ANESTHESIA FOR KIDNEY TRANSPLANT SURGERY

Essay

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Anesthesiology

By

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ABBREVIATIONS

ADH	:	Antidiuretic hormone
ANP	:	Atrial natiuretic peptide
ARF	:	Acute renal failure
ASA	:	American Society of Anesthesiologists
ATN	:	Acute tubular necrosis
ATP-ase	:	Adenosine triphosphatase.
AVP	:	Arginin vasopressin
BP	:	Blood pressure
BUN	:	Blood urea nitrogen
CAPD	:	Continuous ambulatory peritoneal dialysis
CKD	:	Chronic kidney disease
CNS	:	Central nervous system
COP	:	Colloid oncotic pressure
CPK	:	Creatinine phosphokinase
CRF	:	Chronic renal failure
CSF	:	Cerebrospinal fluid
DGF	:	Delayed graft function
ECF	:	Extra-cellular fluid
ECG	:	Electrocardiogram
ESRD	:	End stage renal disease
$EtCO_2$	:	End-tidal carbon dioxide
FRC	:	Functional residual capacity
GFR	:	Glomerular filtration rate
Hct	:	Haematocrit
HD	:	Haemodilaysis
HES	:	Hydroxyethyl starch
HIV	:	Human immunodeficiency virus
ICU	:	Intensive care unit
IV	:	Intravenous
K/DOQL	:	The kidney disease outcomes quality initiative
LVH	:	Left ventricular hypertrophy
OR	:	Operating room
PAC	:	Pulmonary artery catheter
QOL	:	Health-related quality of life
RBF	:	Renal blood flow
r-HuEPO	:	Human recombinant erythropoietin
vWF	:	von Willebrand's factor

ABSTRACT

Organ viability associated with renal transplantation is a product of the right preoperative evaluation and preparation of the patient and the proper anesthetic management of the donor and the recipient patient and the graft preservation during the operation. The outcome is influenced by perioperative fluid and drug treatment as well as close intra-operative monitoring, optimization of intravascular fluid volume and prompt correction of electrolyte disturbances (especially potassium).

Keywords:

Anesthesia
Transplantation
Kidney
Organ

INTRODUCTION

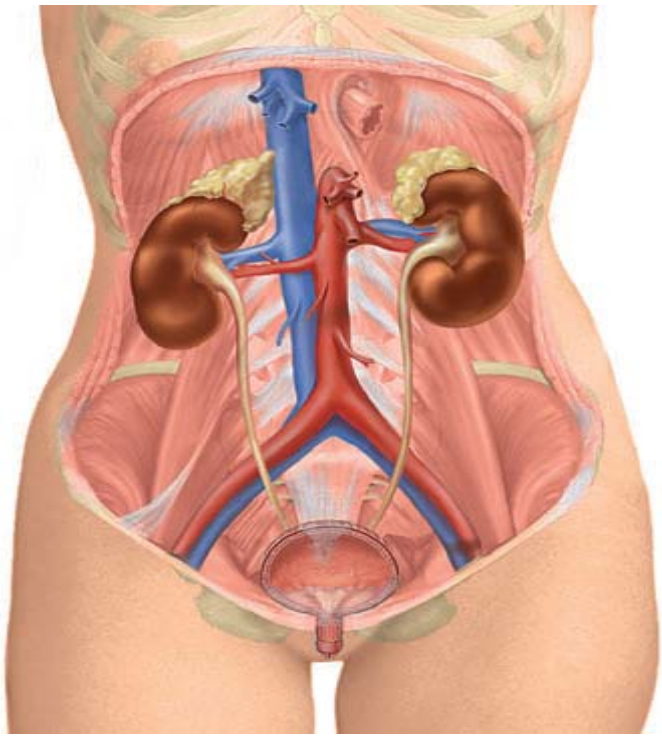
INTRODUCTION

Chronic renal disease is a major health issue in various parts of the world. The number of patients with end-stage renal disease (ESRD) is increasing in both developed and developing countries.

Renal transplantation rather than maintenance dialysis is the preferred method for treating most patients with ESRD because it is more cost-effective, allows a more normal lifestyle, and results in a lower risk for mortality when compared with the outcomes for patients wait-listed for cadaveric kidney transplantation.

Health-related quality of life (QOL) refers to the measure of a patient's functioning, well-being, and general health perception in each of three domains: physical, psychological, and social. Along with survival and other types of clinical outcomes, patient QOL is an important indicator of the effectiveness of the medical care they receive. QOL of patients with end-stage renal disease is influenced by the disease itself and by the type of replacement therapy. Numerous studies have identified the effect of such factors as anemia, age, co-morbidity, and depression on QOL. Most of these factors appear during the predialysis period, and the adequate management of some of them could influence patient outcomes. Among replacement therapies, transplantation appears to give the best QOL for large groups of patients.

Chapter I



ANATOMY OF THE UPPER URINARY TRACT

Chapter I

ANATOMY OF THE UPPER URINARY TRACT

The human renal system is made up of two kidneys, two ureters, urinary bladder, and urethra[(1)].

The kidneys are paired, reddish brown, bean-shaped solid organs that lie well protected deep within the retroperitonum. The kidney lie along the borders of the psoas muscles and therefore, obliquely positioned in the retroperitonum. Accordingly, the lower poles of either kidney lie farther from the midline and are pushed slightly more anteriorly than the upper poles. It lies on each side of the vertebral column between the parietal peritoneum and the muscles of posterior abdominal wall. The position of liver causes the right kidney to be 1-2cm lower than the left kidney. Kidneys and associated adrenal glands are surrounded by perirenal fat and enclosed by perinephric fascia[(1)].

The kidneys are mobile organs, represent about 0.5% of the total weight of the body but receive 20-25% of total arterial blood pumped by the heart, and their position may vary with inspiration and expiration movement of the diaphragm as well as change in position[(2)].

The kidneys range in their measures from 6 cm length and 24gm weight in a full-term newborn, to become between 135-.150 gm weight and between 10-12 cm in vertical length in adult (approximately three to five vertebrae when viewed by radiograph), 5-7 cm in transverse width and 3-5 cm in antroposterior thickness[(3)].

Each kidney is made up of an outer cortex, central medulla, Internal calyces and pelvis. The cortex is homogenous in appearance.

Portions that project toward the renal pelvis between the papillae and fornices are called the columns of Bertin. The medulla consists of numerous pyramids formed by the converging collecting renal tubules, which drain into minor calices **(Fig. 1)**. The nephron is the functional unit of the kidney **(Fig. 2)** and formed of the glomerulus, proximal convoluted tubule, the loop of Henle, the distal renal tubule and the collecting tubule[4].

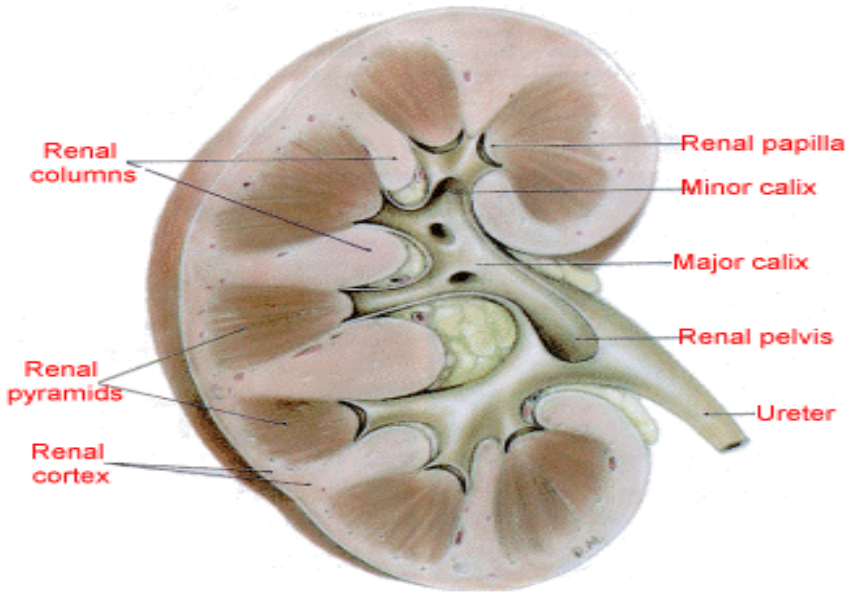


Fig. (1): Structure of the kidney[4]

The kidney receives their blood supply from the renal arteries, which originate from abdominal aorta, before reaching the kidneys, the arteries divide into anterior, posterior branches and then subdivided into lobar arteries. These arteries supply blood to the upper, middle and lower thirds of the kidney. Arching around the bases of the pyramids, then subdivided into interlobular arteries that supply the cortical tissue and kidney capsules. Other interlobular arteries that supply the cortical tissue and the kidney capsule. Other interlobular branches supply the glomerular capsule of the nephron as afferent arterioles.

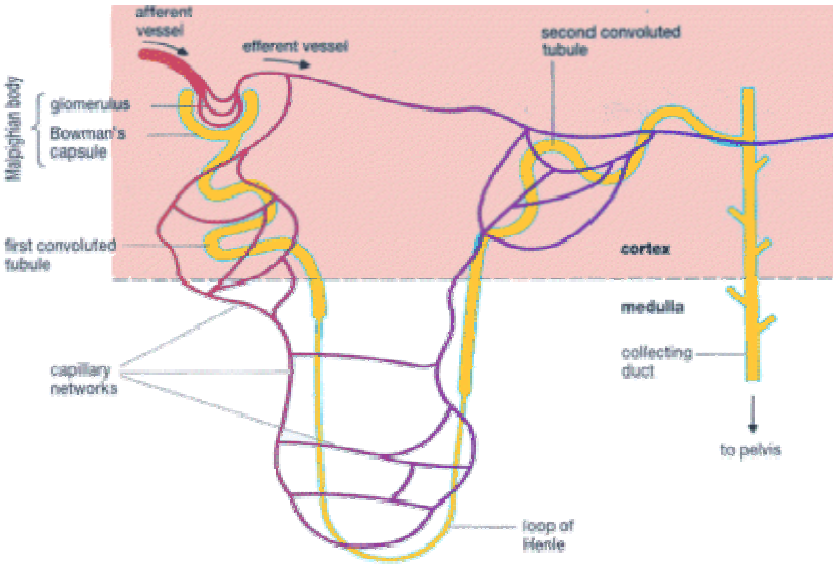


Fig. (2): Structure –function relationship in the nephron[(2)]

The afferent arteriole subdivided to form clumps of capillaries, called glomeruli that are surrounded by Bowman's capsule. The glomerular capillaries empty into the efferent arteriole that carries blood to the peritubular capillaries. This is the only place in the body where an arteriole is positioned between two capillary beds. The renal venous structures parallel the arterial tree such that venous drainage occurs via interlobular, arcuate and interlobar veins which empty into renal veins and then into inferior vena cava[(2)].

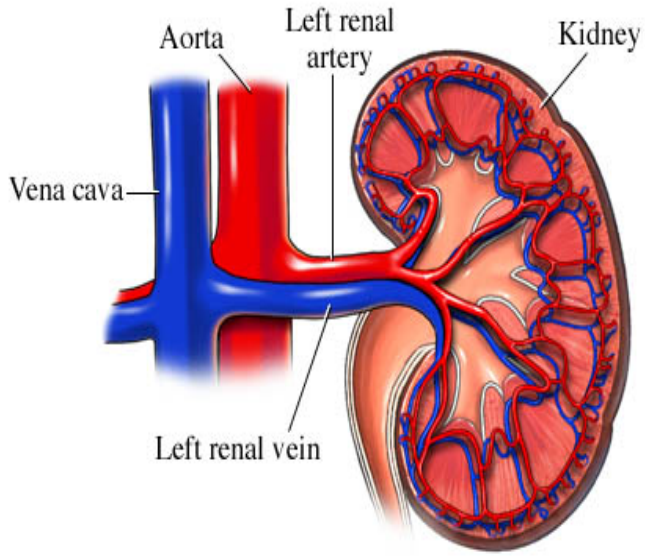


Fig. (3): Blood supply of the kidney[(4)]

They are innervated by sympathetic nerves originating from preganglionic fibers of the eighth thoracic throracic through the first lumbar segments and converge to celiac plexus, aorticorenal ganglion. Postganglionic fibers to the kidney arise mainly from kidneys the celiac and aorticorenal ganglia. Parasympathetic input from the vagus nerve[(2)].

The renal pelvis funnels urine into the ureter, a retroperitoneal, muscular tube that extends to the urinary bladder. The ureter is about 25 cm long and reaches a maximum diameter of about 1.7 cm near the bladder. Each ureter begins at the level of L2 as a continuation of the renal pelvis. The ureters pass dorsal to the bladder and enter it from below, passing obliquely through its muscular wall and opening onto its floor. As pressure builds in the bladder, it compresses the ureters and prevents urine from being forced back to the kidneys. The ureter has three layers: an adventitia, muscularis, and mucosa. The adventitia is a connective tissue layer that binds it to the surrounding tissues. The muscularis consists of two layers of smooth muscle.

When urine enters the ureter and stretches it, the muscularis contracts and initiates a peristaltic wave that “milks” the urine down to the bladder. These contractions occur every few seconds to few minutes, proportional to the rate at which urine enters the ureter. The mucosa has a transitional epithelium continuous with that of the renal pelvis above and urinary bladder below. The lumen of the ureter is very narrow and is easily obstructed or injured by kidney stones[(5)].