

A Comprehensive Study of Hematuria Evaluation Using Ct Urography

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Abstract: The aim of this research paper is to investigate the prevalence and underlying causes of hematuria in a selected patient population. By conducting a retrospective analysis of medical records, the purpose of this study is to identify demographic trends, common risk factors, and associated clinical conditions related to hematuria. Ultimately, the goal is to enhance the understanding of hematuria's consequences in clinical practice, improve diagnostic accuracy, and inform better management strategies for affected patients. The evaluation of hematuria through CT urography is a crucial diagnostic approach in urology. This study aims to assess the effectiveness of CT urography in identifying the underlying causes of hematuria in patients. By analyzing imaging results, we investigate the prevalence of various abnormalities, such as urinary tract stones, tumors, and structural anomalies. Our findings suggest that CT urography not only enhances the understanding of hematuria but also significantly improves clinical decision-making and patient outcomes. This research underscores the importance of incorporating advanced imaging techniques in the evaluation of hematuria to ensure comprehensive patient care.

CT urography is recognized for its high accuracy in detecting tumors and various causes of hematuria. This advanced imaging technique provides detailed visualization of the urinary tract, enabling clinicians to identify neoplasm and other underlying conditions that may contribute to the presence of blood in the urine. All cancers were seen on the nephrographic phase. Its precision and effectiveness make CT urography an essential tool in the diagnostic evaluation of urological disorders, ultimately aiding in timely and appropriate patient management.

Keywords: Hematuria, tumors, ct urography, kidney stones, bladder cancer.

INTRODUCTION

Hematuria can be defined as the presence of blood drops or clots in urine. It can be microscopic hematuria

and gross hematuria. Microscopic hematuria indicates red blood cells (RBC) detection through urinalysis or urine microscopy without apparent visual blood. While macroscopic or gross hematuria refers to visible blood in urine. Infection can cause both gross and microscopic hematuria. Whenever there is a gross hematuria in old persons, consider gross painless hematuria a sign of bladder or urologic cancer until proven otherwise. Hematuria itself is not a disease but rather a symptom or indication that there may be an underlying condition. It can signify various issues such as urinary tract infections (UTI), kidney stones, bleeding from prostate gland, trauma in bladder, bladder or prostate tumors, kidney and urinary tract tumours. Patients at high risk for urothelial carcinoma (UCC) of the bladder or upper urinary tract include those with significant risk factors, particularly a history of smoking and occupational exposures to chemicals. Smoking is one of the most critical risk factors, as tobacco smoke contains numerous carcinogens that can damage the cells lining the urinary tract, making smokers approximately three times more likely to develop bladder cancer compared to non-smokers. Additionally, certain occupations expose workers to hazardous chemicals linked to an increased risk of UCC. For instance, workers in the chemical industry, particularly those exposed to aromatic amines in dye manufacturing and rubber production, face a higher incidence of bladder cancer. Other at-risk occupations include painters, hairdressers, construction workers, and drivers who may encounter solvents, dyes, and diesel exhaust. Other factors contributing to UCC risk include age, with individuals over 55 being more susceptible, and gender, as men are more likely to develop the disease than women. Chronic irritation of the bladder from recurrent urinary tract infections or bladder stones, as well as a family history of bladder cancer, can also

elevate risk. Hematuria requires immediate medical attention. For those identified as high-risk, regular monitoring through cystoscopy and urine cytology tests is crucial for early detection and improved outcomes. Diagnosis of the main cause behind hematuria is very important for the treatment of the condition effectively. Hematuria can be diagnosed by several modalities such as ultrasound, intravenous pyelogram (IVP), and cystoscopy and computed tomography (CT SCAN). Among these the computed tomography has become the most commonly used method for evaluating hematuria. The ct urography is now increasingly used as the initial imaging technique in the patients with hematuria. The concept of CT Urography (CTU) is more appropriate as both the renal parenchyma and urothelium can be evaluated with one relatively non invasive comprehensive examination. CT urography provides a detailed anatomic depiction of each of the major portions of the urinary tract-the kidneys, intrarenal collecting systems, ureters and bladder and thus allows patients with hematuria to be evaluated comprehensively. Hematuria is an episodic condition and may stop after 2-3 urination. Drinking a lot of fluids can help treat hematuria efficiently. Coconut water, fresh lime water and and citrus fruits can help reduce the acidity of urine.

MATERIALS AND METHODS

I conducted a prospective study at Krsna Diagnostic Centre GMC Jammu from May 2024 to December 2024. The focus of my research was on patients presenting with hematuria which was evaluated using NCCT KUB (kidneys, ureters and bladder) and CT UROGRAPHY to gather comprehensive data on the condition. This study aimed to identify the underlying causes and implications of hematuria in the patient population. The results of biopsies and clinical follow up were used as the reference standard. Throughout the study, I collected data on various factors, including demographics, clinical history, and diagnostic outcomes. The findings revealed significant insights into the prevalence of different conditions associated with hematuria, which could enhance our understanding of this symptom and improve patient management strategies.

RESULTS

In this research, a comprehensive analysis was conducted involving a total of 930 patients diagnosed with hematuria. Prevalence of painless hematuria was more common than painful hematuria. Abdominal pain was the most common complaint other than hematuria followed by fever.

CAUSES:

- o Urinary tract infection (UTI)
- o Urinary tract stones (UT STONES)
- o Bleeding from prostate gland
- o Bladder or prostate tumor
- o Kidney and urinary tract tumors
- o Trauma to the kidney or bladder
- o Certain medications such as anticoagulants
- o Polycystic kidney disease

SYMPTOMS WITH HEMATURIA:

- o Urine can look red, pink or brown
- o Burning micturation
- o Painful urination
- o Fever
- o Frequent urinate
- o Flank pain
- o Pain in the bladder area

IMAGING PROTOCOL

The role of CT in imaging the urinary tract has expanded in recent years, particularly with the advent of multidetector (MDCT) scanners and CT urography (CTU). Contrast-enhanced CT is firmly established as the overall most sensitive modality for determining the cause of hamaturia. It is the gold standard in the detection of renal parenchymal masses, calculi, upper tract urothelial tumors, and extrinsic lesions. In patients presenting with acute renal pain, CT KUB will identify ureteric and bladder calculi. Multiphase contrast-enhanced CT is also more sensitive than IVU and ultrasound in detecting renal masses. It also provides excellent lesion characterization as well as imaging the adjacent retroperitoneum and providing information about the local and distant spread of malignancies CTU has a greater sensitivity in diagnosing upper tract urothelial malignancy than IVU. CTU aims to generate multiphase thin-section images through the kidneys, ureters, and bladder that

allow for the detection of the most common urological causes of hematuria, including calculi, renal masses, and urothelial tumors.

An unenhanced scan is initially performed from the upper poles of the kidneys to the lower edge of the symphysis pubis. High attenuation oral contrast should be avoided, as dense contrast can make detection of ureteric calculi more difficult. Most medical institutions employ a three-phase MDCTU protocol for the evaluation of patients with hematuria. Most three-phase MDCTU protocols comprise an initial non-contrast phase to detect urinary tract calculi and a second phase, i.e. the nephrographic phase, which is acquired following a delay of 90-100 seconds after administration of 100 ml of intravenous iodinated contrast, to evaluate the renal parenchyma. This is followed by the pyelographic phase taken 5-10 minutes following contrast administration, to evaluate the urothelium from the pelvicaliceal system to the bladder. These three-phase protocols are used at most institutions as they allow a thorough evaluation of the urinary tract for the most common causes of hematuria i.e. urinary tract calculi, renal neoplasms and urothelial tumors. Two-dimensional and three-dimensional intravenous urography-like images can be obtained by reformatting excretory phase images in the coronal or sagittal planes using volume rendering or maximum intensity projection techniques.

DISCUSSION

Hematuria is one of the most common signs of urinary tract diseases. Hematuria can come from any part of the urinary tract and has many causes, including stones, tumors, infections, injuries, medications, blood clotting disorders, and kidney diseases. One of the main reasons for checking patients with hematuria is to find urological cancers early and accurately. Therefore, tests that are very good at finding tumors are crucial. It's also important to identify other possible reasons for hematuria. Hematuria can be effectively assessed using a detailed CT scan that includes three phases: unenhanced, nephrographic, and excretory imaging. The unenhanced images, taken from the kidneys to the bladder, are great for spotting kidney stones, which are a common cause of hematuria. Nephrographic-phase images are best for showing any abnormal growths in the kidney tissue. Thin-section delayed images taken from the kidneys to the bladder

show the urinary tract filled with contrast material, which helps in finding urothelial diseases. Because MDCT urography can examine both kidney tissue and the lining of the urinary tract in one test, many experts suggest it as a convenient option for assessing various urinary tract problems that cause hematuria.

Present study comprised of 930 patients who presented with hematuria and were referred to the radiology department from urology department for workup with ct urography .all the patients underwent CT urography and diagnosis was established after analyzing all the phases of study with required post processing techniques.

RESULTS

In this research, a comprehensive analysis was conducted involving a total of 930 patients diagnosed with hematuria. The gender distribution revealed that 702 of these patients were males, while 228 were females. With a mean age of 58 years (range 17 to 96) were included in the study. In total, 50% of the patients showed no clear cause for their hematuria, 25% male patients had bladder cancer, 30% of the males above 50 years had benign prostate hyperplasia (prostatomegaly), 10% had prostate cancer, 20% had urinary tract infection and 45% had renal calculi. 25% had cystitis. A small no. of females were diagnosed with bladder cancer, suggesting that it is not widespread among this group. And the urinary tract infection (UTI) was the common cause of hematuria in women. Gross hematuria was present in 10-20% of pyelonephritis cases in females. In males above 50 years, 30% of the chronic smokers had a history of hematuria and were subsequently diagnosed with cancer. Some patients who presented with hematuria had a history of blunt trauma to the bladder. Blunt trauma can cause injury to the bladder, leading to bleeding and subsequently hematuria. At our diagnostic centre, we received both outpatients and inpatients presenting with hematuria, reflecting the widespread occurrence of this condition in diverse patient groups.

Prevalence of hematuria was more common among males (80%) compared to females (20%).

Prevalence of painless hematuria was more common than painful hematuria.

Abdominal pain was the most common complaint other than hematuria followed by fever.

CONCLUSION

Hematuria is a significant clinical finding that can indicate a range of underlying conditions, from benign issues to serious diseases like cancer. Proper evaluation is crucial to determine the cause. Diagnostic approaches, including imaging studies like CT urography, play a vital role in identifying the source of bleeding. Early detection and appropriate management are essential for improving patient outcomes. Understanding the implications of hematuria can lead to timely interventions and better overall care for patients.

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