International Journal of Radiology Research
www.radiologyjournal.in
E-ISSN: 2663-4562, P-ISSN: 2663-4554
Received: 25-03-2021 Accepted: 19-04-2021; Published: 11-05-2021
Volume 3, Issue 1, 2021, Page No. 46-48

Role of intravenous urography in renal abnormalities

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Abstract
Background: Intravenous Urography is useful technique and use for the evaluation of pathology of the urinary tract with the help of ionizing radiation and contrast media. It includes control/scout film of the abdomen and post contrast films at the serial intervals.
Aim: this study is to evaluate the role of IVU under fluoroscopy in different diagnostic conditions.
Methodology: A quantitative prospective study conducted on 40 patients, who underwent IVU procedure. Consent form, History and symptoms were obtained from the patient prior to the investigation.
Results: The result shows that total 40 patient is selected in which 30 (75%) patients have findings and 10 (25%) patients have normal study. 34 (85%) patients have normal functioning right kidney and 6 (15%) have delayed functioning. In the left side kidney, there are 34 (85%) normal functioning, 4 (10%) delayed and 2 (5%) non-functioning kidneys are found. Right side calculus, right hydronephrosis, left side calculus, left hydronephrosis are shown in 15(37.5%), 10 (25%), 8 (20%), 3 (7.5%) respectively. Left PUJ calculus is shown in 2 (5%) patients, Left VUJ calculus is in 2 (5%) patients and left ureteric calculi are seen in 2 (5%) patients.
Conclusions: The study concludes uses of IVU should not be consider as primary investigation for renal anomalies. Ultrasonography should be performed as a primary investigation. Patient with long-standing symptoms is more likely to diagnosed pathology in IVU. For the radiolucent calculus, IVU found gold standard procedures as compared to sonography.

Keywords: IVU, urography, UTI, IVP, urinary tract, inflammation, infection

Introduction
Intravenous Urography/Intravenous Pyelography (IVU/IVP) is a useful technique used for the evaluation of pathology of the urinary tract. It uses the ionizing radiation and contrast media for visualization of the urinary tract. It includes a control/scout film of the abdomen with kidney and urinary bladder and post-contrast films at the serial intervals.

Anatomy
The urinary system, also known as the renal system or urinary tract. This consists of kidneys, ureters, bladder, and urethra. The main purpose of the urinary tract is to remove waste from the body. Pair of kidneys are located between the dorsal body wall and parietal peritoneum on both sides (left and right sides) (fig. 1). The formation of urine begins in the functional unit of the kidney that is called the nephrons. Urine then flows through a system of conversing tubules called collecting ducts. From there urine continues its flow into the ureter, transporting urine into the urinary bladder. Urine exits through the external urethral meatus [1].

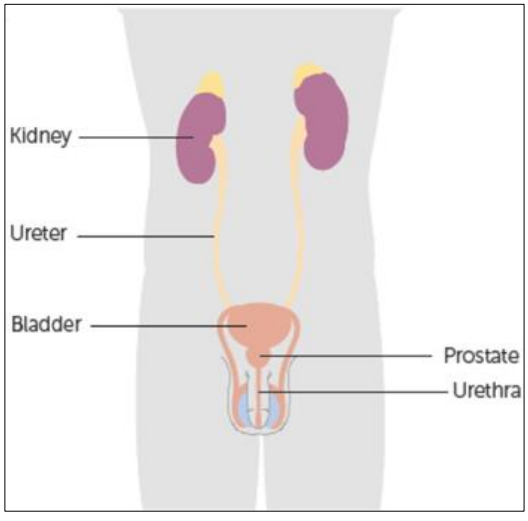

Fig 1: shows anatomy of urinary tract

Intravenous Urography
The IVU procedure is performed under fluoroscopy to evaluate

the urinary tract and for the procedure patient should void prior to the examination. An assessment of the location of calcifications in the urinary tract should be made prior to the injection of contrast medium, because contrast obscure calcification. Oblique conventional radiographs can be helpful in discovering the position and nature of calcifications [1, 2]. Plain films are obtained first and radio-opaque calculi are identified.

Urography nephrograms are produced by filteration of contrast material by the nephrons, with visualization of the renal parenchyma 1–3 minutes after contrast medium injection. A standard radiograph collimated to the kidneys may be sufficient in young patients when the obstruction is the specific issue. Oblique radiographs may be of added benefit if findings allow lateralization [2]. The size of the kidneys should be assessed on every radiograph, and this is best performed during the nephrographic phase. An image is collimated to the kidneys to examine the renal calculus and collecting systems which are obtained in 5 minutes after the compression device is applied. For optimal evaluation of the ureters and pelvicalyceal systems, oblique images are helpful. The release of compression allows the delivery of contrast material into the ureters [3].

KUB radiograph is obtain immediately after compression release, which is 15 minutes after administration of the contrast medium. Imaging with the patient in the prone or dependent oblique position often assists with visualization of radiopaque portions of the ureters, especially in cases of obstruction. In such cases, delayed images must be important tool and must obtained, until opacification to the level of obstruction is not defined. 15–30 minutes after the administration of contrast material, the bladder is often sufficiently filled, and the 15-minute KUB radiograph may be adequate for evaluation. Oblique images may also be useful in ensuring that filling defects are not related to enteric gas, which may project over the bladder on images obtained only in the antero-posterior projection [4, 6, 7].

If there is specific attention is required to bladder disease, delayed images can be helpful and must obtained to improve bladder distention, and oblique, prone, or post void images may be obtained to evaluate filling defects. If distention is incomplete, delayed images of the bladder may be necessary [4]. The bladder position should be evaluated within the anatomy of pelvis. Because the bladder is at the lower aspect of the anatomic pelvis, its position and appearance can be distorted by masses and other pathologic processes [9]. Bladder wall thickening and irregularity of the luminal contrast material associated with bladder defect. Early filling images followed by a post void examination may help in the evaluation of filling defects.

The post maturation image is helpful in diagnosis of patients with upper urinary tract dilatation and assessing residual volume when it is obtained immediately after voiding and demonstrates complete emptying of the bladder. [2, 4,5]

Need of Study

IVU is usually not preferred over ultrasound and CT Urography due to many drawbacks. On USG, ureteric evaluation is often limited due to overlying bowel gases. CT Urography has its own disadvantages like high radiation dose and high cost of the examination. Hence in a rural setting with the majority of patients belonging to low socioeconomic groups, IVU is still a preferred, relatively cheaper and a valuable technique.

Methodology

This quantitative prospective study was carried out to assess the role of intravenous urography in renal abnormalities on the patients who visit in the radiology department of SGT Hospital and Research Institute, Gurugram, Haryana. This study was conducted over the time period of 6 months from 1st October, 2019 to 1st April, 2020. 40 patients were selected predecided according to the inclusion criteria and exclusion criteria of this study. Consent form of each patient was acquired. History and symptoms were obtained from the patient prior to the investigation. IVU was performed under fluoroscopy using intravenous contrast media. Patients with the following findings in ultrasonography were included in this study: Hydronephrotic patients, Renal Calculi, Congenital abnormalities, Horse shoe kidney, absent kidney, Patients with kidney transplant

Post-operative patients, patients with malignancies, patients with on-going chemo/radiotherapy are excluded from the study to avoid putting any patient at risk of delayed urgent care.

Results

The result shows that total 40 patient is selected in which 30 patients have findings and 10 patients have normal study (shown in fig 1). 34 patients have normal functioning right kidney and 6 have delayed functioning (shown in fig 2). In the left side kidney, there are 34 normal functioning, 4 delayed and 2 non-functioning kidneys are found (shown in fig 3). Right side calculus, right hydronephrosis, left side calculus; left hydronephrosis are shown in 15, 10, 8, 3 respectively (shown in Fig 3). Left PUJ calculus is shown in 2 patients, Left VUJ calculus is in 2 patients and left ureteric calculi are seen in 2 patients.

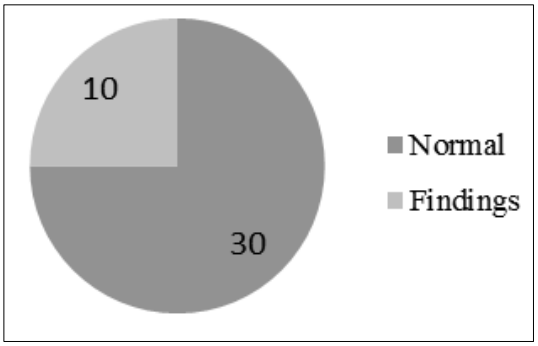

Fig 2: Shows findings in IVU

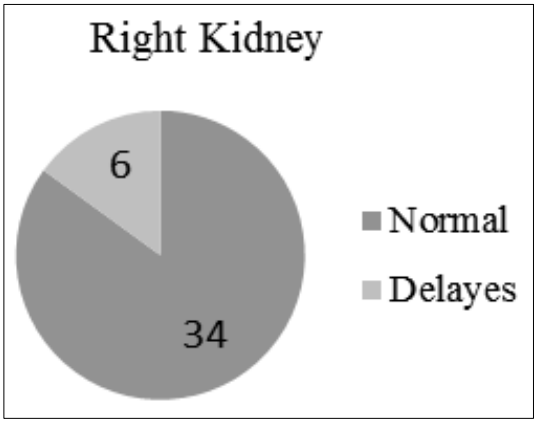

Fig 3: Shows functioning of right kidney

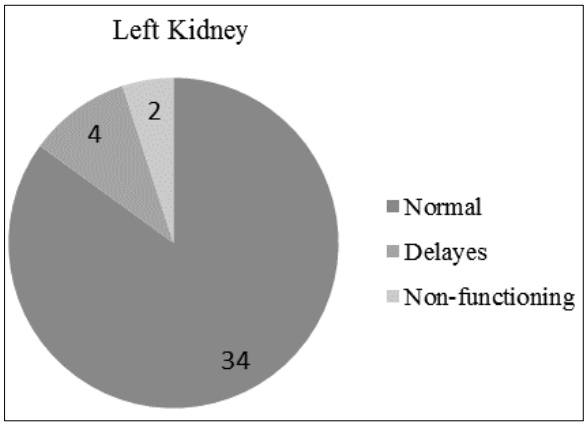

Fig 4: Shows functioning of left kidney

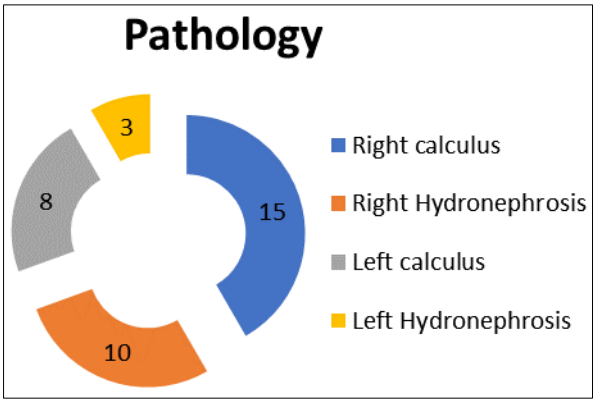

Fig 5: Shows pathology in IVU

Conclusion

The study concludes uses of IVU should not perform as a primary investigation to all patients. Ultrasonography must be performed as a primary investigation. Duration of symptoms must be taken into the account. As a patient with long-standing symptoms is more likely to diagnosed pathologies in IVU. For the radiolucent calculus, IVU found a gold standard procedure as compared to sonography. IVU also shows the functioning of kidneys and any obstruction in the tract. The study shows the uses or importance of IVU in diagnostic radiology as it visualises any pathologies or obstruction which leads more difficulties to the patient in future.

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