

**STUDY OF INTRACAVITARY PRESSURE DURING
PERCUTANEOUS AND URETEROSCOPIC
STONE SURGERY**

Thesis

*Submitted in Partial Fulfilment of
M.D. Degree in Urology*

Presented by

GAMAL ALI AL-ATRASH

Supervised by

Prof. Dr.

Abdel Wahab El-Kasaby

*Prof. of Urology
Ain Shams University*

Prof. Dr.

Ragaa M. Lasheen

*Prof. Of Clinical Pathology
Ain Shams University*

Prof. Dr.

Fathi M. Tash

*Prof. of Biochemistry
Ain Shams University*

*Faculty Of Medicine
Ain Shams University*

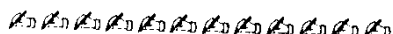
1991



TO THE SPIRIT OF MY FATHER



ACKNOWLEDGMENT



I Wish to express my deepest gratitude to my eminent Prof. Dr. Abdel-Wahab El-Kasaby, Professor of Urology, Ein Shams University, for his kind guidance, sincere help, fatherly encouragement and supervision throughout the course of this work.

To Dr. Ragaa Lasheen Professor of clinical pathology, Ein Shams University, extend my profound appreciation for her generous help and guidance and marvellous attitude in guiding me.

Gratefully acknowledge Prof. Dr. Fathi Tash, Professor of Biochemistry, Ein Shams University, for his sincere guidance and his continuous encouragement.

A word of thanks would be hardly enough to express my greatest thanks to prof. Dr. Ibrahim Abul Fettouh, Head of Urology Department Mattarya teaching Hospital, and to all members of the Department for their generous attitude and kind sympathy.

I wish to express my sincere thanks to Dr. Amira Mokhtar, Lecturer of clinical pathology for her help during the practical work of this study.

My best regards to Dr. Magdy El-Barbry, Lecturer of physiology for his kind help.

I also wish to express my thanks to all the staff in the department of clinical pathology, cleopatra Hospital. I owe great deal to my parents and my wife for their sacrifice, understanding and enthusiasm.

C O N T E N T S

	Page
INTRODUCTION	1
REVIEW OF LITERATURE	
- Renal anatomy , endourological considerations. . .	2
- Percutaneous nephrolithotomy	12
- Renal pelvic pressure during endourologic procedures	28
- Irrigation	46
- Endotoxins and endotoxaemia.	55
- Care and sterilization of endourologic instruments	65
PATIENTS AND METHODS	76
RESULTS.	89
DISCUSSION	113
CONCLUSION	136
SUMMARY.	140
REFERENCES	143
ARABIC SUMMARY	

INTRODUCTION

INTRODUCTION

Since its introduction in the late 1970's, when it was primarily used to treat kidney-stone patients with poor operative risks, Percutaneous Nephrolithotomy has virtually replaced open-stone operations in patients of all ages and for nearly all types of stones. The advantages of the percutaneous method include lower rates of mortality and morbidity, faster convalescence, greater ease of repeat procedures, and greater cost effectiveness. Nevertheless, the recent administration of the extracorporeal shock wave lithotripsy (E.S.W.L.) mandate a critical new look at the percutaneous methods. While E.S.W.L. is neither free of morbidity nor suitable for all cases, it does create a new standard by which percutaneous nephrolithotomy and its complications must be judged (Lee et al., 1986). Percutaneous nephrolithotomy and ureteroscopy carries an inherent risk of irrigant extravasation and pyelorenal reflux which play important roles in the aetiology of septic complications including pyelonephritis, perirenal abscess, bacteraemia and specific complications, in the form of the transurethral resection reaction and postoperative ileus, arise as direct consequence of irrigant extravasation or absorption. These complications are potentiated by increase in intrapelvic pressures occurring during surgery (Goble and Hammonds, 1987).

To assess the extent to which equipment used in P.C.N.L. and U.R.S. are responsible for these complications, intrarenal pelvic pressure was monitored manometrically during clinical percutaneous and ureteroscopy stone removal. The results are presented and their potential clinical significance discussed.

REVIEW

Renal Anatomy , Endourological Considerations.

The basic procedure for all of the endourologic techniques in the armamentarium of the modern urologist and radiologist is the percutaneous needle puncture of the Kidney. In order to do this safely and efficiently , one must have an accurate mental picture of renal anatomy.

Gross Anatomy.

The kidneys lie one on each side of the spinal column beside the bodies of the twelfth thoracic through the third lumbar vertebrae , with the left Kidney a little higher than the right. However , there is enough variation in position and shape. Movement from the supine to the erect position and the motions of breathing may shift the normal Kidney as much as 2.5 cm , the length of one lumbar vertebra. (Kaye and Goldberg, 1982).

The upper poles of each Kidney are more closely approximated than the lower poles.

The psoas muscle not only increases in bulk but also slopes forward in its caudal passage , thus creating the retroperitoneal gutters which are correspondingly shallow in the cranial direction and deeper in the caudal direction. The Kidney which lies in this muscle has an anterior surface which is directed laterally and forward and a posterior surface which is directed medially and backward (Wickham and Miller, 1983).

Therefore , the coronal plane of the Kidney (the plane

passing from the mid renal hilus to the most convex surface of the lateral margin) lie approximately 30° behind the coronal plane of the body (a plane passing longitudinally through the body from side-to-side at right angles to the median plane and dividing the body into front and back portions). (Kaye and Renike, 1984).

Surface Anatomy Of The Kidneys:

A knowledge of the projected position of the Kidneys is necessary for the correct placement of needles especially when collecting system cannot be specified with intravenous contrast medium. The usual position of the kidneys at mid inspiration can be marked on the back as follows : With the patient in prone position two parallel vertical lines are drawn 2.5 cm and 9 cm on either side of midline and two horizontal lines at level of the spinous processes of T11 & L3. Within the resultant rectangles , the outline of the left kidney is drawn with the upper pole more medial (4 cm from midline) than lower pole (6-7cm) , and the right kidney is drawn 1-2cm lower than the left. (Appleton et al., 1958).

The kidneys lie at an angle of approximately 30° of the coronal plane (between L-1 and L-2) , therefore , passes through the middle of the left hilum and upper part of the right hilum. The twelfth rib , which is an important endourologic landmark , crosses the kidneys at an angle of 45° in such a way that one third of the left kidney and slightly less than one-third of the right kidney is above it. The left kidney is also crossed by the eleventh rib. Fig(1).

For the endourologist , the most important surface marking is

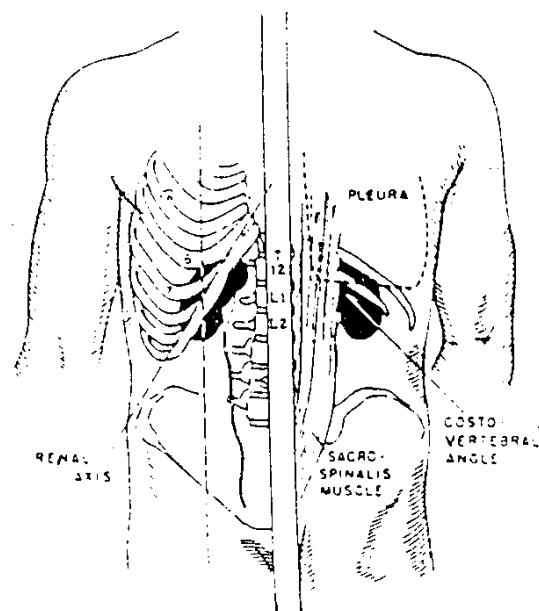


Fig. (1): Surface Anatomy of the Kidneys

that of the renal pelvis. In many persons , the center of the renal pelvis is 4.5 to 5 cm from the tip of spinous process of L-1 (transpyeloric plane) on the left and 1 to 2 cm lower than that on the right (Kaye and Goldberg 1982).

ANATOMIC RELATIONS OF THE KIDNEYS.

For safe endourological manipulations , it is essential to know the anatomic relations of the kidney.

The posterior relations comprise 4 muscles (medially by psoas major , posterior by quadratus lumborum , laterally by aponeurosis of transversus abdominus and superiorly by diaphragm) , three nerves (subcostal , iliohypogastric and ilioinguinal), and two vessels (the subcostal vein and artery) passing with the nerve over the quadratus lumborum muscle. (Tobias and Arnold , 1963). The posterior relations of both kidneys are the same except that the right kidney has less relation to diaphragm and pleura. The diaphragm being attached to inner aspect of the 12th rib, separate the kidneys from the rib and plural cavity.

The principle anterior relation of the kidneys is the peritoneum.

On the right , the adrenal gland overlies the upper pole , the descending or second part duodenum overlies the front of the medial border and the hepatic flexure of the colon is in contact with the lower lateral part of the anterior surface. The two areas covered by the peritoneum are related to the liver above the colon and small intestine below the colon.

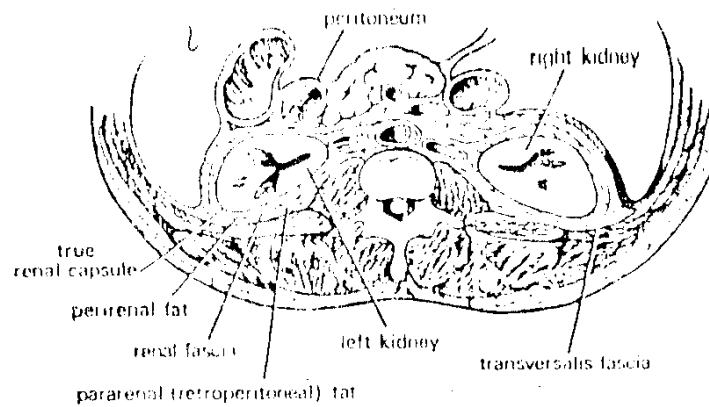


Fig. (2):

Cross section of body looking from above showing hilar aspect of kidneys rotated anteriorly on psoas muscle. The section shows also the four renal coverings: true capsule, perirenal fat, Gerota's fascia and pararenal fat.

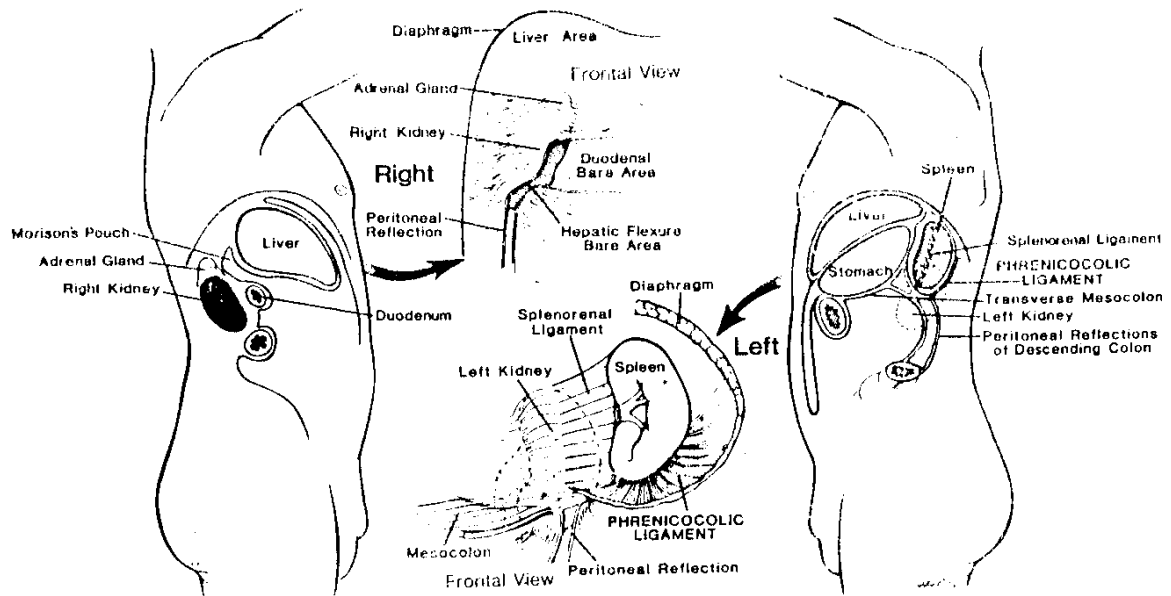


Fig.(3) : Schematic representation of right and left renal anatomy in relation to surrounding viscera. Ligamentous attachments to left kidney are illustrated in frontal and sagittal views. After (Glenn et al., 1987).

The peritoneum covering the liver area of the right kidney forms the lower part of the hepatorenal recess (Morison's Pauch). This recess is the lowest part of the peritoneal cavity when the patient is supine , and fluid may accumulate in it as a complication of percutaneous nephrostomy if peritoneum is entered.

On the left , the three structures are , the adrenal gland , body of pancreas with splenic vessels crossing the hilum and the splenic flexure of the colon covers the lateral part of the kidney.

The areas , that are covered by peritoneum , are related to the spleen above , the stomach laterally and jejunum below the pancreas. Fig(2 & 3)

INTERNAL STRUCTURES OF KIDNEYS:

The classic human kidney contain 14 lobes (range 4-28). Each lobe consists of a central core of medullary tissue surrounded by cortical layer except in the region of the papilla. The papilla projects into the calyx and is the functional and anatomical connection between the renal parenchyme and the collecting system. The papillae were divided into the four main papillary types as in fig(4) .

In studying the morphology of the papillae in human 28% of all papillae were non-convex . Non-convex papillae were mostly located in kidney poles , 50% in the upper pole and 30% in the lower pole. The total number of papillae diminished with the increasing number of non-convex papillae (Tamminen et al.,1977). There are four main types of the collecting duct openings of papillae : round, oval , crescent and slit like openings. The sizes