

The Urinary System - Structure, Positions and Functions

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Abstract

The topic of this paper is the human urinary organ system, written for Dr. Jake Smith. The paper will contain research on this organ system, relating to the position, functionality, structure and mechanisms involved in this organ system. The role of this organ system in the homeostasis of the body's functions will also be discussed. A comparison and analysis of academic medical or biological descriptions as compared to using layman's terms is also described in this paper. Finally, the author reflects on the increased personal knowledge insight gained as a result of this research project.

Organs in the Urinary System

The organs in the urinary system consist of one pair of kidneys, one pair of ureters, one bladder, two sphincter muscles, one urethra and nerves that are found in the bladder. These separate organs function together to create the urinary organ system. The position, structure and function of each organ will be outlined as follows.

Kidneys

The kidneys are two bean shaped organs that function together as one unit. Size ranges depend on age and body type, but commonly found to be between 10 to 11 cm in length. The kidneys are housed inferior to the ribcage, about level with the lumbar region, within the anterior abdominal cavity, protected by a lining which is unique to the kidneys as retroperitoneal organs (“Anatomy and Function of the Urinary System.” n.d). The kidneys are situated on lateral sides of the abdominal cavity, with the left kidney slightly superior due to the positioning of the liver on the right lateral side of the abdominal cavity.

The kidneys filter the blood by removing and eliminating waste products and regulating fluids for the body. This filtration is achieved through absorption of elements contained within the filtrate. Useful nutrients are released back into the blood stream while waste products are processed to continue towards the elimination process. The kidneys play an important part in homeostasis, as they regulate the fluid and electrolyte balances in the blood. Waste material from the kidneys is collected in the renal pelvis, a small funnel like structure inferior to each kidney (“Anatomy and Function of the Urinary System”, n.d.).

Ureters

Inferior to each renal pelvis is one of the ureters, which are narrow muscled tubes that descend from the anterior abdominal area to the pelvic region proximal to the pelvic walls, where

they connect to the posterior of the bladder. The average adult's ureters measure approximately 25 cm long ("The Ureters", 2017).

The waste material, or urine, collected in the renal pelvis is emptied through the ureters into the bladder. The muscular lining and sphincter muscles at the openings of the ureters protect against urine from the bladder backing up into the kidneys, which can cause bladder infections.

Bladder

The structure of the bladder may vary depending on its volume. At full capacity, it could be about 6 inches in length, while it is around 2 inches when emptied ("Medical information and health advice you can trust.", n.d.). The bladder is an expandable organ, as it has to be able to distend to a certain degree in order to carry the liquid waste (urine), which is emptied into it by the kidneys, via the ureters. The bladder lies anterior in the pelvic cavity, superior to the vagina in females and superior to the prostate in males.

The main function of the bladder is the storage and disposal of urine. For this purpose, the bladder lining is muscular as well as expandable. The stored urine can extend the bladder about 3 times its size, and the bladder muscles can contract to expel its contents quickly and efficiently during urination. The urge to urinate stems from nerves in the bladder being triggered depending on its capacity. Interestingly, according to studies, all mammals urinate at the same rate, no matter what their size ("Urination duration: Study finds most mammals need about 21 seconds." n.d.).

Urethra

The urethra is located inferiorly to the bladder, leading away from the body to the pelvic orifice. In males, the urethra is approximately 15-20 cm long ("The Ureters", 2017), and descends from the bladder through the prostate gland and eventually to the penial orifice.

Additional ducts from the testes are fed into the urethra as it passes through the prostate, as the urethra is also part of the male reproductive system since it delivers semen during ejaculation. This is a key difference from the female urethra, which is not part of the female reproductive system. In females, the urethra is about 4 cm long, and passes from the bladder inferiorly to the urethral orifice (“The Ureters”, 2017).

Similar to the ureters, the urethra is designed for transportation, in this case from the bladder to the body orifice for expulsion. While it does serve an additional purpose in males, the urethra is primarily designed for transportation of urine. The urethra has a mucosal lining which protects it from the acidity of the urine (“The Ureters”, 2017).

Homeostasis and the Urinary System

Since the kidneys manage the fluid absorption and secretion of the body, the H₂O and electrolyte levels in the body are very strongly connected to the kidneys, and as a result, blood pressure is in part regulated by the kidneys. When blood pressure drops, the kidneys are triggered to release the substance renin, which converts the angiotensinogen from the liver into angiotensin I, which converts to angiotensin II, which triggers immediate vasoconstriction (Biga et al, n.d.). This causes the blood pressure to rise, thereby regulating homeostasis. While the body uses the angiotensin II as an emergency reaction to maintain blood pressure, at the same time, it also uses angiotensin II to stimulate production of a hormone aldosterone, which increases absorption of salt by the kidneys. Water retention is thereby increased through osmosis, thereby raising blood pressure in a long term effect (Biga et al, n.d.).

Medical Terminology versus “Layman’s Terms”

Patients are interested in understanding their organ structures, functions and general locations. In layman’s terms, the position of the urinary system would have been described as

being situated in the abdominal area to the front of the body, with the kidneys on either side of the middle, connecting to ureters leading downwards towards the bladder, after which it empties the urine through either the female urethra, or the male penis. The patient does not need to necessarily know all the medical terminology, as they will not be operating or treating themselves.

A medical professional needs to know exactly where in the abdominal and pelvic cavity all of these organs are located. Just as with scientific measurements where the units have been previously agreed upon by an international community of scientists, there has to be an agreement on how all the directions and positions will be named so that one doctor can read the notes of another and know exactly what is meant. The exact positions of the organs are also vital since many organs or parts of organs lie very close to each other, and in the case of treatment, severe damage could be done if the exact position of the body's organs is not known.

Conclusion

While I was not familiar with all the medical terminological terms, I did know some of the terminology from watching medical documentaries, reading, and my natural tendency to have long discussions with doctors whenever I can regarding the interior workings of my body. My knowledge of medical terminology has certainly been enhanced by this module and course in general.

Another part of this course is how well it ties into my chemistry course, which deals with electrons, and atoms and the molecular structures without which life cannot function. The very position of the atoms makes a difference in how they are absorbed in the body. I recently wrote a paper on (-) Carvone, and during my research learned that while Carvone is an enantiomer, the simple right or left positioning of one of its side chains makes a difference in the way it smells

and functions. It is fascinating and encouraging to know that even a single atom can make a difference.

References

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