



SNS COLLEGE OF ALLIED HEALTH SCIENCES
SNS Kalvi Nagar, Coimbatore - 35
Affiliated to Dr MGR Medical University, Chennai



DEPARTMENT : PHYSICIAN ASSISTANT

COURSE NAME : NEPHROLOGY

UNIT : GENITO URINARY SYSTEM

TOPIC : MICROCIRCULATION OF KIDNEY



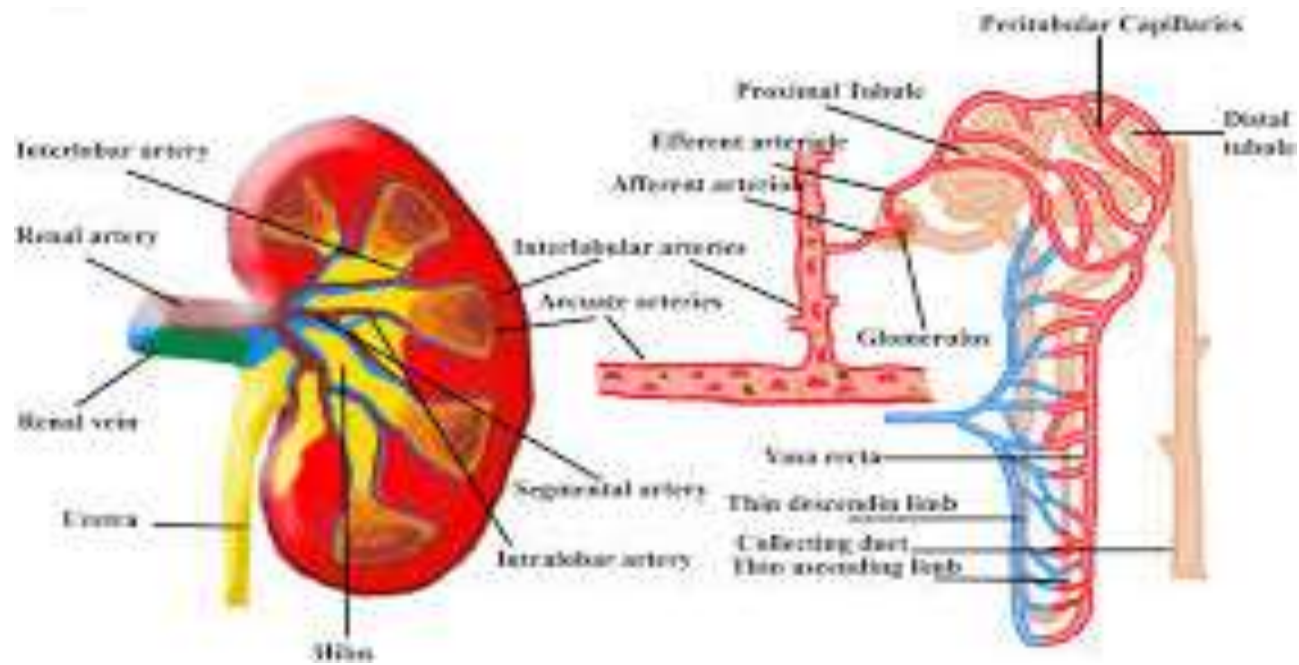
RENAL VASCULATURE



- **Afferent Arteriole:** Branches from the interlobular artery and delivers oxygenated blood to the glomerulus.
- **Glomerulus:** A tuft of capillaries formed by the afferent arteriole, where filtration of blood occurs.
- **Efferent Arteriole:** Drains blood from the glomerulus, leading to further vascular structures within the kidney.



- **Peritubular Capillaries:** Arise from the efferent arterioles and surround the renal tubules in the cortex, participating in reabsorption and secretion.
- **Vasa Recta:** Specialized capillaries that run parallel to the loop of Henle in juxtamedullary nephrons, involved in the maintenance of the medullary osmotic gradient.





GLOMERULAR FILTRATION



- **Glomerular Capillaries:** Fenestrated capillaries with a unique endothelial glycocalyx and podocyte foot processes, allowing selective filtration of plasma components based on size and charge.
- **Podocytes:** Specialized epithelial cells that wrap around the glomerular capillaries and contribute to the glomerular filtration barrier by forming filtration slits.



REGULATION OF RENAL BLOOD FLOW AND GLOMERULAR FILTRATION RATE (GFR)



- Autoregulation: Intrinsic mechanisms within the kidney help maintain stable renal blood flow and GFR despite changes in systemic blood pressure.
- This includes the myogenic response of afferent arterioles and tubuloglomerular feedback mediated by the macula densa.



- Neural Regulation: Sympathetic innervation of the renal vasculature can modulate renal blood flow and GFR, particularly during states of stress or exercise.



TUBULAR REABSORPTION AND SECRETION



- **Peritubular Capillaries:** Surround the renal tubules and provide the necessary blood supply for tubular reabsorption and secretion processes.
- **Transport Mechanisms:** Various transporters and channels on the epithelial cells lining the renal tubules facilitate the reabsorption of water, ions, glucose, and other solutes, as well as the secretion of waste products and drugs into the tubular lumen.



RENAL MEDULLARY CIRCULATION



- **Countercurrent Exchange:** The vasa recta, along with the loop of Henle, establish and maintain the osmotic gradient in the renal medulla, crucial for urine concentration and water conservation.
- **Regulation of Blood Flow:** The medullary circulation is tightly regulated to ensure adequate oxygen delivery to the renal medulla while preventing excessive washout of the medullary solute gradient.



CLINICAL IMPLICATIONS



- Understanding the microcirculation of the kidney is essential for diagnosing and managing various renal disorders, including hypertension, acute kidney injury, chronic kidney disease, and electrolyte imbalances.
- Manipulation of renal blood flow and GFR is a key strategy in the pharmacological management of these conditions, with drugs targeting specific renal vasculature or tubular transport mechanisms.



ASSESSMENT



- What is Glomerular Filtration ?
- What is Renal medullary circulation ?