneum to pass low and medium molecular weight substances through itself.

Acidosis is a shift in the acid-base balance of the body towards an increase in acidity (decrease in pH).

Glomerulonephritis is an immune-inflammatory kidney disease in which the renal glomeruli are affected with the involvement of tubules and interstitial tissue.

Tubulopathy is a large group of diseases occurring with impaired tubular transport of organic substances and electrolytes.

Creatinine is the end product of the creatine phosphate reaction.

Renal failure is a syndrome that develops as a result of impaired renal blood flow, glomerular filtration, tubular reabsorption and secretion, as well as the concentration ability of the kidneys and is characterized by azotemia, electrolyte-water balance and acid-base balance.

Acute and chronic renal failure are distinguished along the course. ARF occurs suddenly as a result of acute, most often reversible kidney damage. CRF develops gradually as a result of progressive, irreversible loss of functioning renal parenchyma. ARF can occur at any age, but more often in 20-40 years

Etiology. The causes of acute renal failure are disorders of general and renal hemodynamics, acute effects on the kidneys of exogenous poisons, infectious agents, acute occlusion and damage of renal vessels, obstruction and compression of the urinary tract, rarely kidney injury.

Etiological factors of ARF can be grouped into:

1) prerenal factors - a sharp decrease in the volume of circulating blood and a decrease in blood pressure in shock or bleeding, the loss of a significant amount of water and electrolytes with profuse diarrhea, prolonged vomiting, burns, as a result of the use of (especially prolonged) diuretics.

(thromboembolism), in acute inflammatory diseases (acute glomerulonephritis, acute pyelonephritis), some acute infectious diseases.

3) postrenal factors - occlusion of the urinary tract with a stone, compression of the ureters by a tumor, hematoma, ligature, etc.).

ARF can also occur after bilateral nephrectomy for vital indications and with traumatic loss of both kidneys (called arena). About 90% of cases of acute renal failure are associated with kidney damage as a result of hemocerculatory disorders and poisoning with nephrotoxic poisons.

Pathogenesis. Necrotic changes in the tubules in acute renal failure due to hypoxia develops as a result of hemodynamic disturbances or histotoxic effects. Impaired renal blood flow and decreased glomerular filtration are the most important mechanisms of ARF. In the origin of oliguria or anuria, a significant role is played by the indiscriminate absorption of the glomerular filtrate through the wall of the damaged renal tubule and edema of the interstitium. Compression of the renal tubules and their blockage by pigment casts are only additional factors in the development of oliguria. A large role in the pathogenesis of acute renal failure belongs to humoral influences, especially from the renin-angiotensin system, which can cause renal vasospasm and ischemia. It is believed that damage to the tubules entails a violation of sodium reabsorption and an increase in its concentration in the area of a dense spot, to which the juxtaglomerular complex reacts by increasing the secretion of renin.

The high activity of renin causes a spasm of the adducting glomerular arterioles (bringing vessels) and a decrease in glomerular filtration. Such vasoactive substances as histamine, serotonin, vasopressin, as well as some steroids increase the sensitivity of tissues to hypoxia, are of a certain importance in the pathogenesis of acute renal failure. It has been established that in this form of the disease, shunting of the renal blood flow is observed, that is, the blood bypassing the cortical substance of the kidney enters the system of direct arterioles of the brain tissue through the glomeruli of the renal corpuscles of juxtamedular nephrons. According to the well-known spasm of interlobular arteries and ischemia of the renal cortex, a certain role also belongs to the pathogenesis of cortical necrosis.

Pathological anatomy. Morphological changes in the kidneys in acute renal failure depend on the etiology of the period of the disease, timeliness, the nature and volume of therapeutic measures.

Macro - and microscopic picture of ischemic changes in the kidneys, or the so-called shock kidney, is more often observed in traumatic shock, blood loss and their nature for processes of exo- and endotoxic origin. Electron microscopic studies indicate a pronounced and deep damage to the renal tubules. Rupture of the renal

tubules (tubolorexis) is considered typical in shock. In shock, it is accompanied by hemolysis and myolysis, morphological changes in the kidneys correspond to hemoglobinuric and myoglobinuric nephrosis. After infusion therapy, the morphological picture of renal tubular damage may change - the brush border of the nephrocytes is stretched.

Thrombosis of the capillaries of the glomeruli, as a manifestation of disseminated within the vascular coagulation of blood, is observed more often with bacteremic shock and pathologically proceeding pregnancy. This also includes symmetric cortical renal necrosis.

Distinguish between total, subtotal, segmental and small forms of necrosis. With the total form, the renal pyramids are preserved, with the subtotal one in the cortical substance there are islets of non-tissue damage, with the segmental foci of necrosis they look like infarctions surrounded by hemorrhages, small forms can be detected only by microscopic examination. With prolonged GNN, the anesthetized cortical substance of the kidney becomes thinner.

Poisoning with ethylene glycol (antifreeze) entails symmetrical cortical necrosis of the kidneys, combined with glycolic nephrosis, and in the pathology of pregnancy - with acute hemoglobinuria, apoplexy and necrosis of the adrenal cortex, necrosis of the anterior pituitary gland. Histologically, coagulation necrosis of the renal cortex is noted. Fibrin thrombi are found in the glomerular capillaries and arterioles.

The zone of necrosis is limited by a demarcation shaft of polymorphonuclear leukocytes. In the future, necrotic areas are subject to organization, fibrosis, calcification.

The nature of kidney damage in case of poisoning with certain chemicals, medicines of plant and animal origin largely depends on the properties of poisons and their metabolites.

The nephrotoxic effect of thiol group poisons (heavy metal compounds, etc.) is a characteristic coagulative necrosis of the epithelium of the renal tubules. A classic example of necronephrosis is the so-called sublimate kidney. With glycolic

nephrosis, the kidney is enlarged, moisture is seen in the section, balloon dystrophy of the epithelium of the tubules of the proximal and distal nephron with oxalate crystals in their lumen and inside the cells is histologically determined. Nephrocytes in a state of balloon dystrophy may not be rejected for a long time, slowing down the regeneration of kidney tissue.

Kidney damage in case of chlorinated hydrocarbon poisoning has some peculiarities. When poisoning with dichloroethane, fatty degeneration of the nephrocytes of the renal tubules of the proximal and distal nephron is noted.

Acute hemoglobinuric nephrosis develops in case of poisoning with hemolytic poisons (acetic acid, arsenous hydrogen, copper sulfate, amino and nitro compounds). Moreover, morphological changes reflect the transport of hemoglobin through the nephron system.

The clinical picture. During acute renal failure, 4 periods are distinguished: the initial action of the etiological factor, oliguria or anuria, restoration of urine output, recovery. In the period of initial action, etiological factors are observed in the manifestation of caused by a specific cause of the disease, for example, with incomplete Infected abortion, anaerobic sepsis, bacteremic shock, intravascular hemolysis and acute renal failure develop.

General signs of the disease: chills, fever, decreased blood pressure, pallor, cyanosis of the skin in combination with rapidly growing jaundice, urine becomes dark in color, it shows protein, erythrocytes, leukocytes, cylinders, blood pigment and detritus.

Regardless of the cause of acute renal failure in this period, hemodynamic changes always prevail, sometimes with a significant drop in blood pressure, only after excretion from shock (collapse) signs of impaired renal function begin to prevail.

The period of anuria or oliguria is characterized by a decrease in diuresis (500 ml / day) and impaired renal functions - the level of products of protein metabolism, non-volatile to-t increases in the blood, the water-electrolyte balance changes.

Patients complain of weakness, loss of appetite, drowsiness, lethargy. Nausea increases, vomiting appears. As the level of urea, creatinine in urinary to-you increases, the concentration of sulfates, phosphates increases, hyperkalemia is observed, the concentration of sodium, chlorine, calcium in the plasma decreases. The more pronounced these shifts, the more clearly the signs of uremia appear. Signs of damage to the nervous system appear: anisocoria, nystagmus, decreased corneal, tendon and periosteal reflexes, anisoreflexia, pathological reflexes, weakness, memory loss, sometimes agitation, convulsions, paralysis. Drowsiness can be replaced by a coma.

During this period, mental disorders may occur, which are mainly in the nature of exogenous reactions, more often in the form of various delirious states. Delirium usually has a fantastic meaning. Less common is amentive syndrome, stunning, the development of which is indicative of aggravating acute renal failure. There can be epileptic seizures up to status epilepticus.

Dysfunction of the genitourinary system and hemodynamics are different, but tachycardia, expansion of the borders of the heart to the left, systolic murmur at the apex of the heart are almost always observed. High Hell is an unstable symptom, but significantly affects the course of this period. It can cause pain in the region of the heart, heart failure, an attack of eclampsia. Sometimes pericarditis occurs, while the patient notes pain in the region of the heart, a pericardial friction noise appears, as the effusion grows into his cavity, the noise decreases, but the symptom of heart failure increases, the borders of the heart expand, the RO-pattern characteristic of pericarditis develops. Especially dangerous is hyperkalemia, which is possible with acute renal failure, which disrupts the electrolytic activity of the myocardium.
Depending on the degree of hyperkalemia, the ECG reveals to varying degrees a pronounced slowdown of atrioventricular and intraventricular conduction, an increase in the amplitude and an aggravated form of the T wave, and a narrowing of the R wave potential.

Rapid breathing is often associated with acidosis, and breathing becomes noisy in severe acidosis (acidemia). Sometimes pulmonary edema occurs against the

background of which pneumonia often occurs. The main causes of pulmonary edema are overhydration, left ventricular failure, a decrease in oncotic blood pressure, and increased capillary permeability. Constantly with GNN, anemia is observed as a result of inhibition of hematopoiesis in the bone marrow, blood loss and hemolysis. The defeat of the gastrointestinal tract, in addition to nausea and vomiting, is manifested by abdominal pain, diarrhea. Due to increased bleeding in vomit and feces, blood is often found. Sometimes serous peritonitis occurs. The period of oliguria or anuria lasts on average 2 weeks, however, cases of longer oliguria (5-6 weeks) are known.

The period of recovery of diuresis has 2 phases of the initial diuresis when about 500 ml of urine is released per day, and polyuria -diuresis exceeds 1800 ml. In the phase of initial diuresis, symptoms. The surge arrester does not change significantly or continues to increase. This phase lasts only 2-3 days and is followed by polyuria. The phase of polyuria sometimes develops violently, the amount of urine can reach several liters, and therefore dehydration occurs, the patient loses weight, the skin becomes dry, the tongue is peeling, the tongue is dry, there is thirst, weakness of pain in the heart.

Extrasystole and pain in the heart are most often signs of hypokalemia, which on the ECG is manifested by a decrease in the CT segment by a decrease and inversion of the T wave, the appearance of a U wave.Polyuria is accompanied by a constant decrease in azotemia, the content of creatinine and urea in the plasma, and the normalization of its electrolyte composition. The period of diuresis recovery is extended on average 20 days, but it can be longer.

The beginning of recovery is considered to be the normalization of blood creatinine and urea levels. This period during which renal blood flow is restored, glomerular filtration and kidney concentration ability lasts from 6 months. up to 2 years.

The most common complication of acute renal failure during anuria is pulmonary edema, as well as pyelonephritis, which can occur during any period of the disease.

Diagnosis. Based on the clinical picture, observations of diuresis and laboratory data (acid-base composition), plasma electrolytes, biochemical changes in nitrogen metabolism). X-rays are taken to diagnose disorders of the heart and lungs. If obstruction of the upper urinary tract is suspected, retrograde ureteropyelography is indicated.

Treatment. The nature of the treatment is determined by the cause of the ARF caused. In case of impaired blood circulation, shock (collapse), anti-shock measures are taken, in acute poisoning, along with anti-shock therapy, measures to remove poison from the body: gastric lavage, infusion therapy, forced diuresis, hemodialysis, hemosorption, hemofiltration, peritoneal dialysis, etc.

With massive hemolysis, exchange blood transfusion, hemosorption with replacement of albumin solution or plasma is indicated. If bacteremic shock is the cause of acute renal failure, antibiotics are prescribed in addition to anti-shock measures.

At the beginning of the period of oliguria or anuria, diuresis is stimulated by intravenous administration of furosemide 160 mg x 4 times a day (up to 1000 mg per day).

If diuresis increases, the use of furosimide is continued. Further therapy, for example, to regulate homeostasis.

Prescribe a high-calorie diet with an increase in carbohydrates and fats (with limited protein and potassium). The volume of the injected fluid should exceed the diuresis and the amount of water is lost by the patient with vomiting and feces, no more than 500 ml, while 400 ml of a 20% glucose solution with 20 units is injected. insulin.

In case of hyperkalemia, in addition to glucose, 10-20 ml of 10% calcium gluconate solution and 200 ml of 5% sodium bicarbonate solution are prescribed intravenously. Anabolic steroids are also used. With developing mental disorders, tranquilizers, antipsychotics are indicated.

If oliguria continues and uremia symptoms increase, the patient should be transferred to the hemodialysis unit, where an artificial kidney or peritoneal dialysis

can be used. Indications for extrarenal cleansing of the blood are an increase in blood urea over 200 mg per 100 ml (33.3 mmol / L), plasma potassium over 6.5 mmol / L, acedemia with a base deficit of 10 mmol / L, hyperhydration with clinical and R - logical manifestation of pulmonary edema, Symptoms of acute uremia.

Forecast. With acute renal failure, it is largely determined by the cause and the severity of structural changes in the kidneys. Posttraumatic and p / o ARF has a more severe prognosis (mortality rate about 50%) than ARF due to other causes (mortality rate 10%).

After suffering from acute renal failure, in most cases, complete recovery occurs. Only in some patients altered renal function remains, which leads to arterial hypertension, sometimes chronic pyelonephritis or nephrocalcinosis develops. After extensive ischemic infarction, symmetric cortical necrosis of the kidneys, it is possible to go into chronic renal failure.

CHRONIC RENAL FAILURE

It occurs most often in young and middle-aged people.

Etiology. CRF is the result of many long-term (from 2 to 10 years) diseases of the kidneys and urinary tract with a gradual decrease in the functional capacity of the kidneys. These include hr. glomerulonephritis, chronic pyelonephritis, interstitial nephritis, systemic diseases are accompanied by kidney damage, diabetic glomerulosclerosis, kidney stones, renal hip joint disease, hydronephrosis, atony and obstruction of the urinary tract, cystic dysplasias, hypoplasias, congenital tubulopathies, etc., amyloids.

Pathogenesis. CRF is characterized by progressive damage to most or all of the nephrons, most often replaced by connective tissue. According to the theory of intact nephrons, proposed in 1969. Bricker, with chronic renal failure, some of the nephrons die, and some remain intact, hypertrophies and homeostasis is maintained for a long time, the preserved nephrons function like the nephrons of a healthy kidney. However, the research of Ratner M. Ya., V.V.Serov, n. A. Tomilina 1977

revealed the heterogeneity and variability of the affected nephrons and what processes they have in the development of chronic renal failure.

Pathological anatomy. Morphological changes in the kidneys depend on the nature of the disease leading to the development of chronic renal failure. Basically, this is a decrease in the mass of functioning nephrons as a result of their atrophy and sclerosis of the organ parenchyma.

Pathological changes in uremia, various uremic encephalopathy are expressed by neuronal dystrophy, hemorrhage and edema. With prolonged and severe uremia, the legacy of the bodies is demyelination of the nerves due to the action of toxins.
With uremic myocardiopathy, hypertrophy and myocardial dystrophy, dilatation of cardiac cavities, atherosclerosis of the coronary vessels, subendocardial hemorrhages, pericarditis, signs of chronic pneumonia and pulmonary edema are found.

With chronic renal failure, chronic pharyngitis and esophagitis with micro and macrohemorrhages are observed. In the stomach and intestines, along with edema of the mucous membrane and submucosa, hemorrhages and erosion are found. Dystrophy, plethora, hemorrhages develop in the liver, which is often enlarged. Chronic uremia is characterized by hyperplasia of the parathyroid glands and osteodestrophy.

The clinical picture. The most common clinical classifications of chronic renal failure are built taking into account the severity of its course and laboratory data, E.M. Tareev 1973 suggested distinguishing 2 stages in the clinical course of chronic renal failure caused by non-surgical diseases - conservative and terminal. In urological diseases, the intermittent course is different, the most recognized is the classification of N.A. Lopatkin, 1972. according to which there are 4 stages of chronic renal failure: latent, compensated, intermittent, terminal. CRF develops gradually, which is associated with a slow increase in blood levels of creatinine, urea, guanidine derivatives, sulfates, phosphates, and other metabolites.
In the conservative stage, when diuresis is preserved (polyuria is often observed), the level of sodium, chlorine, magnesium and potassium in plasma does not increase.

Persistent hypocalcemia is associated with impaired metabolism of vitamin D3 and calcium absorption in the intestine. Polyuria can lead to hypokalemia. Anatomical acidosis is common. The totality of humoral disorders determines the symptoms of chronic uremia.

Patients complain of rapid fatigue, decreased performance, headache, loss of appetite, unpleasant taste in the mouth. There is nausea, vomiting. There is pallor of the skin, dryness, flabbiness. Muscles lose their tone, their small twitchings, tremors of the fingers of the hands appear. Sometimes bone and joint pain occurs. Anemia develops, leukocytosis increases. Increased bleeding. Arterial hypertension, leading to cardiac disorders, was frequently observed. The boundaries of the heart are expanded, its tones are muffled, changes in the ECG are noted (sometimes they are associated with dyskalemia). In the early stages of chronic renal failure, asthenia develops with a predominance of irritable, autonomic disorders and hypochondriacal complaints.

The conservative stage can last for several years. The condition allows the patient to work, but an increase in physical activity, mental stress, inaccuracies in diet, restriction of drinking, infectious diseases, operations can lead to deterioration of kidney function and aggravation of uremic symptoms.

With decreases in glomerular filtration below 10 ml / min, conservative correction of homeostasis is not possible. The terminal stage sets in: oliguria gradually develops, azotemia, acidosis of hyperhydration increases, hyponatremia, hypochlorimia, hypermagnesemia occur, hyperkalemia is possible. The terminal stage is characterized by emotional lability, lethargy, inadequacy of behavior, mental disorders, the nature of which depends on the degree of uremia.

Asthenia occurs in the early stages. Its peculiarity is the predominance of severe fatigue, hyperstizia, disturbances in the rhythm of sleep (insomnia at night, drowsiness during the day). But as the severity of the condition increases, an adenoma occurs, asthenia in some cases is replaced by stunning of varying degrees, up to coma, in others psychoses may develop. Most often hypnagogic delirium occurs. Its feature is the ordinariness of content, hallucinations, contemplation, lack

of motor excitement. Less often, amentia and twilight clouding of consciousness develop. The development of psychosis and end-stage chronic renal failure always indicates an unfavorable prognosis of the underlying disease. Somatic changes are varied, the face is puffy, gray-yellow in color. Itching appears on the skin, scratching, dull, brittle hair. Dystrophy increases, hypothermia is characteristic, the voice is hoarse. An ammoniacal odor from the mouth is felt. There is aphthous stomatitis, sometimes Paraty, the tongue is coated, the stomach is swollen, vomiting, regurgitation, often diarrhea, fetid, dark-colored feces are often repeated. Anemia and hemorrhage are increasing.

Muscle twitching becomes frequent and excruciating. With prolonged development of uremia, pain in the bones and joints appears, and fragility of bones is noted. Noisy breathing is often caused by acidosis, pulmonary edema, pneumonia. Uremia is complicated by pericarditis, pleurisy, ascites, pseudoperitonitis, encephalopathy and uremic coma develop.

The terminal stage lasts from several weeks to several months.

Diagnosis. Established on the basis of anamnesis data on chronic kidney disease, characteristic symptoms - uremia, azotemia and other biochemical disorders.

Treatment. In the conservative stage, therapeutic measures are aimed mainly at restoring homeostasis, reducing azotemia and combating the manifestations of uremia. With a drop in glomerular filtration below 50 ml / min and an increase in creatinine above 2 mg / 100 ml (177 μmol / l), it is advisable to reduce the amount of protein entering the body to 30-40 g per day, and with glomerular filtration below 20 ml / min, a low-protein diet (protein content 20-24 g) per day. The diet should be high in calories (2-3000 kcal) and contain non-essential amino acids (potato and egg diet without meat and fish). Food is prepared with a limited amount of salt up to 2-3 g, and for patients with high hypertension - without salt. In case of violation of calcium metabolism and the development of osteodystrophy for a long time, calcium gluconate and vit. D in large doses up to 100,000 IU / day. it should be remembered, however, that the use of Vit. D in large doses with hyperphosphatemia can lead to

calcification of internal organs, therefore, to reduce the level of phosphorus, Almagel should be taken 1-2 tsp 4 times a day. The level of calcium and phosphorus in the blood is monitored regularly.

Depending on the degree of acidosis, 100-200 ml of 5% sodium bicarbonate solution is injected intravenously. With a decrease in urine output, furosemide (lasix) is shown in doses to cause polyuria. In order to reduce blood pressure, conventional antihypertensive drugs are used in combination with furosemide.

Complex treatment of anemia: prescribe 5% solution of oil testosterone propionate in I ml / m daily or other anabolic steroids, iron preparations, blood transfusions, Vit. B12, folic acid, antibiotics, and chemotherapy drugs are used with caution. Only erythromycin is prescribed in usual doses, the doses of penicillin, ampicillin, methicillin, seporin (cephaloridin) and sulfonamides are reduced by 2-3 times.

The use of streptomycin, monomycin, neomycin, polymyxin, even in reduced doses in chronic renal failure, can cause neuritis of the auditory nerve, etc. Complications. Derivatives of nitrofurans are contraindicated.

With the development of pulmonary edema as a result of overhydration, sorbitol (50 g in p ~ re inside) can be prescribed, it causes diarrhea and the release of a significant amount of fluid. Glycosides for heart failure in chronic renal failure are used in reduced doses, especially in hypokalemia. With pericarditis, small doses of prednisolone are prescribed or hemodialysis is performed, which is more effective in severe cases, surgical treatment is necessary. Tranquilizers can be used as symptomatic agents, for psychosis, neuroleptics. Effective nootropic drugs. Hemodialysis is indicated for exacerbation of chronic renal failure. After improvement of the patient's condition, it is possible to restore and carry out the usual conservative therapy for a long time.

Forecast. The use of hemodialysis and kidney transplantation improved the results of treatment of patients with chronic renal failure, made it possible to prolong their life and achieve rehabilitation for many years. Thanks to hemodialysis until 1981, the lives of 150,000 patients with chronic renal failure were saved in the world.

With the timely application of new surgical methods (hemodialysis and kidney transplantation) in the late stages of chronic renal failure, mental disorders are reduced, but asthenic symptoms and phenomena of psychoorganic syndrome persist. In favorable cases, with prolonged use of hemodialysis, the so-called dialysis-uremic dementia with lethargy and apathy can develop. Prolonged stay of the patient in a state of uremia, severe dystrophy, encephalopathy worsen the results of hemodialysis treatment and do not allow kidney transplantation.

Renal failure in children. It proceeds, as in adults, in acute and chr. form. Main etiological factors, pathogenesis and pathoanatomy, wedge. the picture is similar to those in adults. Treatment is carried out with the same means per kg of mass. The prognosis of GBV in children is very serious, especially in the first two days of life. This is due to the relatively low tolerance to ARF in children. Complex treatment of exacerbation of chronic renal failure is carried out with the use of large doses of diuretics or temporary use of hemodialysis, which often allows you to restore kidney function and transfer the process to a compensated stage. For special indications, a kidney transplant is performed.

Radiation diagnostics in urologists.

Retroperitoneal space

Learning objectives: - to confirm the anatomical and physiological knowledge obtained by students in previous courses. To acquaint students with the methods of radiation imaging, the principles and sequence of their application in the urological clinic, teach them to see pathological changes in organs using these methods, and interpret them correctly.

Skill list: be able to use radiation diagnostic methods. To be able to diagnose and differentiate pathological processes using radiation methods. Know the basic concepts, master the tactics and know the basic methods of radiation diagnostics.

Glossary of terms:

Angiography is an X-ray examination of blood vessels. It can be used in radiography, hybrid operating room, computed tomography. The method allows you

to study the functional state of blood vessels, blood flow and the prevalence of the pathological process.

Urography - X-ray examination of the kidneys and ureters. Plain urography allows you to see the contours of the kidneys, the presence of stones, surrounding organs. Study c provides more information on the function of the kidneys and ureters.

DSA-digital subtraction angiography

EU-excretory urography

CT computed tomography

MRI magnetic resonance imaging

PET Positron Emission Tomography

P-parenchymal index

RRG-radiorenography

RFP radiopharmaceutical

Ultrasound-Ultrasound examination

CRF-chronic renal failure

CPS-calyx-pelvis system

The ampulla is the extended part.

Kidney anomalies are congenital changes in the number, size, position and shape of the kidneys, as well as changes in their structure.

Antegrade urethrocystography is a radiopaque image of the bladder and urethra obtained by excretory urography.

Hydrocalicosis - expansion of the kidney cups.

Hydronephrosis is a kidney disease that occurs with external and internal obstruction of the pelvic-ureteric segment.

Hypernephroma is a malignant tumor of the kidneys.

Densitometry - determination of tissue density using CT.

Diverticulum-protrusion.

Dystopias are congenital malformations of the kidneys.

Excretory urography is a method of contrast radiation diagnostics, which allows to obtain data on renal function.

Infusion urography is a modification of excretory urography, which is especially desirable in cases of decreased renal function.

Kidney cysts are often congenital malformations.

CT-enhancement-carrying out tomography after IV administration of a contrast agent to the patient.

Computed tomography - CT is a layer-by-layer X-ray examination, which is based on computer reconstruction of an image, obtained by scanning an object with a narrow beam. X-ray irradiation

Lipomas are benign tumors of the retroperitoneal space and kidneys.

Magnetic resonance imaging (MRI) is a modern method of radiation diagnostics based on the phenomenon of magnetic-nuclear resonance on the ability of the nuclei of certain atoms (H) to behave like magnetic dipoles.

Medial-median.

Morphology is the structure of a body or organ.

Nephroblastoma (Wilms' tumor) is a malignant tumor of the kidneys in children.

Nephroptosis is a lowered or pathologically mobile kidney more than the height of the body of the lumbar vertebra.

Anatomical characteristics of the retroperitoneal space

The retroperitoneal space is filled with adipose and loose connective tissue and organs located in it and is part of the abdominal cavity.

The back wall of the retroperitoneal space coincides with the back wall of the abdominal cavity - the lower back.

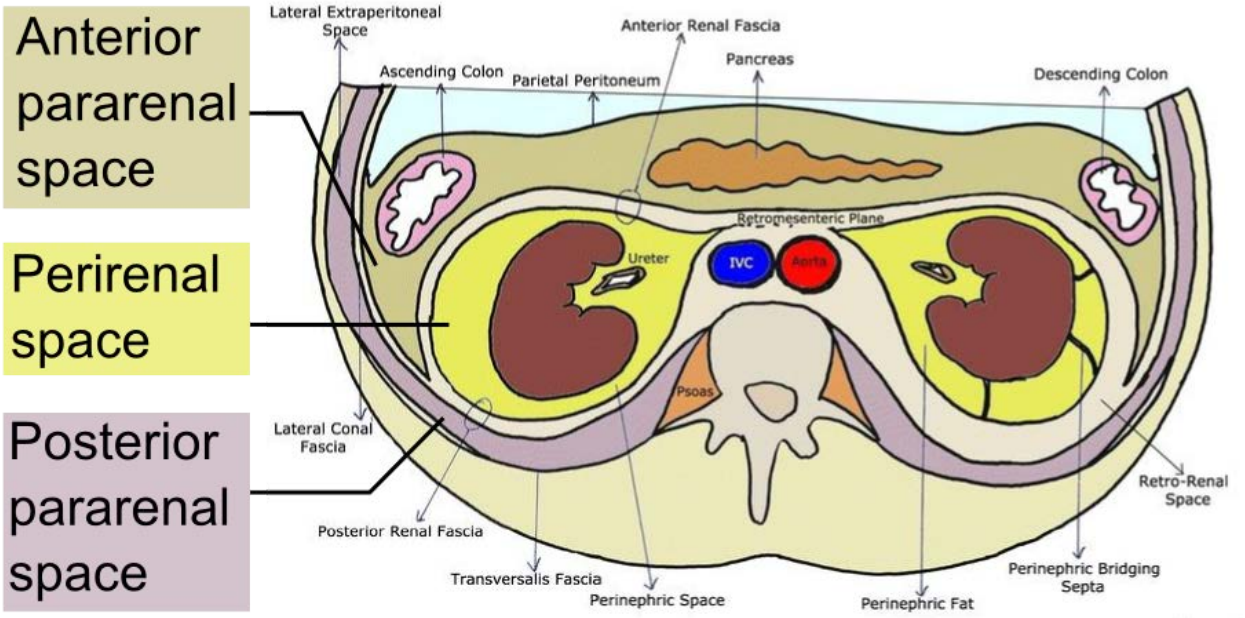
The anterior wall of the retroperitoneal space is the posterior leaf of the parietal peritoneum.

The upper border of the retroperitoneal space corresponds to the place of transition of the peritoneum to the liver, stomach, spleen. The distal limit is at the promontorium level.

The loose connective tissue of the retroperitoneal space is connected with the loose connective tissue of both iliac fossae.

The organs of the retroperitoneal space are surrounded by connective tissue sheaths that attach them to the lumbar spine and to the muscles of the posterior abdominal wall.

The retroperitoneal space is divided into 3 sections: the median (abdominal mediastinum) and two lateral. The middle section corresponds to the section of the spine. Its upper limit is the legs of the diaphragm. Through the holes in the diaphragm of the mediastinum of the abdomen and the mediastinum, the breasts are connected to each other and have lymphatic and venous connections, as a result of which the transition of the inflammatory process in both directions is possible. The mid-section of the abdominal space passes into the pararenal space, and its fiber is combined with the fiber of the fatty capsule of the kidney and is integral with the fiber of the mesentery of the small and large intestine, located obliquely at the level of Ll-L4. Here are the abdominal part of the aorta, the inferior vena cava, the portal vein.



Pic. 11. Retroperitoneal space

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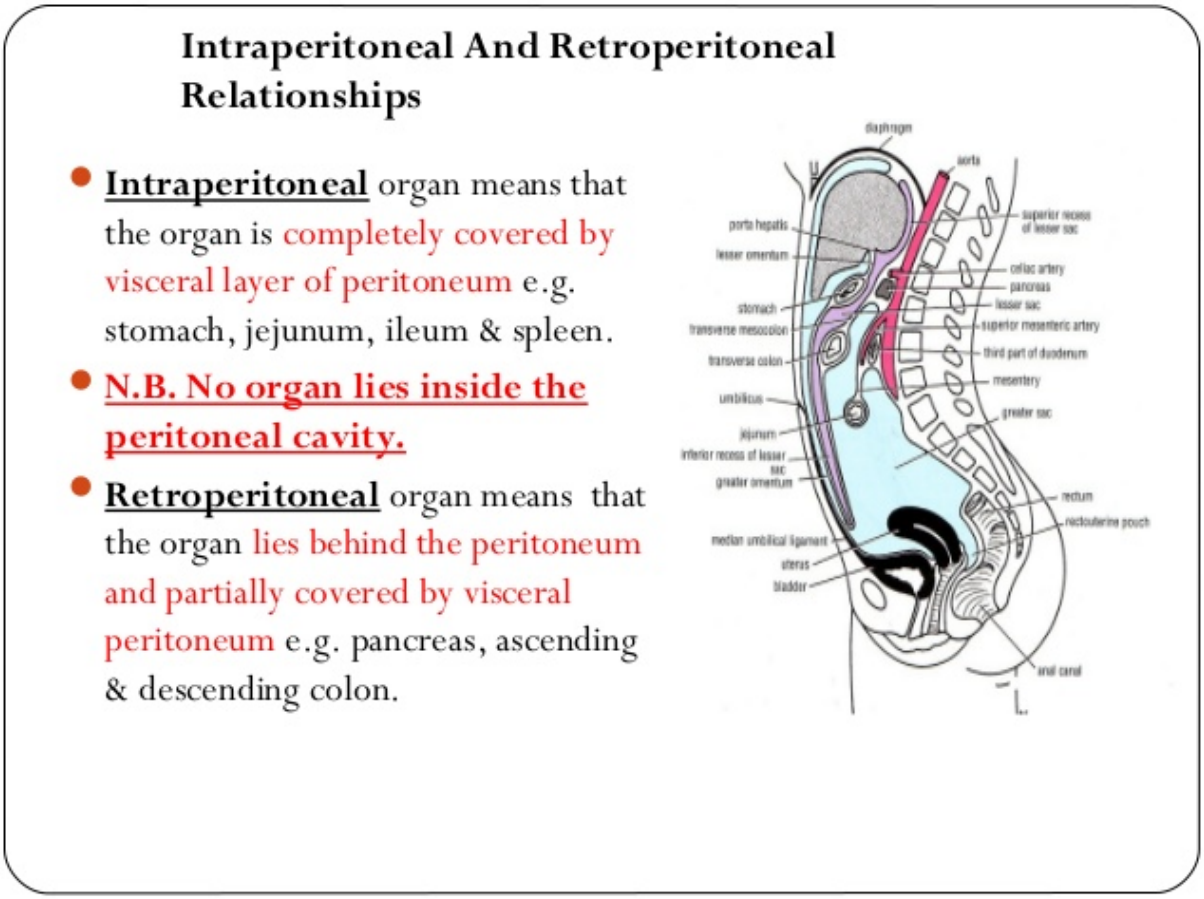

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Anatomical characteristics of the kidneys

The kidneys are paired organs of the urinary system that participate in the regulation of water-electrolyte, acid-base and osmotic equilibrium, excrete products of nitrogen metabolism with urine.

The kidneys are bean-shaped, located in the upper part of the retroperitoneal space on both sides of the lower thoracic and upper lumbar vertebrae. Covered in front by the parietal peritoneum, they lie on the posterior abdominal wall in niches that are formed by the lumbar and square muscles of the lower back. From behind, from above, the kidney is in contact with the diaphragm and corresponds to the level of 11 and 12 ribs.

In relation to the spine, the kidneys are located so that their upper poles are closer to the lateral surface, and the lower ones diverge, so that the distance between them is about 11 centimeters, noticeably greater than the distance between the upper

poles - 7 cm.The long axes of the kidneys form an open angle downward. The height of the location of the kidneys is very diverse, but, as a rule, the left kidney occupies a place from Th11 to the intervertebral cartilage in the L2-L3 segment; the right kidney, due to the presence of a powerful right lobe of the liver, is more often located below the Th12 - L3 level.

The kidneys are surrounded by three membranes, completely different in their structure.

1. Fibrous capsule. Consists of dense connective tissue, which directly covers the renal parenchyma as if with a cover, preventing its expansion. On the surface of the capsule there are a large number of stellate vascular branches, which are connected with the venous system of the surrounding fat capsule and the veins of the kidney itself.

2. Fat capsule. Surrounds the kidney from all sides, most developed on the posterior surface of the kidney, associated with a fat mass in the groove between the psoas and square muscles of the lower back. Consists of large fatty particles without fascial membranes, unlike abdominal fatty tissue.

3. Fascia anterior and posterior renal. Covers the front and back surfaces of the fat capsule in the form of connective tissue plates. Above, it departs from the intra-abdominal fascia, below it splits into two plates - the anterior and posterior ones, which below, enveloping the kidneys, come together and form transverse septa on which the lower pole of the kidney is located. At the level of the iliac crest, the fascia plates merge again with the intra-abdominal fascia.

The mobility of the kidney with a change in body position and respiratory movements of the diaphragm is equal to the height of the vertebral body (2.0-3.5 cm).

The fixed position of the kidneys depends on several factors.

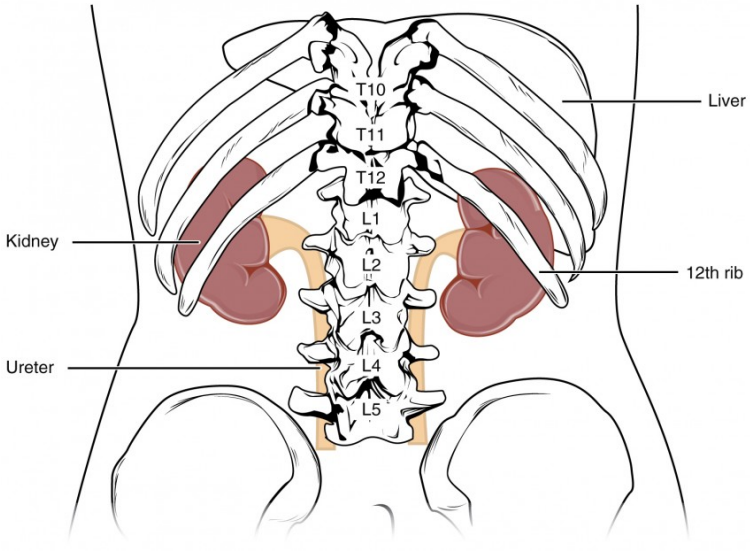
1. Intra-abdominal pressure significantly props the kidneys with swollen bowel loops to the back of the abdomen. Due to lumbar lordosis, the posterior surfaces of the kidneys seem to lie on their inclined renal beds, supported by intra-abdominal pressure.

2. The kidney is also fixed by its vascular pedicle, on which it is suspended, “like a fruit on its branch”.

3. All three renal membranes mentioned above are closely interconnected by connecting bridges and create a soft cushion, like a spring on which the kidney lies.

4. The connecting apparatus of each kidney; on the right - two abdominal ligaments, on the left - one.

The location of the kidneys relative to neighboring organs is different on the right and left. To the right of the anterior surface of the kidney, adjacent from above, the right lobe of the liver, from the bottom-descending part of the duodenum and the right fold of the colon. On the left, the posterior wall of the fornix of the stomach is adjacent to the anterior surface of the adrenal gland and kidney, separated from them by the omental bag. Below and laterally, the anterior surface of the kidney touches the spleen, the descending intestine, below and medially, at the level of the renal hilum - the tail of the pancreas. The lower pole of the left kidney and part of its anterior surface are covered by the splenic fold of the colon.



Pic. 12. Location of the kidneys in relation to the spine.

https://www.ingegneriabiomedica.org/news/tessuti/reni-ingegnerizzati-elettrofilatura-strategia-futuro/

Anatomical characteristics of the adrenal glands

On the anterior-upper surfaces of the kidneys, the adrenal glands are located, which are fused with connective tissue. The common bed for the kidneys and adrenal glands with their membranes is a powerful retroperitoneal fat layer, which in the form of a thick layer of fatty tissue stretches from the diaphragm to the pelvic fatty tissue, where it merges with it. Diverging on the sides, this layer continues to the abdominal wall in the form of retroperitoneal fat.

Distinguish between the body, lateral and medial legs. The adrenal gland consists of medullary and cortical substances, which are independent endocrine glands and have different embryonic origins. In shape, the adrenal gland resembles a cone with three surfaces: anterior, posterior, and inferior (renal). The adrenal gate is located on the anterior surface. The height of the organ is 25-45 mm, the width is 20-35 mm, the thickness usually does not exceed 10 mm.

The bony landmark of the adrenal glands is ThXI-XII, from behind and from above they adjoin the lumbar part of the diaphragm.

The adrenal gland together with the kidneys are contained in the fatty capsule of the kidney.

The right adrenal gland is located 10-20 mm in front of the upper pole of the right kidney, behind the inferior vein, 10 mm outward from the vertebral body, and 5-10 mm behind its anterior edge. Laterally, the gland is delimited from the right lobe of the liver by retroperitoneal fatty tissue. The medial surface of the adrenal glands is parallel to the right crus of the diaphragm.

The left adrenal gland is located outward of the left crus of the diaphragm, anterior to the outer edge of the vertebral body and the upper pole of the left kidney. The aorta is located medial to the gland. The reference point for identifying the left adrenal gland is the tail of the pancreas, which is anterior and slightly lateral to it. The adrenal gland can touch the body of the stomach.

Anatomical characteristics of the urinary tract

The urinary tract is a set of anatomical structures in which urine accumulates and through which urine is excreted. The urinary tract includes the pyelocaliceal system, ureters, bladder, and urethra.

The calyx-pelvic segment corresponds to the junction of the pelvis into the ureter and the first physiological fold of the ureter. Its length is 1.0-2.0 cm. Normally, the pelvic-ureteric segment should not be narrower than the underlying ureter, and the angle formed by the axis of the pelvis and the axis of the ureter is 120-160 120. In addition, the lower contour of the pelvis smoothly passes into the ureter without deformation.

Localization of the pelvic-ureteric segment makes it possible to more reliably judge the position of the kidney. Normally, this segment is located in the Bazy-Moyrand zone, not below the L2 transverse process. The zone itself is limited by horizontal lines drawn through the transverse processes L1 and L2, and by a vertical connecting them, located 5 cm outward from the axial line of the spine. The image of the kidney itself is located lateral to this zone.

On the medial edges of the kidneys are the renal gates, which correspond to the pelvis, renal artery, renal vein, and lymphatic vessels. The renal pelvis originates from the renal bowls, in which the renal papillae open. The shape and size of the pelvis, like the renal cup, is different: in some cases it is highly developed and has the shape of an ampoule, in others it is poorly developed or even absent and the renal cup, as it were, passes directly into the ureter. There are many transitional forms between these extreme forms.

In relation to the skeleton, the renal pelvis corresponds to the interval between the transverse processes of the 1st and 2nd lumbar vertebrae. On the right, the pelvis is located slightly lower, on the left - above.

The size and shape of the cups and pelvis are varied. The upper, middle and lower large cups are distinguished. Small cups extend from the top of each, into each of which one or more renal papillae protrude. The large cups are drained into a bowl.

Smooth and sharp contours of the pelvis turn into the outlines of the ureter, which forms an obtuse angle with the axis of the pelvis.

The ureter lies on the psoas major muscle and crosses it obliquely from top to bottom and from outside to inside, at a distance of 2-3 cm from the vertebra. Below the ureter, bending through the iliac vessels and the border line, enters the small pelvis. In the middle of the psoas major muscle, the ureter crosses n.genitofemoralis. The pressure of the calculus on this nerve causes pain radiating to the axillary region and the scrotum or labia majora in women. In front of the upper part of the right ureter, the descending part of the duodenum is adjacent. Outside the right ureter is the cecum with the initial section of the ascending colon. When located medially, the appendix may be in close contact with the iliac ureter. The descending colon is located outside the left ureter. The pelvic ureter is located symmetrically on both sides, the ureters descend along the lateral walls of the small pelvis, turn outward, then approach and flow into the bladder. The ureters are divided into two almost equal sections: the abdominal and pelvic, each of which is divided into three parts. The abdominal part - to the narrowed part (this is the narrowest part of the ureter - 2-4 mm in diameter), the lumbar part - to the iliac crest, the iliac part - to the borderline of the entrance to the small pelvis. The pelvic region is divided into the actual pelvic, prostate and intramural parts. The intramural part of the ureter has an oblique direction when passing through the bladder wall. Its mouth is covered with a special fold - the ureteral valve. In an adult, the length of the entire ureter ranges from 28-34 cm. The abdominal region accounts for 15-16 cm. The pelvic region has the same length. The ureter has three constrictions and two dilations. The upper narrowing has the smallest width - 2-4 mm. The second narrowing corresponds to the bend of the ureter during its transition into a small pelvis 4-6 mm. The third narrowing is located in the intramural part of the ureter and is up to 4 mm in diameter. The ureters drain secondary urine from the pelvis into the bladder.

The bladder is an unpaired hollow organ located in the anterior part of the small pelvis. It distinguishes between the top, body, neck, which go one into one. The bottom of the bladder is fixed to the urogenital diaphragm. When the bladder is full,

its upper wall is pushed to the top, taking the shape of a vault. In an empty bubble, the upper and lower walls touch each other, the bubble shape approaches saucer-like. The wall of the bladder consists of the mucous membrane, submucosa, muscular membranes.The mucous membrane has a large number of folds, they are absent only in the area of the bladder triangle, which is associated with the poorly expressed submucosa here. The triangle itself is limited by the orifices of the ureters and the inner opening of the urethra.

The submucosal layer contains a large number of blood vessels, which causes the reddish color of the mucous membrane of the inflamed bladder. The muscular outer shell has smooth muscle fibers arranged in three layers. The most powerful is the middle layer, which forms the circular muscle-contractor of the bladder.

The bladder has an abdominal cover on top and on the sides, which forms a transverse vesicular fold on the front surface. The apex of the bladder is turned forward and does not protrude above the upper edge of the symphysis when the bladder is emptied.The widest part of the bladder is the bottom. In men, it is turned towards the rectum, the prostate gland, seminal vesicles and the ampullar part of the vas deferens are adjacent to it. In women, the bottom of the bladder is turned towards the wall of the uterus and the upper part of the anterior wall of the vagina.

The neck of the bladder is a narrowed part of it, directed to the urogenital diaphragm, where it gradually passes into the urethra. In men, the cervix is attached to the prostate gland, and in women it is fixed to the urogenital diaphragm.The internal opening of the urethra in men is at the level of the middle of the symphysis. For women, it is lower.Adult human bubble capacity is 250-300ml. With pathological changes, the bladder can stretch, reaching the navel, and contain 2-3 liters of urine. On the sides of the bladder, between its walls and the internal guard muscles, there is abundant loose fiber. Fixation of the bladder is carried out mainly due to its fusion with the urogenital diaphragm. Links are of secondary importance. The sensitivity of the mucosa increases dramatically with inflammation. Inflammation of the bladder neck gives pronounced clinical phenomena that are associated with constant irritation of the area of the inner opening of the urethra.

RADIATION ANATOMY OF THE RETROPERITONEAL SPACE AND ORGANS OF THE URINARY SYSTEM

Radiography refers to the usual methods of X-ray examination, it receives an image of an object fixed on a light-sensitive material in the form of photographs, and tomography is a special method that requires the use of special equipment.

The X-ray radiation generated in the anode of the X-ray tube is directed to the patient, in whose body it is partially absorbed and scattered, and partially passes through him. The detector picks up X-rays and converts them into diagnostic information. The detector can be a fluorescent screen, photographic or X-ray film, and the like.

The X-ray method of research remains the leading one in the urological clinic for many diseases, since it allows to identify anatomical, morphological and functional changes in the kidneys and urinary tract.

The primary conditions when choosing a method for obtaining the most reliable data on the patient's condition in the shortest possible time and with the least consequences for him.

Examination of urological patients usually begins with a plain radiography of the kidneys. Its analysis, taking into account anatomical and clinical data on diseases, often makes it possible to determine the ways and means of further, deeper examination, since it only gives an idea of the location, shape, size, contours of the kidneys, as well as the presence of stones and limestone formations in the abdominal cavity , the spine.

To establish the position, shape and function of organs in normal and pathological conditions makes it possible to urography (X-ray of the kidneys and urinary tract after the introduction of a radiopaque substance). Depending on the level of their contrasting distinguish pyelography (renal pelvis and cups), ureterography (ureters), cystography (bladder), urethrography (urethra), pyeloureterography.

Excretory (excretory, intravenous) urography uses the ability of the kidneys to remove iodinated radiopaque substances (triombrast, urografin, etc.) from the bloodstream, which allows you to obtain data on kidney function and visualize the cavities of the renal calyx and pelvis, ureters, bladder, urethra.

The first X-ray is taken 5-7 minutes after the intravenous administration of drugs, and the subsequent ones - after 15-20 and 25-30 minutes. If not everything is clearly visible on these pictures, an additional picture is taken in 1-2 hours.

High-speed imaging in the arterial, capillary and venous phases of the renal circulation is performed with renovasography.

Contraindications: severe failure of the kidneys, liver, cardiovascular system, thyrotoxicosis, idiosyncrasy to iodine preparations.

With a decrease in kidney function, as well as to identify tumors, cysts, developmental abnormalities, infusion urography is used, which allows you to get a more contrasting image of the kidneys and their cavities. The contrast agent is diluted with a 5% glucose solution or isotonic sodium chloride solution 2 times (1 ml per 1 kg of patient weight), injected intravenously for 5-7 minutes. Pictures are taken immediately after injection and after 10-20 minutes.

In order to study the reserve capabilities of the kidneys, as well as the urodynamics of the upper urinary tract, the recognition of renovascular hypertension, pharmacourography is used - a combination of infusion urography with diuretic drugs. The technique (according to Pitel Yu. A. and Zolotarev I.I.) is as follows: 20 ml of 60% urografin is injected into the intravenous infusion system with isotonic sodium chloride solution through a puncture of a rubber tube and after 1-3 minutes. X-ray is performed. If the quality is satisfactory, 20-30 mg of furosemide is injected by repeated piercing of the rubber tube and a picture is taken after 1-3 minutes. This method saves contrast medium and shortens the examination time.

Retrograde (ascending) pyelography is more traumatic than infusion urography, but for a more detailed study of the structure of the urinary tract, it is better, since it allows you to get a more contrast and relief image of them, due to the

fact that radiopaque substances do not dissolve in the mass of circulating blood to a low concentration. Method: 8-10 ml of 20-30% solution of contrast agents is injected through the urinary catheter. With the help of retrograde pyelography, the morphological state of the renal cavity system is specified in patients with pyelonephritis, hydro- and pyelonephrosis, renal and ureteral tuberculosis, as well as in tumors and other lesions of the renal pelvis.

Contraindications: acute focal lesions of the renal pelvis and ureters, significant hematuria, high body temperature, infectious diseases, decompensation of the cardiovascular system.

To study the bladder, cystography is used, for which 150-200 ml of contrast agent or gas is filled retrogradely through the urethra (pneumocystography). Pictures are taken in direct and two oblique projections. Cystography makes it possible to establish the shape of the bladder, to identify foreign bodies, tumors, stones and other morphological changes.

If this method is not possible due to stricture of the urethra, prostate adenoma, then descending (excretory) cystography is used: after 30-60 minutes. after intravenous administration of water-soluble iodine preparations.

If a tumor is suspected, double contrasting of the bladder is used by retrograde injection of highly atomic substances (20-40 ml) or gas.

To determine the external contours of the bladder, pericystopneumography is performed: the introduction of gas into the peri-vesicular fatty tissue, and when this method is combined with a pneumocystography, the thickness of its wall is established.

To study the contractility of the walls of the bladder, a series of X-rays are taken on one film in the process of filling it with a contrast solution (60, 90, 120, 150 ml) - polycystography.

Ascending urethrography (retrograde) - pictures of the urethra are performed after retrograde filling of the bladder with 60-70% urografin solution (using Janet's syringe). If a gas (oxygen, nitrous oxide, carbon dioxide) is injected

into the urethra, then the method is called pneumourethrography, and if an image of the bladder is obtained, it is called urethrocystography.

The radiopaque image of the bladder and urethra, obtained by excretory urography, is called descending (antegrade) urethrocystography.

To study the vessels of the urinary system, angiography is used - an X-ray examination of blood vessels after the introduction of X-ray contrast agents.

2.2. Magnetic resonance imaging

Tomography is a method of layer-by-layer X-ray examination; it is used to obtain an isolated image of a selected layer of an anatomical object. On a conventional radiograph, the sum of shadows from the entire thickness of the examined organ is displayed, as a result of which the details of the internal structure of this organ are masked. The result is achieved by moving the X-ray tube and film in opposite directions along the body of the stationary patient. With such a movement, the image of the details on the X-ray diffraction pattern is smeared, except for the image of the formations at the level of the center of rotation of the film-tube system, corresponding to the selected layer.

Magnetic resonance imaging (MRI) is a method that allows you to image thin layers of the human body in any projection: in frontal, sagittal, axial and oblique projections. At the same time, air and bones do not interfere with visualization.

MRI is based on the phenomenon of nuclear magnetic resonance. If a body, which is in a constant powerful magnetic field, is irradiated with external electromagnetic pulses, selective absorption of the energy of the electromagnetic field is observed.

Magnetic resonance imaging is based on hydrogen, the nucleus of which contains one proton. In a strong external magnetic field, hydrogen atoms in tissues are ordered. An additional radio frequency pulse refracts the magnetized network of hydrogen atoms in the tissues, after which the excited atoms are positioned along the axis of the magnetic field and generate an electrical signal that is received in the ring-shaped receivers. The return to equilibrium is called magnetic relaxation, and the signal decay is constantly recorded. Magnetic relaxation is a unique

characteristic of each type of tissue that can be described by relaxation periods T1 and T2. These indicators determine the image contrast and signal intensity.

The magnetic field is first changed in the longitudinal direction (along the axis of the patient's body), then in the anteroposterior direction, then in the transverse direction. After the cessation of the influence of the alternating magnetic field, a resonant release of energy occurs in the form of an MR signal. The spatial image is obtained on the monitor within the plane of the object.

Computed tomography is performed using a tomograph. It consists in determining the degree of attenuation of a narrow X-ray beam, which sequentially moves around the object, passing through its thin section. The computer calculates information about the density of each section of the cut and feeds the image to the display screen. The detectors of the tomograph reveal a difference in the density of structures of less than 1%, and on an X-ray image - only 10%. With computed tomography, the obtained image is processed and stored in the computer memory.

MRI, in comparison with X-ray and radionuclide methods, uses very low energy beams. In addition, CT is based on determining only the electron density, while MRI determines the proton density, two relaxation periods (T1 and T2) and the speed of fluid movement. But this technique is more expensive, technically more difficult and theoretically harder to understand.

Layered images are associated with tissue characteristics: density (CT), echogenicity (ultrasound) and the intensity of the MR signal. Tissue characteristics are usually given in relation to the surrounding unaltered tissue, and in many anatomical areas, in relation to muscle density. Thus, the CT-density of the liver is 10 units higher than the density of the spleen, the liver tissue is more echogenic than the kidney tissue.

Higher density (echogenicity, MR signal intensity) corresponds to higher image brightness.

Radiologically, only 4 types of tissues and media are differentiated:

- air;
- adipose tissue;

- soft tissue + liquid;
- bone tissue + neglect.

Radionuclide research

An important advantage of radionuclide diagnostic methods is a very high sensitivity, and the higher it is, the greater the accuracy. During radionuclide diagnostics, it is possible to introduce such a number of labeled atoms into the human body, which practically does not change the total content of chemical elements in the body and thus does not affect the course of life processes and allows obtaining highly reliable results. The method is minimally invasive because the radiation doses are small.

Radionuclide studies use an RFP (radiopharmaceutical) to diagnose diseases based on the study of the structure, body function and metabolism in health and disease.

Radioactive isotopes are atoms of one chemical element that have the same nuclear charge (the same number of protons), but different atomic weights, due to a different number of neutrons, their chemical and biochemical properties are similar. Both an ordinary chemical element and its isotopes are equally involved in the biochemical reactions of the body. Radioactive isotopes are distinguished by the instability of atomic nuclei, which, when they transform (decay), release energy in the form of high-energy radiation and are called radionuclides.

The molecule of radiopharmaceuticals (RFP) contains a radionuclide and a chemical that is allowed to enter the human body for diagnostic or therapeutic purposes. The radionuclide should emit a certain spectrum of energy, cause minimal exposure of the body and reflect the state of the organ under study.

The basis of radionuclide diagnostics is the measurement of the radioactivity of the whole body or individual areas (organs, tissues, biological material). Depending on the purpose of the study, various processes are studied. For example, to study the function of an organ, the accumulation and excretion of RFP are observed. If you introduce a drug that is tropic to the organ, then the better the blood circulation in it, the better the organ functions, the faster it will capture this drug

from the blood. In this case, the radioactivity of the drug will decrease, and the faster it is excreted from the body if it is excreted, for example, by the kidneys. To study the topography of the organ (location, size, shape, shape), to identify focal or diffuse pathological changes, the study of the distribution of RP in it helps.

There are two groups of methods of radionuclide diagnostics: in vivo diagnostics, in vitro diagnostics.

PI vivo-diagnostics-RP is introduced into the human body in various ways. After that, the radiation is registered. With this method, a person is irradiated.

IP vitro-diagnostics-process takes place in a test tube, in which there is a radioactive preparation, and certain components of human biological substances (blood serum, tissue extracts, urine and other excretions) are added to it. Based on their interaction with a radioactive drug, important diagnostic information is obtained. With this technique, the patient is not exposed to radiation.

In vivo diagnostics include: radiometry (number of pulses per second, minute); radiography (chronograph) - a curve of radioactivity changes over time is obtained; scanning (scan) - the distribution of the RFP is studied; scintigraphy: static or dynamic; emission computer equally - and two-photon tomography.

Radiometry is based on counting the amount of radionuclide emissions per unit of time from a certain area.

Radiography- Registration of the decay of radionuclides from one or another organ is carried out not in digital form, but in the form of a curve of radioactivity over time.

Scanning is a method of planar imaging based on the accumulation and distribution in the organ of the radiopharmaceutical, tropic to this organ or to the pathological focus in it.

Scintigraphy is a method of obtaining a planar image of an organ based on the distribution of RFP in it by recording scintillations on an oscilloscope screen or on a computer monitor. Unlike scanning, scintigraphy can be performed not only in static, but also in dynamic modes, with information being recorded on a computer.

Emission computed tomography has two types: single-photon (SPECT) and positron (PET). In SPECT, images are obtained using conventional radionuclides in which one photon is released in a single decay. For PET, radionuclides are used that emit two oppositely directed photons, their registration occurs in certain areas of detectors opposite to the human body.

Radiorenography (RRG) is used to diagnose violations of secretory-excretory processes: chronic pyelonephritis, acute and chronic glomerulonephritis, hydronephrosis, urolithiasis, chronic renal failure, arterial hypertension. Principle of the technique: graphical registration of changes in radioactivity over each kidney and over a region of the heart. With the help of radiographic curves obtained from parts of the heart, right and left kidneys, the rate of blood cleansing from RFP and the functional state of each kidney are assessed. Curves obtained from areas of the kidneys are called renograms.

Renogram interpretation - qualitative and quantitative. Qualitative interpretation is based on visual assessment of the curve: normal or pathological type of renogram.

A normal renogram has three segments:

1. Vascular - reflects the passage of RP through the vessels of the kidneys.
2. Secretory - reflects the process of accumulation of RP by cells of the proximal tubules of the nephron.
3. Excretory-displays the process of RFP withdrawal.

Pathological curves have a deformed, wavy, two-humped appearance. There are obstructive, parenchymal, isostenuric, reflux, and afunctional types of renograms.

Obstructive - varying degrees of impairment of the excretory segment. The renogram is ascending. The curve has no third segment. This type of renogram is observed with hydronephrosis, obstruction of the ureter with a stone or its compression from the outside by a tumor process.

The parenchymal curve retains the correct three-segment character with a moderate slowdown in the decay of the excretory segment, often against the

background of a decrease in the steepness and height of the secretory segment, it can be unilateral or bilateral. As a rule, it is low-amplitude due to a decrease in the number of functioning nephrons. This type of renogram is observed in inflammatory kidney diseases (pyelonephritis, glomerulonephritis), urolithiasis, and arterial hypertension.

The isostenuric renographic curve is transformed into a two-segment one, in which only the vascular and excretory segments are differentiated, which is due to the fact that the minimum dose of the injected RP exceeds the maximum transport capacity of the renal tubules. This happens with a sharp weakening of the functional capacity of the renal parenchyma, chronic renal failure.

The reflux chronogram of this type is three-segment, but against the background of a decrease in the steepness, increases in the renographic curve periodically appear.

Afunctional - most often it has a one-sided character, typical for such pathological conditions as the absence of one kidney (congenital or after nephrectomy), pelvic renal dystopia, primary or secondary shriveled kidney.

Quantitative interpretation assumes the calculation of numerical indicators: the time of maximum accumulation of RP by the kidney (TMAX = 3.2 ± 0.15 min.), The half-life of the indicator from the kidney (T1 / 2 = 7.2 ± 0.48 min.), The amplitude of the renogram (83.4 ± 3.0 IMP / S), the ratio of these indicators to the left and to the right, Winter's indicator (43.1 ± 1.67).

Scanning and nephroscintigraphy. Provides information about the topographic and anatomical features of the kidneys, their shape, size, as well as the accumulation and distribution of RP in the renal parenchyma. This study is used if there is a suspicion of a focal process in the renal parenchyma (tumor, cyst, tuberculosis), a pathological mobile kidney, for the differential diagnosis of kidney and abdominal tumors, as well as with kidney anomalies:

1. Abnormalities in the number of kidneys (single kidney);
2. Abnormalities in the position of the kidneys (pelvic dystopia, kidney rotation);
3. Abnormalities of kidney development (horseshoe kidney, L-shaped kidney);

4. Abnormalities in the development of the ureters (hypotension of the ureters).

Dynamic renoscintigraphy is performed to determine the structural and topographic features of the kidneys, as well as their functional state. Indications: chronic pyelonephritis, acute and chronic glomerulonephritis, renal hydronephrosis, urolithiasis, chronic renal failure, arterial hypertension, anomalies of the kidneys and ureters, tumors and kidney cysts.

Ultrasound procedure

Ultrasound examination (echography, ultrasonography) - examination of organs and tissues of the body using reflected ultrasonic waves from the interface (boundaries of media with different acoustic properties.

Ultrasound is a mechanical vibration with a frequency of more than 70 kHz, propagating in a medium that has elastic properties. Particles of the medium do not move in the direction of wave propagation, but vibrate near their equilibrium positions.

To obtain and register ultrasonic vibrations, the direct and reverse piezoelectric effect is used, that is, the transformation of the energy of mechanical vibrations into electrical energy by a piezoelectric element and vice versa. When an alternating electric current is supplied to the piezoelectric element, it begins to vibrate, generating mechanical vibrations in accordance with the frequency of the applied alternating electric potential (reverse piezoelectric effect). The resulting ultrasound propagates deep into the biological object, partially reflected at the limits of tissues with different acoustic properties. Ultrasonic waves reflected from the object's structures return to the piezoelectric element and cause its oscillations, which leads to the appearance of electric charges on its surface, which change with the same frequency as the frequency of the received ultrasound (direct piezoelectric effect). The resulting piezoelectric sensor weak electrical signal is amplified, processed and displayed on the monitor screen.

The transducer emits ultrasound intermittently, sending out 1000 short pulses per second. Knowing the speed of passage of ultrasound in tissues, as well as the

time it takes for the beam to reach the object, partially reflect from it and return to the sensor, it is possible to calculate the distance to the object. This principle lies at the heart of ultrasound.

Ultrasound, like other types of energy, has a certain effect on biological objects. Depending on the frequency, intensity and exposure time, ultrasound waves can be harmless (diagnostic parameters), have a therapeutic effect (therapeutic doses), and cause pathological changes in tissues and organs (damaging doses).
Most researchers have found that ultrasound with an intensity of 100 mW / cm2 does not have a negative effect on body tissues. For diagnostics, ultrasound is used not more than 20-30 mW / cm2.

Subjectivism in assessing the ultrasound picture limits the possibilities of ultrasound. To eliminate this factor, close contact of the echoscopist with clinicians, endoscopists, a thorough preliminary study of the outpatient card or medical history is necessary.

A detailed ultrasound examination of the urinary system must begin with a well-filled bladder. The optimal volume for examining the urinary organs is 200-300 ml. From the side of the abdominal wall on sonograms, it is visible as a structureless oval shadow with clear arcuate contours.

Tight filling of the bladder leads to physiological hypertension in the ureters, which facilitates their examination.

In diseases of the organs of the retroperitoneal space, methods of radiation diagnostics can reveal changes that may be characteristic of not one disease, but several - general radiation syndromes. Such common syndromes of retroperitoneal pathology are indirect signs of lesions of adjacent organs. It is advisable to distribute them as follows:

1. Syndrome of excess gas in the intestine - pneumotosis

a) segmental;

b) diffuse.

2. Syndrome of organ dislocation (nephroptosis).

3. Syndrome of organ deformity caused by changes in the size, shape and contours of the organ.

4. Diaphragmatic syndrome:

a) deformation of the dome;

b) displacement of the dome;

c) diaphragmatitis.

5. Thoracic syndrome.

6. Bone syndrome.

7. Syndrome of the psoas muscle (change or disappearance of the contours of this muscle indicates inflammatory or tumor processes in the retroperitoneal space).

Radiation examination of patients in the clinic allows you to study the vital state of human organs and systems, that is, its clinical anatomy and physiology. Knowledge of the features of the ray image of the anatomical structures of the retroperitoneal space and the urinary tract normally contributes to the identification and study of pathological changes in it.

At the first stage of the study of urological patients, plain radiography is performed along with sonography.

On radiographs, the shadows of the kidneys are placed indirectly, parallel to the outer edge of the psoas major muscle, the intersection of the longitudinal axes of the kidneys forms an acute angle open in the caudal direction. The kidneys are located at the level of the XII thoracic - III lumbar vertebra; the left kidney is located 1.5-2 cm higher than the right one. During breathing and changes in body position, the kidneys are displaced by 3-4 cm.

The pelvis are located at the level of I-II of the lumbar vertebra and can have an ampullary, branched or mixed shape. In the first case, the pelvis is located medial to the kidney, outside its parenchyma, in the second, it is surrounded by it. The capacity of the pelvis is 6-10 ml. Depending on the type of pelvis, it branches towards the parenchyma, forming 3-5 large cups, which are divided into 6-10 small cups. Downward, the pelvis narrows and passes into the ureters, which have a

number of physiological curves and narrowings. On the x-ray image, the width of the lumen of the ureter ranges from 3-10 mm.

If it is necessary to examine in detail the cups and the bowl, direct contrasting of the upper urinary tract is done - retrograde or antegrade pyelography. The technique of retrograde, or ascending pyeloureterography, consists of injecting a water-soluble contrast agent directly into the pelvis through a ureteral catheter. The catheter is passed through the urethra and bladder using a cystoscope.

Ascending (retrograde) pyelography. With weak excretion of the contrast agent by the kidneys, to study the calyx-pelvic system, direct contrasting is used by introducing a contrast agent into a bowl through a catheter, which is introduced under aseptic conditions using a cystoscope through the urethra into the bladder and then into the ureter to the pelvis. Then the cup-pelvis system is filled with a small amount of contrast medium - 8 ml. On the radiographs taken after this, the structure of the cups and pelvis is clearly traced.

Retrograde pyelography is used to diagnose ureteral anomalies, which are manifested primarily by an increase in their number (doubled, less often tripled ureter) and are most often combined with kidney pathology. Of particular interest is the retrocaval ureter, which is located with its middle part behind the inferior vena cava and bends around it, which leads to the development of a hydronephrotic kidney due to a violation of urine passage.

There is also an ectopia of the orifice of the ureter, which can be located in the urethra, seminal vesicle, vas deferens, vagina, genital slit. Diagnosis is difficult due to not always possible catheterization. Excretory urography, due to a combination of changes in the kidney parenchyma and a decrease in the concentration of the substance, also does not provide sufficient filling of the ureter with it. In this case, it is better to apply retrograde or excretory pyelography.
Retrograde pyelography is contraindicated in acute inflammatory processes in the kidneys and urinary tract and in hematuria.

Antegrade pyelography is performed by injecting a contrast agent into the bowl by percutaneous puncture or through a pyelonephrostomy drain.

On the urogram, the abdominal part of the ureter is projected in the form of a narrow strip parallel to the spine, the pelvic part is superimposed on the ilio-sacral junction and passes into the intramural region.

With a slight filling, the bladder is an oval with an elongated upper contour, which becomes even more convex as it fills. The average bubble capacity is 200-300 ml. The projection of its lower contour is 1 cm above the pubic articulation or at its level.

With EH, the bladder is contrasted on delayed images after 40-60 minutes. The contrasting urethra on the radiograph gives an uneven heavy shadow, slightly wider than the shadow of the ureters.

Cystography - X-ray of the bladder after directly filling it with a contrast agent through the urethra. In this case, the shadow of the bladder is very intense and normally uniform. The method allows you to get an idea of the contours of the bladder cavity, as well as study the physiology of urination.

Cystography is used along with cystoscopy, complementing each other. Cystography can be descending (excretory) and ascending (retrograde).

Descending (intravenous) cystography is performed 0.5-1.0 hours after intravenous administration of a contrast agent.

Ascending (retrograde) cystography is performed after filling the bladder with contrast agent along the catheter, it gives a clearer image of the bladder.

On the cystogram, the bladder normally has smooth, even contours. The shape is different: round, oval, oblong, pyramidal. In men, the shadow of the bladder is rounded, in women it is oval, the transverse diameter prevails over the longitudinal one, the upper contour is concave. In children, the bladder is pear-shaped.

Additional X-ray examination of the bladder after emptying allows to detect the presence of residual urine, to establish the presence of vesicoureteral reflux and changes in the upper urinary tract, which are often observed in prostate adenoma. On the cystogram of the bladder tumor, prostate adenoma, X-ray-negative calculi are detected in the form of filling defects, diverticula - in the form of protrusions

located outside the contours of the bladder. Cystography makes it possible to diagnose cystic fistulas, it is critical in the diagnosis of bladder rupture.

The film is laid in the transverse direction, the center is located between the navel and the pubis.

Computed tomography of the bladder is done after a cleansing enema and taking water to fill the bladder, with the patient in the supine and abdominal position. The fluid-filled bladder stands out well on tomograms, and the thickness of its walls can be determined.

The patient is placed on the table along the midline, the upper edge of the cassette is placed at the level of Th 10 or at the level of the xiphoid process of the sternum. The central ray is directed perpendicular to the body through a point located 3 cm below the xiphoid process. The focal length is 90-100 cm. The exposure conditions apply depending on the type of X-ray machine.

You do not need to hold your breath: the bladder does not move when breathing. For X-ray of the bladder, a 24x30 cm film is sufficient.

Radiation anatomy of the kidneys. Radiation changes in kidney disease

Primary methods of renal imaging - radiography, excretory urography (EU), ultrasound. Additional (according to indications) - infusion urography, CT, renography (radioisotope study).

In plain radiography, bean-shaped shadows of the kidneys stand out in the image due to the presence of a fat capsule around them at the level of Th12-L2 on the left and L1 L3 on the right. The twelfth rib crosses the shadow of the left kidney approximately in the middle, and the right one - between the upper and middle third. The upper poles of the kidneys are located closer to the midline of the body than the lower ones. The outlines of the kidneys are normally clear, the shadow of the kidneys is uniform.

Preparation of patients: on an empty stomach, after cleansing enemas the night before and in the morning of the study day.

Pictures are taken in a horizontal position of the patient on his back with a vertical course of the beam. In this position, the kidneys and upper urinary tract located in

the retroperitoneal space are closest to the X-ray film. The closer the subject is to the film, the better the image quality. In addition, the image quality depends on the distance of the film from the tube and the focus of the tube: the greater the distance and the smaller the focus of the tube, the better the quality of the X-ray. A large film is used with the reflection of the domes of the diaphragm and the pubic connection. X-ray of the kidneys must be done while holding the patient's breath while exhaling, the patient's position is motionless.

Plain urography is a method of contrast radiological examination of the excretory system. It is based on the physiological ability of the kidneys to capture iodinated organic compounds from the blood and excrete iodized organic compounds in the urine. Water-soluble X-ray-positive contrast agents are used that contain 3 iodine atoms. They absorb X-rays to a greater extent than the surrounding tissues and are organic iodine compounds.

Currently, domestic triombrast and urografin are used in 60% and 76% concentrations. They must meet the following requirements:

- give an intense shadow in the picture;
- do not decompose in the body;
- excreted in the urine unchanged;
- do not irritate the urinary tract and vascular walls;
- do not have a harmful effect on the body;
- easy to dissolve in water;
- easy to sterilize and stored for a long time.

Preparation of the patient: on an empty stomach, cleansing enemas, emptying the bladder.

Method: 20-40 ml of urotropic contrast agent is injected into the cubital vein. The first urogram is done in 5-7 minutes, the second in 10-15 minutes, the third in 20-25 minutes. If necessary, delayed radiographs are taken after 40-60 minutes. An image of the renal calyces, pelvis, ureters and bladder appears sequentially in the images. The shadow of the kidneys appears more clearly.

Excretory urography is a mandatory imaging step for suspected stones and, together with plain radiography, has advantages over ultrasound as a primary imaging method. EH provides an overview of the entire urinary tract, reflects the excretory function of the kidneys, and details the state of the PCS and ureters. For EI, aqueous solutions of triatomic contrast agents in a volume of 20 ml are used. contrast agents in a volume of 20 ml.

The kidneys on the urograms have images, as in the survey images, but their shadow is more intense.

With reduced excretory renal function, infusion urography is used. For this purpose, up to 100 ml of contrast agent in 5% glucose solution is injected intravenously to the patient using a system for drip infusion of liquid. Urograms are done in dynamics.

Abnormalities of the kidneys and ureters can manifest themselves in the form of changes in the number and size of the kidneys (aplasia, hypoplasia, additional or double kidney), their position (dystopia), changes in the ratio and shape (fusion of two kidneys, horseshoe kidney), structural restructuring (cysts), anomalies vessels, as well as doubling or splitting of the ureters, diverticula and anomalies of the ureteral orifice.

Renal angiography is used to diagnose renal aplasia. The absence of a vascular tree of the organ, coupled with the absence of a ureteral opening in the bladder, is a direct sign of a congenital absence of the kidney.

Angiography is the main method of differential diagnosis in case of kidney hypoplasia (congenital decrease in its size with preserved functions). This pathology must be differentiated from the kidney wrinkled due to pyelonephritis. With hypoplasia of the kidney, only a decrease in the size of the vascular pattern is noted, and with wrinkled, the angiogram is depleted due to small vessels (the picture of a “burnt tree”). On the excretory urogram and the retrograde pyelogram of the pyelocaliceal system, hypoplasia does not differ in appearance from a normal kidney, except for its miniature size.

The third or fourth additional kidneys are rare, most often located below the normally located and have a separate ureter, which opens independently into the bladder, and sometimes merges with one of the ureters.

Duplicate kidneys are on one side or on both sides, are larger than usual, their pelvis and ureters are not connected to each other. With ultrasound on longitudinal scans, there is a significant increase in the length of the kidney and the presence of two separate groups of cup structures in it. But if the cups are branched, it is not always possible to detect a duplicated kidney using ultrasound.

Dystopias are congenital anomalies of the position of the kidneys that develop as a result of the incomplete passage of the kidney into the lumbar region. The anomaly can be pelvic, iliac, lumbar. A likely sign of a defect may be the level of renal artery discharge from the aorta (normally at the level of the body and lumbar vertebra). Lumbar dystopia-kidney is slightly lower than normal. Iliac - reaches the pelvis.

Pelvic - localized in the small pelvis. Sometimes, in the presence of a mobile kidney, the diagnosis of lumbar dystopia is mistaken. However, with dystopia, the displacement of the kidney is much less than with a mobile kidney.

Changes in the ratio and shape of the kidneys: horseshoe-shaped kidney - there is an accretion of the lower poles, between which there is an isthmus; α-shaped kidney - one of the kidneys is located normally, and the other (reduced in size) is connected to it closer at a right angle in the region of the lower pole.

Anomalies in the development of the renal parenchyma are manifested by cysts, often associated with cysts of other parenchymal organs. Diagnosed with ultrasound, CT.

A simple cyst of the kidney is formed from the duct of the primary kidney (Vol'rov Strait) with improper formation of renal tissue in the early stage of embryogenesis. Most often it comes out of the cortical layer, much less often a cyst occurs in the center of the kidney. Kidney cysts are found on ultrasound. They look like a well-defined echo-negative formation with smooth internal contours of a

rounded or oval shape, devoid of internal echo structures. In the presence of a large cyst, the contour of the kidney often changes and its size increases.

Of all X-ray methods, only angiography makes it possible to obtain an image of blood vessels, which is necessary to diagnose their lesions and recognize a number of diseases that are accompanied by changes in blood flow and morphology of the renal vasculature.

An example of a vascular abnormality would be an additional artery to the lower pole of the kidney. By crossing the ureter, it can compress it and cause hydronephrosis.

Distinguish between general and selective renal arteriography. A catheter is passed from the femoral artery into the abdominal aorta and placed over the origin of the renal arteries. If necessary, use a translumbar puncture of the aorta with a lumbar puncture. Through a needle or catheter, using a special injector, 40-60 ml of a water-soluble contrast agent is injected into the aortic lumen and a series of X-rays are taken. First, an image of the aorta and large renal arteries (early arterial phase) is obtained, then - the shadow of small intraorgan arteries (late arterial phase), then - a general increase in the intensity of the shadow of the kidneys (nephrographic phase), a weak shadow of the renal veins (venogram), and finally - the image of the cups and the pelvis, since the control substance is excreted in the urine.

A more detailed study is possible with their selective contrast. In this case, a catheter is inserted directly into the renal artery and a contrast agent is injected through it.

Renal arteriography is done when renovascular hypertension is suspected and when planning surgery for an abnormal kidney, as well as intravascular interventions.

In contrast study of renal vessels, preference is given to the technique of digital subtraction angiography (DSA). Selective venography is performed by introducing a catheter from the inferior vena cava into the renal vein.

Often, the examination of the patient in the urology department begins with sonography (ultrasound scanning). This is due to the harmlessness and high

information content of the method. Sonography allows diagnosing most diseases of the urinary and urinary organs, which are accompanied by changes in their structure, as well as to study urodynamics and renal blood flow.

Indications for ultrasound of the kidneys:

* pain in the lumbar region or along the ureters;

• suspicion of the presence of focal formations in the kidneys (tumors, cysts, polycystic, abscesses, calculi);

* identification of hydronephrosis and other signs of urostasis, its causes and effects;

* the presence of hematuria to determine its cause (stone, tumor, etc.);

• diffuse diseases and pathological conditions of the kidneys (nephritis, nephropathy) to identify and assess the degree of morphological changes in the organ;

* chronic urinary tract infection;

• acute pyelonephritis and its complications;

• kidney injury;

* non-functioning kidney (according to urography data);

* impossibility of conducting excretory urography in case of impaired renal function; the goal is to establish the presence or absence of a kidney, its size, shape, diagnosis of a wrinkled kidney or the presence of an obstruction to the outflow of urine;

• identification of abnormalities in the development of the kidneys and urinary tract;

• renal failure of unknown origin;

* monitoring the condition of the transplanted kidney.

Ultrasound allows you to assess the position of the kidneys, their displacement during breathing, size, shape, shape, differentiate the cortex and the medullary layer, the renal sinus, the pyelocaliceal system (PMS) and the state of the perirenal tissues. Ultrasound guides in relation to the nature of the disease and the choice of methods for further research. But ultrasound does not give an idea of the function of the kidneys and does not sufficiently visualize the ureters, therefore, in many patients,

the primary method of radiation examination remains excretory urography, which is preceded by an overview urography.

Ultrasound of renal vessels. Doppler ultrasound is used for radiological study of renal vessels, their morphology and blood flow - one of the ultrasound options. The main renal arteries depart from the aorta at almost right angles at the level of L1 or the disc between L1-L2, 10-20 mm below the mesenteric artery. At the hilum of the kidney, the main renal arteries are divided into segmental arteries located in the renal sinus. The diameter of the main renal arteries is 3-5 mm, segmental - 2.1-2.3 mm. Arteries with a diameter of 1.5 mm depart from the segmental arteries, which are directed into the space between the pyramids.

In the corticomedular zones are arched arteries that surround the base of the pyramids.

The renal veins have a slightly larger diameter and, unlike arteries, do not pulsate. The main renal veins are located in front and below the arteries (see Fig.). Computed tomography (CT). When examining the kidneys, the patient is in a horizontal position on his back on the tomograph table. 6 slices are made every 0.8-1.6 cm at the level of XI-XII of the thoracic vertebrae to L3. On transverse CT scans of the abdomen, a normal kidney has the shape of an irregular bean.

Normally, the density of the renal tissue at CT has the range of + 30-40 Hu, and after the injection of 20-40 ml of contrast agent, the density of the parenchyma rises to 70-100Hu. After the introduction of contrast, the cortical substance is firstly contrasted, and then the medulla, PCS and renal vein.

The CT image of the kidneys is fully consistent with their anatomy in cross section. On tomograms, the kidneys are located at the T12 –L3 level, the left kidney is 15 mm higher than the right one. The length of the kidney is up to 100 mm. The fibrous capsule of the kidney is not normally visible. Around the fibrous capsule is a fatty capsule, which is more pronounced along the posterior surface and in the zone of the kidney hilum. Against the background of adipose tissue, which has a low density, the image of the kidneys is well differentiated.

When carrying out a computed tomography of the kidneys, three levels are distinguished: the upper pole of the kidney, the hilum of the kidney, the lower pole of the kidney. Upper pole level. Medially and anterior to the upper pole of the right kidney, the inferior vena cava, the descending branch of the duodenal loop and the head of the pancreas are located. The right adrenal gland is located between the superior medial surface of the kidney and the inferior vena cava. The right crus of the diaphragm and the spine are located medially. The fascia and muscles of the lumbar region are visible behind. The upper lobe surface of the right kidney is bordered by the medial surface of the right lobe of the liver.

The renal parenchyma on tomograms is homogeneous, the cortical and medullary layers are not differentiated due to a small densitometric difference (density). After artificial contrasting, the density increases from 30-35 Hu to 120 Hu. Kidney collar level. The location of the kidney gate corresponds to the level between L1-L2. The inner surface of the kidneys at this level is adjacent to the psoas muscles located on both sides of the spine. Anterior to the right renal pedicle and the inferior vena cava is the duodenum at the junction of the vertical part to the lower horizontal part.

At the level of the hilum, the kidney has the largest dimensions - 5x4, 5 cm, and the renal parenchyma is C-shaped. Inside it is the renal sinus, in which the cups, pelvis, segmental blood and lymphatic vessels, lymph nodes and fatty tissue are located, which has a negative density of 80-100 Hu. Through the gate, the renal artery, nerves, lymphatic vessels enter the renal sinus, and the renal vein and ureter come out.

The pelvis of the intrarenal type is located in the sinus, and it is not visible at the hilum. Pozanirkov's pelvis has a triangular shape and is directed towards the gate. The density of the pelvis contents is 5-20 Hu. After the introduction of a contrast agent, its density rises to 200 Hu. The density of vascular structures is within 30-36 N and corresponds to the density of the parenchyma. The pelvis passes into the ureter, the width of which is 2-5 mm.

The set of vessels of the hilum of the kidneys form the vascular pedicles. The veins look like linear structures, directed obliquely upward, medially and backward, where at the L1 level they flow into the inferior vena cava. The right renal vein is shorter than the left one, the width of the renal veins is 5-10 mm.

The renal arteries do not completely enter the cut, they are located 10 mm below the veins and back from them. Their diameter is smaller. The renal arteries branch off from the aorta at the L1 level.

Lower pole level. The lower poles are located at the L3 level, have an oval shape, clear contours, a homogeneous structure, a density of 30-35 Hu. At this level, the cut of the right kidney is slightly larger than the left one. At the level of the lower pole of the right kidney, laterally and in front, the ascending part of the large intestine is visible. Medially from the kidney, the inferior vena cava is visible in the form of an oval, located on the lumbar muscles. To the left and in front of the lower pole of the left kidney is the descending part of the large intestine, anteriorly - the loops of the small intestine, medially - the psoas muscle.

Magnetic resonance imaging (MRI) allows you to examine the kidneys in different projections. On axial sections, the image of the kidneys resembles their image on computed tomograms, but gives a clearer border between the cortical and medullary layers.

Radioisotope research. Radiorenography is a graph of the radioactivity of the kidney versus time after administration of a radionuclide drug. The method makes it possible to determine the secretory function of each kidney separately, the state of renal blood flow and diagnose urinary tract obstruction. For the study, radiopharmaceuticals (RFP) labeled with technetium-99, which has a half-life of 6 hours, and hippurate labeled with iodine-131 are used.

Radionuclide study of the kidneys - static scintigraphy, is performed 2 hours after the injection of the drug technetium, which is retained in the epithelium of the renal tubules. Pictures in various projections give an idea of the morphology of the kidney and changes in its parenchyma.

Dynamic scintigraphy is a common method of assessing renal parenchymal function. The method is carried out by injecting hippuran or technetium compounds, which quickly pass through the kidney tissue into the urine. Technetium provides more reliable information and is excreted, unlike hippuran, not by the glomeruli, but through the tubules.

The study of renal function can also be performed on a multichannel radiometer using three sensors. The curves obtained reflect the vascular, secretory and excretory phases of renal function in a differentiated manner and allow their quantitative analysis.

Kidney size is assessed visually or measured with ultrasound biometry. Length is the largest dimension in a longitudinal renal scan. Width is the smallest transverse dimension, thickness is the smallest anteroposterior dimension in a transverse kidney scan at the level of the hilum.

Normal: length - 10-12 cm, width 5-6 cm; thickness 4-5 cm.

With numerous diffuse kidney lesions, which are accompanied by an increase or decrease in their volume, it is necessary to determine it.

To calculate the volume of the kidneys, the formula for the volume of a truncated ellipse is usually used:

Kidney volume = length x width x thickness x 0.53

Age-related changes in the kidneys. Involutive changes in the kidneys are characterized by atorophia expressed in varying degrees. Due to atrophy, the volume of the kidneys at 80 years old can decrease to 55-60% of the initial level without manifestations of renal failure. Atrophy and volumetric reduction are the result of uniform sclerosis of the parenchyma. With radiation examination, there is a thinning of the parenchyma and an increase in echogenicity due to the development of fibrosis. Due to angionephrosclerosis in combination with pyelonephrotic changes, small cortical cysts can also be traced.

In case of insufficiency of the factors on which the fixed position of the kidney depends, the prolapse of the kidneys occurs - nephroptosis, which is divided into three types:

a) displaced kidney;

b) a mobile kidney;

c) vagus kidney.

In addition, the kidneys rotate around the axis.

For the diagnosis of nephroptosis, pictures are taken in the horizontal and vertical position of the patient, which makes it possible to establish the degree of mobility of the kidney (normally 2.5-3 cm). The kidney can be located at the entrance to the large pelvis or even move to the opposite side. In this case, bends and even loops of the ureter and the expansion of the upper urinary tract are characteristic.

The transplanted kidney does not differ from its own in anything other than localization. Of course the graft artery is sutured end-to-end with the internal iliac artery or end-to-side with the external iliac artery. The graft vein is anastomosed to the external iliac vein. The transplanted kidney is placed in the right or left iliac fossa directly under the skin. Often only the upper two-thirds are covered by the peritoneum. Placing the allograft directly under the skin makes ultrasonography convenient because the ilium blocks the necessary imaging. Such an arrangement of the graft makes it possible to distinguish between the medulla and cortex of the kidney during ultrasound: the medulla is seen to be slightly more echo-positive than the cortical.

The picture of the transplanted kidney on CT and MRI does not differ from the image of the own kidney.

Non-specific inflammatory kidney disease

When an infection penetrates the fatty capsule of the kidney (otherwise called perirenal tissue, paranephria), paranephritis occurs, which is diagnosed by X-ray: the contours of the psoas muscle cannot be traced. The fatty renal capsule, being a natural contrast to the renal parenchyma, makes it possible to image the shadow of the kidney on an X-ray.

In most cases, the paranephrotic process is localized along the posterior surface of the kidney and its lower part, where the capsule is most massive.

X-ray symptoms depend on the pathological changes and the stage of the disease. The dynamics of the disease can be traced using radiographs, which are periodically repeated. In the pleural cavity on the side of the affected kidney, there may be an effusion, the dome of the diaphragm is motionless.

Plain X-ray of the abdominal cavity reveals diffuse darkening in the kidney, the absence of the contours of the kidney and psoas muscle, curvature of the lumbar spine. Diabetic patients may have gas in the area of the abscess due to the presence of putrefactive flora.

On pyelograms, which are done on inhalation and exhalation, limitation of the mobility of the kidney is characteristic. Due to the fixation of the kidney with an inflammatory infiltrate, the contours of the cups and pelvis are emphasized, the kidneys are displaced.

The destructive process can be caused by osteomyelitis of nearby bone formations and vice versa - to spread to them from the peri-renal tissue.

Acute pyelonephritis. On a survey picture of a patient with acute pyelonephritis, one of the kidneys seems to be swollen due to a moderate increase in volume. In addition, there is an indistinctness or absence of the contour of the psoas muscle, sometimes diffuse darkening at the site of the kidney, the presence of a "rarefaction halo" around the affected kidney due to edema of the perineal tissue, small scoliosis towards the lesion.

Excretory urography provides additional data on renal impairment. In most patients on the urogram, the filling of the urinary tract with contrast agent is absent or occurs later than on the healthy side.

The excretory urogram shows the sharpness of the contours of the renal pelvis and calyces, which indicates an inflammatory edema of the perirenal tissue. At the same time, a sharp restriction of movement or complete immobility of the kidney during the patient's breathing is noted on the urogram. While on the healthy side the displacement range is 2.5-4 cm, on the diseased side it is absent or does not exceed 1 cm. To determine this phenomenon, 2 pictures are taken on one film during maximum inhalation and exhalation.

In acute pyelonephritis on the pyelograms, the cups, pelvis, and proximal parts of the ureters may be narrowed as a result of compression by an inflammatory infiltrate.

Excretory urography also establishes the initial stages of chronic pyelonephritis, which is characterized by a decrease in the concentration capacity of the kidney and a slowdown in the excretion of contrast agent by it. Radiographs and pyelograms show deformation. cups and pelvis due to edema and infiltration of their walls. Over time, the spastic stage turns into hypotonic and atonic, there is an expansion of the pyelocaliceal system and the ureter: the cups become rounded, and the vaults acquire a mushroom shape. Changes in the renal parenchyma are radiographically determined only in the advanced phase of the disease. At the stage of infiltration, a slight increase in the organ and the distance between the individual atonic cups is noticeable. As the process progresses, atrophy and sclerosis of the renal tissue occurs, the convergence and deformation of the cups, which indicates the wrinkling of the kidney. The surface of such an organ is uneven, calcifications appear in its parenchyma. The release of contrast agent with excretory urography is sharply slowed down or absent altogether. Retrograde pyelography reveals a reduced pyelocaliceal system, which resembles that in the presence of a hypoplastic kidney, but, unlike the latter, there is a marked decrease in the thickness of the parenchyma. The renal carbuncle can be traced as a limited protrusion of the contour of the kidney in combination with changes in the parorenal tissue in the general image. In this case, it is necessary to differentiate with a tumor that infiltrates the peri-renal tissue. On urograms and pyelograms, the kidney carbuncle turns out to be compression or amputation of the calyx. In addition, urography reveals dyskinesias of the pelvis and ureter, which are not observed in non-inflammatory processes.

When the carbuncle is abscessed into the calyx-pelvic system, the contrast agent during pyelography fills the decay cavity.

Sonography is an important radiation method for detecting carbuncle. At the onset of the disease, the carbuncle gives a site of increased echogenicity in the kidney parenchyma. As the purulent fusion of the central zone of the infarction

increases, the hypoechoic inhomogeneous focus increases. The focus of abscess formation from the central hypoechoic focus (pus with tissue detritus) and the echogenic contour of the infiltrated parenchyma. More often, the focus breaks into the perinephric tissue and causes paranephritis, less often into the calyx-pelvic system.

Hydronephrosis, or hydronephrotic transformation, is an expansion of the calyx-pelvis system, which gradually leads to atrophy of the parenchyma and suppression of kidney function. The reasons for the expansion of the renal cavity system can be long-term organic obstacles to the outflow of urine at any level of the urinary tract.

Hydronephrosis is congenital, acquired, persistent, intermittent.

In its development, hydronephrosis has three stages:

the first stage is only the pelvis enlarged. Kidney function is slightly impaired;

the second stage is the expansion of the pelvis and calyces, as a result of which the medulla atrophies; the third stage - the kidney turns into a thin-walled sac.

Variants of the structure of the cavity system are of fundamental importance for the timing of the development of hydronephrosis. With an extrarenal location of the pelvis, the process is slowed down, with an intrarenal one, it is most accelerated. Sonography for hydronephrosis is carried out without difficulty. Renal cysts, which in most cases are located haphazardly and have constant size, can simulate the expansion of the PCS. In unclear cases, intravenous urography is recommended.

Nephrolithiasis - urolithiasis. Clinical symptoms are intermittent low back pain, hematuria, fever.

The absence of a shadow on the survey image does not yet indicate the absence of a stone, and its presence on the X-ray in the kidney area gives reason to suspect a calculus.

Stones are a mixture of organic and mineral substances and, according to their chemical composition, can be oxalates, phosphates, urates, carbonates, etc. Oxalate and phosphate calculi are X-ray-positive, clearly visible on a general X-ray picture,

the rest of the stones in the pictures are indistinct, therefore they are called X-ray negative.

On the survey radiograph, coral calculi are clearly visible, which have a characteristic shape that resembles a cast of the renal pelvis and cups.

Renal-ureteric stones are characterized by a specific location and shape. In the renal pelvis, they are most often oval or triangular, in the ureters - oblong or fusiform.

But the seals found against the background of the kidney shadow may not be calculi, but calcifications of certain areas of the parenchyma due to tuberculosis or tumors. Calcified lymph nodes or phlebolitis are sometimes mistaken for stones, which, unlike kidney stones, give rounded shadows, numerous and bilateral. For differential diagnosis, X-rays are taken in lateral projection or ultrasound is used. Unlike the X-ray method, ultrasound examination can detect calculi of any chemical composition, of various sizes.

During sonography, a coral calculus looks like an echogenic structure that fills the kidney MHR in whole or in part; an intense acoustic shadow is determined from the stone.

To ascertain the localization of a shadow suspicious for calculus, it is necessary to carry out sonography under conditions of physiological hypertension, when accurate differentiation of the harvesting system and other elements of the central echo complex is possible. The presence of calculus in the CPS often causes urinary stasis and inflammatory edema of its walls - hypoechoic "halo". At the same time, it is not always possible to completely exclude the presence of small stones in the PCS.

Solitary calculus has an echogenicity greater than or equal to that of the renal sinus. The chemical composition of calculi is important for their image: urates and phosphates appear as bright hyperechoic structures and are detected in sizes starting from 3-4 mm, and oxalate stones are close to the echogenicity of the renal sinus and are diagnosed at sizes over 6 mm.

If calculi are not found, especially with X-ray negative urates and with reduced kidney function, retrograde pyelourethrography is used. In this case, the stones are determined in the form of filling defects with clear contours, around which a contrast agent is visible in the form of a thin strip, which makes it possible to distinguish, in particular, pelvic stones from tumors.

X-ray examination and sonography - methods that complement each other are performed in parallel in case of doubtful cases of nephrolithiasis.

Renal colic is usually caused by calculus of the pelvis or ureter. The migration of calculus from the kidney to the ureter delays the outflow of urine, increases the pressure in the PCS and its expansion, which causes an attack of renal colic. There is very severe lower back pain that spreads to the abdomen. In this case, small stones give a large clinic and vice versa. As the stone moves down to the bladder, dysuria increases, and pain radiates to the groin area. After the passage of the calculus, pain and dysuric phenomena stop.

It must be remembered that calculi are usually localized in the physiological narrowings of the ureter (in the intramural and prostate sections, at the level of the intersection with the vessels and in the pelvic-ureteric segment).

The causes of renal colic can be established with a plain abdominal X-ray. The shadow of a calculus found in the images gives grounds to suspect nephro- or ureterolithiasis. But renal colic can also be caused by an X-ray stone or the presence of blood clots, mucus, pus in the ureter, as well as allergic edema or dyskinesia of the ureter. In such cases, additional research methods should be used, in particular, excretory urography. The main sign of renal colic is a prolonged increase in the shadow of the kidney, which is more contrasted due to the reverse resorption of the contrast agent by the tubules.

At the height of the attack, when renal colic is accompanied by an expansion of the ureter and PCS, it is better to perform an ultrasound scan. In the absence of urostasis, the diagnosis of renal colic is unlikely.

Acute obstructive pyelonephritis is a consequence of an acute disturbance of urodynamics, which occurs when the ureter is obstructed by a stone after an attack of renal colic, with the corresponding clinical manifestations of intoxication.

On the plain x-ray it is manifested by a slight scoliosis in the affected side, indistinctness or absence of the contour of the psoas muscle, diffuse darkening at the site of the kidney, with a strip of enlightenment around it due to edema of the perineal tissue, limitation of the mobility of the kidney.

Ultrasound revealed an expansion of the ureter and the harvesting system of the kidney, an asymmetric increase in its size (the difference is more than 20%). The parenchyma thickness in the middle segment can reach 20-22 mm. The echogenicity of the renal parenchyma increases, and the echogenicity of the central echo complex decreases. An extravasate appears at the lower pole of the kidney in the form of a thin "sickle". With an unfavorable course, purulent complications occur.

The presence of an incomprehensible shadow on the overview image suggests ureterolithiasis. To clarify the diagnosis, sonography is used, the sensitivity of which reaches 95%. Most calculi are located in the lower third of the ureter within 12-24 hours after the onset of an attack, and saline calculi - after 2-3 hours and, once in the bladder, disappear, therefore, sonography begins from the mouth and pelvic ureter. In addition to calculi, signs of edema of the orifice of the ureter can be detected.
The nephrogram lasts for about an hour and a half. After that, it gradually disappears, the contrast agent from the parenchyma enters the general bloodstream and is excreted by the opposite kidney.

With a prolonged course of renal colic, as a result of increased intramuscular pressure, the function of the fornical apparatus is impaired, the resorption of contrast urine back into the blood from the cups does not occur, the kidney FMS and the ureter are filled to the site of the obstacle.

At the same time, the tone of the upper urinary tract is reduced, which is reflected in the images in the expansion of the WMS and the ureter. In this case, the ureter loses its normal cystoid structure. During renal colic, stasis in the upper urinary tract is detected in almost all cases. After the end of colic, stasis occurs in

88% of patients in the first 3 hours, in 76% - after 6-12 hours, in 50% - after 24-48 hours.

On the descending cystogram after renal colic, an asymmetry of the bladder can be observed, caused by a weak filling of the half of the bladder on the side of colic, caused by a spasm of the bladder detrusor along with calculus.

Increased intramuscular pressure in renal colic can cause renal-renal reflux, which can be seen on excretory urography. On urograms, the contrast agent penetrates beyond the BMS, which proves an increase in intramuscular pressure and the presence of an obstructing factor in the urinary tract.

Specific inflammatory kidney disease

Tuberculosis of the kidneys and ureter is most likely to be an X-ray method, which makes it possible not only to establish the presence of the disease and determine its prevalence in the organ, but also to assess the functional capacity of the kidneys and upper urinary tract. In the presence of tuberculosis, a change in the shape and size of the organ is visible on the roentgenogram, and in the case of an inflammatory process (wrinkling), retraction of the contour, swelling in the presence of a cavity or dilatation of the cups. An increase in the shadow of a diseased kidney can occur during the development of pyonephrosis, and the visual one - compensatory. Often with tuberculosis, calcification of tuberculous foci is detected. Tuberculosis has several periods, depending on which, after the diagnosis is established, various methods of radiation diagnostics are used. The earliest stage of kidney tuberculosis - specific pyelitis, can be established radiographically. It is characterized by ulcers of the papilla and the penetration of the contrast agent into the parenchyma. Most often, one papilla and the cup adjacent to it are affected, in contrast to nonspecific pyelonephritis, in which many papillae and cups are affected. Along with the narrowing and lengthening of the cup during the infiltrative process, sometimes you can find its compression, which is defined on the pyelogram as a filling defect. Infiltration of the large cup is accompanied by the expansion of the small cups. During the development of a large infiltrate in the renal parenchyma,

amputation of a whole group of cups may occur, while the X-ray picture resembles a tumor process.

The formation of a cavity in the kidney is characterized by the presence of various sizes of rounded, triangular or irregularly shaped cavities with current contours and a depot of contrast from the outside of the cup vault. The process is manifested by a characteristic X-ray picture from the pelvis and ureters, at first the tone of the pelvis decreases and it expands, and as specific pyelitis and tuberculous granulomas appear, it shrinks.

With fresh seeding of the kidney with tuberculous granulomas, functional disorders can also be determined using renography. With further progression of the process, destructive changes occur in the kidney parenchyma - cavernous cavities with fibrosis around them. To identify a destructive cavity, it is better to use excretory urography, because the early appearance of a specific infiltrate, which causes deformation of the cup and narrowing of its lumen, with retrograde pyelography interferes with the penetration of contrast agent into the cavity associated with the cup. With excretory urography, they begin also in the case when it is necessary to prevent infection of a healthy organ. Pictures should be taken immediately after contrast administration and repeated at short intervals. But if the kidney is significantly affected and its excretory and concentration function is impaired, retrograde pyelography should be preferred.

On sonograms, the cavity resembles a kidney cyst, but has a heterogeneous content and compacted perifocal tissue.

When drawn into the HMS process, deformation of the cups and pelvis is traced on the urograms and retrograde pyelograms. From the cups, the contrast agent penetrates into the cavernous cavities of the renal parenchyma.

CT makes it possible to best determine the volume of tuberculous lesion and its localization.

The nephrogram gives an idea of the prevalence and localization of the tuberculous process in the renal parenchyma, topographic relation to the renal artery.

Arteriography in the arterial phase reveals deformation and breakage of small arteries, in the nephrotic phase - areas of the parenchyma that do not function.

Renal angiography is especially valuable in the closed form of a specific process, when the cavity is not filled in a retrograde manner.

Tumors and cysts of the kidneys.

Any formation should be perceived as potentially malignant until signs are found proving the opposite.

In patients with suspected mass lesion, the leading method of radiation diagnostics is ultrasound scanning as the simplest, cheapest and most accessible method.

Mass lesion syndrome is the most common sign of a tumor in the kidney. Cysts and tumors develop latently for a long time, and clinical and laboratory studies are of very relative importance due to their non-specificity and heterogeneity of results.

Tactics of radiation examination in case of suspected tumor.

The first stage: ultrasound scanning-urography.

Second stage: CT angiography.

Examination of patients with kidney tumors at the first stage involves performing sonography, which allows detecting a tumor node 2 cm or more in size. A malignant tumor looks like an irregular round or oval formation, heterogeneous in echogenic density. A tumor node with ultrasound is usually diagnosed with its subcapsular localization, when the kidney contour is deformed. This is due to the fact that the echogenicity of the tumor is close to the echogenicity of the parenchyma.

The internal echo structure of the tumor node can be different. Tumors of small size are homogeneous, large ones are heterogeneous, with cystic hemorrhages and calcification.

Sonography reveals enlarged lymph nodes in the renal hilum in the presence of Mts.

For tumors with benign signs, observation is necessary, which is terminated in the event of a dynamic process. If the neoplasm is more than 4 cm in diameter, the likelihood of its malignancy increases.

Papillary cancer of the pelvis manifests itself as asymptomatic hematuria. Sonographically, the tumor looks like a hypoechoic mass that fills the bowl. When the tumor grows beyond the HRM, the echogenic strip of the central echo complex separating the tumor and the renal parenchyma disappears.

Papillary cancer of the pelvis is able to metastasize to the ureters and bladder. In this case, their sonographic images coincide with the picture of primary papillary tumors.

On the excretory urograms, the tumor causes a number of symptoms, which include deformation and displacement of the calyx and pelvis, amputation of the calyx, uneven contours of the pelvis or the presence of a filling defect in it, deviation of the ureter.

The second stage of the examination depends on the results of sonography and X-ray examination and involves the use of CT and angiography. The methods of this stage are important for the choice of therapeutic measures, since they allow detecting small tumors in the velvet layer and metastases in the lymph nodes, as well as finding out the state of the renal and inferior vena cava.

Kidney cysts are acquired and congenital. The latter are most common and represent developmental anomalies. They can be both solitary and numerous. On a plain radiograph, the solitary cyst looks like a rounded shadow, clearly delineated, sometimes with calcification, adjacent directly to the shadow of the kidney. When using contrast methods of X-ray examination, cysts are manifested by displacements and deformation of the cups and the renal artery, a change in the shape of the pelvis. They can be distinguished from a tumor thanks to CT and angiograms, which show the expansion of the vascular pattern, compression and displacement of the vessels to the opposite pole of the organ from the cyst. Numerous renal cysts (polycystic) give a very diverse x-ray picture. for their diagnosis, various methods of radiation research are used.

Traumatic kidney injuries, which are accompanied by extensive hemorrhages in the retroperitoneal pararenal fiber, on the plain radiograph give a diffuse homogeneous shadow in the region of the kidney with the disappearance of its contours and the edge of the psoas muscle. With fluoroscopy of the chest cavity, a restriction or complete lack of mobility of the dome of the diaphragm from the damaged side is revealed.

Excretory urography is atraumatic for the kidneys and makes it possible to get an idea of the function of a healthy kidney, which is important for damaged nephrectomy. Depending on the degree of damage to the organ, a different amount of contrast agent goes beyond the calyx-pelvic system and gives shapeless and excellent shadows.

Specific inflammatory diseases of the ureters, bladder

The defeat of the ureters by tuberculosis causes changes in their contours and shortening of the length, which manifests itself radiologically. The ureter in the early stages of the tuberculous process is atonic and dilated. Subsequently, as the ulcerative-sclerotic changes develop, strictures are formed, abrupt shortening, correction of bends and loss of tone, the corresponding side of the bladder is raised and sloped.

Changes in the bladder are characterized by its asymmetry, decrease in volume, and the presence of vesicoureteral reflux.

Ureteral tumors can be correctly diagnosed in most cases using ultrasound. Most often, malignant papillary formations are found in the ureter, which have a number of sonographic signs: the presence of a hypoechoic tissue formation up to 1 cm thick in the lumen of the ureter, terminal hydro-ureteronephrosis, secondary papillary neoplasms on the walls of the bladder.

Arising in any part of the ureter, the tumor fills its lumen and descends into the bladder. Narrowing of the ureter causes hydronephrotic transformation and secondary stone formation.

Infection with stagnant urine leads to purulent complications. Patients complain of hematuria and fever. X-ray methods reveal the absence of kidney function on the side of the pathology. With ureteral fibroma, sonography has a similar picture with a papillary tumor, but unlike it, the lumen of the ureter is not completely closed and urodynamics is preserved.

Tumors of the bladder. X-ray diagnosis of bladder tumors is carried out using cystography. The classic sign of a tumor on the cystogram is the asymmetry of the shadow of the bladder on the side of the localization of the neoplasm and the filling defect with uneven contours. The shape and size of the filling defect correspond to the intra-fur part of the tumor. Cystography allows you to determine the nature of tumor growth and get an idea of the thickness of the bladder wall in the neoplasm. Double staining can be used to recognize bladder tumors. Thickening of the bladder walls in the area of the tumor is a sign of infiltrative growth.

A wide-based bladder tumor with a knobby surface and a thickened wall are signs of malignancy. Calcifications on the surface of a tumor are usually a salt deposit in necrotic tissues and are also a sign of malignancy.

In the case of a benign tumor, the bladder wall has smooth, even, non-draining contours.When analyzing the images, you should pay attention to the visible bones of the skeleton to detect metastases in them.Excretory urography, in addition to cystography, allows to exclude compression of the ureteral orifice by the tumor, impaired passage of urine, and the presence of hydronephrosis.

Imaging, although less accurate than histological examination, remains the best method for staging and monitoring detected tumors.

Vesicoureteral reflux. Inflammatory changes in the bladder wall with involvement of the ureter can lead to stricture and rigidity of the orifice of the ureter with vesicoureteral reflux (MCP). Reflux most often occurs during urination. This is active reflux, in which the transition of the contrast agent from the bladder to the ureter is radiologically observed at the time of the patient's self-emptying of the bladder. With this type of reflux, very high pressure is transferred from the bladder to the bowl, which is clinically manifested by acute pain in the lower back.

With passive reflux, the immediate transition of contrast from the bladder to the ureter through free communication is radiologically traced. Since the pressure in the renal pelvis during reflux increases significantly, there are conditions for the development of renal pelvis reflux. Thus, reflux creates conditions for an ascending infection.Reflux can be detected with emergency urography, descending and ascending cystography, and cystorentgenoscopy.

The concept of MCP has expanded significantly with the introduction of sonography and renography into wide clinical practice. At present, it is recognized that the leading anatomical prerequisite for the antireflux mechanism of the secular-microfusion (CMC) is the length of the intravesical ureter, which is normally 2.5 + 0.5 cm. Moreover, the ratio of the lengths of the intramural and submucosal segments is 1: 2 with the volume bladder 200-300 ml. If it overflows, a functional decrease in the length of the SMS is possible - "slipping" of the ureter from the bladder. With anatomical lateralization of the intravesical ureter, its length is significantly lower than the standard indicators (0.6 + 0.15), which is accompanied by a significant dysfunction of the SMS.

To confirm the suspicion of ureteral stones, plain radiography in two projections is used with a radiopaque catheter inserted into the ureter. Ureteral stones are elongated or spindle-shaped. In the presence of stones, the contrast agent with intravenous urography fills the dilated ureter only above the localization of the calculus. If the X-ray is done at a later time after contrasting, then due to the impregnation of the calculus with a contrast agent, even X-ray-negative stones can be seen. In the case of blockage of the ureters with a stone, the contrast agent does not pass into the upper urinary tract or a filling defect is observed. The stones of the upper third of the ureter and the calyceal system are clearly visible on ultrasound.
Dilation of the upper urinary tract (total or limited) is observed in the presence of a stone or cicatricial narrowing, neoplasm, inflammatory edema or wrinkling of the bladder, when the orifice of the ureter is compressed, as well as in other diseases of the urinary tract, prostate adenoma, pregnancy.

Bladder stones can be primary or secondary, which have descended from the upper urinary tract. Bladder stones increase in size. On the radiograph, stones are detected due to the presence of calcium salts. With a low calcium content, stones appear as delicate shadows or filling defects on the cystogram.On a plain radiograph, bladder stones are visible in most patients, which is especially valuable when it is impossible to do other studies. The structure of the stone is clearly visible, due to which one can judge the chemical composition of the calculus.

In the anteroposterior images, the shadow of the bladder calculus is projected over the symphysis. Localization of the stone below this level indicates that it is a posterior urethral stone, in contrast to which prostate stones are usually numerous, small, located on both sides of the midline. To clarify the localization of the stone in the bladder and in the terminal segment of the ureter, a combined radiation study is used.When analyzing the radiographs of patients with bladder stones, it should be borne in mind that similar shadows can be caused by fecal stones, lymph node abnormalities, and phlebolitis. Foreign bodies enter the bladder during masturbation. These are pins, pencils, thermometers, etc. On plain X-ray, most foreign bodies give a clear shadow. After a long stay in the bladder, foreign bodies become covered with salts and give a shadow of an ordinary calculus in the picture. Radiography allows not only to identify the stone, but also to establish its true nature of the secondary nature.

Traumatic bladder injuries are examined using contrast ascending cystography. Diagnosis is based on the leakage of a contrast solution or urine outside the bladder (into the abdominal cavity or whitish tissue), which is determined in the images in the direct and oblique projections. But even before contrasting cystography, a conventional X-ray image allows you to get a complex of indirect symptoms and suspect damage to the bladder.The presence of fractures of the pubic and ischial bones with displacement of fragments, rupture of the symphysis and hematuria on the survey image is an indication for a targeted emergency examination of the bladder.

INTERCONNECTION OF DISEASES OF THE URINARY SYSTEM WITH DISEASES OF OTHER SYSTEMS AND ORGANS

Lung condition in certain kidney diseases

With generalized lesions of the renal parenchyma, which occur in diseases such as acute renal failure, glomerulonephritis and others, radiological manifestations have much in common.

Radiation examination of the abdomen usually begins with a plain chest X-ray and a targeted study of the state of the border thoracoabdominal zone.

In acute diseases of the organs of the upper floor of the abdominal cavity, thoracic syndrome can be observed, which combines a number of radiation symptoms: high standing and limited mobility of the diaphragm, secondary pleurisy, changes in the basal parts of the lungs. Determination of the state of water balance by x-ray examination of the lungs is of decisive importance for the diagnosis of acute renal failure. On a plain radiograph with pulmonary edema, bilateral extensive changes in the lungs are usually noted.

The peripheral parts of the lungs are free from damage. Changes are localized in the central parts of each lobe of the lungs and have a characteristic appearance - "butterfly" edema: foci of darkening in the central parts of the lungs, surrounded by a free zone of normal parenchyma. These shadows express the increased permeability of the dilated alveolar capillaries, which leads to the so-called water lung. In 35% of cases with renal failure, pulmonary edema is accompanied by effusion in the pleural cavities. These radiological signs are earlier than peripheral edema. Along with pulmonary edema on the plain radiograph of the abdomen, signs of edema of the tissue of the retroperitoneal space and kidneys are revealed. At the same time, the density of the retroperitoneal space increases, as a result of which it is impossible to detect the shadows of the lumbar muscles and kidneys.

The enlargement of the kidneys can be due to both urinary stasis and extensive changes in the parenchyma.

Plain radiography results dictate the decision-making algorithm.

The state of the skeleton in diseases of the urinary tract

The description of the image of the organs of the urinary system is carried out in relation to individual bones, which have a constant location. The spine has the most stable landmark, so the study of survey images begins with the skeletal system; lumbar and lower thoracic vertebrae, ribs, pelvic bones. This is dictated by the fact that painful processes in diseases of the urinary tract are accompanied by symptomatic scoliosis, which indicates the pathology of the urinary tract.

Changes in bones can be the result of diseases of the urinary system, that is, secondary, as well as independent - primary. Secondary bone lesions of the skeleton can be caused by metastases of hypernephroid kidney cancer or prostate cancer. Often, by the localization and nature of bone metastases, one can recognize the type of neoplasm and its primary focus. Thus, the diagnosis of prostate cancer is made in the presence of characteristic bone metastases, when the disease does not manifest itself clinically. Prostate and kidney cancer cells more often metastasize to the lumbar vertebrae, ribs, and pelvic bones. Bone metastases are osteoclastic (lytic) and osteoblastic (sclerotic). Osteolytic metastases are more common. On radiographs, they are characterized by oval structureless defects of various sizes without foci of humiliation with scalloped contours. Osteolytic metastases to the vertebral bodies cause compression. Osteoblastic metastases are characterized by uniform, intense bone tissue. In these cases, against the background of a normal spongy cauldron structure, irregular forms of humiliation appear, which merge. They are called cancerous osteosclerosis. Such bone marbling is characteristic of prostate cancer metastases. With osteoblastic metastases, pathological bone fractures are less common. Osteolytic and osteoblastic metastases can be combined in the same patient.

Bone abnormalities can be caused by degenerative lesions that present clinically with low back pain similar to those of kidney disease. On the pictures in such cases, you can see the radiation signs of deforming osteochondrosis, spondylitis, spondyloarthrosis, tuberculosis of the spine.

The state of the vascular system in kidney disease

Diseases of the kidneys and their vessels can cause the development of nephrogenic arterial hypertension. One of the reasons for this is a violation of the flow of arterial blood to the kidney due to atherosclerosis or kinking of the artery in nephroptosis. This is renovascular hypertension. Another reason is a violation of intrahepatic blood flow in glomerulonephritis or chronic pyelonephritis. This form of hypertension is called parenchymal hypertension.

At the first level, radiation diagnostics are limited to urography and renography. If possible, use the second level, in which the study is carried out in two stages. At the first stage, sonography, CT, diagnostic scintigraphy are done. These methods make it possible to find out the anatomical and functional state of the kidneys and to select patients with the genesis of the disease, which is allowed. At the second stage, with nephrogenic hypertension, angiography is performed using digital subtraction.

Kidneys in diabetic patients

The ratio of length, width and thickness of the kidneys is normally 2: 1: 0.8. a change in these dimensions is a frequent and specific sign of diffuse kidney disease. The most informative coefficient of the ratio of the width and thickness of the kidneys, which in the presence of a number of nephropathies approaches 1 (“symptom 1”). Normally, this ratio is less than or equal to 0.8. this symptom can be detected with minimal manifestations of nephropathy. It often occurs in patients with type 2 diabetes mellitus, sometimes even before the clinical manifestations of nephropathy. In this case, the width and thickness of the kidney are practically equal; therefore, the kidney is round in cross section.

TUBERCULOSIS OF THE GENITOURINARY SYSTEM. UROGENITAL TUBERCULOSIS.

Learning objectives: to teach students to properly examine patients with urogenital tuberculosis, to pay special attention to early manifestations of the disease, methods of early diagnosis, features of treatment, clinical examination of patients and examination of working capacity, as well as the study of basic concepts, classification.

List of skills: know the basic concepts of urogenital tuberculosis, master the tactics of diagnosing and treating tuberculosis of the genitourinary system. To master the schemes of conservative treatment of tuberculosis of the kidneys and ureter. Determine the indications for surgical treatment. To study the peculiarities of clinical examination of patients with urogenital tuberculosis and examination of their working capacity.

Glossary of terms:

Tubercles (lat., Lump) - nodules in the tissues of the body, caused by a tubercle bacillus.

Tuberculin is a specially processed extract from the culture of the causative agent of tuberculosis (Koch's bacillus). Used to diagnose tuberculosis.

Tuberculosis is a common infectious disease of humans and some animals, affecting mostly the lungs, bones, skin, joints.

CONDITIONAL ABBREVIATIONS

EU - excretory urography

CT - computed tomography

MRI - Magnetic Resonance Imaging

UVA - ureterovesical anastomosis

Ultrasound - ultrasound examination

CRF - chronic renal failure

CPS - the calyx-pelvis system

MBT - Mycobacterium tuberculosis

Theoretical material:

Urogenital tuberculosis can rightfully be attributed to the most common pathology of the genitourinary system. This is evidenced by statistical data, both domestic and foreign authors. Tuberculous kidney injuries account for 13-15 percent of the total number of all surgical diseases of the upper urinary tract, second only in frequency only to kidney stones, and tuberculosis of the external genital organs in men - 20-25 percent of scrotal diseases.

Modern methods of X-ray examination make it possible to recognize tuberculosis of the genital organs in the early stages of its development, and thus to start rational treatment in a timely manner.

Gender, age, side of defeat. Kidney tuberculosis occurs with equal frequency in people of both sexes. It usually affects people of a young and blooming age. The largest number of patients occurs from 20 to 40 years old. It is generally accepted that it is less common in children under 10 years of age and in the elderly. Basically, kidney damage of one side or the other, according to the literature, cannot be established. Bilateral kidney lesions were noted by a number of authors in 33-35% of cases.

Pathogenesis. According to many authors, kidney tuberculosis is a secondary process in the body and it occurs as a result of hematogenous metastasis from the existing primary complex in the lungs, intestines or lymph nodes. Thus, renal tuberculosis is considered as a local manifestation of general tuberculosis infection in the body.

Mycobacterium tuberculosis, as a rule, penetrate into the kidney by hematogenous route and extremely rare lymphogenous route from adjacent organs affected by tuberculosis (intestines, mesenteric lymph nodes, spine).

However, in many patients with tuberculosis of the kidney, during a severe clinical examination, it is not possible to establish a specific process in other organs, from which hematogenous infection was possible.

At the 1st All-Russian Congress of Urologists in 1926, A. I. Abrikosov pointed out that organ tuberculosis, including kidney tuberculosis, occurs in early

childhood. Developing as a result of metastasis of 1% of the primary complex, chronic tuberculosis of the genitourinary system, like any so-called organ tuberculosis, is a factor that enhances the body's immunity in relation to secondary lung infections with tuberculosis.

This explains the frequent cases of the absence of any signs of an active tuberculous process in the lungs with tuberculous lesions of the urinary system. However, the path of hematogenous drift from the primary complex is not the only possible one.

ZA Lebedeva (1952), A. I Myants (1954), AN Chistovich (1960) admit that mycobacterium tuberculosis can penetrate the kidney simultaneously with damage to the lungs or lymph nodes during primary infection of the body. However, while in the lungs or intestines mycobacterium tuberculosis find favorable conditions for their development, these conditions are not very favorable in the parenchyma of the kidney, where special sensitization of the renal tissue and its susceptibility are required for their vital activity.

According to AI Mayants, this sensitization sometimes occurs 3-10 years after the primary clinical manifestation of tuberculosis in the body. As soon as the infectiousness of tuberculosis was proved, features were found that distinguish it from other infectious diseases.

It was found that the nature of the course and morphological manifestations of TVS in many cases depend on how the tubercle bacillus first entered the body, or the process takes place in an organism that has already undergone tuberculosis infection. Depending on this, 2 periods were distinguished in the development of fuel assemblies: 1) the primary complex 2) the result of reinfection.

In 90-95 percent, the primary infection is through the respiratory tract.

The main feature of the primary FA is its development against the background of active foci of primary infection - a constant source of body sensitization.

The primary focus is the source of hematogenous tuberculosis. It is characterized by the presence of foci in various organs and is characterized by increased body activity. At the same time, the occurrence of a metastasis focus in the kidney and the

development of a progressive process in them does not coincide in time: metastasis occurs in childhood, and the development of TVS in the kidney begins 10-15-20 years later, when there is no longer tuberculosis in other organs.

Hematogenous transfer to the kidney usually occurs during the period of bacillemia. Sometimes this occurs with an exacerbation of a tuberculous focus in any localization, in other cases, new tuberculous foci appear. The body as a whole and its individual organs are sensitized to tuberculosis infection. Clinical studies have established that hematogenous drift of tuberculosis infection into the kidney is observed in pulmonary tuberculosis in 5-14%, and in tuberculosis of the skeletal system - in 2-12.7%. These data should be taken into account during preventive examinations of the population.

More recently, some studies have recognized the possibility of infection in the kidney ascending (urinogenically) from the bladder affected by tuberculosis. Today, this route of penetration of tuberculosis infection into the kidney is considered a liquid phenomenon. It is possible only in some cases as a result of the reverse flow of urine infected with mycobacterium tuberculosis and the bladder into the ureter with spasmodic contractions of the bladder and insufficiency of the vesical orifices of the ureters due to their specific lesions. This phenomenon is called vesicoureteral reflux. The ascending path of the spread of tuberculosis infection from the affected bladder to the kidney is possible, both in the case of a banal infection through the opening of the ureter, and along the lymphatic pathways located in the surrounding tissue.

The penetration of mycobacterium tuberculosis into the kidney parenchyma does not always cause the development of a specific process in it. The nature of the changes that occur depends on the degree of natural or acquired immunity from these conditions, the following options for the development of the pathological process in the kidney are possible: a) Mycobacterium tuberculosis penetrated into the kidney are reduced by the body's defenses and die; b) mycobacterium tuberculosis in the kidney in a latent state, without causing any deviations from the parenchyma; c)

mycobacterium tuberculosis find favorable conditions for their life, as a result of which a specific tuberculous process develops in the kidney.

Until recently, it was the authors' opinion that in most patients the tuberculous process first affects one kidney and the simultaneous impression of both kidneys is noted only in 15-20 percent (GM Fronshtein, IM Epstein, etc.). However, today this point of view is denied by many authors. So A. I. Mayants and A. N. Chistovich and others believe that in most patients with tuberculosis two kidneys fall ill at the same time, but the degree of damage in each of them is not equally intense. In one of the kidneys, the tuberculous process is in a latent state and is not clinically observed, and in the future it is even eliminated, and in the other kidney a blooming focus develops with the progression of the process. The reliability of these statements is confirmed in practice - in a rapid outbreak in a number of patients with a tuberculous process in another kidney after nephrectomy, although a preliminary clinical examination of this kidney before the operation did not establish a tuberculous process in it.

Veselovsky (1955) believes that all modern diagnostic methods are not sufficient to state that the kidney, which is considered healthy, is not affected by tuberculosis and kidney tuberculosis in the initial form is always bilateral.

For a long time, almost the only thought was expressed, however, that the settling of a specific embolus hematogenously introduced into the kidney occurs in the medulla at the apex of the papillae, since the most pronounced specific changes in the parenchyma of the removed kidney are found in this layer. However, during the autopsy of the corpses of patients who died of pulmonary tuberculosis, at the early stages of the development of a specific process in the kidneys, the bulk of the tubercles was found in the cortical layer of the kidneys and, to a lesser extent, in the medulla. At a later date, specific changes predominate in the medulla.

The tuberculous process, which develops in the parenchyma of the kidney, during its spread reaches the tops of the calyces, and obeying the decay breaks into the lumen of the urinary tract. There is a permanent connection of the focus with the cups, bowl and bladder.

Infection with tuberculosis of the pelvis and calyces, according to many authors, occurs by contact. AI Mayants does not exclude the spread of tubercle bacilli through the lymphatic vessels located in the submucous layer of the pelvis or ureter.

With further progression, the tuberculous process spreads to the bladder, which is affected by tuberculosis only with a long process in the kidneys, from where it spreads downward.

In the presence of a tuberculous process in the bladder, significantly pronounced destructive changes are usually noted in the renal parenchyma. However, in some cases, when a common ulcerative process of the urinary bladder mucosa is detected, only a specific infiltrate appears in the affected kidney without signs of decay.

For a long time, the bladder remains intact to tuberculous infection. According to V.D. Grund, this condition is explained by the stability of the nerve trunks passing through its wall.

Pathological anatomy. Concerning the acute miliary form of renal tuberculosis, it should be said that clinically it is not recognized and is found only on the section. Therefore, more detail should be given to chronic kidney tuberculosis.

When mycobacterium tuberculosis settles in the kidney parenchyma, the presence of the necessary allergic state of the body and, in particular, sensitization of the renal parenchyma, a tuberculous process (tuberculous tubercle) begins to develop.

Further, various dynamics of the tuberculous process is possible.

In some cases, the disintegration of the tubercles occurs, while from the fusion of adjacent disintegrated tubercles in the parenchyma of the kidney, decay cavities (cavities) are formed, sometimes these are single cavities, in other cases there are many of them, which occupy large areas of the renal parenchyma (polycavernous process) if the collapse of the tubercles occurs on the mucous membrane of the pelvis or ureter, then specific tuberculous ulcers are formed here. The wall of the cavity is

covered with necrotic tissue, and its cavity is filled with caseous contents or thick pus. In the center of specific foci, nonspecific inflammatory changes develop. Areas of perifocal inflammation are sometimes closed for a long time.

With favorable protective conditions in the body, the reverse development of the formed tubercles, their resorption, scarring, and petrification is possible. The dynamics of these changes is especially pronounced in relation to the kidney, where, along with the preserved tubercles, can be found in the medulla. Petrification of tuberculous changes is possible not only in tubercles, but also in separate cavities and even in massive lesions of the kidney - mistletosed kidney.

As a result of scarring of specific ulcerative changes from the performed antibacterial treatment or under the influence of the body's defensive reactions, a narrowing of the lumen (passage) of the ureter often develops, followed by impaired motility of the pelvis. As a result of the expansion of the bowl and cups and the stagnation of the contents in the cavities, in a number of patients, a specific tuberculous pyonephrosis is formed: the parenchyma of the kidney becomes thinner, and the organ itself turns into a purulent sac. In some cases, with complete obliteration of the lumen of the ureter, the entire kidney can be turned off - autonephrectomy. A false cure sets in: urine becomes transparent, dysuric phenomena disappear.

Sometimes, instead of pyonephrosis, kidney atrophy develops, in which only a lump of sclerosing tissue is determined at the level of its location, in the center of which are the remains of the renal parenchyma with the phenomena of a specific tuberculous process. In some cases, the atrophied parenchyma of the kidney is replaced by hyperplastically growing adipose tissue and turns into a lump of fat with scant remnants of renal tissue. These changes are called kidney fat replacement. It is extremely rare in the presence of pyuria and mycobacterium tuberculosis, urinary cystological examination of the removed kidney does not establish specific changes characteristic of tuberculosis. The histological picture of the kidney in these patients corresponds to a chronic inflammatory process such as nephrosclerosis. SP Fedorov called this form of kidney tuberculosis Kokhovsky nephrocirrhosis. The defeat of

the same paranephria is manifested in two variants. In some cases, it is accompanied by a purulent melt of fatty tissue, in others, which is much more common, sclerosing paranephritis develops, as a result of which the kidney is surrounded by a cicatricial carapace. Such changes in the perineal tissue make the surgeon, when removing the kidney, run over to the subcapsular method.

With the spread of the process to the urinary tract on the mucous membrane of the pelvis, ureter and bladder, specific tuberculous changes - tubercles - develop, and as a result of their disintegration, one or another severity of ulcerative changes. Simultaneously with these changes in the mucous membranes, a sclerosing process develops in the fatty tissue surrounding the pelvis and ureter.

Scarring of specific ulcers on the mucous membrane of the ureter, as well as periurethral tissue, contributes to the formation of narrowing of the lumen (passage) of the ureter, and on this basis there is a violation of the motility of the pelvis and ureter. Changes occurring with tuberculous lesions of the bladder, identical to those described for lesions of the pelvis, tubercles, specific ulcers, sclerosing process in the peri-vesicular tissue.

As a result of scarring of ulcerative changes and infiltration of peri-vesicular tissue, the development of a wrinkled so-called "small bladder" is possible, usually accompanied by insufficiency of the vesical orifices of the ureters. The latter circumstance can cause a too severe complication - ureteral reflux.

Classification. Until now, there is no approved and generally accepted classification of renal tuberculosis. Most of the proposed classifications of renal and urinary tract tuberculosis are based on the principle of staging. They are based on the pathomorphological course of the tuberculous process: from the initial infiltrative changes in the depths of the renal parenchyma to the development of polycavernous tuberculosis of the kidney - tuberculous pyonephrosis.

Before the antibacterial era, the classification of renal tuberculosis was mainly clinical. For example, S.P. Fedorov defined two forms of kidney tuberculosis: 1- acute or subacute, miliary form, 2 - chronic kidney tuberculosis. Chronic kidney

tuberculosis, in turn, he divided into two subgroups: a) with specific tuberculous changes; b) without specific changes in the type of chronic nephritis.

In the past, when early nephrectomy was the main method of treatment, any classification was recognized to solve the main diagnostic problem - recognition of diseases at an early stage. At present, the most receptive and sufficiently relevant to practical goals is the following classification:

I. Clinical and radiological forms of renal tuberculosis:

1) tuberculosis of the renal pelvis (without existing radiological changes)

2) tuberculosis of the renal papilla (papillitis)

3) cavernous tuberculosis of the kidney

4) tuberculous pyonephrosis

II. Phase of the tuberculous process:

1) open tuberculous process

2) shutdown

3) total segmental scarring

4) Calcification of one cup

III. Bacillary: BK + BK-2

IV. Functional state of the kidney:

1) Function is broken

2) Function reduced

3) No function

V. Complications:

Pyelonephritis, nephrolithiasis, hypertension, amyloidosis, etc.

Each of these forms is easily determined by classical methods, has its own clinical and radiological characteristics, prognosis and treatment methods.

Symptomatology. In the clinic of kidney and urinary tract tuberculosis, unfortunately, there is not enough specific pathognomonic symptoms, quite often renal tuberculosis can proceed under the guise of a completely different disease.

Brief clinical assessment of selected symptoms.

a) Bacilluria:

This term should be understood as the excretion of Mycobacterium tuberculosis in the urine in the absence of pyuria. Bacilluria is a symptom of great practical importance, since it may be the first manifestation of latent renal tuberculosis. While proceeding without any clinical manifestations, bacilluria manifests itself suddenly and indicates that there is a lesion of the renal parenchyma and does not allow mycobacterium tuberculosis to pass through (Kilpoitner). However, he found that mycobacterium tuberculosis under certain conditions can pass through the renal filter without causing changes in the kidney. He claims that bacilluria is a temporary phenomenon and occurs periodically. His opinion is that bacilluria should be recognized only when it manifests itself with any complications or exacerbation of the tuberculous process in the lungs (hemoptysis, pneumothorax, which is accompanied by a large intake of mycobacterium tuberculosis into the blood). Emphasizes that the usual research methods are not enough for this - it is necessary to examine the urine daily for several weeks. These data were confirmed by M. M. Chausovskiy.

B) Piuria.

The manifestation of pyuria is the connection of the tuberculous focus with the urinary tract. At the first stage of the symptom, due to the small lumen of the junction, the intensity of pyuria is very low. It can be noted periodically and even disappear for a while. As the passage extends, connecting the bowl and the cups with the tuberculous focus, the amount of pus in the urine increases accordingly - pyuria becomes sharply expressed. In those cases when, in the course of antibacterial treatment, cicatricial processes in the neck of the calyx or ureter cause an infection of their lumen, the inflow from the tuberculous focus stops and pyuria is not detected. Since pyuria or renal tuberculosis goes away for a long time in the absence of pain, it is often misinterpreted as chronic pyelitis or pyelonephritis, and therefore patients undergo long-term and unsuccessful treatment. Pyuria is the main and most persistent symptom of kidney tuberculosis. The amount of pus in the urine can vary widely: from a barely expressed opacity to the formation of a strong sediment, similar to that observed in pyelonephrosis. The intensity of pyuria depends both on

the degree of the destructive process in the kidneys and on the conditions for emptying the tuberculous focus. In cases of the presence of "asymptomatic" pyuria, one should think about the possibility of renal tuberculosis and conduct a long urological examination.

C) Hematuria:

Of clinical interest is the total hematuria arising in the initial stage of the disease, of course, as the first symptom of the kidney tubercles, which is associated with their disintegration and the involvement of the walls of blood vessels in this process. Sometimes they are so intense that they sometimes force urologists to perform nephrectomies. Its intensity depends on the caliber of the vessels affected by tuberculosis (manifested by tuberculosis).

A sudden onset, an unsystematic course, an intense nature, a rapid disappearance - make these hematurias similar to those in kidney neoplasms.

Total hematuria can also be noted at the later stages of tuberculous impression of the urinary system - when the process spreads to the bladder mucosa (this is due to the presence of blood-producing ulcers). Therefore, the presence of only total hematuria should also be thought about kidney tuberculosis, especially in young people.

D) Urinary disorder:

Dysuric disorders occur with damage to the bladder and those pathological changes in the mucous membrane of the bladder that are observed in tuberculosis. However, urination disorders can also occur in the absence of changes in the mucous membrane of the bladder. In such cases, they should be considered as a manifestation of the renal-cystic reflex I. M. Epshtein believes that such phenomena arise under the influence of tuberculous intoxication.

The intensity of diuresis of these disorders in kidney tuberculosis depends on the nature of specific changes in the bladder, the depth of the lesion and the localization of the process. Of the disorders of urination, the following are noted: imperative urges, more often nighttime, and then daytime urination, pain during and at the end of the act of urination, urinary incontinence.

However, dysuria is not an early sign of illness. Disorder of urination in kidney tuberculosis progresses rapidly, becomes painful, tiring for patients. The frequency of urination fluctuates in a wide range: the bulk of patients retain urine for an average of 1.5-2 hours, sometimes the frequency of urination is significantly increased - the urge occurs after 10-20 minutes (the bladder neck, the Lietot triangle region, a sharp decrease in the volume of the bladder, obstructive insufficiency apparatus).

E) Pain syndrome:

Pain in kidney tuberculosis can be noted as dull in the area of the affected kidney, and acute - the nature of renal colic.

Dull pains are caused by the enlargement of the kidney and its pinching in a little compliant capsule. They are localized in the hypochondrium or in the corresponding half of the lumbar region. They develop gradually, have a long-term course. Aching pain in nature can have typical irradiation in the groin, thigh, scrotum, not associated with the position of the patient's body or physical stress. Sometimes pain can radiate to a healthy kidney.

About 21 percent of cases of kidney tuberculosis, there are acute pains such as renal colic. They are no different from those of other kidney diseases. These pains are based on the following three factors: spastic contractions of the wall of the pelvis or ureter, cicatricial changes in the lumen of the ureter and blockage of the lumen of the ureter with pus with fecal masses, or blood clots - renal colic may result in its discharge. Of considerable interest are cases of kidney tuberculosis, which disappear with renal colic as the only symptom of the disease.

E) General condition of patients:

The general condition of patients with tuberculosis of the renal organs can be satisfactory even with a significant destructive process in the kidney. Sometimes patients are with increased appetite, in excellent condition, without loss of ability to work, go in for physical exercise and sports.

Violation of the general condition occurs when the process spreads to the bladder with a tubercular rash in the kidney parenchyma and does not go parallel to

the intensity of the destructive process. With small foci, a poor general condition may be noted, and with large ones, good. The severe general condition of the patient should raise suspicion of the possibility of bilateral renal damage.

G) Patient's temperature:

Fever is not a typical symptom of kidney tuberculosis. AI appearance can be associated with many things:

1) an additional infection that has joined the tuberculous process

2) a lumpy rash in the parenchyma with an ascending kidney infection

3) delay in the contents of the cavities with insufficient emptying, followed by the absorption of toxic products into the blood

4) the influence of extrarenal tuberculous foci, mainly of the process in the lungs.

In most cases, observing an increase in temperature has the character of subfebrile fever. Often, a high temperature (flowing like a hectic curve) is the first symptom of a process in the kidney, which has already gone far. The duration of the febrile period may be limited to one or several days, in other cases it lasts weeks and months, which is accompanied by an exacerbation of the process in the kidney, increased pain and dysuric disorders.

In cases where the cause of the high temperature cannot be established, with a proven one-sided process in the kidney with significant destructive changes in the parenchyma, it is necessary to perform nephrectomy: the operation quickly removes the state of intoxication and saves it life.

Combined kidney disease with tuberculosis and stones.

Combined kidney disease with tuberculosis cannot be regarded as a casuistic observation. According to L.P. Kreiselburg, this condition is observed in 8 percent of cases. Until now, the following issues of this message are considered controversial:

Is there any relationship between these processes or these lesions should be considered as a random combination of two independent diseases

Which of these processes is primary in the kidney and can one of them be recognized as a prone factor.

Forms of combined lesions according to Gotstein

Kidney tuberculosis and stones in the kidney of the same name.

Tuberculosis in one, and stones in the other kidney.

Stones of both kidneys, tuberculosis in one.

Tuberculosis in both kidneys, and stones in one.

Tuberculosis and stones in both kidneys.

Most often there is the first group, in the second place the second.

DIAGNOSTICS

Diagnostics. Diagnosis of renal cavernous tuberculosis using modern methods of endoscopic examination and contrast radiography of the urinary system does not present any particular difficulties. Difficulties in diagnosis mainly arise in the initial stages - the infiltrative form of kidney tuberculosis in the absence of destructive changes determined on the roentgenogram.

According to the urology department of the Ministry of Health, the percentage of admissions is about 17 percent. The main reason for this problem is the lack of familiarity of general practitioners with the clinical manifestations of tuberculosis of the urinary system, poor study of the analysis and insufficient use of all possible methods of bacteriological and biological examination of urine for the presence of mycobacterium tuberculosis.

Diagnosis of renal tuberculosis is designed to solve the following problems:

1) confirm the presence of tuberculous lesions in the urinary system or exclude the specific nature of the purulent-inflammatory process. It must be supported by evidence;

2) determine the prevalence of the process in the urinary system: there are lesions of one or two kidneys, damage to the ureter and bladder;

3) to establish the volume of destructive changes in the kidney parenchyma, since their severity determines the choice of a method of treatment - conservative or surgical.

4) Determine the functional state of the diseased and healthy kidney, since the assumption of surgical treatment largely depends on this. In addition, it is necessary to exclude the presence of tuberculous foci in the systems, in particular, in the genitals of men.

The diagnosis of kidney tuberculosis should least of all be based on indirect signs, since these indicators do not determine the nature of the disease, cannot become elements of specific diagnostics. But sometimes the presence of such non-specific criteria (aseptic pyuria, a history of tuberculosis of the lungs or other organs, chronic cystitis, which does not respond to conventional therapy). It is often a valuable diagnostic aid, and sometimes the only way to make a diagnosis.

Palpation examination of the area of the kidneys in the issue of specific diagnosis of tuberculosis of the urinary system is not of great importance. In some cases, positive results determine the state of the diseased kidney (its enlargement, mobility) and perirenal tissue, which can be taken into account in determining the complexity of the surgical intervention. The enlarged kidney is palpable only with pyonephrosis. Until the membranes are involved in the tuberculous process, the kidney is mobile. With the involvement of peri-renal tissue, the mobility of the kidney is sharply limited, sometimes a dense infiltration is determined at this level. In some cases, with suspicion of kidney tuberculosis, when it was not possible to establish the specific symptoms of this disease, palpation of the thickened ureter during vaginal examination in women may, to a certain extent, speak in favor of tuberculosis.

Urine examination. The data of the general analysis of urine do not allow the diagnosis of renal tuberculosis in patients. They only indicate the presence of a purulent-inflammatory process in the urinary organs without determining its etiology. The only proven diagnosis of kidney tuberculosis for the installation is the finding of mycobacterium tuberculosis in purulent urine.

Not being specific symptoms, some of the deviations found in the urine of these patients, however, give the right in some cases to speak in favor of kidney tuberculosis.

A) persistent acidic urine reaction.

This symptom is recognized by a number of authors as pathognomonic for renal tuberculosis. According to H.M. Epstein, the acidic reaction of urine in tuberculosis of the urinary tract can sometimes persist up to 3 months. According to LP Kreisalburg, the alkaline reaction of urine occurs only in 1.3 percent of patients. However, in his opinion, the acidic reaction of urine is not specific for tuberculosis of the urinary tract, since it can also be observed in other diseases. However, a persistently expressed acidic reaction of purulent urine that does not contain microbes, even if Mycobacterium tuberculosis is not found, which is very suspicious of tuberculosis of the urinary organs.

B) Proteinuria

According to R. M. Kronshtein, proteinuria should induce thinking about kidney tuberculosis. The diagnostic value of proteinuria is considered from several points of view:

1) albuminuria as an early symptom of renal tuberculosis, which can occur long before the manifestations of the disease

2) cylinderless albuminuria as a specific sign of renal tuberculosis

3) albulinuria as a manifestation of concomitant nephritis of the second kidney.

In the latter category of patients, the amount of protein exceeds 1-2 percent and is usually accompanied by the presence of enzyme elements characteristic of nephritis. The amount of protein in the urine of patients with kidney tuberculosis, as a rule, does not reach a high level, rarely exceeds one percent. In some cases, large amounts of protein must be attributed to concomitant hematuria.

B) Mycobacterium tuberculosis in urine.

Clear evidence of tuberculosis kidney disease is the detection of mycobacterium tuberculosis in purulent urine. But their absence in urine does not deny this diagnosis. The fact of the matter is that the existing methods for their determination do not give an absolute opportunity to identify mycobacterium tuberculosis in urine in all cases.

There are three methods for detecting mycobacterium tuberculosis in urine:
1) bacterioscopic - in fixed and specially stained smears from urine sediment
2) bacteriological - by inoculating urine on special media
3) biological - infection of a guinea pig with infectious urine of a patient. These three methods complement each other.

It should be noted that the biological method is also not always correct. A positive result can sometimes be obtained, and in the absence of tuberculosis in the kidneys, S.D. Fedorov described a case from his practice, when, on the basis of a positive result, nephrectomy was performed. A kidney tumor was found on histology.

Sometimes vaccinations do not give a negative effect if there are few tuberculosis bacteria in the urine used for urine testing or they are not virulent enough, in particular, under the influence of antibacterial treatment. A positive result of a biological test to identify the specific nature of the disease is determined in the range of 84-90%.

D) Aseptic pyuria.

In the antibacterial period, aseptic pyuria received much attention. In our time, the question of the diagnostic significance of aseptic pyuria in renal tuberculosis is being revised. Clinicians have observed frequent reports of renal tuberculosis with nonspecific pyelonephritis. Most likely, as a result of the use of antibiotics, their bacteriological effect is reflected in the weakening of the activity of mycobacterium tuberculosis, which entails an increase in the manure of harmful microbes.

The true aseptic pyuria should include those cases where the absence of flora was detected by crops.

Aseptic pyuria is not a specific sign of renal tubercle, it is possible in other diseases. However, in kidney tuberculosis, aseptic pyuria is persistent, while in other diseases it is determined only periodically. It is determined in 85% of patients with renal tuberculosis (L.P. Krayzelburg).

Blood test. Changes in blood, which are noted in patients with tuberculosis of the urinary organs, are not specific only for this disease. They are important mainly

in assessing the effectiveness of antibacterial treatment, prognosis and when establishing indications and contraindications for surgical intervention in malnourished and debilitated patients.

A) specific changes in the blood (basselemia, serological reactions). Any active tuberculosis focus in the body can become the source of bacillemia. Of course, it is not possible to establish at the expense of which focus this state came.

The opinions of different scientists regarding the significance of basalemia differ. Also received definitions and serological reactions such as complement deviation.

Acceleration of SOE, leukocytosis, lymphopenia are also not specific for renal tuberculosis.

B) Protein functions of blood plasma.

Recently, in the diagnosis of tuberculosis of the urinary organs, the determination of the level of protein functions of the patient's blood plasma by electrophoresis has been widely used. In the exudative stage of the disease, in the presence of tissue decomposition processes, the globulin reaction increases. Acute exudative inflammatory processes are characterized by an increase in the globulin fraction. Currently, the study of the state of protein fractions in the blood plasma is carried out after the preliminary administration of tuberculin in 24-48 hours. On this basis, the indicators found become more characteristic of tuberculosis infection data, allowing differential diagnosis with non-specific processes in the urinary organs.

C) C-reactive protein.

In recent years, research articles have been published on the study of C-reactive protein in tuberculosis infection. Normally, this protein is not detected in humans.

Not being specific for any infection, it serves as an early indicator of developing acute inflammatory and destructive processes in the patient's tissues. C-reactive protein in patients with kidney tuberculosis appears early, the most stable in comparison with changes in the blood protein formula, and can be used as one of the early signs of the disease.

Endoscopic examinations.

Cystoscopy takes one of the leading places among the methods for diagnosing tuberculosis of the urinary organs. She can identify specific elements of tuberculosis infection in the bladder and thereby confirm the diagnosis with a documenting method. In this case, you can find out the side of infection, and in combination with indigo carmine breakdown and the functional state of the patient and healthy kidney. Sometimes the bladder is so reduced that cystoscopy becomes impossible, the minimum bladder capacity is sufficient for cystoscopy (40-50 ml).

Specific changes in the bladder can be expressed as tuberculous tubercles and ulcers. This is enough to determine the diagnosis. The tubercles have the appearance of yellowish formations the size of a pinhead or hemp seeds, surrounded by an auxiliary rim located along the blood vessels, concentrated more often in the region of the orifice (orifice) of the ureter of the affected kidney. Moderate progression of the process in the bladder, tubercles are much less common.

Tuberculous ulcers are a decay product of tubercles, they correspond to a later stage of bladder damage. Their peculiarity is that they are linearly corresponding to the localization of the former tuberculous tubercles.

The mouth of the ureter affected by tuberculosis often undergoes a number of changes. Accompanied by infiltration of the orifice and scarring processes, they are so characteristic that many authors give them the meaning of specific ones: mouth gaping, its retraction, stellar shape with uneven edges, bullous edema. The mucous membrane of the bladder in some areas may be covered with fibrinous plaque. Cystoscopy usually reveals changes in the mucous membrane of the bladder on the side of the kidney injury.

Chromocystoscopy aims to:

Reveal the side of kidney damage in the absence of subjective complaints. Determination of the functional state of each kidney, which is very important when deciding on the choice of a method of treatment, and in particular an operational one

However, the intensity of indigo carmine excretion does not always correspond to the severity of kidney damage. Sometimes, while maintaining the excretory function, massive destructive changes are observed and vice versa.

Therefore, in addition to the above methods, according to S.P. Fedorov, it is necessary to carry out catheterization of the ureters. This is achieved by:

1) obtaining urine directly from the kidneys to confirm the source of pyuria and the possibility of detecting mycobacterium tuberculosis.

2) checking the patency of the ureter of the affected side and thereby identifying the narrowings that are important in the diagnosis of renal tuberculosis.

Fluoroscopic examination.

X-ray examination for tuberculosis of the kidneys and ureter is central among other diagnostic methods.

X-ray diagnostics for tuberculosis of the urinary organs should solve the following tasks:

a) confirm or exclude the tuberculous nature of the lesion.

b) establish the volume of destructive changes in the urinary organs

c) to clarify the prevalence of the process in the urinary system

d) determine the functional state of both a sick and a healthy kidney

Only then can the question of the method of treatment be decided. In the diagnosis of kidney tuberculosis, the following can be used: plain radiography, ascending pyelography, internal urography, tomography, urocimography and renal angiography.

Plain X-ray in the diagnosis of urinary organs can be a very valuable method for recognizing renal tuberculosis. In the pictures you can find petrification, the presence of misty areas, the presence of concomitant calculi, etc.

Ascending pyelography gives a complete picture of destructive changes in the kidney (one or many cavities), changes in the pelvis calyx, etc.

When the process spreads to the ureter, characteristic specific changes occur in this organ.

a) direct direction of the ureter - it loses its curvature and takes the form of a stretched string between the bladder and the kidney

b) narrowing along the course of its lumen above which, a series of successively located expansions appears. In some cases, the anatomical state of the entire ureter is revealed, its lumen sometimes reaches a considerable width.

Excretory urography is less important for the recognition of renal tuberculosis than ascending pyelography, especially in the early stages of the disease. However, it becomes one invaluable method in the diagnosis when ascending pyelography is technically not possible to perform in the presence of ulcerative lesions of the bladder with a decrease in its capacity and with insurmountable obstacles along the ureter, developed as a result of tuberculous narrowing.

She points to those destructive changes that are in the kidneys, and the degree of preservation of kidney functions.

Indications for excretory urography in renal tuberculosis can be divided into two groups: absolute and relative. The absolute should include those cases when it is not possible to make ascending pyelography (urethral strictures, low bladder capacity, ureteral obstruction), and all relative cases of kidney tuberculosis.
TOMOGRAPHY can be performed to obtain auxiliary data.

a) performing the shadow of the kidney, when this is not achieved by plain radiography or excretory urography.

b) identification of specific changes in the parenchyma of the kidney and in the pelvis, if ascending pyelography is impossible when the usual excretory urography does not give a clear contrasting shadow of the pelvis or cavities

c) to identify in the parenchyma of the kidney large cavities covered with a shadow of the expanded cups or bowls.

UROKIMOGRAIYA - reflects violations of the motor and evacuation functions of the affected organs (ureter, nature, frequency, rhythm and direction of peristalsis).

CYSTOGRAPHY reveals limited distension of the bladder and the presence of vesicoureteral reflux (if any). It is possible to establish the side of the lesion if cystoscopy and catheterization of the ureters are impossible.

Renal angiography. The disease can only be established with a developed process. The number of vessels at the level of the tuberculous focus decreases, their caliber becomes varied, and the contours are uneven. The terminal vessels of the branch disappear, rudely breaking off at the very focus of the pathological process. Renal angiography acquires great diagnostic value in the extensive so-called tuberculous kidney infiltrates.

Renal angiography can be useful to clarify the boundaries of a specific process in patients who are invited to undergo a resection of the kidney.

TREATMENT

More recently, with regard to the treatment of unilateral tuberculosis of the kidney, there was a unanimous opinion that the only rational method is the early removal of the affected kidney. SP Fedorov RM Fronshtein in all his writings argued that in case of confirmation of unilateral tuberculosis of the kidney, it is necessary to carry out nephrectomy. In this case, the removal of the kidney is recommended to be carried out as early as possible, until the tuberculous process has spread to the bladder or the second kidney.

The discovery of anti-tuberculosis drugs and their introduction into the clinic has created a new era in the treatment of tuberculosis.

The latter are divided into two groups: the main antibacterial drugs (1st line) and 2-reserve drugs (second line).

First-line drugs include streptomycin PASK, and isonicotinic acid hydrazide derivatives (ftivazide).

Treatment usually begins with first-line drugs. using simultaneously two or three drugs of this series. This combined use of the drug increases the effectiveness of therapy and prevents bacteria from developing drug resistance. Streptomycin is

given intravenously, usually 0.5 g per day. Ftivazid is prescribed first up to 0.1 g three times a day, intravenously, and then, with good transfer of the drug, 0.3 g three times a day. Ftivazid is well tolerated by patients and does not give side effects. Only in some patients there is a place of paresthesia of intercostal nerves and nerves of the extremities, convulsions and angioral attacks. Therefore, ftivazide is contraindicated in coronary insufficiency, after myocardial infarction, in epilepsy, heart defects, with decompensation and organic diseases of the central nervous system. Ftivazide reduces blood clotting. Tubazid is administered orally at 0.15-0.2 g per day. Has significant toxicity. Duration of treatment is 3-4 months.

Saluzid 0.5 2-3 times a day (10% -5-10 ml i / m, i / v, subcutaneously)

Metazid 0.2-0.5 g 2o.d. Less toxic.

Larusan 0.1-0.3 g 2-3 g per day.

Side effects: dyspeptic disorders, headaches, changes in white blood, in particular significant zosinophelia.

Contraindications: Liver diseases, organic diseases of the central nervous system, glomerulonephritis.

In connection with the great success of antibacterial therapy, the indications for surgical treatment of urinary tuberculosis have significantly narrowed. Currently, the absolute indications for surgical treatment are polycavernous renal tuberculosis, tuberculous pyonephrosis. The indication for nephrectomy A.I. Mayants refers to a melted, non-functioning kidney.

The main methods of surgical intervention for renal tuberculosis is its removal. In addition to this radical operation, today organ-preserving ones are also used, which are kidney resection and cavernotomy.

Contraindications to nephrectomy. Absolute:

a) cavernous tuberculous process in the second kidney with bilateral lesion;

b) significant insufficiency of the second (healthy) kidney;

c) generalization of the tuberculous process in the body.

Relative: a serious general condition of the patient, a tuberculous process in the lungs in the stage of an infiltrative outbreak, pregnancy in the second half or passing with

a complication, exhaustion of the patient, if it is associated with a tuberculous process in the kidney, not only is not a contraindication to nephrectomy, but dictates its implementation.

Plastic surgery on the ureter:

1) Replacement of the ureter with a narrowing in the pelvic-ureteric segment with a loop of the small intestine (A.P. Frumkin).

2) the technique of surgery for structures in the pelvic segment of the ureter according to Ban-Guk-Boar.

Bladder plastic surgery.

a) intestinal plastic (loop of the ileum of the small intestine) (S. D. Goligorsky, A. M. Gasparyan)

b) a segment of the sigmoid colon (Kuess, A.P. Frumkin).

DAMAGE TO THE PROSTATE AND SEMINAL VESICLES.

Learning objectives: to teach students to examine patients with genital tuberculosis, to know the symptoms of the disease, the peculiarities of the diagnosis of treatment.

List of skills: to know the main symptoms of genital tuberculosis, to master the tactics of diagnosing and treating tuberculosis of the reproductive system. Know the schemes of conservative and surgical treatment. To know the features of clinical examination of patients with genital tuberculosis and the examination of their working capacity.

Glossary of terms:

The epididymis is a paired organ of the male reproductive system that serves for the maturation, accumulation and advancement of sperm.

The seminal vesicles are a paired organ of the male reproductive system.

Vesiculography is an x-ray examination of seminal vesicles pre-filled with a contrast agent.

We examined the pathogenesis above. What factors contribute to the development of a tuberculous focus in the organs of the reproductive system in men.

a) trauma.

As A.I. Mayants admits, hemorrhage and disturbance of innervation mobilizes infection. It is now recognized that trauma is giving impetus to the development of an already organized patent focus.

b) postponed gonorrheal inflammation of the urethra and gonads. However, this is a controversial issue.

c) sexual excesses. The theoretical influence of active sexual activity on the development of genital tuberculosis is completely admissible. The predominance of the disease in young people during the period of enhanced sexual function is a confirmation of this assumption.

Tuberculosis of the reproductive system in men is rarely localized in any one of its organs. In most patients, clinical examination can reveal a tuberculous process in a number of gonads.

Most often found in a combined lesion of the epididymis in combination with tuberculosis of the prostate and the vas deferens.

More recently, the external organs - the testes and epididymis - were recognized as the primary localization of tuberculosis in the genital area. However, Oppenheim's experiments proved that the primary focus in the reproductive system is the prostate gland and seminal vesicles, hence the hematogenous process, or more often along the seminal tract, antiperistaltic spreads to the testicle and epididymis. The third group of authors BN Holtsov, Gochen admit the possibility of primary infection of any organ of the genital area without any elective tendency of one or another of them.

Pathological picture of the prostate and seminal vesicles.

Specific changes in the prostate gland develop both in the follicles themselves and on the walls of the excretory ducts. As a result of the fusion of tuberculous tubercles and their cheesy decay in the parenchyma of the gland and seminal vesicles, decay cavities (caverns) can form. Subsequently, the contents of these cavities break through and enter the urethra or paraprostatic tissues, forming persistent purulent fistulas on the perineum or buttocks. In rare cases, the content of the cavities is opened into the lumen of the rectum. In rare cases, petrification of caseous contents is possible, which should be distinguished from prostate stones in differential diagnosis.

Symptomatology.

The clinical course of tuberculosis of the external genital organs does not always develop in the same way.

There are two clinical forms of the disease: acute and chronic. Why there is such a division is still unknown. The acute form begins with sudden, pulling pains in the scrotum with irradiation along the spermatic cord and into the sacrum. Swelling of the affected side of the scrotum appears. The skin becomes red, shiny

and tense. The spermatic cord and especially the vas deferens thickens and becomes sharply painful, the body temperature rises, the patient's condition is extremely depressed. Of course, by the end of the second week, acute symptoms subside and the disease becomes chronic.

The chronic form develops gradually, rarely determined by random examination of the patient. Pains are dull seals along the seminal canal, a tuberous dense formation is noted in the body and tail of the epididymis. The border between the epididymis and the testicle is delineated, which does not happen in the acute form, in which the epididymis and testicle merge into one conglomerate.

Subsequently, the density merges and undergoes melting. The abscesses grow together with the skin of the scrotum, the skin turns red, thinns, the abscess comes out with the formation of a persistent fistula that does not heal for a long time. Mycobacterium tuberculosis is rarely found in pus. In some patients, fistulas sometimes heal with a dense retracted scar.

Diagnostics.

Diagnosis of epididymitis or orchiepididymitis does not cause much virginity. The main task is to clarify the nature of the lesion of the epididymis, that is, to differentiate tuberculosis of the external genital organs from gonorrheal processes and especially from the category of so-called nonspecific epididymitis that is often found in our country and in our time.

The rational choice of the method of treatment and the highlighting of the question of indicators, for surgical treatment, the removal of the appendage depends on the formulation of such a diagnosis.

It is necessary to know that nonspecific epididymitis in most patients have a flabby, torpid, chronic course and it is very difficult to distinguish them from specific (tuberculous) lesions. Unconditional evidence of tuberculous lesions of the epididymis or testicle is the presence of fistulas in the scrotum. Finding the tuberculous process in two organs and especially in the urinary system can become very important in determining the tuberculous nature of the lesion of the epididymis. Is a specific diagnosis of tuberculosis of the external female genital organs possible?

- A positive Perquet reaction in adults indicates only the presence of a tuberculous focus in the body, without determining the degree of its activity, and of course its localization.
- Serological tests - Bordet-Jatu complement deviation (however, it is not universal).
- Determination of tuberculosis bacteremia by bacteriological blood tests for the presence of the causative agent of tuberculosis (Lachtenstein).

Treatment.

Specific therapy (tuberculin treatment) is not justified. Patients who are diagnosed early from the onset of the disease and who have a tendency towards a predominance of productive changes should be treated only with conservative treatment (but not less than 7-9 months).

X-ray therapy. If in the 30s X-ray therapy was used quite widely, then today, in the presence of antibiotics, the widespread use of X-ray therapy is inappropriate.
Surgery. Surgical treatment is the main and most rational method of treatment. It should be recommended for such reasons.

a) the appendage is affected by tuberculosis as an organ has lost its functional significance.

b) the tuberculous focus in the epididymis has a constant threat of the spread of the process in the testicular parenchyma.

c) the presence of unilateral tuberculosis lesions of the external genital organs is very dangerous for the opposite side, both in the possibility of its defeat by a specific process, and in relation to the toxic effect on the function of the still unaffected organs of the reproductive system of the opposite side.

Four types of surgery:

1) resection of the epididymis

2) removal of the epididymis along with the testicle

3) organ-preserving operations, testicular resection, opening and processing of the cavity

4) radical surgery on the pelvic female genital organs.

Prostate tuberculosis.

Unfortunately, prostate tuberculosis cannot be considered a rare disease (about 10 percent of cases). He always struck the seminal vesicles.

Most patients with prostate tuberculosis are completely asymptomatic. However, with the spread of the process into the thickness of the organ, there are: frequent, painful or difficult urination, terminal hematuria. Dull pain in the perineum is possible. When opening the cavity in the posterior urethra, pyuria appears. Ulcers form, indicating the presence of tuberculosis in the prostate. The general condition of patients in the early stages of the disease is usually satisfactory, with cavernous lesions, general weakness, rapid fatigue, low-grade or high temperature, and poor appetite are noted.

Considering that in men with pulmonary tuberculosis, the prostate gland is more often affected, in all these patients, a mandatory rectal digital examination is shown, as well as prostate secretions.

The prostate gland in such patients is enlarged. Its surface in some areas may be bumpy, the consistency is dense, elastic.

In all these patients, urine analysis is necessary in two portions - the presence of leukocytes in the second portion, while the first portion is absent. It is necessary to investigate sperm culture for Mycobacterium tuberculosis.

In some cases, the diagnosis can be made after ascending urethrography. The contrast mass penetrates into the prostate parenchyma and reveals the decay cavities. Vesiculography (insufficient filling of the testicles with seminal vesicles, eaten up the contours of the urinary duct) can be of great help. Differential diagnosis is discussed in detail in practical exercises.

Treatment.

Treatment of tuberculosis of the prostate and seminal vesicles today is carried out only in a conservative way, through the use of antibacterial chemotherapy drugs actively and for a long time.

Effective antibacterial treatment of the prostate gland in a sanatorium-resort environment in combination with a balanced diet, vitamins, climate and the use of koumiss. The treatment is periodically repeated.

Surgical treatment is used only in limited cases - with the formation of a cavity of decay in the thickness of the prostate gland or with the breakthrough of specific abscesses into the paraprostatic tissue with the formation of drip abscesses, purulent or urinary fistulas. In these cases, the caverns are opened, followed by their drainage and the use of antibiotics and chemotherapy.

A number of authors (A. I. Mayants, V. D. Grund) in the normal state of the urinary tract, along with the treatment of streptomycin, prescribe vitamin D in an alcohol solution - 25-30 units per day for 3 months.

Indications and contraindications for the spa treatment of tuberculosis and the close periods of stay of these patients at the resort:

1) unilateral tuberculosis of the kidney without determining destructive changes from the parenchyma on the roentgenogram. Duration of stay at the resort 2-3 months.

2) unilateral tuberculosis of the kidney with destructive changes in the papillae, with one-sided or two small caverns. Treatment period. at the resort 3-4 months

3) tuberculosis of one kidney. The length of stay at the resort is determined individually, but not less than 3 months.

4) patients referred after a nephrectomy for renal tuberculosis. It is advisable to send them to sanatorium-resort treatment for 6-12 months. after operation. Duration of stay 2-3 months. After their return, these patients should be monitored in local TB dispensaries for 2 years.

5) patients with bilateral renal tuberculosis with moderately pronounced changes in each of them with satisfactory function. Length of stay 4 months.

6) patients with residual changes in the bladder after nephrectomy. Stay at the resort for at least 3 months.

7) tuberculosis of the testicles and their appendages. These patients can be referred to the spa both before and after the operation.

8) tuberculosis of the prostate gland. The term of stay at the resort is 2 months, with repeated treatment after one year.

Contraindication.

1) unilateral polycavernous tuberculosis of the kidneys.

2) tuberculous pyonephrosis.

In addition, a contraindication for referral is the presence of pronounced changes in the bladder.

TEST

1. Normally, the blood supply to the kidney occurs due to:
   a) one central artery
   b) two arteries
   c) three arteries
2. Additional vessels are more frequent
   a) one-sided
   b) double-sided
   c) they don't exist
3. Additional arteries in the kidneys are often the cause of:
   a) hydronephrosis
   b) hypoplasia
   c) agenesis
4. Why the dystopic kidney in the lower back cannot be moved to its normal place?
   a) long arteries
   b) short ureter
   c) long veins
   d) long spermatic cord
5. Are kidney tumors more common?
   a) in normal kidneys
   b) dystopic
   c) fused

6. Do inflammatory processes and urolithiasis occur more often?
   a) abnormal kidneys
   b) in normal kidneys
   c) not functioning
7. What types of kidney abnormalities have fused tissues
   a) rudimentary kidneys
   b) dwarf buds
   c) hypoplastic kidneys
8. In what anomalies does chronic failure occur earlier?
   a) dystopic
   b) multicystic
   c) polycystic
9. What causes contribute to the occurrence of prerenal anuria?
   a) hypertensive syndrome
   b) bleeding
   c) inflammatory process of the prostate gland
10. When do postrenal anurias occur?
   a) obstruction of the ureter (s)
   b) with urethritis
   c) with pyelonephritis
   d) with glomerulonephritis
11. When obturation of the ureter with calculi should be used first?
   a) nephrostomy
   b) ureterotomy
   c) ureteral catheterization
12. Do the stages appear earlier with arresters?
   a) diuretic
   b) oligoanuric
   c) initial

13. How many stages of development is the arrester divided?

a) in three stages

b) in four stages

c) in five stages

d) in six stages

14. At diuretic stage ARF prevail?

a) leukocyturia

b) erythrocytoria

c) potassium

d) bilirubinemia

15. In what diseases are the glomeruli of the kidney primarily affected?

a) chronic pyelonephritis

b) chronic glomerulonephritis

c) chronic gastritis

d) chronic epididymitis

16. What diseases contribute primarily to kidney tubular damage?

a) chronic cholecystitis

b) mastitis

c) interstitial nephritis

d) cystitis

17. What is more effective for chronic renal failure?

a) antibacterial therapy

b) bladder catheterization

c) hemodialysis

d) kidney transplant

18. The most informative method for assessing the urodynamics of the upper urinary tract:

a) Chromocystoscopy

b) excretory urography

c) Electromyography of the pelvis and ureters

19. The most accurate method for studying the urodynamics of the upper urinary tract:

a) Plain urography
b) X-ray television urography
c) Chromocystoscopy

20. The most important contraindications for excretory urography:

a) Hypersensitivity to iodine
b) Shock
c) Collapse

21. Excretory urography should not be performed when:

a) High body temperature
b) Menses
c) With severe damage to the excretory capacity of the kidney

22. Contraindications to retrograde ureteropyelography

a) Acute urethritis, acute prostatitis
b) tuberculosis of the urinary system
c) General weakness

23. The most characteristic signs of kidney tumors on the excretory urogram:

a) Deformities of the pyelocaliceal system and contour tuberosity
b) lack of contrast highlighting
c) Bumpiness of the contour

24. The safest method for diagnosing pyelonephritis in pregnant women:

a) Overview shot
b) computed urography
c) Chromocystoscopy

25. When carrying out excretory urography, one should take into account:

a) Bilirubin of blood
b) daily amount of urine and its specific gravity
c) Creatinine and blood urea

26. The optimal research method for differentiating between hypoplasia and secondary renal wrinkles:

a) Chromocystoscopy
b) Angiography
c) excretory urography
d) CT scan
e) Retrograde pyelography

27. The most accurate method for the diagnosis of cross renal dystopia:

a) Sonography
b) Angiography
c) retrograde ureteropyelography
d) Excretory urography
e) CT scan

28. The most informative method for diagnosing secondary acute pyelonephritis:

a) Chromocystoscopy
b) laboratory blood tests
c) RRG
d) X-ray methods

29. The most indicative and informative method for the diagnosis of kidney carbuncles:

a) Chromocystoscopy
b) excretory urography
c) sonography, computed tomography
d) Selective renal angiography

30.Tuberculosis of the kidneys and ureters is:

a) a common infectious disease
b) a specific complication of organ disease
c) local manifestations of a general specific infection

31.Primary localization in tuberculosis:

a) kidneys
b) urethra
c) ureters

32.The ages of people most likely to have kidney tuberculosis:

a) 15-30 years old
b) 40-60 years
c) 50-70 years old
d) 20-40 years old

33.Etiology of renal tuberculosis:

a) bovine type of tubercle bacillus
b) pork type of tubercle bacillus
c) human type tubercle bacillus

34.The main route of infection of the kidney with tuberculosis bacilli:

a) lymphogenous
b) combined
c) hematogenous

35.The most common morphological forms of renal tuberculosis:

a) focal-cavernous
b) fibrinoplastic
c) billion

36.Morphological feature of renal tuberculosis:

presence of necrosis

a) development of milky apostems
b) the development of purulent inflammation
c) development of a specific granuloma

37. The nature of the course of renal tuberculosis:

a) sharp
b) subacute
c) chronic

38.Morphological changes in the urinary tract with renal tuberculosis:

a) pyonephrosis
b) cicatricial wrinkling
c) cicatricial-hydronephrotic

39.Factors contributing to the development of renal tuberculosis:

a) radiation damage
b) a decrease in the immune response
c) weakening of the body
d) decrease in the morpho-functional status of the kidney.

40.Morphological picture of lesions in renal tuberculosis:

a) clusters of lymphoid and epithelioid cells
b) diffuse lesion of a specific nature
c) a focus of caseous necrosis and along the periphery of the accumulation of epithelioid, lymphoid, langance cells.

CORRECT ANSWERS

1	a	9	b	17	d	25	c	33	c
2	a	10	a	18	b	26	b	34	c
3	a	11	c	19	b	27	c	35	a
4	b	12	b	20	a	28	d	36	c
5	b	13	a	21	c	29	c	37	c
6	a	14	c	22	a	30	c	38	c
7	a	15	b	23	a	31	a	39	c
8	c	16	c	24	c	32	d	40	c

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МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ’Я УКРАЇНИ
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КАФЕДРА УРОЛОГІЇ

М. А. Довбиш, І. М. Довбиш, О.М. Міщенко

АКТУАЛЬНІ ПИТАННЯ СУЧАСНОЇ УРОЛОГІЇ

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