RADIOLOGICAL MANIFESTATION OF URINARY CALCULI

THESIS

In Partial Fulfilment for the
Requirement of the Master Degree in
(RADIO-DIAGNOSIS)

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1982

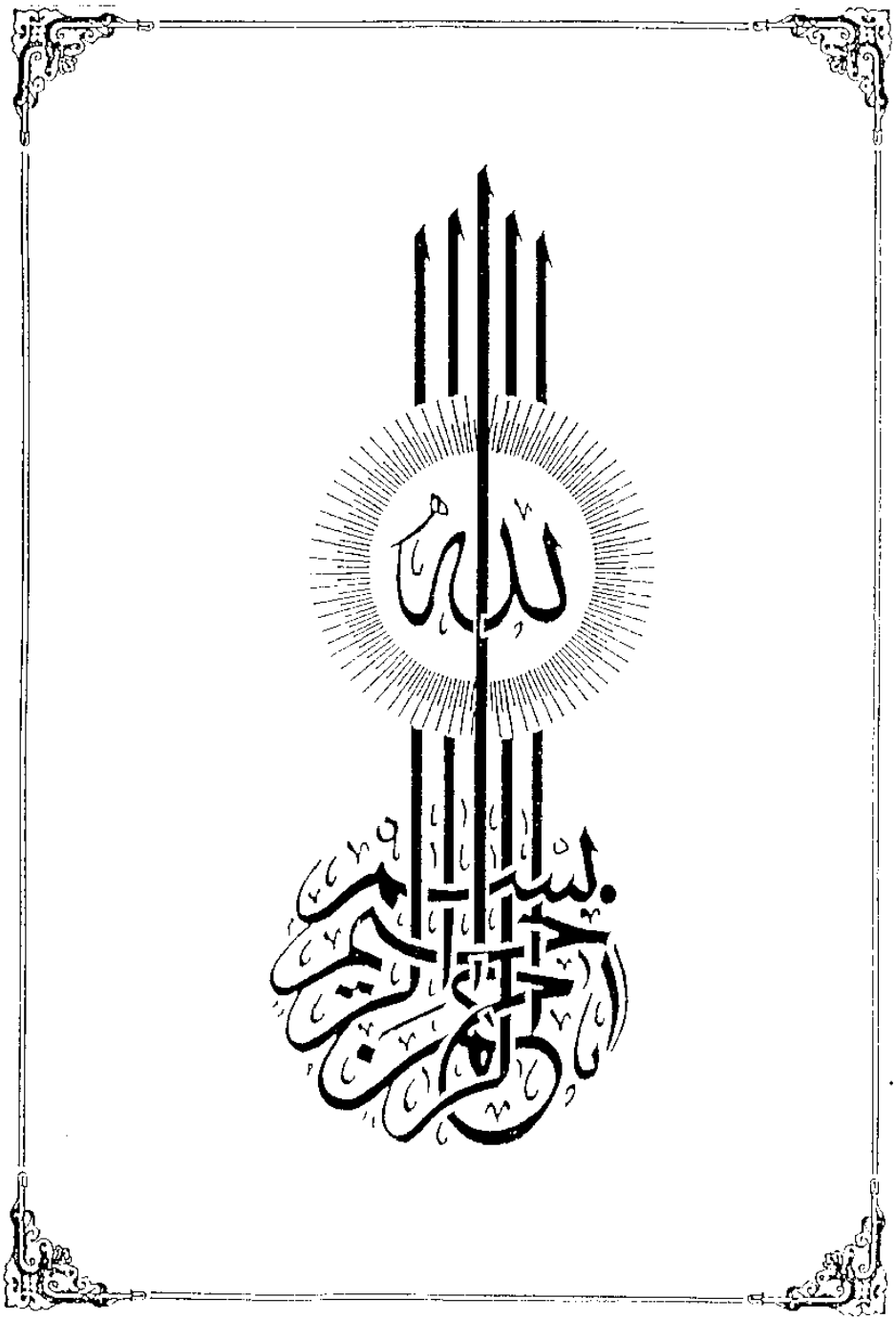
ACKNOWLEDGEMENT

I would like to express my deepest gratitude for the help offered by Professor Dr. Mohamed Sami El Biblawi, professor of Radiology, Ain Shams University, Faculty of Medicine.

I am also grateful to Dr. Jannette Boushra Hanna, Assistant professor of Radiology Ain Shams University, for here assistance and continuous supervision.

I would like to record my sincere gratitude to my senior staff and colleagues.

Samia El Said



C O N T E N T S

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INTRODUCTION AND AIM OF WORK

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The diagnosis of the urinary calculi depends largely on radiological examination. The condition may not be suspected on clinical examination and the radiologist is the first to discover them.

The role of radiological examination in such conditions is very important as it clears the situation and size and may be the type of the stone.

Also Radiological examination gives an idea about the function of both kidneys and also if there is an any complication elsewhere in the urinary tract.

The differential diagnosis of radio opaque shadows is very important to exclude others.

The aim of this work is to emphasize the role of radiological manifestation of urinary calculi.

ANATOMY OF URINARY TRACT

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The urinary tract consists of the following major structures, the kidneys - one on each side of vertebral column, the ureters, the urinary bladder and the urethra.

The Kidneys:

The kidneys are paired, retroperitoneal, bean-shaped organs lying on each side of vertebral column. (Meschan 1976).

Their upper ends are on a level with the upper border of the twelfth thoracic vertebra, their lower, with the third lumbar vertebra. The right kidney is usually slightly lower than the left, probably on account of its relationship to the liver; the left is a little longer and narrower than the right and is a little nearer to the median plane. The long axis of each kidney is directed downwards and laterally; the transverse axis, laterally and backwards. Each kidney is about 11 cm. in length, 6 cm. in breadth, and about 3 cm. in thickness. The lateral border is convex, and the medial border is concave. (Gray's 1958).

The surface of the kidney is invested by a thin but strong fibrous capsule. External to it is a considerable quantity of fat tissue known as the adipose capsule (Gerota's capsule). It is this fatty tissue envelope that permits identification of the kidney on plain radiographs, since it is considerably more radiolucent than the surrounding muscular structures. On the other hand, perirenal inflammations or neoplasms may invade this fatty envelope and impair good detail. It is this adipose capsule which is continuous with the tela subserosa and which is insufflated with air or oxygen in the performance of perirenal air insufflation studies. (Meschan 1976).

The relationship of the kidney to other structures:

Posteriorly, the kidneys lie on a muscle bed composed of the diaphragm, the psoas major, quadratus lumborum, and transversus abdominis muscles. The structures intervening between the quadratus lumborum and the kidney are the subcostal vessels and nerves. The diaphragm separates the upper part of the kidney from the pleura and the twelfth rib.

Anteriorly, the right kidney has the following relationships: the suprarenal gland overlaps its upper end, and the duodenum overlaps it along it hilus. The hepatic flexure of the colon covers the lower end of the kidney. A loop of jejunum lies between the colon and dudenum. The right lobe of the liver tends to overlie the right kidney.

The left kidney, anteriorly: has the following relationships: the suprarenal gland caps its upper medial portion, and the spleen borders upon its upper lateral aspect. The body of the pancreas with the splenic vessels lies across the kidney at its midsection. The left half of the transverse colon crosses the kidney below the pancreas, and the descending colon overlaps its lower part laterally. The stomach, the transverse colon and the jejunum are all separated by the peritoneum.

Blood vessels of the kidney:

The kidneys are supplied by two renal arteries arising from the aorta immediately below the superior mesentric artery at the level of the disc between the first and second lumbar vertebrae. The left artery is shorter than the right and originates at slightly higher level.

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 cava.

The ureters:

The ureter is a tubular connection between the kidney and the urinary bladder, extending downward from the renal pelvis. It is approximately 5 mm. in diameter and 25-30 cm. in length. It is fairly uniform in size except for three slight constrictions; (a) at the uretero pelvic junction. (b) at the place where the ureter crosses the pelvic brim. (c) at the extreme lower end of the ureter as it passes through the urinary bladder wall.

The ureter has 2 portions, the superior abdominal portion and the inferior pelvic portion.

The abdominal portion of the ureters on both sides are embedded on the medial aspect of the psoas major muscles and pass ventral to the common or external iliac artery to enter the true pelvis. They lie ventral to the transverse processes of the third, fourth and fifth lumbar

vertebrae, and both are crossed by the spermatic or ovarian vessels.

The abdominal portion of the Rt. ureter is covered by descending dudenum and is situated to the right of inferior vena cava. The left abdominal portion is crossed by left colic vessels and sigmoid mesocolon.

The pelvic portion of the ureters, in male, begins at the pelvic brim, courses close to the internal iliac artery along the ventral border of the greater sciatic notch. It turns medially to reach the lateral angle of the urinary bladder at the level of the lower part of the greater sciatic notch.

In female, the pelvic ureter forms the dorsal boundary of the ovarian fossa. It runs medially and ventrally on the lateral aspect of the cervix and upper part of the vagina to the fundus of the urinary bladder.

The intra mural portion of the ureters runs obliquely through the urinary bladder for a distance of approximately 2 cm. and opens into the urinary bladder.

Vessels of the ureter:

The arteries of the ureter are branches of the renal, internal spermatic, superior and inferior vesical arteries.

The veins follow correspondingly named arteries.

The urinary bladder:

The urinary bladder is a strong, muscular hollow viscus which receives the urine from the kidneys through the ureters. It lies posterior and superior to the pubic symphysis.

In adult, when it is empty, it lies in the pelvis, but when distended it balloons upwards. The neck of the urinary bladder is about 2-3 cm. behind the pubic symphysis, a little above its lower border.

Vessels of the urinary bladder:

The arteries supplying the bladder are the superior, middle and inferior vesical arteries which are derived from the anterior trunk of the hypogastric artery. The obturator and inferior gluteal arteries also supply the bladder.

The veins consist largely of a plexus on the infero-lateral surface.

The urethra:

The male urethra extends from the internal urethral orifice of the urinary bladder to the external urethral orifice at the end of the penis. It measures approximately 17 - 20 cm. in length. It's component parts, from below upwards are: external urethral orifice, cavernous part, membranous part, prostatic portion and internal urethral orifice.

The external urethral orifice is located at the tip of the glans penis and it is the narrowest portion of the urethra, and about 0.6 cm. in length. The cavernous urethra extends from the external urethral orifice to the membranous part. It is about 15 cm. in length and 0.6 cm. in diameter. The membranous part connects the cavernous and prostatic parts. It is the shortest segment and measures only 2 cm. in length. The prostatic portion, measures about 3 cm. in length and extends between the membranous part and the internal urethral orifice.

The female urethra is a narrow membranous canal that extends from the internal to the external urethral orifice and measures about 4 cm. in length and 0.6 cm. in diameter.

The vessels of the urethra:

The arteries arise from the internal pudendal artery, a branch of the internal iliac artery.

The veins accompany the arteries, unite to form the internal pudendal vein. (Last, 1977 - Meschan 1976).