ROLE OF ULTRASONOGRAPHY IN CYSTIC RENAL DISEASES

Essay
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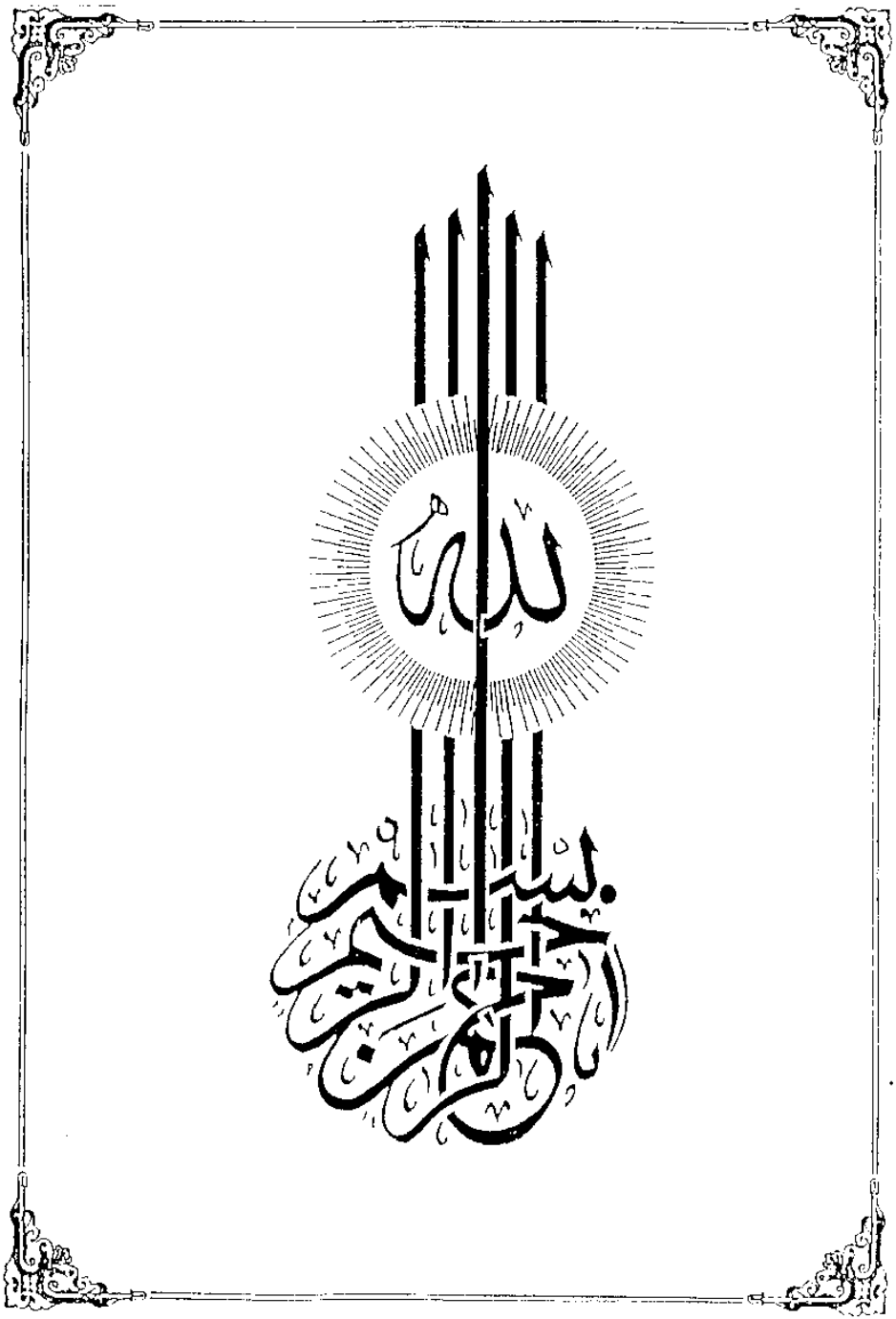

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Introduction and Aim of Work

Review of literature

Gross Anatomy of the Kidney

They are paired organs situated in the posterior part of the abdomen, one on each side of the vertebral column, behind the peritoneum, they are surrounded by a mass of adipose connective tissue and a capsule *(Gray's Anatomy, 1978).* The kidneys are normally somewhat asymmetrical in size but they rarely differ in length by more than 2 cm *(Voorthuisen, 1979).*

The long axis of each kidney is directed downwards and laterally, their cranial end is at the superior border of the twelfth thoracic vertebra, their caudal limits at about the third lumbar vertebra *(Gray's Anatomy, 1978 and Sussman & Newman 1976).* The Rt kidney is usually slightly inferior to the left kidney, probably on account of its relation to the liver, the left is a little longer and narrower than the right and is a little nearer to the median plane. The upper poles of both kidneys lie in contact with the diaphragm and the upper medial aspect is 2.5cm from the midline, the lower poles being about 2.5 cm above the highest point of the iliac crest and the lower medial aspect is 7.5 cm from the midline *(Davis and Coupland, 1969).* There is a deep longitudinal medial notch (hilum) in which the renal sinus is located.

The right renal pelvis is located opposite the transverse process of the second lumbar vertebra. The left kidney is ordinary about 2 cm higher than the right. A kidney which will descend to a level where its pelvis is below the level of the lower border of the third lumbar vertebra is usually abnormal *(Emmett & Witten, 1974).*

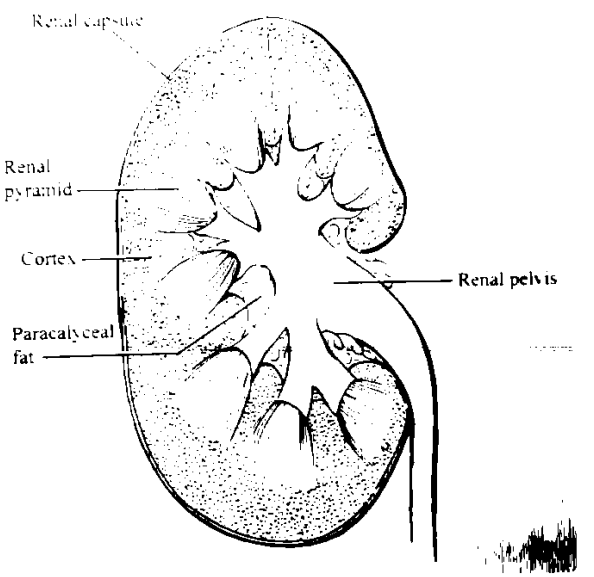

Fig. (1) : A longitudinal section through normal kidney.
(Quoted from: Mc Gahan J.P. and Goldberg B.B., 1998).

Relations of the kidneys:

A) Posteriorly :

The relations of the posterior surface of both kidneys are similar. They are related to the diaphragm superiorly, psoas major medially, the quadratus lumborum and transversus abdominis laterally. The subcostal vessels and nerves and the iliohypogastric and ilioinguinal nerves lie posterior to the kidney and anterior to the quadratus lumborum muscle *(Romans, 1975).*

B) Anteriorly :

The left kidney, has the following relationships, the left suprarenal gland overlaps its upper medial portion, and the spleen border upon its upper lateral aspect. The body of the pancreas with the splenic vessels lie across the kidney at its midsection *(Last, 1973).*

The left half of the transverse colon crosses the kidney below the pancreas, and the descending colon overlaps its lower part laterally. The area above the pancreatic region is related to the stomach.

Only the descending colon, pancreas, and suprarenal gland are not separated from it by peritoneum *(Cunningham, 1973).*

Anteriorly, the right kidney has the following relationships : the suprarenal gland overlaps its upper pole, especially, medially and the duodenum overlaps it along its hilus. The hepatic flexure of the colon covers the lower end of the kidney. A loop of jejunum lies between the colon and the

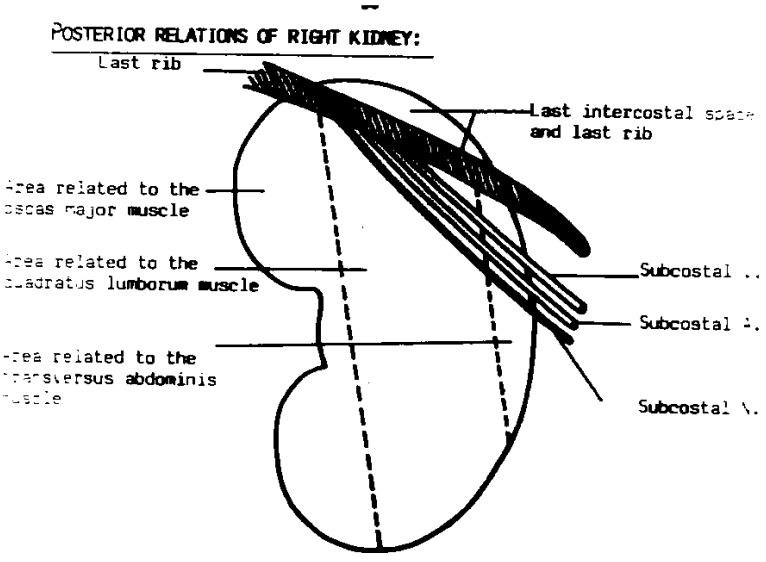

Fig. (2) : Posterior relations of right kidney (Quoted from : Nour El Din M.A., 1983).

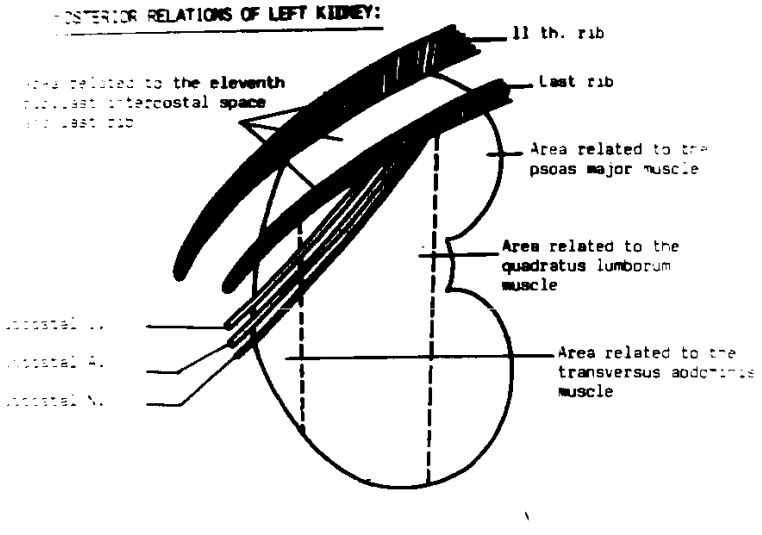

Fig. (3) : Posterior relations of left kidney (Quoted from : Nour EL – Din M.A., 1983).

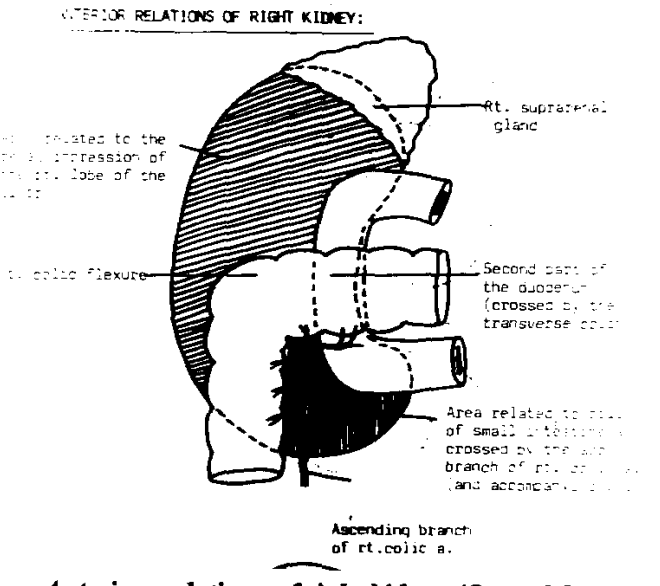

Fig. (4) : Anterior relations of right kidney (Quoted from : Nour El-Din M.A., 1983).

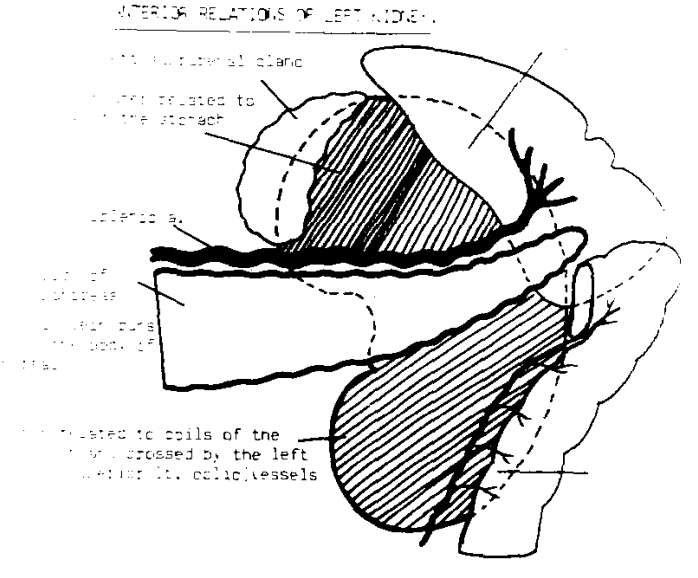

Fig. (5) Anterior relations of left kidney (Quoted from : Nour El-Din M. A., 1983).

duodenum. The right lobe of the liver tends to overlie the right kidney *(Davies, 1967).*

Structures of kidney :

On the cut surface there is an outer, paler cortex adjacent to the capsule, it contains the proximal parts of collecting tubules, the convoluted tubules, and minute blood vessels while the medulla contains darker, triangular masses (Renal Pyramids) which show radial striations and are separated from each other by extensions of the cortical tissue (Renal Columns).

There is about eight to eighteen renal pyramids, the base of it join the renal cortex and the apex extends into the sinus as a small conical projection (Renal papillae).

The renal pelvis forms the collecting duct system leading to the ureter, usually it is formed of two major calyces which divide into minor calyces each of which terminates in relation to one, two or three renal papillae *(Romanes, 1973).*

Blood supply of the kidney :

A) Arterial blood supply :

Each kidney receives its blood supply from renal artery which is a branch of abdominal aorta derived at the level of first lumbar vertebra *(Gray's Anatomy, 1978).* Each artery divides into four or five branches close to the hilus of the kidney, the majority pass anterior to the pelvis of the kidney but one or two pass posterior to it.

The apical segment is usually supplied by the posterior branch of the renal artery while the lower segment of the kidney is supplied by the anterior branches of the renal artery for the most parts.

B) Venous drainage :

The renal veins are parallel to the renal arteries upon emerging from the kidney, two main branches are formed which empty into the inferior vena cova *(Davies, 1967)*. A few capsular veins drain to the lumbar veins *(Last, 1978)*.

Lymphatic drainage of kidney :

To the para-aortic nodes at the level of origin of the renal arteries, the surface of upper pole may drain through the diaphragm into nodes in the posterior mediastinum *(Last, 1978)*.

Nerve supply :

The kidneys are supplied by many plexus :

From coeliac plexus, Aortico-renal ganglion, lowest thoracic splanchnic nerve, first lumbar splanchnic nerve and aortic plexus. The plexus is continued into the kidney around branches of the renal artery, mainly it is vasomotor in function *(Meschan, 1975)*.

Renal Sonographic Anatomy

The kidneys are retroperitoneal structures with the right kidney usually located just posterior to the liver and extending caudaly. The gall bladder often comes to rest just anterior to and some times in contact with the anterior surface of the kidney. The left kidney usually lies just slightly higher with its upper and often lateral borders in direct contact with the medial surface of the spleen. The kidneys are bean shaped and have certain characteristic of reflectivity that make their pattern distinctive in almost all cases.

Renal capsule :

The renal capsule and the perinephric fat exhibit a distinct layer of highly reflective echoes that distinguish the kidney from adjacent structures ***(Rosenfield et al., 1978).***

Renal Parynchyma :

The cortex is non-uniform being thickest in the polar region. The renal medulla is relatively anechoic, with the triangle-shaped renal pyramids separated by intervening columns of Bertini. The highly reflective punctuate echoes at the base of the renal pyramids have been shown histologically to represent the arcuate vessels ***(Rosenfield et al., 1978).***

Normally in healthy persons the overall echoe amplitude of the kidney is considered less than that of the liver. This difference in amplitude is an important distinguishing sonographic feature that enable one to identify with certainty that the kidneys are normal. It is generally accepted that the normal order of progressing echo intensity is : renal medulla, renal cortex, spleen, liver, pancreas and finally renal sinus