



USE OF INTRAVENOUS PYELOGRAPHY IN KIDNEY STONE & OBSTRUCTIVE UROPATHY DISEASE- AN OBSERVATIONAL STUDY AT TERRITORY HEALTHCARE CENTRE OF WESTERN UTTAR PRADESH INDIA

Radiology

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ABSTRACT

Background: To study various advanced technologies for the diagnosis of kidney stones to analyze IVP findings in a tertiary health care center in western UP on the basis of observation in the radiology department. UPUMS saifai Etawah, Saifai Diagnostic Centre, Saifai Etawah. **Method:** A retrospective, observational study was conducted with 100 patients aged between 12 and 55 years. These patients had come to get diagnosed in the following departments: Radiology Department of Uttar Pradesh University of Medical Sciences, Urology Department of Uttar Pradesh University of Medical Sciences, Saifai Etawah; and Saifai Diagnostic Center, Saifai Etawah. These patients had a history of kidney stones from December 2019 to June 2021. They were retrieved from a tertiary health care center database. Demographic data and diagnostic reports were reviewed and analyzed. All patients were examined using digital x-ray machines, fluoroscopy, and other x-ray machines. **Results:** A retrospective, observational study was conducted with 100 patients aged between 12 and 55 years (mean age, 21.5 years). Patient demographic characteristics, history, and IVP report findings were retrieved from the hospital database and analyzed. approximately male patients were just doubled as compared to female patients IVP findings were abnormal in 80 out of 100 patients (80%) patients. hydronephrosis was the most frequent finding observed among 49 out of 80 patients (61.25%) Bilateral kidney stones, the second most frequent finding was observed in 22 out of 80 patients (27.5%). kidney cyst was observed in 4 out of 80 patients (5%), obstructive uropathy in 4 out of 80 patients (5%), and a horseshoe kidney patient was 1 out of 80 patients (1.25%). **Conclusions:** In cases of renal stone, Hydronephrosis was the common radiographic finding. KUB radiography and intravenous Pyelography are the primary and most commonly used for the diagnosis of kidney stones.

KEYWORDS

Intravenous Pyelography, KUB X-rays, kidney stone,

INTRODUCTION:

Madhya Pradesh, Bihar, And West Bengal Are All Part Of This Stone Belt. Renal Stone Incidence And Recurrence Rates Are High In Certain Areas Until The End Of The Twentieth Century; Intravenous Urography (IVU) Was The Most Commonly Used Radiological Investigation For The Diagnosis Of Urinary Tract Pathology. Ultrasonography Became Commonly Applied In Clinical Diagnosis In The Late 1970s, And Computed Tomography (CT) Scanning Was Used To Diagnose Renal Disease After The 9th Decade Of The Last Century [1,2]. Shortening The Scanning Time And Radiation Dose, As Well As The Invention Of Multiplanar Three-Dimensional (3-D) Reconstruction, Improved The Diagnostic Utility Of CT Imaging Later. The "Gold Standard" Of Urologic Imaging Is Now CT Scanning. In The Evaluation Of Renal Pathology Congenital Abnormalities, Infections, Injuries, And Cancers Have All Been Diagnosed Using Multiphase CTU (3,4) Renal Stone Is A Disease Worldwide The Study Has Found That As Many As 1 In 11 Americans Develop A Kidney Stone. Over The Past 15 Years, The Incidence Has Increased By Almost 70% (5, 6). The Number Of Imaging Systems Invented To Evaluate Kidney Stones Also Increased Between 1992 And 2009. The Use Of CT scans To Study Kidney Stones Has Been Tripled (7). The Diagnosis Of A Suspected Kidney Stone Patient Is The First Step In Managing This Incidence By Establishing The Size And Location Of Kidney Stones. Food Patterns Are One Of The Most Significant Aspects Of The Development Of Renal Stones, And Stones Substance Deposition Can Be Controlled By Managing Food Intake. The Indian Diet Involves A Wide Variety Of Different Tastes, Varying From The Colorful Cuisine Of Rajasthan To The Spicy Meal Of Punjab, And The Somewhat Sweet, Oil-Based Diet Of Gujarat To The Slightly Sour Seafood Of The South. All Of These Delicacies May Be Found In This Paradise. Although Several People In The Country Are Vegetarian, There Is Still A Large Variety Of Flavorful Non-Vegetarian Recipes Available. Increases In Urine Calcium Excretion Are Strongly Associated With Animal Protein Consumption, Resulting In A Decrease In Urinary Ph And Citrate Excretion, Which Are The Building Blocks Of Stone Formation. Because Of This Regular Diet In Indian Culture, We Assume It Is Critical To Highlight The Nutritional Elements That Cause Kidney Stone Formation [8] In India, KSD Is

Common A Population Subject To Them, There Is A 12-Percent Population Risk Of Urinary Stones [9]. Renal disease has a significant impact on 50% of the population and can cause kidney failure [9]. Apart From In South India, Where Only A Small Percentage Of The Population Is Affected By Urolithiasis, In North India, KSD Affects 15% Of The Population. Affected By Kidney Stones [10]. Maharashtra, Gujarat, Rajasthan, Punjab, Haryana, Delhi, Affecting the Majority of Family Members. Different Types Of Stones Are Found Approximately 80-90% [11] Of All Urinary Stones Contain Calcium, Uric Acid Stones Occur For About 6-10% Of Urinary Stones [12] Cystine Stones Are Exceptionally Rare (1%-2%) Of Urinary Calculi, Struvite Stone Is (6%-10%) [13] Drug-Induced Stones (1%) (13) Examinations May Indicate The Existence Of Kidney Stones In The Urinary System. Simple Abdominal X-Rays, Which Can Miss Small Kidney Stones, Are Replaced With High-Speed Or Dual-Energy Computed Tomography (CT), Which Can Detect Even Small Stones. (14) Ultrasound, A Noninvasive Test, And Intravenous Urography Are Some Of The Other Imaging Techniques The Choice Of The Correct Imaging System For Kidney Stones Involves Many Factors: Age Of The Patient, Cost Of The Imaging Modalities, Patient Body Habits, Availability Of Imaging Modalities, And Tolerance Of Ionizing Radiation. There Are Now Multiple Imaging Modalities Available Today (15).

The most widely available imaging modalities are KUB Plain Radiography, Intravenous Pyelography (fluoroscopy machine with a spot film device), ultrasonography, CT scan, and MRI. Specificity, sensitivity, cost, and ionizing radiation dose vary between the modalities for kidney stones. KUB plain imaging radiography. And fluoroscopy uses single energy to produce photons that enter anterior tissue and exit posterior contra laterally. KUB radiography has been used to conduct IVP, which can find out the presence of hydronephrosis and obstruction. Nowadays, this imaging system has been largely replaced with the introduction of CT. Some stones like cystine and struvite are poorly seen in KUB radiography, and matrix stones and uric acid stones are not visible. For this reason, we can do ultrasound and KUB in conjunction. (16) Intravenous pyelography is a radiological examination of the abnormal urinary tract after

intravenous injection of contrast media. Contrast media is excreted and filtered from the bloodstream through the kidney via the ureter. It goes to the bladder. Through x-ray imaging of the urinary tract, it gives information about structural, functional, and congenital abnormalities. IVP is nowadays widely replaced by CT urography. Before the invention of helical computerized tomography, IVP was the procedure of choice for diagnosing kidney stones. IVP is the most widely available, least expensive, and least sensitive radiological procedure for the detection of kidney stones. The European Association of Urology guideline approves non-contrast CT scans to clear the diagnosis in patients with acute pain. ACT scan is superior to IVP. (17)

The importance of IVU is that it helps in the diagnosis of mild hydronephrosis, kidney stones, entire urinary system, renal function, renal calculi, and medullary sponge kidney. Visualize the collecting portion of the urinary system for a true functional abnormality of the KUB calculi, horseshoe kidney, Cystitis Benign prostatic hyperplasia, glomerulonephritis, Renal calculi Staghorn calculus, Renal trauma, Persist pyuria Gynecological or transplantation after ureter surgery, kidney donor transplantation, or renal transplantation. Hydronephrosis, Kidney function is impaired due to pyelonephritis. Renal hypertension is visualized. IVP can visualize nonopaque stones as filling defects. The disadvantages of intravenous urography include the need for a lot of time for delayed film and intravenous contrast material. An allergic reaction may range from mild to severe reaction. Despite the guidelines of the urology association [18], doctors, particularly urologists, continue to request IVU, and radiologists continue to perform [18, 19] image.

MATERIAL & METHODS:-

Using different technical advancements, retrospective observational research was undertaken to retrospectively examine the trend of intravenous pyelography use in diagnostic radiography to diagnose urinary tract disease involving kidney stones in tertiary health care hospitals in rural areas. over 2 years in western Uttar Pradesh. A study was conducted with 100 patients aged 12 to 55 years old present in the departments of Radiology and Urology at Uttar Pradesh University of Medical Sciences, Saifai Etawah, and Saifai Diagnostic Center Etawah. The hospital database was searched for patient histories with kidney stones from December 2019 to June 2021. Digital x-ray machines, fluoroscopy, and other x-ray machines were used to evaluate all of the patients. The patient's demographic data characteristics Intravenous pyelography radiologic findings were collected and analyzed based on patient age, gender, outdoor patient, and indoor patient.

Study design and data collection:-

Inclusion Criteria all male and female patients who are aged between 12 and 55 years old will be included. (Except for children and pregnant women, who are more reactive, and ionization radiation is harmful to children and pregnant women.) Furthermore, children are opposed to the IVP procedure. All the OPD and IPD patients, Department of Surgery and Department of Urology, Department of Radiology, UPUMS saifai Etawah, U.P. Saifai Diagnostic Center saifai, patients who come to the department with a history of pain in the abdomen, blood in urine, sharp pain in the back and lower abdomen, nausea and vomiting (symptoms suspected of kidney stones) are included in UPUMS saifai Etawah and Saifai Diagnostic Center saifai Etawah U.P.

Exclusion criteria

Patients with a history of blood pressure, coronary artery disease, diabetes, myelomatosis, multiple myeloma, sickle cell anemia, and any drug reaction should be monitored in history. Patients under the age of 12 and over the age of 55 years, including pregnant female patients,

Study area: The present study will be conducted in the Department of Radiology, UPUMS, Saifai, Etawah U.P. Department of Urology, UPUMS Saifai, Etawah U.P. Department of Surgery, UPUMS Saifai, Etawah U.P. Saifai Diagnostic Center, Saifai, Etawah U.P.

Results:- The patient data of the participant of this study has been kept confidential and his medical records have been treated with confidentiality. This data has not been disclosed to anyone except the researcher, supervisor, co-supervisor, and concerned department of research where it is performed. Urinary tract abnormalities were involved in male and female patients of age groups more than 12 and less than 55 years. 100 patient data were collected from the emergency

department, OPD, IPD, urology department, department of radiology, and saifai diagnostic center between Dec 2019 and Dec 2021. 80 out of 100 patients went to kidney stone investigation. In, 50 patients were male and 30 patients were female. The age range of these patients was from 12 to 55 years (Mean age of 21.5 years). The majority of the patients referred for diagnosis in the Radiology department using IVP were from urology, surgery, and emergency department.

Table 1: Patient Age and sex distribution among the studied 100 patients out of 100 patients 80 patients with a kidney stone (According to data collection and observation of diagnostic report)

Sr. Number	Patient Age (In Years)	Male	Female	Total number of Male and Female	Total number of Male and Female (%)
1	12 – 20	5	2	7	7.8%
2	20 – 30	14	8	22	27.5%
3	30 – 40	17	6	23	28.75%
4	40 – 50	10	8	18	22.5%
5	50 – 60	4	6	10	12.5%
Total		50	30	80	

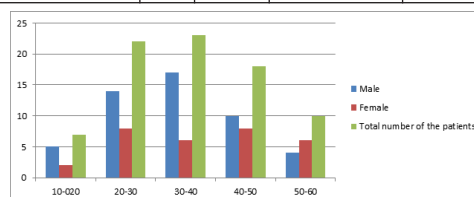
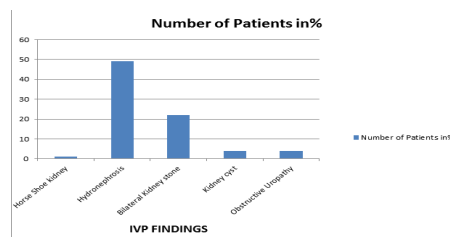


Table 2: Complications of the 80 kidney stone patient during the study (According to the history of the patient)

Complications	No of patients	No of patients (in %)
Mild pain in abdomen and back, fever.	20	25%
Pain in abdomen & during urination, blood in urine, smell in urine, low urine volume.	20	25%
Fever and chill, nausea and vomiting, flank pain in abdomen	54	67.5 %
Family history with kidney stone	2	2.5 %
History of Diabetes ,Bronchospams, hypertension	4	5 %

Table 3 Clinical diagnostic finding (According to the patient data collection and observation of diagnosis finding)

IVP Finding	No. of Patients	No. of Patients (%)
Horse shoe kidney	1	1.8 %
Hydronephrosis	49	61.25 %
Bilateral Kidney Stones	22	27.5 %
Kidney cyst	4	5 %
Obstructive Uropathy	4	4.8 %



Discussion:-

The selection of the best appropriate diagnostic imaging in urology practice is essential. Despite progressively advanced developments in CT technology, it is probable that urologists will continue to request an instead of a CT scan, or may find themselves longing for an intravenous Pyelography after a CT scan has been performed. Kidney stones are one of the most common problems in developing countries and the rest of the world that affect the urinary system. Some of the medical conditions that increase the risk of kidney stone problems

include high-fat diets, inadequate nutrition, and the addition of food that contains oxalate crystals, a high protein diet, and post-surgery defects. A computerized tomography (CT) scan is an extremely useful diagnostic tool. In a variety of typical clinical settings, it has been suggested that CT can and should replace the intravenous Urogram. It is necessary to investigate this viewpoint. The clinician's need for patient management must be the motivating cause behind the investigation selection decision.

On August 31, 2016, the author wrote: An overview of kidney stone imaging techniques. Wayne Brisbane,¹ Michael R. Bailey,² and Mathew D. Sorensen^{1,3} Patients with kidney stones will be seen by clinicians in a variety of medical disciplines. Nephrolithiasis, affects one out of every eleven Americans and the prevalence has climbed by over 70% in the last 15 years. [20, 21] The selection of the best appropriate diagnostic imaging in urology practice is essential despite progressively advanced developments in CT technology, it is probable that urologists will continue to request an instead of a CT scan, or may find themselves longing for an Intravenous pyelography after a CT scan has been performed. Kidney stone is one of the most common problems in developing countries and the rest of the World which affects the urinary system. Some of the medical conditions that increase the risk of kidney stones problems such as a high-fat diet, inadequate nutrition, the addition of food that contains oxalate crystals, a high protein diet, and post-surgery defects. The computerized tomography (CT) scan is an extremely useful diagnostic tool. In a variety of typical clinical settings, it has been suggested that CT can and should replace the intravenous urogram (IVU). This point of view needs to be examined. The clinician's needs for patient management must be the motivating cause behind the investigation selection decision.

Author wrote in 2016 Aug 31 An overview of kidney stone imaging technique. Wayne Brisbane,¹ Michael R. Bailey,² and Mathew D. Sorensen^{1,3} Patients with kidney stones will be seen by clinicians in a variety of medical disciplines. Nephrolithiasis, or affects one out of every eleven Americans, and the prevalence has climbed by over 70% in the last 15 years.^[20,21] The number of imaging procedures ordered to evaluate kidney stones is also increasing. The use of CT for imaging patients with kidney stones tripled between 1992 and 2009^[22]. Imaging of individuals with suspected kidney stones aids diagnosis and is the initial step in treatment by determining the size and location of the stones.^[23] The clinical location, patient body habitus, cost, and ionizing radiation tolerance all play a role in determining the best imaging technique for kidney stones. There are a variety of imaging modalities available, but CT, ultrasound, and plain film radiography of the kidney, ureter, and bladder (KUB) are the most commonly used. In this review, we'll go over the fundamentals of each imaging modality, including its sensitivity and specificity, as well as its advantages, disadvantages, and prices. We also look at clinical guidelines from the American Urological Association (AUA), the European Association of Urology (EAU), and the American College of Radiology (ACR), as well as areas of recommended practice. We also highlight topics of new research, as imaging is a top goal in the field of urinary stone disease^[24]. In addition, we analyzed a major randomized controlled trial conducted in 2014 that compared CT and Ultrasonography for the evaluation of acute renal colic in the emergency department^[25].

The number of imaging procedures ordered to evaluate for kidney stones is also increasing: the usage of CT for imaging patients with kidney stones tripled between 1992 and 2009^[22]. Imaging of individuals with suspected kidney stones aids diagnosis and is the initial step in treatment by determining the size and location of the stones.^[23] The clinical location, patient body habitus, cost, and ionizing radiation tolerance all play a role in determining the best imaging technique for kidney stones. There are a variety of imaging modalities available, but CT, ultrasound, and plain film radiography of the kidney, ureter, and bladder (KUB) are the most commonly used. In this Review, we'll go over the fundamentals of each imaging modality, including its sensitivity and specificity, as well as its advantages, disadvantages, and prices. We also look at clinical guidelines from the American Urological Association (AUA), the European Association of Urology (EAU), and the American College of Radiology (ACR), as well as areas of recommended practice. We also highlight topics of new research, as imaging is a top goal in the field of urinary stone disease^[24]. In addition, we analyze a major randomized controlled trial conducted in 2014 that compared CT and Ultrasonography for the evaluation of acute renal colic in the emergency department^[25].

The author wrote in June 2018. Abdullah Mikhla² and Hameed M. Aklani¹ With the advancement of technology, certain previous techniques have lost their value and relevance and have been replaced by newer techniques that are more sensitive and specific, less invasive, and less expensive [26]. Despite the fact that IVU was previously called the "gold standard" imaging procedure for the urinary tract, CT scanning has taken over that role as a result of its introduction and continued development over the last two decades. Due to the fact that IVU is a harmful radiologic procedure with hazards such as radiation exposure, allergic reactions, and nephrotoxicity, [27], the majority of radiologic findings are normal, with percentages variable from study to study. Despite the fact that IVU use is decreasing globally, the current study demonstrates that it is increasing in Yemen's tertiary care hospitals. In contrast to the current study's findings, a study conducted in a single medical center in the United States found a threefold drop in IVU use from July 1995 to February 2006 [28]. Similarly, the use of IVU has decreased significantly at the Montefiore Medical Center in the Bronx, USA, from 323 instances in 1999 to 17 cases in 2006, and IVU has not been conducted at the Brigham and Women's Hospital in Boston, Massachusetts, since 2000 [29]. The current study's increased trend in IVU use could be due to doctors' lack of understanding that other alternative techniques, such as CT scanning, can provide a more accurate delineation of the urinary tract. In fact, for the vast majority of urinary tract infections, CT is more sensitive and specific. Cost, on the other hand, might be considered another disadvantage of CT, with some physicians still believing that IVU is more cost-effective. When other costs such as the duration of the IVU process, the cost of the room, and the personnel and follow-up tests necessary are factored in, the IVU becomes more expensive than CT. Pfister et al. [30] observed that NCCT is a better option for IVU because of its higher diagnostic accuracy and better economic impact as a result of its higher effectiveness, faster performance, cheaper cost, and reduced risk. It also allows for the detection of a number of other renal and extra renal disease disorders [30]. To conclude, IVU is still widely used in Yemen. The presence of urinary tract calculi was the most common IVU finding, suggesting that urolithiasis is the most common cause of IVP. Sameera R. Mehta; Pavan Annamaraju wrote on May 10, 2021. Only by understanding the procedure, limitations, and basic rules of interpretation can accurate conclusions be drawn from the IVP.

In 1906, Fritz Volcker and Alexander von Lichtenberg developed retrograde urethral catheterization for urinary tract imaging. This method yielded mixed results and was rarely successful. Intravenous Pyelography was developed by Osborne and colleagues in 1923 to visualize the kidneys, ureters, and bladder. [31] This method was more practical, straightforward, and secure. A significant contribution to medicine was the development of an intravenous approach for viewing the upper urinary system. There was a significant contribution to the medical field. Due to the limitations of intravenous Pyelography, Ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI) are now widely employed for the examination of urinary tract illnesses.

IVP is a test used to evaluate pain in the flanks and lower back, as well as hematuria. It can be used to diagnose urinary tract congenital malformations, urinary calculi, enlarged prostate, kidney, ureter, and bladder neoplasms, as well as scars and strictures.^[32] Radiological techniques are essential in the treatment of patients with kidney stones. Only when the technique and basic rules of IVP are known can an accurate conclusion be reached. In the diagnosis, therapy, and follow-up of patients with kidney stones, imaging of the urinary system is critical. KUB (kidney ureter bladder) radiography, IVP (intravenous Pyelography) Ultrasonography (USG), and CTU (CT Urography) magnetic resonance Urography are some of the imaging modalities used by urologists (MRU). Intravenous Pyelography (IVP) was once regarded as the gold standard for diagnosing kidney stones, but CT Urography has largely replaced it due to its high sensitivity and specificity, as well as its ease of use. However, due to its high sensitivity and specificity, as well as the convenience with which it may be performed, CT Urography has largely superseded IVP in recent years. All of these diagnoses have advantages and risks. In rural areas where only X-Ray machines are available, conventional X-ray is more useful. Ultrasonography was the gold standard for detecting and diagnosing calculus, especially in pregnant women, but due to a lack of radiologists, USG examination of patients is hampered. USG is now exclusively used for pregnant women and individuals who have significant conduct. It is now exclusively used for pregnant women and individuals who have significant conditions for which IV contrast

cannot be administered. The USG was similarly successful in detecting ureteric stones. One of the major issues with IVP is that it is unable to differentiate between acute obstruction and residual abnormalities from previous obstructions. According to Earb et al., the benefit of detecting renal parenchymal attenuation value on the acute obstruction side and the chronically obstructed side is significantly different. NCCT exhibited a greater diagnostic rate for kidney stones than IVU, especially for stones in the distal ureter. More kidney stones were seen when NCCT was compared to IVU. Although some of these stones do not require treatment at the time of diagnosis, they do require active monitoring. However, in rural areas where CT scans are not readily available, IVP is still recommended.

Conclusion: - Kidneys stone is one of the most common problems in developing countries and the rest of the World affects the urinary system. Some medical conditions increase the risk of kidney stone problems such as a high-fat diet, inadequate nutrition, addition of food that contains oxalate crystals, high protein diet, and post-surgery defects. Kidney Stone formation depends upon various factors such as metabolic, environmental, and nutritional factors.

Improvement in diagnostic modalities has led to a better understanding of the disease. Radiological techniques play an important role in the management of patients with kidney stones. An accurate conclusion from IVP is in practice only when the technique and basic rules of this technique are known. Imaging of the urinary system is significant in the diagnosis, management and follow-up of patients with kidney stones urologist have used many types of imaging modalities including KUB(kidney ureter bladder) radiography, Intravenous pyelography(IVP) ultrasonography (USG)and CTU (CT urography) magnetic resonance urography (MRU).all the technique has their different advantage and limitations. Historically Intravenous pyelography IVP was considered the gold standard for the diagnosis of kidney stones but nowadays IVP has largely been replaced by CT urography, due to its high sensitivity and specificity and the ease of performing the study. All these diagnoses have their advantage and disadvantage. Conventional X-Ray is found to be more use full in rural areas where only X-Ray machines are available. Ultrasonography was a standard mode for detecting and diagnosing calculus, especially in pregnant ladies, but because Radiologists are very less available hampers the USG evaluation of patients. Nowadays USG is only used for pregnant patients and patients suffering some serious diseases in which IV contrast cannot be given. USG was also poor in the diagnosis of Ureteric stones. . One of the significant problems in IVP is that it cannot differentiate between acute obstruction and residual abnormalities from earlier obstruction. CT has the benefit to identify renal parenchyma attenuation value on the acute obstruction side and the chronically obstructed side significantly different, according to Earbs et al. NCCT had a higher detection rate for kidney stone diagnosis than IVU, especially for stones in the distal ureter .When comparing NCCT to IVU, more kidney stones were seen. Some of these stones may not require involvement at the time of diagnosis, but they do necessitate active monitoring.

Ethical Approval: - The study was approved by the Ethical Committee of Nims University Jaipur, Rajasthan-India

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Conflict of interest: - The authors declare that they have no known competing financial Interests or personal relationships that could have appeared to influence the work reported in this paper.

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