INTRODUCTION

The major function of kidneys is to filter the blood and form urine with removal of nitrogenous substances urea and ammonium compounds, as well as dissolved carbon dioxide. They also get rid of excess water and salts to keep the constant osmotic concentration of blood. Plain x-ray abdomen can outline obstructive radio-opaque stones but intravenous urography (IVU) is the main exploratory radiological technique, allowing morphologic and functional assessment of the urinary system. Other imaging techniques like ultrasonography, computerized tomography (CT) and magnetic resonance imaging (MRI) has partially replaced the IVU especially in patients with allergy to iodinated contrast or renal failure. While performing IVU in normal kidneys, renal parenchymal opacification (nephrogram) appears in one minute after injecting a water soluble, radio-opaque contrast and pelvi-calyceal system (pyelogram) in the next two minutes, followed by the ureters in 5-10 minutes. When CT can not identify the level of obstructive uropathy and when acute obstructive uropathy is thought to be caused by calculi, sloughed papilla, or blood clot, IVU or retrograde pyelography is indicated. Ultrasonography is an important screening test in pregnant patients with acute flank pain and in acute renal failure.

There are many diseases that impair the renal excretory function like hydronephrosis, pyonephrosis, renal parenchymal diseases, retroperitoneal fibrosis, renal agenesis, renal neoplasm and polycystic kidney disease. In obstructive uropathy there is obstruction to the drainage of urine at renal, ureteric or urinary bladder level. In childhood, it is mainly due to urethral valves, and stricture /stenosis at uretero-vesical or uretero-pelvic junction. In young adults, the most common cause is stone at pelviureteric junction (PUJ), intra-ureteric or vesico-ureteric junction (VUJ), leading to hydrourerter and hydronephrosis. While in men over 60 years, benign prostatic hyperplasia and carcinoma prostate are the common causes. Improper function of VUJ valve will lead to hydroureter and hydronephrosis by vesico-ureteric reflux. Abdominal /pelvic and retroperitoneal tumors, neurologi-
Evaluation of Renal Excretory function by IVU

cal defects, retroperitoneal fibrosis, strictures of ureters (congenital or acquired), blood clots, tumor of kidney, ureter or urinary bladder are other causes of obstruction. Ureteric duplication with blockage at lower end of one is also the cause of hydrourerter and hydronephrosis. Appropriate radiographic studies are beneficial in the diagnosis of pyonephrosis, renal or peri-renal abscess and emphysematous pyelonephritis. In renal tuberculous patients, strictures of draining urinary pathway is the main cause of renal failure.7

Retrograde pyelography is used in patients with severely impaired renal function, specially when the kidneys cannot be visualized by IVU.8 Ultrasonographic findings of pyonephrosis is low amplitude echoes of debris in hydronephrotic kidney & its absence excludes pyonephrosis with a high degree of accuracy.9 In severe infection like emphysematous pyelonephritis, ultrasonography fails to differentiate between hydronephrosis and early pyonephrosis.10

Acute flank pain is the most common urological presentation in the emergency room. The diagnostic workup requires comprehensive history taking, physical examination and radiological investigation.11 Urinary tract imaging can also determine the site and size of the stone and delineate the intracalyceal anatomy. IVU has been the standard imaging modality in uroradiology since 1930s.12

This study was conducted to find out the prevalence of diseases causing impairment of renal function by Intravenous urography.

MATERIAL AND METHODS

This cross-sectional study was conducted at Radiology Department, DHQ Teaching Hospital, D.I.Khan, Pakistan, from January 2008 to December 2008. Patients referred for IVU were suffering from abdominal pain, lump in the flank, dysurea, hematuria or retention of urine. Plain x-ray abdomen (KUB) was taken for all patients. Ultrasonography was performed in selected cases to correlate with the IVU findings.

RESULTS

The results of IVU are depicted in the Table and some of the representative films of IVU given below:

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Excretory function of affected kidney</th>
<th>Number (Percentage)</th>
<th>Diseases</th>
<th>Excretory function of affected kidney</th>
<th>Number (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral renal stones</td>
<td>15 Non-excretory 22 Delayed excretory</td>
<td>37 (18.5%)</td>
<td>PUJ Obstruction</td>
<td>4 Delayed 3 Poor excretory</td>
<td>7 (3.5%)</td>
</tr>
<tr>
<td>Bilateral ureteric &amp; ipsilateral renal stones</td>
<td>1 Non-excretory 8 Delayed excretory</td>
<td>9 (4.5%)</td>
<td>Posterior urethral valves</td>
<td>Bilateral delayed excretory kidneys</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Ureteric stones</td>
<td>12 Delayed 1 Non-excretory</td>
<td>13 (6.5%)</td>
<td>Urterocele</td>
<td>Delayed excretory</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Stag horn stones</td>
<td>5 Non-excretory 6 Delayed excretory</td>
<td>11(5.5%)</td>
<td>Renal masses</td>
<td>Non-excretory</td>
<td>11(5.5%)</td>
</tr>
<tr>
<td>Tuberculous kidney</td>
<td>Non-excretory</td>
<td>2 (1%)</td>
<td>Crossed ectopic kidney</td>
<td>Delayed excretory</td>
<td>4 (2%)</td>
</tr>
<tr>
<td>Ipsilateral renal stones</td>
<td>Delayed /Poor excretory</td>
<td>2 ( 1% )</td>
<td>Pelvic masses</td>
<td>Delayed excretory</td>
<td>5 (2.5%)</td>
</tr>
<tr>
<td>Pyonephrosis</td>
<td>4 Non-excretory 5 poor excretory</td>
<td>9 (4.5%)</td>
<td>Pneumoureter / pneumonephrosis</td>
<td>Non-excretory</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Nephrocalcinosis</td>
<td>Non-excretory</td>
<td>3 (1.5%)</td>
<td>Urteretic strictures</td>
<td>Delayed excretory</td>
<td>7 (3.5%)</td>
</tr>
<tr>
<td>Vesical mass</td>
<td>Non-excretory</td>
<td>6 (3%)</td>
<td>Post traumatic</td>
<td>Non excretory</td>
<td>4 (2 %)</td>
</tr>
<tr>
<td>Renal agenesis</td>
<td>Non-excretory</td>
<td>2 (1%)</td>
<td>Bilateral normal kidneys</td>
<td>Bilateral normal excretory</td>
<td>62 (31%)</td>
</tr>
</tbody>
</table>
DISCUSSION

In this study of 200 patients, the cases of renal calculi, tuberculous kidneys and nephrocalcinosis were 67. Out of them 53 patients were accurately diagnosed by plain radiography and IVU and this ratio 79% is more than with the compared study which reported 64%.
In our study, the cases of obstructive hydronephrosis were 59 and 55 patients were diagnosed properly by IVU (93%). This figure was more than the compared study in which it was 90%.

In delayed excretory kidneys, initially the IVU outlines the faint nephrogram, then dense nephrogram, then faint pyelogram and lastly fair to sharp pyelogram, mostly in the form of hydronephrosis while in poor excretory function, faint nephrogram appears in late films which is persistent and disappear earlier. In case of non-excretory, nephrogram appears neither in the initial films nor in the delayed films while in completely normal excretory renal function, nephrogram appears in 1-2 minutes post IV contrast film, pyelogram in 5-10 minutes, urogram in 15 minutes and cystogram in 20-25 minutes.

In acute renal pain, the excretory function appears impaired which is mostly false and is due to acute inflammation. At this stage, diagnostic approach by plain x-ray abdomen KUB after proper bowel wash and ultrasonography are more valuable.

Comparing this study with others, the prevalence of stones in the kidneys and ureters are more in this region with increased number of non-excretory kidneys. In rest of the conditions like renal masses, vesical masses, pelvic masses, crossed ectopic kidneys, pneumoureter /pneumonephrosis and post-traumatic cases, the excretory urography remained valuable.

CONCLUSION

Intravenous urography is a reliable method of determining the renal excretory function.

REFERENCES


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