

CONTENT

UROGENITAL SYSTEM	9
URINARY ORGANS	9
Kidney	9
Ureter	18
Urinary Bladder	19
Urethra	21
GENITAL SYSTEM	23
Male Genital System	23
Male Internal Genitalia.....	23
Male External Genitalia.....	30
Female Genital System.....	35
Female Internal Genitalia	35
Female External Genitalia	42
DEVELOPMENT OF UROGENITAL SYSTEM IN HUMANS.....	45
Development of Urinary Organs.....	45
Development of Reproductive Organs.....	47
Internal Genitalia.....	47
External Genitalia	49
ORGANS OF HEMATOPOIETIC AND IMMUNE SYSTEM	52
Bone Marrow	57
Thymus	58
Tonsils	61
Lymphoid Nodules in the Walls of Hollow Internal Organs.....	64
Lymphoid Nodules of Small Intestine	65
Lymphoid Nodules of Appendix	66
Lymph Nodes.....	66
Spleen.....	69
Lymphatic System.....	72
Lymph Vessels and Regional Lymph Nodes at Different Sites	77
ENDOCRINE GLANDS	87
Pituitary	88
Thyroid Gland	90
Parathyroid Glands.....	92
Pineal Gland	93
Endocrine Pancreas	94
Endocrine Gonads	94
Adrenal Gland.....	95
Paraganglia	97
Diffuse Neuroendocrine System.....	98

CARDIOVASCULAR SYSTEM.....	99
HEART	104
BLOOD VESSELS	120
Vessels of Pulmonary Circuit	120
Vessels of Systemic Circuit	123
Aorta	123
Common Carotid Artery and Its Branches.....	125
External Carotid Artery and Its Branches.....	125
Internal Carotid Artery and Its Branches.....	132
Subclavian Artery and Its Branches	137
Arteries of Upper Limbs	145
Thoracic Aorta and Its Branches.....	152
Abdominal Aorta and Its Branches	154
Pelvic Arteries	161
Arteries of Lower Limbs	167
Variations and Anomalies of Arteries	177
VENOUS SYSTEM.....	180
System of Superior Vena Cava.....	182
Veins of Head and Neck	188
Veins of Upper Limb.....	193
System of Inferior Vena Cava	196
Hepatic Portal Venous System.....	198
Pelvic Veins	201
Veins of Lower Limbs	205
Variations in Vein anatomy.....	209
Development and Age-related Characteristics of Blood Vessels.....	211
Arteries	211
Veins.....	213
Fetal Circulation.....	214
NERVOUS SYSTEM.....	217
Development of Human Nervous System	219
CENTRAL NERVOUS SYSTEM.....	221
Spinal Cord.....	221
Meninges of Spinal Cord	229
Brain.....	231
Telencephalon	235
Limbic System and Its Main Functions	240
Structure of Cerebral Cortex and Distribution of Its Main Functions	240
Basal Nuclei and White Matter of Telencephalon	242
Lateral Ventricle.....	248
Diencephalon.....	250
Midbrain	254
Isthmus of Rhombencephalon.....	256
Hindbrain.....	256
Medulla Oblongata	260

Fourth Ventricle.....	262
Projection of Cranial Nerve Nuclei onto Rhomboid Fossa and Brainstem.....	265
Conduction Pathways of Brain and Spinal Cord.....	266
Exteroceptive Pathways.....	269
Proprioceptive Pathways.....	271
Descending Projection Pathways.....	276
Extrapyramidal Pathways.....	278
Age-related Characteristics of Brain.....	280
Variations and Anomalies of Spinal Cord and Brain.....	280
Cranial Meninges.....	281
PERIPHERAL NERVOUS SYSTEM.....	287
Cranial Nerves.....	289
Olfactory Nerve (I).....	291
Optic Nerve (II).....	292
Oculomotor Nerve (III).....	292
Trochlear Nerve (IV).....	294
Trigeminal Nerve (V).....	295
Abducens Nerve (VI).....	303
Facial Nerve (VII).....	304
Vestibulocochlear Nerve (VIII).....	307
Glossopharyngeal Nerve (IX).....	307
Vagus Nerve (X).....	309
Accessory Nerve (XI).....	313
Hypoglossal Nerve (XII).....	313
Spinal Nerves.....	315
Cervical Plexus.....	318
Brachial Plexus.....	321
Thoracic Nerves.....	333
Lumbar Plexus.....	335
Sacral Plexus.....	340
Coccygeal Plexus.....	350
Age-related Characteristics of Peripheral Nervous System.....	351
Variations and Anomalies in Cranial and Spinal Nerve Structure.....	351
AUTONOMIC NERVOUS SYSTEM.....	352
Sympathetic Part of Autonomic Nervous System.....	356
Abdominal and Pelvic Autonomic Plexuses.....	362
Parasympathetic Part of Autonomic Nervous System.....	367
Cranial Component.....	367
Sacral Component.....	370
Variations and anomalies in Autonomic Nervous System Structure.....	370
SENSE ORGANS.....	377
Eye.....	377
Eyeball.....	377
Accessory Visual Structures.....	385

Orbital Fasciae, Fascial Nodules, and Cellular Spaces	389
Development and Age-Related Characteristics of Eyes	390
Variations and Anomalies of Eyeball.....	392
Ear As Organ of Hearing and Balance.....	393
Development and Age-Related Characteristics of Ear	409
Variations and Anomalies in Ear Development	410
Olfactory Organ	411
Gustatory Organ	412
Integumentary System and its Appendages	414
Skin	414
Skin Appendages	416
Variations and Anomalies of Hair, Nails, Sweat Glands, and Sebaceous Glands	417
Mammary Gland.....	417
INDEX	420

UROGENITAL SYSTEM

The urogenital system (*apparatus urogenitalis*) includes the urinary organs, as well as male (**Fig. 1**) and female (**Fig. 2**) reproductive organs sharing a common development and showing close anatomical and functional interrelationships.

URINARY ORGANS

The urinary organs (*organa urinaria*) produce urine (kidneys), transport urine from the kidneys (renal calyces, renal pelvis, ureters), and also serve to store urine in the urinary bladder and excrete urine from the body through the urethra.

KIDNEY

The kidney (ren, from Greek *nephros*) is a paired, bean-shaped organ weighing from 120 to 200 g. The kidney has an *anterior surface* (*facies anterior*) and a *posterior surface* (*facies posterior*), an *upper end*, or *pole* (*extremitas superior*), and a *lower end*, or *pole* (*extremitas inferior*), as well as a convex *lateral border* (*margo lateralis*) and a concave *medial border* (*margo medialis*). At the medial border there is a depression: *renal hilum* (*hilum renalis*), into which the renal artery and nerves enter, the ureter, renal vein, lymphatic vessels emerge, forming the renal pedicle (**Fig. 3**). Deep in the renal hilum there is a depression that extends into the substance of the kidney, the *renal sinus* (*sinus renalis*). In the renal sinus there are small and large renal calyces, the renal pelvis, blood and lymph vessels, nerve fibers and adipose tissue.

The right and left kidney are located on either side of the vertebral column, on the posterior abdominal wall, retroperitoneally. The left kidney is located somewhat higher than the right. The upper end of the left kidney is located at the level of the middle of T11, and the upper end of the right kidney corresponds to the lower edge of this vertebra. The twelfth rib crosses the posterior surface of the left kidney in the middle of its length, and the right does so at the border of its upper and middle third. With its layers the posterior surface of the kidney is adjacent to the diaphragm, the quadratus lumborum muscle, the transversus abdominis muscle, and the psoas major muscle (renal bed).

The suprarenal gland is located at the superior pole of each kidney (**Fig. 4**). The anterior surfaces of the right and left kidney are located behind the parietal peritoneum (in the retroperitoneal space) and thus are in contact with certain internal organs. The superior part of the anterior surface of the right kidney is adjacent to the liver, and the inferior third is adjacent to the right colic flexure; the descending part of the duodenum is adjacent to the medial border of the right kidney. The anterior

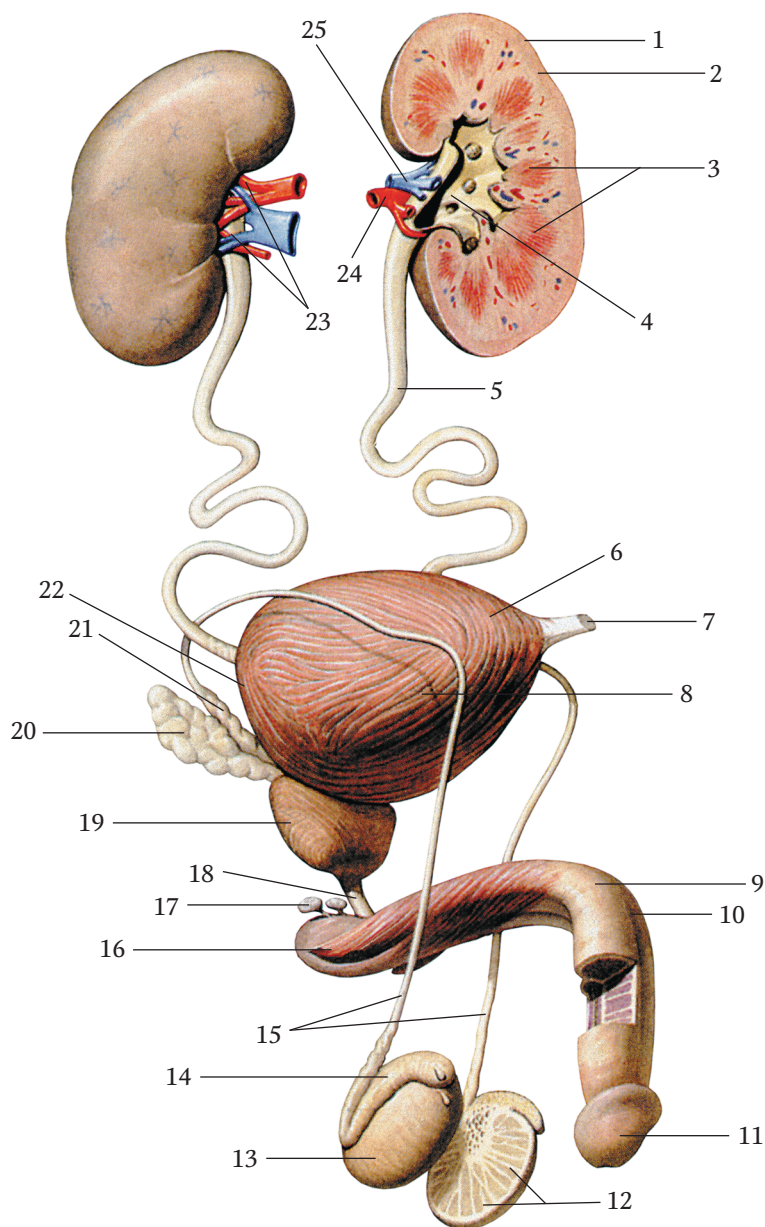


Fig. 1. Male urogenital tract (anterior and right lateral views): 1 – kidney; 2 – renal cortex; 3 – renal pyramids; 4 – renal pelvis; 5 – ureter; 6 – apex of urinary bladder; 7 – median umbilical ligament; 8 – body of urinary bladder; 9 – body of penis; 10 – dorsum of penis; 11 – glans of penis; 12 – lobule of testis; 13 – testis; 14 – epididymis; 15 – ductus deferens; 16 – root of penis; 17 – bulbourethral gland; 18 – membranous part of urethra; 19 – prostate; 20 – seminal vesicle; 21 – ampulla of ductus deferens; 22 – fundus of urinary bladder; 23 – renal hilum; 24 – renal artery; 25 – renal vein

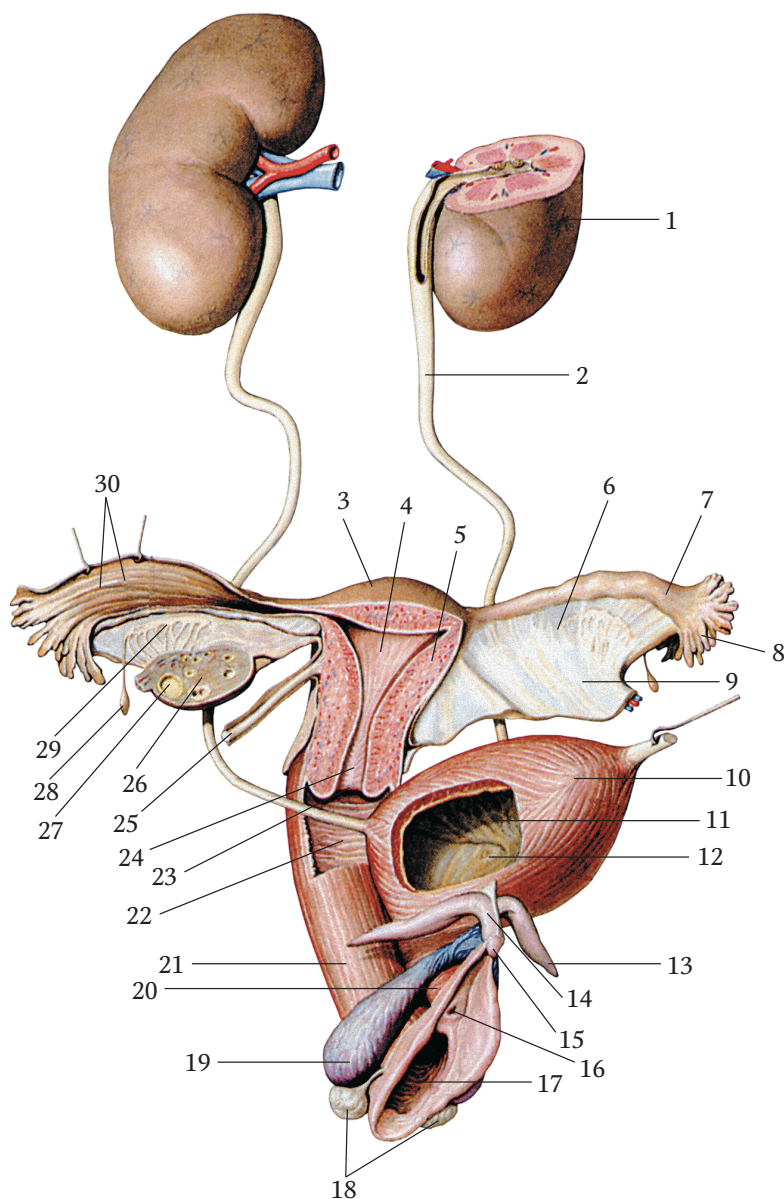


Fig. 2. Female urogenital tract (anterior and right lateral views): 1 – kidney; 2 – ureter; 3 – fundus of uterus; 4 – uterine cavity; 5 – body of uterus; 6 – mesentery of uterine tube; 7 – ampulla of uterine tube; 8 – fimbriae of uterine tube; 9 – mesentery of uterus (broad ligament of uterus); 10 – urinary bladder; 11 – mucous membrane of urinary bladder; 12 – ureteric orifice; 13 – crus of clitoris; 14 – body of clitoris; 15 – glans of clitoris; 16 – external urethral orifice; 17 – vaginal orifice; 18 – greater vestibular gland (Bartolin's gland); 19 – bulbs of vestibule; 20 – female urethra; 21 – vagina; 22 – vaginal rugae; 23 – external orifice of uterus; 24 – cervical canal; 25 – round ligament of uterus; 26 – ovary; 27 – ovarian follicle; 28 – vesicular appendage; 29 – oophoron; 30 – tubal folds

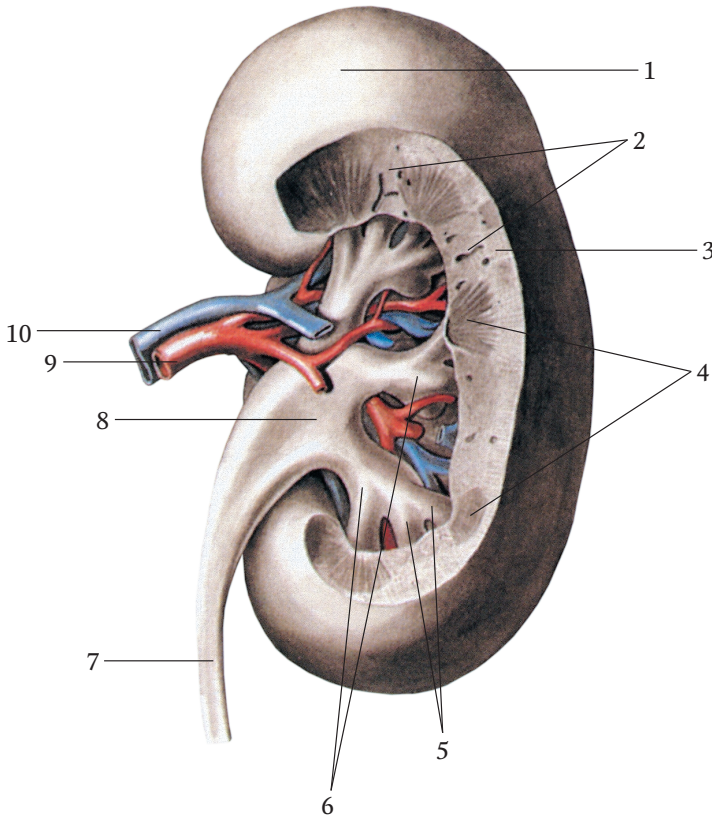


Fig. 3. Right kidney (posterior view; frontal section): 1 — posterior surface of kidney; 2 — renal columns; 3 — renal cortex; 4 — renal medulla (pyramids); 5 — minor renal calyces; 6 — major renal calyces; 7 — ureter; 8 — renal pelvis; 9 — renal artery; 10 — renal vein

surface of the left kidney in the upper third is in contact with the stomach, with the pancreas in the middle, and with loops of the jejunum in the lower third. The lateral border of the left kidney is adjacent to the spleen and left colic flexure.

The kidney has several layers. Adjacent to the renal tissue is the *fibrous capsule (capsula fibrosa)*, outside of which is a thick *adipose capsule (capsula adiposa)*, better expressed on the posterior side of the kidney. Outside the adipose capsule of the kidney, there is the *renal fascia (fascia renalis)*, consisting of anterior and posterior leaflet. *The anterior leaflet* of the renal fascia encloses the right and left kidney, renal vessels, the abdominal part of the aorta, and the inferior vena cava anteriorly.

Superiorly, above the suprarenal glands and laterally to the kidneys, the anterior leaflet fuses with the posterior leaflet. *The posterior leaflet* of the renal fascia is attached to the spine medially to the kidneys on the left and right. The inferior borders of the anterior and posterior leaflet of the renal fascia are not connected to each other. Anterior to the anterior leaflet is the parietal peritoneum.

The kidney consists of two layers. Cortex: The cortex is the outer layer of the kidney, and it measures 0.4 to 0.7 cm in thickness. It contains renal corpuscles, proximal convoluted tubules, and distal convoluted tubules. The cortex has a lighter and darker

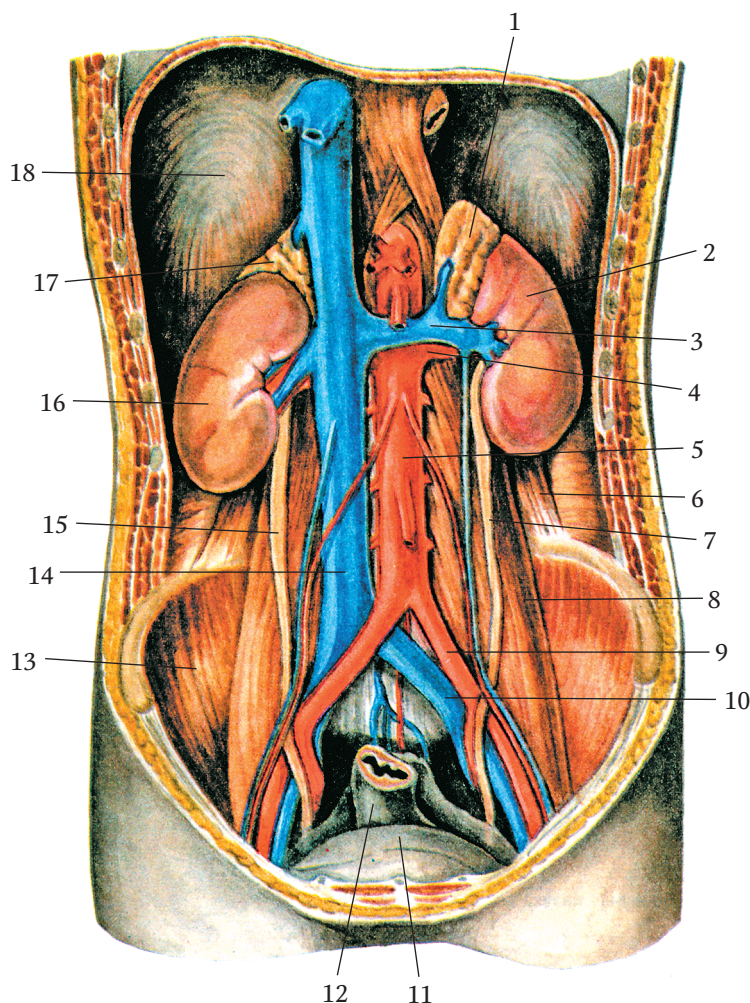


Fig. 4. Position of the right and left kidneys on the posterior abdominal wall (anterior view): 1 – left suprarenal gland; 2 – left kidney; 3 – left renal vein; 4 – left renal artery; 5 – abdominal part of aorta; 6 – quadratus lumborum muscle; 7 – left ureter; 8 – psoas major muscle; 9 – left common iliac artery; 10 – left common iliac vein; 11 – urinary bladder; 12 – rectum; 13 – right ilioc muscle; 14 – inferior vena cava; 15 – right ureter; 16 – right kidney; 17 – right suprarenal gland; 18 – diaphragm

appearance due to the arrangement of renal tubules. The lighter areas, called medullary rays, extend from the medulla into the cortex. The darker areas are called cortical labyrinth and contain renal corpuscles and convoluted tubules. Medulla: The medulla is the inner layer of the kidney, and it measures 2 to 2.5 cm in thickness. It contains renal pyramids, which are cone-shaped structures that point towards the renal hilum. The medulla also contains loops of Henle, collecting ducts, and papillary ducts (*nephrons*). The renal cortex (*cortex renalis*) consists of alternating lighter and darker areas. The lighter areas extend from the renal medulla into the cortex as rays and are