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Evaluation of renal function in obstructive nephropathy

by

I.V.U versus isotope renal scan

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بسم الله الرحمن الرحيم

وقضى ربك ألا تعبدوا إلا إياه و بالوالدين إحسانا ☼

صدق الله العظيم

DEDICATION

To:

My Wife……

My son Mohammad

My daughters

Pary

, Elaf,

Lelaf

Acknowledgement

Firstly I will want to thank Allah for his patience, nothing could be exist without support of him.

The last lines of this text should be words of gratitude to all those who helped to make this thesis possible.

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Abbreviations

I.V.U	*Intravenous Urography*
U.S	*Ultrasound*
D.T.P.A	*Diethylene Triamine Pentacetic Acid*
D.M.S.A	*Dimercaptosuccinic Acid*
M.A.G-3	*Mercaptoacetyltriglycine-3*
LOCM	*High-Osmolar Contrast Media*
HOCM	*High-Osmolar Contrast Media*
MBq	*Mega Baquarrel*
Max	*Maximum*
m.Sv E.D	*Millisevert Effective Dose*
P.U.J	*Pelviureteric Junction*
A.P	*Antero-Posterior*
R.P.O	*Right Posterior Oblique*
R.I.C.K	*Radioisotope Center Khartoum*

ABSTRUCT

The study is performed prospectively conducted at radioisotope center in Khartoum, RICK. **75** cases of different age groups of obstructive uropathy was selected whose diagnosed by IVU in different centers, Male (48) 64% ,Female ((27) 36%. The onset of presentation was acute (2) 2.7% , chronic (66) 88.0% , acute on chronic (7) 9.3% . The radio opaque shadows was seen as a cause of obstruction in(52) 69.3%, and not seen in (23) 30.7% .The radio opaque shadows was Single in (32)42.7%, Multiple in (20)26.7%. The IVU shows (40)53.3% with non functioning kidneys, the remaining (35)46.7% were different grades of obstruction.

The ureter was normal in (40) 53.3%, dilated in (2) 2.7%, Not seen in (33) 44.0%. The bladder was Normal in (75)100%.

Forty percent (53.3% non-visualizing kidneys on excretory urography were studied with Tc^{99m} scintiscanning. In (29)38.7% no blood flow , in (11)14.7% little blood flow were demonstrated on nucleide scanning. The relative perfusion was 1-10.9% in (14)18.7% patients, 11-20.9% in (15)20.0%, 21-30.9% in (7)9.3% , 31-40.9% in (3)4.0% & 41-50.9% in (1)1.3% patient. The relative function was less than 1% in (3)4.0%patients, 1-10.9% in (30)40.0%, 11-20.9% in (5)6.7% & 21-30.9% in (2)2.7% patients.

Different grades of obstructive uropathy were studied ; In (2)2.7% grade 1 show normal blood flow and relative perfusion of 41-50.9% and 51-60.9%, while relative function were 41-50.9% and 51-60.9% respectively.

In 7 cases of grade 2; (4)5.3% patients show normal blood flow, (3)4.0% show moderate blood flow, (2)2.7% show relative perfusion 31-40.9%, (4)5.3% relative perfusion 41-50.9% and (1)1.3% relative perfusion 51-60.9%, Relative function show 31-40.9% in (3)4.0%, 41-50.9% in (2)2.7% patients & 61-70.9% in (2)2.7% patients.

In 21 cases of grade 3; (10)13.3% show little blood flow and (11)14.7% moderate blood flow. The relative perfusion shows 21-30.9% in (8)10.7% patients, 31-40.9% in (6)8.0% patients, 41-50.9% in (4)5.3% patients and 51-60.9% in (3)4.0% patients. The

relative function shows 11-20.9% in (6)8.0% patients, 21-30.9% in (6)8.0% patients, 31-40.9% in (8)10.7% patients & 41-50.9% in (1)1.3%patient.

In 8 cases of grade 4; (7)9.3% show little blood flow and (1)1.3% moderate blood flow, (5)6.7% patients show relative perfusion of 21-30.9%, in (3)4.0% patients is 31-40.9%. The relative function is 1-10.9% in (4)5.3% patients, 11-20.9% in (3)4.0% patients, 31-40.9% in (1)1.3% patient.

CHAPTER ONE

INTRODUCTION AND LITRERATURE REVIEW

INTRODUCTION

Urinary obstruction affects patients of all ages and is responsible for thousands of hospital admissions and surgical procedures each year.

Obstruction predisposes to urinary infection, renal damage, and renal failure. At autopsy, 3-4% of adult and 2% of children have urinary obstruction. Because it is one of the few causes of potentially reversible renal damage, clinical and laboratory investigations continue to be directed at improving earlier diagnosis and treatment. Sadly, clinical clues suggesting obstructive develop relatively late in many patients, and renal damage can progress to renal failure without even a hiat that the urinary tract in compromised.[i]

Information about the total and individual function of the kidney is necessary for clinical management particularly surgical treatment, and this functional assessment can only be achieved with radionuclide methods, when this essential difference between radionucliede and other radiological procedures (e.g. I.V.U) is appreciated; the use of each technique and interpretation of the result can be optimized for each clinical problem[(1)]

Study of the problem:

To evaluate the importance of both I.V.U and radionuclides studies in the investigation of obstructive uropathy with each other. The I.V.U, or excretory urogram, is still the most valuable examination of urinary tract, it gives excellent anatomical images of the kidneys and to some extend, an indication of their function.

The importance of radionucliede in the investigation of renal diseases is the functional and quantitative information. They provide whereas radiological techniques for the most part (but not exclusively) provide structural detail.

The methods are therefore, complementary and in general they provide more useful clinical information together than alone.

OBJECTIVES

- To evaluate the function of kidney by I.V.U and radioisotope renal scan.
- To evaluate the correlation between the two methods.

MATERIALS AND METHODS

It is a retrospective hospital-based study. The study population will consist of patient with different age groups and sexes diagnosed as obstructive uropathy by other imaging studies including I.V.U and radioisotope renal scan is conducted at Radio-Isotope Center in Khartoum.

Data analysis:

The collected data will be intered and processed in a personal computer.

We will use SPSS program (statistical Package for Social Sciences) for population, means, sensitivity, and specificity standard deviation.etc.

- Correlation between the two methods.

Definitions:

The subject of urinary obstruction is plagued by terminological problems. To avoid confusion, some definitions are needed.

Obstruction:

From an urodynamic standpoint, the diagnosis of urinary obstruction requires proof of increased resistance to urine flow. Pressure within the collecting system is a function of resistance and urine flow (pressure = flow x resistance).

Maintenance of urine flow with increased resistance produces elevated pressures within the collecting system. In many cases, this can be deduced safely from excretory urography, computed tomography, retrograde pyelography, radionuclide renography, or other imaging examinations.[1]

Functional obstruction:

Obstructed patients with a fixed point of narrowing in urinary tract are said to have an anatomical obstruction. Some times, however, a fixed narrowing cannot be demonstrated despite elevated pressures proximally. These are called functional obstruction. Examples are detrusor-bladder neck and detrusor-external sphincter dyssynergia, primary obstructive megaureter and some cases of pelviureteric junction (PUJ) obstruction.[1]

Hydronephrosis*:*

To the pathologist, the term hydronephrosis is specific: dilatation of renal pelvis and calice (pelvicaliectasis) in association with back pressure changes in renal parenchyma. For urologist and radiologist on the other hand, the term hydronephrosis has evolved differently to mean only dilatation of the collecting structures, with or without obstruction. As used here hydronephrosis refer only to dilatation of the collecting system, which may or may not be obstructed.[1]

Not all hydronephrosis is caused by obstruction, for example, vesicoureteric reflux may cause severe but non-obstructive hydronephrosis.

Hydronephrosis should be categorized as either obstructive on non-obstructive.

With obstructive hydronephrosis the degree of dilatation of the pelvicaliceal system are a notoriously poor and at time frankly misleading indicator of the severity of obstruction.

Moreover, a common error is to assume that mild hydronephrosis indicate only mild obstruction. Further, some patients with acute, complete obstruction have no hydronephrosis at all in the first 24-48 hours after onset of obstruction.

A four-grade classification system is used for hydronephrosis based on excretory urography on ultrasound.

Grade I: Is the most minimal dilatation appreciable, characterized by slight blunting of caliceal fonices. Successful abdominal compression during excreting urogarphy in a non-obstructed patient often produces a picture of grade one hydronephrosis, similarly, a well-hydrated patient often exhibits grade I hydronephrosis on ultrasound.

Grade II, Grade III and IV correspond to mild, moderate, and severe hydronephrosis.

Grade II has obvious blunting of the caliceal fornices and enlargement of the calices, but the intruding shadows of the papilla, although flattened, are still easily seen.

Grade III characterized by rounding of the calices with obliteration of the papillae.

Grade IV extreme caliceal ballooning define it.[1]

Renal parenchymal thinning is often obvious with grade III or IV hydronephrosis, but there is no fixed relationship between the degree of dilatation and parenchymal atrophy. Its important to reemphasize that grade I hydronephrosis can be associated with total obstruction and hence cannot be ignored.

Hydrocalix: Caliceal dilatation caused by obstruction of its neck (infundibulum) is termed hydrocalix or hydrocalicosis.[1]

Hydroureter:

A dilated ureter may be called hydroureter, ureterectasis, or simply wide ureter. Ureteric dilatation, like hydronephrosis, however, even, may be either obstructive or non-obstructive. Obstructed ureters and ureters subjected to repeated vesicoureteric reflux often become remarkably tortuous and dilated. Ureteric tortousity reflects elongation of a tubular, muscular structure that is fixed at both ends and is a response of the ureter to increased intraluminal pressure and volume. The normal ureter often has a pathologically insignificant spindle-shaped or fusiform dilatation just above its crossing with the iliac artery. The proximal uriteric caliber is normal.[1]

Pathophysiology:

In a normally functioning kidney, urine is formed within the tubular system. It empties into the clayces, where pacemaker sites generate peristaltic activity to propel urine into the pelvis. Urine is conveyed into the ureter, where further peristalsis moves it in boluses into the bladder. The collecting system has a baseline pressure of 0-10 cm water, with peristaltic waves producing pressure in the range of 20-60 cm water.

Pelvic pressure remains low despite the much higher pressure generated transiently within the ureteric lumen during peristalsis and within the bladder during micturation with ureteric obstruction or vesicoureteric reflux, renal pelvic pressure rises and may lead to kidney damage. Obstructive uropathy is a general term that describes obstructive morphological changes in any part of the urinary tract, i.e. hydronephrosis. The renal functional or physiological alteration caused by obstruction is termed obstructive nephropathy. The effects of urinary obstruction on overall renal function are influenced by whether obstruction is unilateral or bilateral, acute or chronic, partial or complete, and intermittent or constant. Pre-existing renal disease or coexistent infection also modify the effects of obstruction upon renal function.[(ii)]

Acute obstructive nephropathy:

Upon sudden, complete obstruction of the ureter, intrapelvic pressure rises rapidly, the rate of increases depending in part upon the state of hydration and the baseline health of the kidney. Levels of 50-70 mmHg are commonly reached within minutes to hours, at first, renal blood flow (RBF) increases transiently, but over the next 6-12 hours renal vascular resistance increases, causing a drop in RBF of up to 30%.[(iii)] There are two mechanisms that act to temporarily decompress the nephron in the face of raised intratubular pressure: (1) Pyelosinous and pyelovenous backflow via fornix terns; and (2) enhanced reabsorption to fluid fronie tubuls. Both makes room for continuing but reduced glomerular filtration in the face of total obstruction. There is considerable evidence that a preglomerular vasoconstriction, probably at the afferent arteriolar level, develops early in acute obstructive nephropathy and plays a major role in the inescapable reduction in glomerular filtration rate (GFR). Doppler ultrasound measurement of the renal resistive-index has been used with variable success to confirm an increased intrarenal vascular resistance in-patient with acute obstruction.[iv]

The results of animal experiments suggest that rapid changes in vascular resistance, renal blood flow, intrarenal blood flow distribution, and GFR are mediated by the intrarenal release of prostaglandins,. Angiotensin, and other vasoactive compounds[v]

After several days of total ureteric obstruction, intrapelvic pressure begins to fall as progressively less glomerular filtrate is produced. In 6-8 weeks of continuing reduced blood flow ischamic tissue loss occurs. The renal intrapelvic pressure returns to normal or even subnormal levels as the kidney's capacity to generate urine against a fixed resistance is lost.[6]

Experiments conducted by uaghan and Gillen water on dogs revealed a direct relationship between the duration of obstruction and loss or renal function. Complete recovery of function occurred when the obstruction was relived in 7 days; permanent loss of function was observed when the obstruction continued for 42-56 days.

Obstructive and post obstructive atrophy:

Relief of a total but short-lived obstruction leads to full restoration of GFR as long as there is no function or pre-existing renal disease. Longer periods of total obstruction cause progressive nephrone loss, leading to medullary and cortical atrophy.[3]

Relief of obstruction that has already caused atrophy is followed by improvement in renal function, but not to normal. Evidence of glomerular loss and tubular damage can be demonstrated by specific tests of function. The kidney often shrinks, the calices become blunted, and urinary concentration and acidification mechanisms are impaired.[3]

These semi-converted kidneys showing the anatomical and functional sequel of a temporary bout of obstruction are said to be exhibit (post obstructive atrophy). Some experiments suggest that even a few days of complete obstruction may cause subtle yet permanent enthrone abnormality that are most detected by the usual global tests of glomerular and tubular function.[6]

Complication of acute obstruction:

1. ***Calyceal perforation:*** The fornix is the most common site of upper rupture caused by high pelvic pressure, spilled urine fills the renal sinus (pylosinus back flow), perirenal space, and retroperitoneum. Contrast assumes a characteristic "streaky" appearance as it descends between fascias, septa, and retroperitoneal fat. Urine outside the collecting system is detected even without intravenous contrast on CT, sonography, and even on MR imaging. Contrast in the renal sinus may be contained and resemble a peripelvic cyst.[7]

2. ***Renal sinus lymphocele:***

There is marked increase in renal lymph flow during obstruction. The lymphatic are distended to maximum and, rarely, some may rupture. If extra-vasated lymph is localized in the renal sinus, a cyst like structure is seen on sonography, on I.V.P and CT, displacement of the renal pelvis is evident.(7)

Non dilated obstruction uropathy:

Even in presence of most sever obstruction, on rare occasion the upper tract will not be dilated.

Such obstruction may be impossible to diagnose by sonography and even by CT.(8)

Chronic obstruction (complete):

Radiological finding:

Progress dilatation of the upper tract accompanies complete obstruction; the nephrone gradually disappears until after 6-12 weeks there is irreversible loss of renal function. Grade III or IV hydronephrosis is present on sonography. Remaining renal parenchyma is only one millimeter thick, but close opacity after contrast injection, this sign known as shell nephrogram, is specific for chronic obstruction.(7)

Chronic obstruction (Partial):

Radiological findings:

A. Urography and CT:

1. Delay in excretion.

2. Dilatation: usually detected on contrast, examination, dilatation is also seen on unenhanced CT. Dilated system must be differentiated from pelvic and parapelvic cysts.

3. Negative pyelogram. Nephrogram may contrast the dilated, unopacified collecting system from outside thus rendering it visible.

4. Crescent sign of Dunbar: when partial obstruction persist unchecked, dilatation of the collecting system continues. The collecting ducts also dilated and gradually assume a position parallel to the renal outline. Concentrated contrast in dilated ducts is seen as a crescent, a radiographic sign pathognomonic for chronic obstruction.(9)

5. Visualization of individual papillary similar to crescent sign, if the collecting ducts are seen in face, they look like dense dots on urogram.(10)

6. Fluid-flow interface sign. Specific gravity of contrast is grater than that of urine; contrast tends to accumulate in the most dependent part of the Reno collecting system, gradually displacing urine a head of it. The interface between contrast and urine is seen on CT. On urography, fluid fluid interface is seen only in the upright position and, although pathognomonic for obstruction.

7. Pelvocalyceal wall opacification; long standing obstruction may be accompained by hyperemia and thicking or swelling of the pelvis wall. After abolus of contrast, a pelvocalyceal wall blush may be absorbed on sonography and even better on CT.

8. Failure to drain in upright position; good drainage on an upright radiograph rules out obstruction. Failure to empty in such a position is very suggestive of obstruction[11]

B. Sonography:

Dilatation of the collecting system and the ureter is evident, depending on the site, degree, and longevity of the obstruction grade I, II, III, IV are in common use.

C. Nuclear medicine:

Tc^{99m} DTPA scan will show delayed excretion, diminished uptake compared with the normal side, dilated collecting system, and occasionally dilated ureter to the point of the obstruction.

D. MRI imaging:

Magnetic imaging is not the primary method for evaluating a urinary tract obstruction.[7]

Methods of imaging the urinary tract

1. Plain film, including tomography.
2. Excretion urography.
3. Micturating cystourethrography.
4. Ascending urethrography.
5. Retrograde pyeloureterography.
6. Percutaneous renal puncture.
7. Arteriography.
8. Venography-including renal vein sampling.

9. U.S.

10. Radionuclide imaging.

    - Static.
    - Dynamic.

11. CT.

12. MRI.[12]

LITRETURE RIVEW

Kallerhoff M, et al. 1992 studied, Obstruction of the kidney leads to terminal kidney failure within a few years. Therefore, early recognition of such obstruction is of importance. Non-invasive diagnostic ultrasound examination now allows intrauterine visualization of a suspected obstruction. However, the implications of such a dilated ureteral pelvic system are obscure. Whether there is obstruction or dilatation can only be evaluated postnatally by a nuclear technique. The aim of our study was to measure the recovery of kidney function. They investigated 13 kidneys of 9 newborns or small infants (up to 2 years). The follow-up was continuous for up to 29 days. The parameters were: urine output (24-h clearance), glomerular filtration rate, fractional excretion of sodium and potassium, free water clearance, total protein excretion, albumin and alpha 1 microglobulin excretion. The urine output fell from 0.3 to 0.12 ml/min within 14 days after relief of obstruction. The glomerular filtration rate rose from nearly 30 ml/min to about 50 ml/min within a week. The fractional excretion of sodium and potassium indicated recovery of the proximal tubli. The fractional sodium excretion fell below 1% within 4 days. The free water clearance reflects the concentrating ability of the kidney, and in kidneys from newborns it had only positive values, while in kidneys of children older than 6 months there were also negative values. The protein excretion and the albuminuria showed recovery of the glomerular as well as the tubular system.(13)

Anochie I, Eke F. 2004 studied: Obstructive uropathy is a cause of morbidity and mortality in children. This study was carried out to identify the causes and outcome of obstructive uropathies seen in our children's ward. METHODS: The case records of children with the diagnosis of obstructive uropathies who were treated at the University of Port Harcourt Teaching Hospital (UPTH) between October 1997 and October 2002 were reviewed. RESULTS: A total of 20 patients, all males were seen. The ages ranged from 4 weeks to 13 years with a mean of 2.3+/-2.8 years. The causes of obstructive uropathy were posterior urethral valves (PUV) 16 (80%), bladder calculi 2 (10%), bladder rhabdomyosarcoma and urethral stenosis 1 (5%) each. Poor stream of urine and dysuria were the commonest presentation. The duration of symptoms ranged from 2 days to 13 years. One of the patients with PUV was diagnosed prenatally. Hypertension and urinary tract infection each were found in 50% of the patients while 6 (30%) presented with features of renal failure. Seven patients died, giving a mortality rate of 35%. Age at presentation less than one year and duration of symptoms longer than one month was associated with higher mortality although it was not statistically significant. CONCLUSION: PUV is the commonest cause of obstructive uropathy seen in UPTH. Earlier diagnosis during pre-natal period or when this is not possible, diagnosis within the first week of life should be encouraged. Parents, nurses and attending doctors should ensure they observe the urinary stream of every male child before discharge from the hospital for early detection and management.[(14)]

Cronan JJ. 1992 Studied, Ultrasound is an integral tool in the contemporary assessment of urinary tract obstruction. Pulsed and color Doppler have eliminated many previous false-positives due to blood vessels or non-obstructive hydronephrosis. Limitations of the ultrasound technique still exist and on occasion necessitate the utilization of intravenous urography.[15]

Parkhouse HF, Barratt TM, 1988 studied that dilatation of the urinary tract does not necessarily imply obstruction, and other factors may be operative: maldevelopment, infection, reflux, and polyuria. Obstruction of the urinary tract in intra-uterine life is associated with renal dysplasia: the original obstructive lesion may be transient but the consequent dysplasia and dilatation may be permanent. Routine antenatal ultrasound identifies a new population of infants with urinary tract dilatation, many of whom remain a symptomatic and would not otherwise have come to medical attention: the natural history and appropriate schedules of investigation and management of this group are still being evaluated. Anatomical imaging by ultrasound establishes the presence and extent of dilatation. Micturating cystourethrography, intravenous urography and antegrade pyelography establish the site but not the functional significance of an obstructive lesion. Isotope renal scanning with Tc^{99m}-DTPA may identify an acutely obstructed kidney with a decrease renal uptake, prolonged parenchymal transit time, and delayed clearance of the isotope from the renal pelvis after furosemide. However, such analyses often give equivocal results in infants with poor renal function and markedly dilated urinary tracts. Obstructive uropathy should be seen as a disturbance of the normal pressure-flow relationships in the urinary tract, and be defined and investigated as such. Antegrade perfusion with renal pelvic pressure measurements has technical pitfalls, but is the definitive method of establishing upper tract obstruction.

Videocystourethrography is the established method of investigating the lower urinary tract in older children but needs further development to be applicable to infants.[16]

Somerville CA, Chmiel R, Niall JF, Murphy BF. 1992 Studied the occurrence of obstructive uropathy in the absence of dilatation of the urinary tract. CLINICAL FEATURES: Five cases of non-dilated obstructive nephropathy are described. All patients were uraemic on presentation. Obstruction was caused by retroperitoneal malignancy in two patients and uric acid lithiasis in the remaining three. All patients had at least one ultrasound examination. Isotope renography and computed tomography were performed in three and four patients respectively. None of these imaging techniques suggested obstruction in any of the cases. Radionuclide scans were characterized by unusually poor perfusion and parenchymal phase images. INTERVENTION AND OUTCOME: An immediate diuresis and a rapid return of normal renal function occurred after relief of the obstruction in all cases. CONCLUSION: The absence of dilatation in obstructive nephropathy is uncommon but may be responsible for delayed diagnosis and management of a readily treatable cause of renal failure. [17]

el-Dahr SS, Lewy JE. 1992 studied congenital urinary tract obstruction is a common cause of renal failure accounting for up to 20% of end-stage renal disease cases. Intrauterine obstruction often results in parenchymal loss and renal dysfunction. The pathophysiology of obstructive nephropathy and its further depression of renal function are related to severe renal vasoconstriction, which is in large part angiotensin mediated. Signs suggestive of urinary obstruction in the newborn may include an abdominal mass, hypertension, oligoanuria/polyuria, urosepsis, and hyperchloremic acidosis. The combination of renal ultrasound, diuretic renal scans, and voiding cystourethrogram are the main diagnostic modalities in infants with hydronephrosis. Nonsurgical management of ureteropelvic junction obstruction has become more popular, particularly in mild to moderate cases. Early fulguration or bypassing the obstruction of urethral valves is essential and a decrease in serum creatinine to below 1 mg/dL within 1 month of relief of obstruction is a favorable prognostic sign. Obstruction complicated by infection is dangerous and requires prompt intervention. Any newborn with a urinary tract infection, regardless of sex, should be presumed to have urinary obstruction or reflux until proven otherwise.(18)

Ballesteros Sampol JJ. 2002 studied; Obstructive uropathy is a result of the particular tubular configuration of the urinary tract and involves virtually all its organs. This review analyses upper urinary tract obstructions as well as a number of lower urinary tract conditions whenever the circumstances of the urological disease progress so advises it. A comprehensive exposition is made of the different types of obstruction, the basic pathophysiological principles and the respective anatomical transposition. The pathophysiological features characterising intrauterine obstructions, obstructions occurring during pregnancy and in the elderly are also highlighted. Finally an updated analysis is made of the diagnostic contribution made by all techniques susceptible to be used when dealing with obstructive uropathies highlighting the prognostic relevance of early diagnosis and treatment. The hope placed in the use of modern techniques to establish a differential diagnosis of chronic obstructive uropathy is also emphasized.[19]

Coar D. 1991 studied; in summary, obstructive nephropathy accounts for 2 to 10 percent of acute renal failure. Clinical signs, such as anuria with a rising serum creatinine back pain, may suggest the diagnosis. Ultrasound is a good screening test, but pyelography may be required to make the diagnosis. Treatment is primarily aimed at relieving the obstruction and managing the post-obstructive diuresis. If found early, even patients with complete obstruction, once relieved, experience a complete return of renal function.[20]

DewanPA, Moon D, Anderson K. 1991 studied; OBJECTIVES: To analyze the relationship between hydronephrosis due to urinary tract obstruction and the presence of the sonographic eggshell sign, which is a recently described crescent of increased echogenicity at the caliceal/parenchymal interface and possibly an indicator of raised intrarenal pressure. METHODS: All patients presenting between 1996 and 1999 for surgical management of pelviureteral junction obstruction or congenital posterior urethral obstruction had films reviewed for the presence of the eggshell sign. RESULTS: Of 94 patients, 40 presented postnatally and 54 had hydronephrosis detected on the antenatal ultrasound scan. Of the postnatal group, 16 (40%) had urethral obstruction, of whom 4 (25%) displayed the eggshell sign; in the 24 with pelviureteral junction obstruction, the echogenic pericaliceal crescent was seen in 5 (20.8%). Of the 54 in the prenatal group, 8 (15.4%) were found to have urethral obstruction, 5 (62.5%) of whom demonstrated the eggshell sign. Of the 46 prenatally diagnosed patients with pelviureteral junction obstruction, 31 (70.5%) displayed the eggshell sign before birth; we were unable to satisfactorily review 2 patients' ultrasound scans. CONCLUSIONS: Antenatally diagnosed hydronephrosis due to significant urinary tract obstruction seems to be related to the appearance of the eggshell sign on ultrasonography, particularly in those patients with pelviureteral junction obstruction. Those patients without significant caliceal distension and those with renal dysplasia or severe hydronephrosis with low-pressure kidneys were less likely to display the eggshell sign. Although the association with other causes of hydronephrosis is unknown, we believe these figures support the need for further investigation of the eggshell sign as a marker of raised intrarenal pressure to possibly provide another data point in the sonographic evaluation of congenital hydronephrosis.(21)

McAfee JG, Singh A, O'Callaghan JP. 1980 Studied, nuclear imaging supplementary to excretory urography did not improve the detection of obstruction or the determination of the site or etiology of the lesion. However, rapid sequential radionuclide images showed decreased renal perfusion in 64%, more frequently than did an obstructive nephrogram (40%); this finding appeared to occur with more severe degrees of obstruction. Functional impairment of the obstructed kidney was demonstrated more often with I^{131} Hippuran (o-iodohippurate sodium) (91%) than with Tc^{99m} glucoheptonate (68%) or excretory urography (66%). Neither nuclear nor urographic studies could predict the degree of functional recovery of the kidney until the increased intrapelvic pressures was relieved.[22]

Jakobsen H et al. 1988 Diuresis renography and pressure flow studies were performed in 14 patients with unilateral hydronephrosis. Based upon the results of intravenous pyelography, typical symptomatology, and the outcome of surgical treatment, all patients were found to have upper urinary tract obstruction. It was therefore possible to calculate the sensitivity of the two tests. Obstruction was found at the pressure flow studies in 7 of 14 patients (50%), while an obstructive pattern was found at diuresis renography in 12 of 13 patients (92%). Due to a very low glomerular filtration rate, diuresis renography was equivocal in 1 case. Based upon these results, diuresis renography seems to be superior to pressure flow studies in cases with upper urinary tract obstruction.[23]

Mesrobian HG, 1991 studied; radionuclide diuresis pyelograph; Radionuclide diuresis renography continues to be relied upon as a major diagnostic tool to differentiate obstructive and non obstructive hydronephrosis. Controversy continues to exist with respect to methodology and interpretation of intermediate obstructive patterns. In this study radionuclide diuresis pyelography was performed in 11 renal units with hydronephrosis and a pre-existing percutaneous nephrostomy tube in place. The procedure consisted of the introduction per kidney of 20 muc. /kg. Tc^{99m} and sterile saline as a bolus into the renal pelvis via a percutaneous nephrostomy tube to produce a volume equal to the capacity of the hydronephrotic system. The kidney was monitored with a gamma camera and computer system. Furosemide (0.3

mg./kg.) was injected intravenously halfway into a 40-minute study. The time/activity curves thus generated were relatively independent of the cortical transport phase. The 2 types of curves were accelerated and constant. Analysis of these pyelogram curves revealed a strong correlation between the presence of an accelerated clearance rate response to furosemide and hydronephrosis without obstruction in 5 of 6 renal units. A constant clearance rate response to furosemide correlated with the presence of obstruction in 4 of 5 units. These observations may indicate that diuretic pyelogram curve dynamics may reflect not only the presence or absence of obstruction but also the ability of the hydronephrotic kidney to respond to the diuretic. More experience must be accumulated to determine the conditions under which diuresis pyelography may become useful clinically.(24)

Rufini V, et al. 2002 studied; unilateral hydronephrosis due to obstruction of the uretero-pelvic junction is one of the most common indications for scintigraphic evaluation of the kidneys in the pediatric patient. In these cases, dynamic renal scintigraphy-both standard and after diuretic administration--is a simple and well-established procedure, allowing demonstration of structural and functional abnormalities of the involved kidney, with relatively low radiation dose to the child. Scintigraphic procedures allow the differential diagnosis between obstructive and non-obstructive causes as well as an estimation of renal function of the hydronephrotic kidney providing indication for a conservative or a surgical approach.(25)

Xianyu Z, Wu H, Zhou J, Zhou P, Zhao M. 2001 studied Nuclide renal dynamic imaging on 88 (110 times) transplanted kidney. Two kinds of renal scintigraphic characteristics were identified in recipients with supravesical obstruction of the graft. First, the regular type was characterized by radioactivity defect area in kidney parenchyma during early uptake period followed by ureteropelvic retention. Second, the tubular type was typified by cortical retention and attenuation in collecting system during the whole test period with a special sign of "hollow kidney". Non-obstructive dilated calyces showed similar signs as the regular type. Acute rejection reaction and tubule necrosis demonstrated obstructive time-activity curves. However, the radioactivity retention appeared in cortex. It was suggested that dilated calyces and obstructive renogram might not be reliable evidence for upper urinary tract obstruction. The signs of radioactivity attenuation in kidney parenchyma during early uptake period followed by ureteropelvic retention may be more valuable for the evaluation. As for tubular obstruction, specified "hollow kidney" was the characteristic sign, which is helpful for the diagnosis.(26)

CHAPTER TWO

PATIENT AND METHODS

PATIENT AND METHODS

Study type;

This is an observational hospital based study performed retrospectively.

Study area;

The study was conducted at radioisotope center in Khartoum, RICK.

Study sample*;*

Seventy-five patients.

Study population;

The study population was patients with obstructive uropathy who had intravenous urography, performed before in different centers and then isotope study was performed in nuclear department in RICK by Gamma camera with low-energy general purpose collimater.

Data analysis; Data was analyzed and then displayed in form of text, tables and figures.

Data collection techniques;

All data were collected by the author, were collected in pre designed data sheet, and included the following;

1.The personal data.

2.I.V.U finding.

3.Renal dynamic isotope study finding.

Material:

Urinary tract obstruction is a very common problem that, if untreated, may lead to progressive renal damage. Acute obstruction is diagnosed clinically and by radiological techniques. Uptake of radioactive tracer varies from no uptake at all to normal uptake depending on the pressure build-up in the obstructed collecting system and time.

Radionuclide function measurements have limited prognostic value in acute obstruction. Chronic obstruction leads to the compromise of renal function. Radiologic techniques (excretory and retrograde urogram), CT and US accurately define the anatomy of the involved portion of the urological tract and the pathology of the lesion but not the functional status of the individual kidneys in a simple quantitative manner. The flow, uptake, and excretion of tracers accurately reflect the functional status of each kidney and are used to follow the renal function after therapeutic interventions. Invasive testing often may be necessary to predict the functional recovery.

Excretion urography:

Indications: suspected urinary tract pathology.

Contrast medium:

HOCM or LOCM 370 is acceptable but the following "high-risk" groups should receive LOCM:

1. Infants and small children and the elderly.
2. Those with renal and/or cardiac failure.
3. Poorly hydrated patients.
4. Patients with diabetes, myelomatosis or sickle cell anemia.
5. Patients who had a previous severe contrast medium reaction with HOCM or those with a strong allergic history.

Adult dose: 50 ml, and paediatric dose 1ml/kg.[12]

Patient preparation*:*

1. No food for 5 hours prior to the examination. Dehydration is not necessary and does not improve image quality, and it is contraindicated in renal failure, multiple myloma and infancy.
2. Patients should, preferably, be ambulant for 2 hours prior to the examination to reduce bowel gas.
3. The routine administration of bowel preparation fails to improve the diagnostic quality of the examination and its use makes the examination more unpleasant for the patient.
4. If the examination is to be performed on a patient who has previously had a severe contrast medium reaction, consideration should be given to administering

methyl prednisolone 32 mg orally 12 and 2 hours prior to injection of contrast medium in addition to ensuring that a LOCM is used.[12]

Preliminary film:

1. Supine, full-length AP of the abdomen, in inspiration. The lower border of the cassette is at the level of the symphysis pubis and the X-ray beam is centered in the mid-line at the level of the iliac crests. The position of overlying opacities may be further determined by:
2. Supine AP of the renal areas, in expiration. The X-ray beam is centered in the mid-line at the level of the lower costal margin.
3. 35% posterior oblique views or tomography of the kidneys at the level of a third of the AP diameter of the patient (approx. 8-11 cm). The optimal angle of swing is 25-40^0. The examination should not proceed further until these films have been reviewed by the radiologist and deemed satisfactory.[12]

Technique:

The median antecubital vein is the preferred injection site because flow is retarded in the cephalic vein as it pierces the clavipectoral fascia. A 19-G needle is advanced up the vein to reduce the risk of a perivenous injection and the injection is given rapidly as a bolus to maximize the density of the nephrogram.

Upper arm or shoulder pain may be due to stasis of contrast medium in the vein. This is relieved by abduction of the arm.[12]

Films

1. Immediate film AP of the renal areas. This film is exposed 10-14s after the injection (arm-to-kidney time). It aims to show the nephrogram, i.e. the renal parenchyma opacified by contrast medium in the renal tubules.
2. Five minutes film; AP of the renal areas. This film is taken to determine if excretion is symmetrical and is invaluable for assessing the need to modify technique, e.g. a further injection of contrast medium if there has been poor initial opacification. A compression band is now applied around the patient's abdomen and the balloon positioned midway between the anterior superior iliac spines, i.e. precisely over the ureters as they cross the pelvic brim. The aim is to produce better pelvicalyceal distension. Compression is contraindicated:

   One. After recent abdominal surgery.

   Two. After renal trauma.

   Three. If there is a large abdominal mass.

   Four. When the 5 min film shows already distended calyces.
3. Fifteen minutes film. AP of the renal areas. There is usually adequate distension of the pelvicalyceal systems with opaque urine by this time. Compression is released when satisfactory, demonstration of the pelvicalyceal system has been achieved.
4. Release film. Supine AP abdomen. This film is taken to show the whole urinary tract. If this film is satisfactory, the patient is asked to empty their bladder
5. After micturition film. Based on the clinical findings and the radiological findings on the earlier films, this will be either a full-length abdominal film or a coned

view of the bladder with the tube angled 15 caudal and centered 5 cm above the symphysis pubis. The principal value of this film is to assess bladder emptying to demonstrate a return to normal of dilated upper tracts with relief of bladder pressure, to aid the diagnosis of bladder tumours, to confirm ureterovesical junction calculi and uncommonly, to demonstrate a urethral diverticulum in females.[12]

Additional films:

1. Thirty-five degree posterior oblique of the kidneys, ureters or bladder.
2. Tomography-when there are confusing overlying shadow.
3. Thirty degree caudad angulations of the tube for the renal area. This may throw a faecal laden transverse colon clear of the kidneys.
4. Prone abdomen-may provide better visualization of the ureters by making them more dependent.
5. Delayed films-may be necessary for up to 24 hours after injection in cases of obstructive uropathy.[12]

The infant:

Excretion urography is seldom indicated in this age group; U/S with or without radionuclide imaging is the preferred imaging modality. As in all paediatric work the technique should be flexible to suit the problem. The radiologist should inspect each film and decide on any modification of technique before the next film. A typical basic film sequence is:

One. A 2-minute film of the renal areas.

Two. A 5-minute film of the renal areas.

Three. A 15-minute full-length abdominal film.

Abdominal compression is not used. Excretion of contrast medium during the first month of life is delayed and prolonged. Optimum visualization of the upper urinary tract may not occur until 1-3 hours, therefore, if the initial 2 and 5 min films show little opacification, further films at 1,2 and 3hour may provide more information than multiple films in the first hour.[12]

The older child:

Again, radiation dose should be minimized by the use of ultrasound and radionuclides in preference to radiography. The adult film sequence is used.

Excessive bowel gas may interfere with satisfactory visualization of the kidneys. A fizzy drink will produce a gas-filled stomach, which acts as a window through which the kidneys can be seen, if the gas-filled stomach is not large enough to reveal the right kidney the patient can be turned into the RPO position.

An important indication for excretion urography in children is evaluation of diurnal enuresis where an ectopic ureter is a possibility which has not be excluded or confirmed by other imaging modalities. The position of the distal ureters is best documented by obtaining spot films on a fluoroscopy unit with the child in a 30-degree oblique position.[12]

Excretory micturating cystourethrography:

This technique is used when further information is required regarding the urethra or the act of micturition. However, opacification is not as great as when contrast medium is instilled retrogradely. Excretion urography is performed in the usual manner and when the bladder is full, spot films are taken of the bladder and urethra during micturition.[12]

Complications:

- Due to the contrast medium.
- Due to the technique: incorrectly applied abdominal compression may produce intolerable discomfort or hypotension.[12]

Dynamic renal scintigraphy:

Indications:

1. Diagnosis of obstructed versus non-obstructed dilatation.
2. Diagnosis of renal artery stenosis.
3. Assessment of perfusion in acute renal failure.
4. Assessment of renal function following drainage procedures to the urinary tract.
5. Demonstration of vesicoureteric reflux.
6. Assessment of renal transplantation.
7. Renal trauma.[12]

Contraindications*:* none.[12]

Radiopharamaceuticals:

Tc^{99m}MAG-3, 100 MBq max (0.7mSv ED), (200 MBq max (1mSv ED) for first-pass blood flow imaging) highly protein bound, so mainly cleared by tubular secretion (80%) with only around 20% glomerular filtration (mean normal clearance is approx.

370 ml min-1). Good quality images due to fast clearance and greater kidney/background ratio than ^{99m}Tc-diethylene triamine pentacetic acid (DTPA), therefore better for poor renal function, although more expensive. Now the radiopharmaceutical of choice due to best image quality.

1. ^{99m}TC-DTPA, 150 MBq typical (1 mSv ED), 300MBq max (2mSv ED), (800 MBq max 5 mSv ED) for first-pass blood flow imaging). Cleared by glomerulr filtration (mean normal clearance is approx. 120 ml min^{-1}). Lower kidney/background ratio than MAG-3 or hippuran, so poorer image quality and moisier clearance curves, Cheap and widely available.
2. ^{123}I-orthoiodohippurate (hippuran), 20 MBq max (0.2 mSv ED). Almost entirely cleared by tubular secretion (mean normal clearance is approx. 500 ml min^{-1}). High kidney/background ration, but image quality is limited by the recommended maximum activity. For many years the gold standard, but high cost and limited availability due to ^{123}I being a cyclotron product.[12]

Equipment:

1. Gamma camera.
2. Low-energy general-purpose collimator.

Patient preparation:

1. The patient should be well hydrated with around 500 ml of fluid immediately before administration of tracer.
2. The bladder should be voided before injection. [27]

Technique:

1. The patient lies supine or sits reclining with their back against the camera.
2. The radiopharmaceutical is injected I.V and image acquisition is started simultaneously.
3. Perform dynamic 128x128 acquisitions with 10-15 sec frames for 30-40 min (for quantitative perfusion studies, e.g. in the transplanted kidneys, 1-2 sec frames over first minute are acquired.
4. If poor excretion is seen from one or both kidneys after 10-20 min, a diuretic (frusemide 40 mg) is administered slowly during imaging. Imaging should be continued for at least a further 15 min. Since maximum diuresis does not occur until 15 min after administration of frusemide, as an alternative it may be given 15 min before the radiopharmaceutical (the so called "F-15" renogram) which can be useful after equivocal standard "F + 20" studies.
5. If significant retention in the kidneys is apparent at the end of the imaging period, ask the patient to void and walk around for a minute, then take a further short image.[12]

Films: All posterior.

Hard copy: 2-5 min images for duration of study.

Analysis:

The following information is produced using standard computer analysis:

1. Background-subtracted kidney time-activity (renogram) curves.
2. Relative function figures.

Additional figures are sometimes calculated:

1. Perfusion index, especially in renal transplant assessment.
2. Parenchymal and whole kidney transit times.[28]

Additional techniques:

Pre- and 1 hour post-captopril (25-50 mg) study for diagnosis of renal artery stenosis. The patient should ideally stop diuretic and ACE inhibitor medication 3-5 days prior to the test test.[29]

1. Indirect micrurating cystography following renography to demonstrate vesicoureteric "reflux". The bladder must not have been emptied and the kidneys should be reasonably clear of activity. Continuous dynamic 5-s images are acquired for 2 min before and up to 3 min after micturition, with generation of bladder and kidney time-activity curves.[30]

2. Glomerular filtration rate (GFR) measurement and individual kidney GFR with DTPA studies by taking blood samples for counting. Similarly, effective renal plasma flow (ERPF) measurement with hippuran and a MAG-3 clearance index may be obtained.[31]

3. The images obtained with MAG-3 can be analysed for the presence of renal scarring and there is good correlation with the results obtained with DMSA (MAG-3 is 80% tubular secreted). DMSA remains the gold standard for cortical scarring because of the higher information density and ability to obtain multiple projections, but simultaneous renal clearance information can be gained with MAG-3.[32]

4. With the appropriate computer software and fast-frame acquisition, compressed images may be generated to demonstrate and quantify ureteric peristalsis and show reflux (best with MAG-3 or hippuran),[33] although the technique has not yet found a widely accepted clinical role.

Aftercare:

1. The patient is warned that the effects of diuresis may last a couple of hours. The patient may feel faint because of hypotension when adopting the erect posture at the end of the procedure.

2. After captopril administration, blood pressure monitoring under medical supervision should be carried out until back to normal.

3. Normal radiation safety precautions.

Complications: None, except after captopril, when care must be taken in patients with severe vascular disease to avoid hypotension and renal failure.[12]

CHAPTER THREE

RESULTS & FIGURES

RESULTS

The aim of this study is to evaluate the importance of both I.V.U and radionuclide in the investigation of obstructive uropathy with each other. The I.V.U, or excretory urogram, is still the most valuable examination of urinary tract, it gives excellent anatomical images of the kidneys and to some extend, an indication of their function.

The importance of radionucliede in the investigation of renal diseases is the functional and quantitative information. They provide whearas radiological techniques for the most part (but not exdusively) provide structural detail.

The methods are therefore, complementary and in general they provide more useful clinical information, It is a retrospective hospital-based study.

The study population consisted of patients with different age groups and sexes diagnosed as obstructive uropathy by other imaging studies including I.V.U, and radioisotope renal scan is conducted at Radio-Isotope Center in Khartoum.

There were seventy five patients collected selectively ,all are diagnosed as cases of obstructive uropathy. After further evaluation of devided renal functions by dynamic isotope renal scan using ^{99m}Tc-diethylene triamine pentacetic acid (DTPA) ,and corellation with the functions reveald by I.V.U , the following variables were assessed with regard to the age ,sex , underline cause , onset and degree of obstructions , non functioning kidneys, crosstabulation between methods of investigation , and Chi-Square Tests.

Fig.1 Shows distributions of study population according to the age groups ; 1-10 years (7) 9.3% ,11-20 years (11) 14.7% , 21-30 years (20) 26.7% ,31-40 years (15)

20.0% ,41-50 years (6) 8.0%, 51-60 years (7) 9.3%, 61-70 years (6) 8.0% more than 70 years (3) 4.0%.

Fig.2 Shows distributions of study population according to the sex groups ; Male (48) 64% ,Female ((27) 36%.

Fig3 Shows distributions of study population according to the onset of presentation ; Acute (2) 2.7% , Chronic (66) 88.0% , Acute on chronic (7) 9.3% .

Fig.4 Shows presence of radio opaque shadows as a cause of obstruction ; Present (52) 69.3% , Absent (23) 30.7% .

Fig.5 Shows frequency of radio opaque shadows ; Single (32) 42.7% ,Multiple (20) 26.7% .

Fig.6 Shows site of radio opaque shadows ; Rt renal area (17) 22.7% , Lt renal area (23) 30.7% , Both renal area (4) 5.3%, Rt upper ureter (1) 1.3% , Rt mid ureter (1) 1.3% ,Rt lower ureter (1) 1.3% ,Lt lower ureter (7) 9.3%.

Fig.7 Shows demonstration of Rt ureter; Normal (40) 53.3%, dilated (2) 2.7%, Not seen (33) 44.0%.

Fig.8 Shows demonstration of Lt ureter; Normal (38) 50.7%, Not seen (36) 48.0%, Not applicable (1) 1.3%.

Fig.9 Shows demonstration of Bladder; Normal (75)100%.

Fig.10 Shows demonstration of Rt kidney function by I.V.U ; Normal functioning (38) 50.7% , Non functioning (18) 24.0% , obstructed Grade 2 (6) 8.0%, obstructed Grade 3(9)12.0%, obstructed Grade 4 (4) 5.3%.

Fig.11 Shows demonstration of Lt kidney function by I.V.U ; Normal functioning (34) 45.3% , Non functioning (22) 29.3%, obstructed Grade 1 (2) 2.7%, obstructed Grade 2 (1) 1.3%, obstructed Grade 3 (12) 16.0%, obstructed Grade 4 (4) 5.3%.

Fig.12 Shows demonstration of RT kidney blood flow by isotope scan : Normal blood flow (41) 54.7%, Moderate blood flow (9) 12.0%. Little blood flow (12) 16.0%, No blood flow (13) 17.3%.

Fig.13 Shows demonstration of Rt kidney relative perfusion by isotope scan : 1-10.9%;(7)9.3%, 11-20.9%; (6) 8.0%, 21-30.9%; (10)13.3%, 31-40.9%; (8)10.7%, 41-50.9%; (6) 8.0%, 51-60.9% ;(4)5.3%, 61-70.9%; (13) 17.3%, 71-80.9% ; (8)10.7%, 81-90.9% ; (7) 9.3% , Mor than 91%;(6) 8.0%.

Fig.14 Shows demonstration of Rt kidney relative function by isotope scan : Less than : 1%; (2) 2.7% , 1-10.9% ; (16) 21.3% , 11-20.9% ;(5)6.7% , 21-30.9% ; (4)5.3% , 31-40.9% ; (7)9.3%, 41-50.9% ; (1)1.3% , 51-60.9% ; (3) 4.0% , 61-70.9%; (5) 6.7%, 71-80.9% ;(5) 6.7% , 81-90.9% ; (9)12.0% , Mor than 91%;(18)24.0%.

Fig.15 Shows demonstration of Lt kidney blood flow by isotope scan: Normal blood flow (37) 49.3%, Moderate blood flow (6) 8.0%. Little blood flow (16) 21.3%, No blood flow (16) 21.3%.

Fig.16 Shows demonstration of Lt kidney relative perfusion by isotope scan : 1-10.9%;(7)9.3%, 11-20.9%;(9)12.0%, 21-30.9%;(10)13.3%, 31-40.9%;(8)10.7%, 41-50.9%;(4)5.3%, 51-60.9%;(9)12.0%, 61-70.9%; (7) 9.3%, 71-80.9% ; (9)12.0% , 81-90.9% ; (5) 6.7% , Mor than 91%; (7)9.3%.

Fig.17 Shows demonstration of Lt kidney relative function by isotope scan:

Less than 1%;(1) 1.3%, 1-10.9%;(18) 24.0%, 11-20.9%;(9) 12.0%, 21-30.9%;(4) 5.3%, 31-40.9%;(5) 6.7%, 41-50.9%;(3) 4.0%, 51-60.9%;(3) 4.0%, 61-70.9%;(6) 8.0%, 71-80.9%;(4) 5.3%, 81-90.9%;(6) 8.0%, moor than 91%;(16) 21.3%.

Fig.18 Shows crosstabulation of Rt kidney function by I.V.U and Rt kidney blood flow by isotope scan ;

Normal functioning (38)50.7%; normal blood flow(38)50.7%.

Non functioning (18)24.0%; No blood flow(13)17.3%, Little blood flow(5)6.7%.

Obstructed Grade 2 (6)8.0% normal blood flow(3) 4.0%,moderate blood flow(3)4.0%.

Obstructed Grade 3(9)12.0%; Little blood flow(3) 4.0%, moderate blood flow(3)4.0%.

Obstructed Grade 4 (4) 5.3%; Little blood flow(4) 5.3

Fig.19 Show crosstabulation of Rt kidney function by I.V.U and Rt kidney relative perfusion by isotope scan ;

Normal functioning (38)50.7%; 31-40.9%(1)1.3%, 41-50.9%(1)1.3%, 51-60.9%(4)5.3%, 61-70.9%(12)16.0%,71-80.9%(7)9.3%,81-90.9%(7)9.3%, Mor than 91%(6)8.0%.

Non functioning (18)24.0%;1-10.9%(7)9.3%, 11-20.9%(6)8.0%, 21-30.9% (4)5.3%, 31-40.9%(1)1.3%.

Obstructed Grade 2 (6)8.0%; 31-40.9%(2)2.6%, 41-50.9%(3)4.0%, 71-80.9%(1)1.3%.

Obstructed Grade 3(9)12.0%; 21-30.9%(3)4.0%, 31-40.9%(3)4.0%, 41-50.9%(2)2.7%, 61-70.9%(1)1.3%.

Obstructed Grade 4 (4) 5.3%; 21-30.9%(3)4.0%, 31-40.9%(1)1.3% .

Fig 20 Shows crosstabulation of Rt kidney function by I.V.U and Rt kidney relative function by isotope scan ;

Normal functioning (38)50.7%;51-60.9%(3)4.0%,61-70.9%(3)4.0%, 71-80.9%(3)4.0%, 81-90.9%(9)12.0%, More than 91%(18)24.0%.

Non functioning (18)24.0%; Less than 1%(2)2.7%,1-10.9%(14)18.7%, 11-20.9%(1)1.3%, 21-30.9% (1)1.3%.

Obstructed Grade 2 (6)8.0%; 31-40.9%(3)4.0%, 41-50.9%(1)1.3%,61- 70.9%(2)2.7%.

Obstructed Grade 3 (9)12.0%;11-20.9%(2)2.7%, 21-30.9%(3)4.0%,31-40.9%(4)5.3%.

Obstructed Grade 4 (4) 5.3%; 1-10.9%(2)2.7%, 11-20.9%(2)2.7% .

Fig.21 Shows crosstabulation of Lt kidney function by I.V.U and Lt kidney blood flow by isotope scan ;

Normal functioning (34)47.4%; Normal blood flow(34)47.4 %.

Non functioning (22)24.0%; No blood flow(16)21.3%, Little blood flow(6)8.0%.

Obstructed Grade 1 (2)2.7%; Normal blood flow(2)2.7%.

Obstructed Grade 2 (1)1.3%; Normal blood flow(1)1.3%.

Obstructed Grade 3(12)16.0%; Little blood flow(7)9.3%, Moderate blood flow(5)6.7%.

Obstructed Grade 4 (4) 5.3%; Little blood flow(3) 4.0%, Moderate blood flow(1)1.3%.

Fig.22 Shows crosstabulation of Lt kidney function by I.V.U and Lt kidney relative perfusion by isotope scan ;

Normal functioning (34)45.3%; 31-40.9%(1)1.3%, 51-60.9%(5)6.7%, 61-70.9%(7)9.3%, 71-80.9%(9)12.0%, 81-90.9%(5)6.7%, more than 91%(7)9.3%.

Non functioning (22)29.4%; 1-10.9%(7)9.3%, 11-20.9%(9)12.0%, 21-30.9% (3)4.0%, 31-40.9%(2)2.7%, 40.0-50.9(1)1.3%.

Obstructed Grade 1 (2)2.7%; 40.0-50.9(1)1.3%,51-60.9%(1)1.3%.

Obstructed Grade 2 (1)1.3%; 41-50.9%(1)1.3%.

Obstructed Grade 3 (12)16.0%; 21-30.9%(5)6.7%, 31-40.9%(3)4.0%, 41-50.9%(1)1.3%, 51-60.9%(3)4.0%.

Obstructed Grade 4 (4) 5.3%; 21-30.9%(2)2.7%, 31-40.9%(2)2.7% .

Fig.23 Shows crosstabulation of Lt kidney function by I.V.U and Lt kidney relative function by isotope scan ;

Normal functioning (34)47.7%; 51-60.9%(2)2.7%,61-70.9%(6)8.0%, 71-80.9%(4)5.3%, 81-90.9%(6)8.0%, More than 91%(16)21.3%.

Non functioning (22)29.4%; Less than 1%(1)1.3%,1-10.9%(16)21.3%, 11-20.9%(4)5.3%, 21-30.9% (1)1.3%.

Obstructed Grade 1 (2)2.7%; 41-50.9%(1)1.3%,51-60.9%(1)1.3%.

Obstructed Grade 2 (1)1.3%; 41-50.9%(1)1.3%.

Obstructed Grade 3 (12)16.0%; 11-20.9%(4)5.3%, 21-30.9%(3)4.0%,31-40.9%(4)5.3%,41-50.9%(1)1.3%.

Obstructed Grade 4 (4) 5.3%; 1-10.9%(2)2.7%, 11-20.9%(1)1.3%, 31-40.9%(1)1.3%.

FIGURES

CHAPTER FOUR

DISCUSSION

CONCLUSION AND RECOMMENDATION

DISCUSSION

There is a wide variety of imaging studies available for evaluation of a potentially obstructed patient. Selection of a specific test over another depends on the acuity of obstruction, the patient's age and renal function. Considerations must also be made for the cost of the test, reliability and feasibility of long term follow up by repeated exams. In the non-acute setting where urinary tract obstruction is suspected either on the basis of a rising serum creatinine, history, or prior urinary tract abnormalities, an ultrasound may be used as the initial screening procedure. If ultrasound fails to show any evidence of significant hydronephrosis or hydroureter it is concluded that this patient does not have significant obstruction. Generally, no further studies relative to detecting urinary tract obstruction are-performed.

If ultrasound demonstrates the presence of hydronephrosis or hydroureter further studies to determine the point and cause of obstruction are performed, unless the ultrasound examination has clearly demonstrated this, as in the case of an obstructing ureteral stone. In adults, an intravenous pyelography (IVP) is often perform to delineate the point and hopefully cause of an obstruction. If there is good renal function, the IVP will generally be successful in answering these questions. There is no always one "best" way to utilize the multiple studies available and it is often the results of a specific study that will determine if a further study is necessary and which modality to use.[34]

In this study successfully used I.V.U determined the point of obstruction in (3952.0%
.

Simple radiographic studies such as the KUB have a role, although limited, in the evaluation of obstruction. A single view plain film may be sufficient to diagnose the presence of a ureteral stone. The plain film is limited by its low sensitivity for detection of opaque as well as non-opaque stones. Recent studies have shown a sensitivity of about 50% for stone visualization with the abdominal film. And in this study evaluate the presence of radio opaque shadows in (44)58.7% at both renal area , and in (10)13.2% at both ureteral area , it is low cost with low radiation exposure and may be done rapidly within the urology clinic. Occasionally a suspected ureteral calcification seen on plain film turns out to be a vascular phlebolith when more specific studies are performed.[35]Stones larger than 5mm and with CT attenuation above 300H will likely be detected on abdominal radiography.[36]

Intravenous pyelography (IVP) plays an important role in the diagnosis of obstruction. It is the classic test which can assess anatomy and to some extent the function of the kidney. Acute obstruction is identified by the presence of a delayed and often increased nephrogram .

Lome LG, Pinsky S, Levy L, studied Thirty-one patients with 35 non-visualizing kidneys on excretory urography were studied with Tc^{99m} scintiscanning. In 11 cases good renal blood flow and concentration were demonstrated on nucleide scanning.All patients had significant parenchyma and recoverable renal function after appropriate surgical management. In 20 cases there was little or no blood flow on the scan. These patients either had a congenitally absent kidney or severely destroyed parenchyma. The dynamic renal scan is a sensitive method for predicting renal salvageability of a kidney that fails to visualize on excretory urography.[37]In this study 75 patients with (40)53.3% non-visualizing kidneys on excretory urography were studied with Tc^{99m} scintiscanning. In (29)38.7% no blood flow, and in (11)14.7% little blood flow were demonstrated on nucleide scanning. In (14)18.7% the relative perfusion was from 1-10.9%, In (15)20.0% the relative perfusion was from 11-20.9%, In (7)9.3% the relative perfusion was from 21-30.9% In (3)4.0% the relative perfusion was from 31-40.9%, In (1)1.3% the relative perfusion was from 41-50.9%. In (3)4.0% the relative function was less than 1%, In (30)40.0% the relative function was 1-10.9%, In (5)6.7% the relative function was 11-20.9%. In (2)2.7% the relative function was 21-30.9%.

In this study also different grade of obstructive uropathy are evaluated; In (2)2.7% of grade 1 show normal blood flow, and both show relative perfusion 41-50.9% and 51-60.9% respectively, and both also showed relative function 41-50.9% and 51-60.9% respectively.

In 7 cases of grade 2; (4)5.3% show normal blood flow and (3)4.0% showed moderate blood flow, (2)2.7% show relative perfusion 31-40.9%, (4)5.3% show relative perfusion 41-50.9%, and (1)1.3% relative perfusion was 51-60.9%, (3)4.0% show relative function was 31-40.9%, (2)2.7% show relative function 41-50.9%, (2)2.7% show relative function 61-70.9%.

In 21 cases of grade 3; (10)13.3% show little blood flow and (11)14.7% show moderate blood flow, (8)10.7% show relative perfusion 21-30.9%, (6)8.0% show relative perfusion 31-40.9%, and (4)5.3% relative perfusion was 41-50.9%, and (3)4.0% relative perfusion 51-60.9%, (6)8.0% show relative function 11-20.9%, (6)8.0% show relative function 21-30.9%,(8)10.7% show relative function 31-40.9%, (1)1.3% show relative function 41-50.9%.

In 8 cases of grade 4; (7)9.3% show little blood flow and (1)1.3% show moderate blood flow, (5)6.7% show relative perfusion 21-30.9%, (3)4.0% show relative perfusion 31-40.9%, (4)5.3% show relative function 1-10.9%,(3)4.0% show relative function 11-20.9%, (1)1.3% show relative function 31-40.9%.

Buck AC, Macleod MA, Blacklock NJ, studied The advantages of Tc^{99m} DTPA(Sn) in dynamic renal scintigraphy and the measurement of renal function. The results of excretion urography (IVU) and dynamic renal scintigraphy using Tc^{99m} DTPA(Sn) were compared in 109 urological patients. Computer analysis of the gamma camera data provided a reproducible, accurate, qualitative and quantitative assessments of the renal function and was found to be superior to urography in the detection of morphological defects of the renal parenchyma and in the identification of early upper tract obstruction. The radio-isotope study is a safe, non-invasive investigation, easily performed on an out-patients basis, requires no prior preparation and is without significant radiation hazard to the patients.[38]

CONCLUSION

The study population consisted of seventy five patients with different age groups and sexes(Male (48)64%,Female (27)36%.) collected selectively, diagnosed as obstructive uropathy by other imaging studies including I.V.U, and radioisotope renal scan is conducted at Radio-Isotope Center in Khartoum.

Forty 53.3% was non-visualizing kidneys on excretory urography, whene studied with Tc^{99m} scintiscanning, (29)38.7% of them shows non functioning while remaining shows variable low functions.

In the study also different grade of obstructive uropathy are evaluated ; In (2)2.7% of grade 1 shows normal blood flow, and both shows relative perfusion 41-50.9% and 51-60.9% respectively, and both also showed relative function 41-50.9% and 51-60.9% respectively.

In 7 cases of grade 2; (4)5.3% shows normal blood flow and (3)4.0% shows moderate blood flow, (2)2.7% shows relative perfusion 31-40.9%, (4)5.3% shows relative perfusion 41-50.9%, and (1)1.3% relative perfusion was 51-60.9%, (3)4.0% shows relative function was 31-40.9%, (2)2.7% showes relative function 41-50.9%, (2)2.7% shows relative function 61-70.9%.

In 21 cases of grade 3; (10)13.3% shows little blood flow and (11)14.7% shows moderate blood flow, (8)10.7% shows relative perfusion 21-30.9%, (6)8.0% shows relative perfusion 31-40.9%, and (4)5.3% relative perfusion was 41-50.9%, and (3)4.0% relative perfusion 51-60.9%, (6)8.0% shows relative function 11-20.9%, (6)8.0% shows relative function 21-30.9%,(8)10.7% shows relative function 31-40.9%, (1)1.3% shows relative function 41-50.9%.

In 8 cases of grade 4; (7)9.3% shows little blood flow and (1)1.3% shows moderate blood flow, (5)6.7% shows relative perfusion 21-30.9%, (3)4.0% shows relative perfusion 31-40.9%, (4)5.3% shows relative function 1-10.9%,(3)4.0% shows relative function 11-20.9%, (1)1.3% shows relative function 31-40.9%.

Recommendation;

1. Radioisotope scan is superior to urography because it is easily performed, no preparation is needed, less radiation hazard to the patient and others, mor accurate divided relative function and even determine blood flow of obstructive kidney.

2. Radioisotope scan also advised to perform mor in acute cases to warned the doctors and patient about the extend of the problem and it is significant, and should not to be limited only to patient prior to surgical intervention.

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