

# ROLE OF ULTRASOUND IN THE EVALUATION OF RENAL PARENCHYMAL DISEASES

Essay

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By

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## **LIST OF ABBREVIATIONS**

|      |                                    |
|------|------------------------------------|
| AR   | : Acute rejection                  |
| ARCD | : Acquired renal cystic disease    |
| ARF  | : Acute renal failure              |
| ATN  | : Acute tubular necrosis           |
| CEC  | : Central echo complex             |
| CMD  | : Corticomedullary differentiation |
| Cs-A | : Cyclosporine-A                   |
| e.g. | : for example                      |
| G.N. | : Glomerulonephritis               |
| IgA  | : Immunoglobulin A                 |
| MSK  | : Medullary sponge kidney          |
| SLE  | : Systemic lupus Erythrematosis    |
| T/L  | : Ratio of thickness to length     |
| U/S  | : Ultrasonography                  |

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# *Introduction And Aim of Work*

## **1. Introduction and aim of work**

Renal parenchymal diseases represent a common and serious problem. Individual syndromes of altered renal function can be grouped according to the structural element of the kidney affected by the disorder (Hayden et al., 1984)

In this study, the role of U/S examination in the diagnosis of the disorders affecting the glomeruli and the renal tubules and interstitium will be discussed

The value of sonography in assessing the renal size and contour is well accepted. In addition to this gross anatomical information, the echopattern of the renal parenchyma may show the presence of parenchymal renal disease.

However, many of the parenchymal renal disease show unique sonographic criteria that may lead to specific diagnosis (Evan C., 1984).

# Anatomy Of The Kidney

## **Anatomy of the kidney**

### **Position:**

The kidneys are two reddish-brown organs situated in the posterior part of the abdomen one on each side of the vertebral column . behind the peritoneum. they are surrounded by fat and some areolar tissue

They lie in the lumbar region extending from the 12<sup>th</sup> thoracic vertebral body to the 2<sup>nd</sup> or 3<sup>rd</sup> lumbar bodies [Stephanie,1992]

The right kidney is slightly inferior to the left, probably on account to its relationship to the liver. The left is little longer and narrower than the right and is slightly nearer to the median plane.[Wegner,1995]

### **Size of the kidney:**

The kidneys measure approximately 12cm long, 6cm wide and 3.6cm thick.

Their sizes are approximately that of two and half lumbar vertebrae and their associated discs on radiograph [Stephanie,1992]

### **Shape of the kidney:**

On coronal section each kidney is seen to have an outer cortex and an inner medulla .

Extensions of cortex centrally as columns [of Bertini] separate the medulla into pyramids whose apices, jutting into calyces, are called papillae.

Minor calyces combine to form two or three major calyces, which in turn unite to form the pelvis of the kidney.

The pelvis may be entirely intrarenal or extrarenal. The gap between the renal substance and the pelvis is called renal sinus which is filled with fat.

The functional subunit of the kidney is called the nephron and consists of a glomerulus in the cortex and a tubule in the

medulla ,this drains to a collecting duct , which empties into calyx at the tip of the medulla.

At the hilum , the pelvis lies posteriorly and the renal vein anteriorly with the artery in between .(Fig.-1) [Stephanie, 1992]

### **The Relations of the kidneys:**

**These are as follows:**

#### **Posteriorly:**

*Upper third* : diaphragm and 12<sup>th</sup> rib and the costo diaphragmatic recess of the pleura.

*Lower third* : medial to lateral : psoas , quadratus lumborum and transversus abdominis muscles .

#### **Superiorly:**

The adrenal gland-more medial on the right kidney.

#### **Anteriorly:**

##### *Right Kidney:*

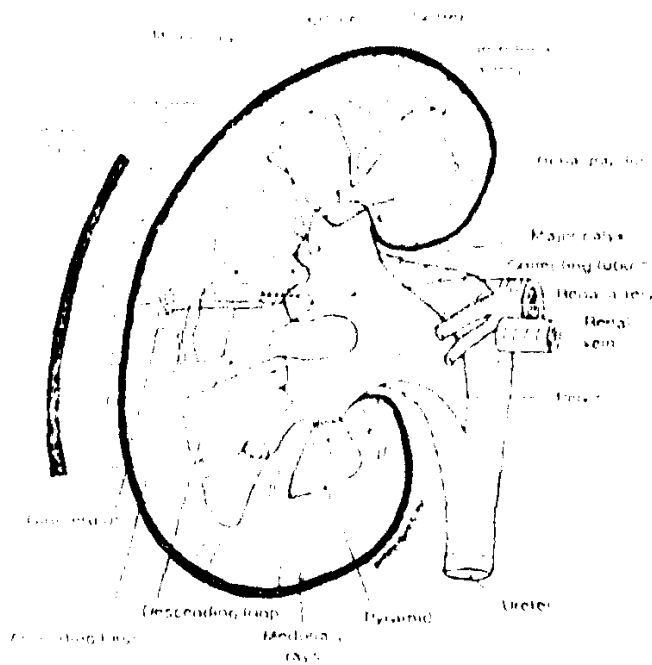
Liver  
2 nd Part of the duodenum  
Ascending colon  
Small intestinal loops

---

##### *Left Kidney:*

Stomach  
Pancreas and its vessels  
Spleen  
Splenic flexure of the colon  
Jujenal loops

[ Stephani, 1992]



**Fig. 1:** The internal structure of the kidney.  
 (Quoted from **Hagen-Ansert et al; 1995**)

### **Blood Supply of the Kidney:**

The kidneys are supplied by the renal arteries which leave the aorta at right angles opposite the body of L2.

The left artery is shorter than the right. Each artery divides usually into 3 branches which enter the hilum of the kidney ; 2 in front and 1 behind the renal pelvis.

The posterior branch passes to the upper pole . After further division the arteries enter the kidney substance.

The renal artery further divides into interlobar and interlobular arteries which ascend in the columns of Bertini [between the pyramids ] and then each arches along the base of the pyramids to form the arcuate arteries.(Figure 2&3)  
[Mc Minn 1994]

### **Venous Drainage :**

Veins from the renal segments communicate with one another profusely and eventually from five or six vessels that unite at the hilum to form the single renal vein . [Mc Minn 1994]

### **Lymph Drainage :**

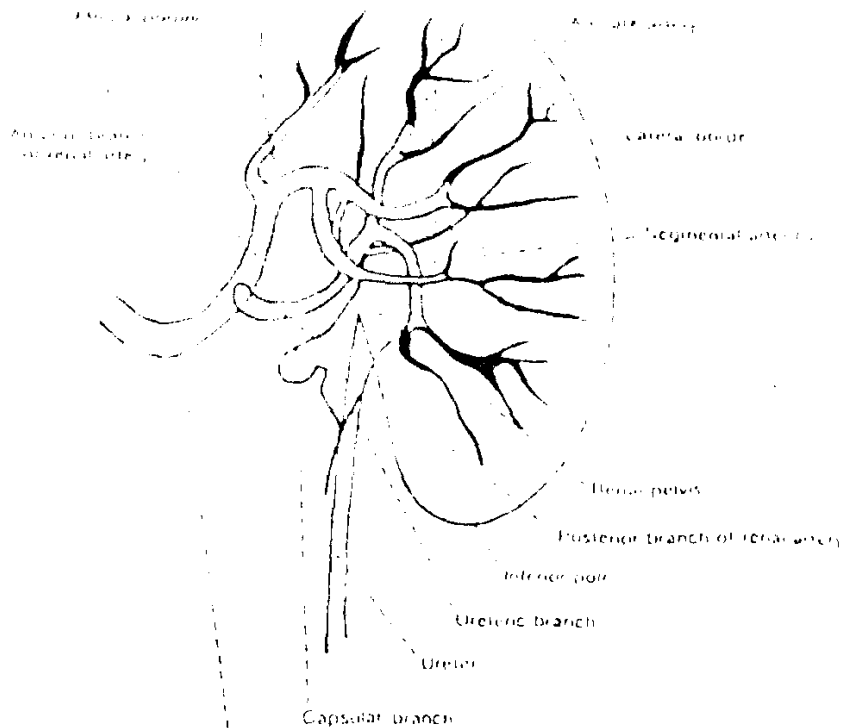
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~~The lymphatics of the kidney drain to para-aortic nodes at the level of origin of the renal arteries L2.~~

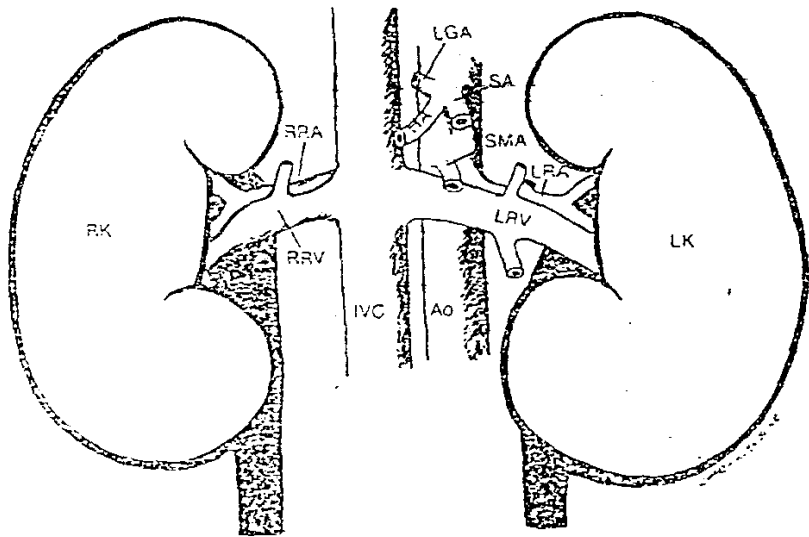
The surface of the upper pole may drain through the diaphragm into nodes in the posterior mediastinum . [McMinn 1994].

### **Nerve Supply :**

Renal nerves are derived from both parts of the autonomic system . The sympathetic preganglionic cells lie in the spinal cord from T12 to L4 segments and they send preganglionic fibres to the thoracic and lumbar splanchnic



**Fig. 2:** The normal vascular anatomy of the kidney.  
(Quoted from **Wolf et al.; 1995**)



[Fig.3 ]: Vascular relationship of the great vessels and their tributaries to the kidneys. Ao: Aorta; IVC: inferior vena cava; RRV: right renal vein; RRA: right renal artery; LRV: left renal vein; LRA: left renal artery; SMA: superior mesenteric artery; SA: splenic artery; HA: hepatic artery; LGA: left gastric artery (*Quoted from Hagen-Ansert; 1995*).