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Original Research Article

Unenhanced Multidetector Computed Tomography (MDCT) of Kidneys, Ureter and Bladder in the Initial Imaging of Suspected Renal Colic

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Abstract: ***Introduction:*** Renal colic is a form of stomach discomfort that is usually caused by ureter blockage by dislodged renal stones. In suspected cases of acute renal urolithiasis and acute flank pain, computed tomography (CT) of the kidney, ureter and bladder (KUB) is being employed more and more in place of intravenous urography or KUB radiography due to its higher accuracy. ***Aim:*** The present study aims to assess the role of unenhanced multidetector computed tomography (CT) of kidneys, ureter and bladder (KUB) in the initial imaging of suspected acute renal colic. ***Methodology:*** This study was performed from December 2020 to March 2021 at Gujranwala Division. 138 cases of suspected acute renal colic underwent CT KUB. The demographic data, radiological data, clinical information and follow up data were recorded for each patient. The statistical package for social sciences (SPSS) v.17 was used to perform descriptive analysis. ***Results:*** There were 91 (53.5%) male and 79 (46.5%) females included in the present study with mean age of 50.86 ± 18.57 years. Out of 170 patients, only 138 (81.17%) were indicated with acute findings, whereas 32 (18.82%) individuals showed no acute findings. Majority of the stones had location near the pelvic brim (n=47; 27.6%). ***Conclusion:*** The use of CT KUB should be encouraged for evaluation of renal colic.

Keywords: computed tomography, KUB, CT, acute renal colic.

INTRODUCTION

Renal colic is a form of stomach discomfort that is usually caused by ureter blockage by dislodged renal stones. The VUJ, the narrowest point in the upper urinary tract, has the most frequent blockage location. Typically, renal colic starts in the flank and extends commonly underneath the chest or the below abdomen [1]. Usually it occurs in waves, although it is not consistent owing to ureteric peristalsis. Often one of the most terrible pains is mentioned [2, 3, 4]. Many suffer from urolithiasis-related renal colic in the emergency room because it can lead to severe and unstoppable agony. The characteristic presence of urolithiasis is a renal colic with a colic that spreads to the groin.

Although this disease may be exceedingly uncomfortable, most ureteric stones below 5 mm are finally transmitted into the bladder and are not permanently physically damaged without any therapy. It was said that the session was traumatic owing to significant pain and the experience of blood and coagulation as well as stones. In most circumstances, it is advisable to drink extra water to help with lithotripsies or endoscopic surgery in other circumstances. To lessen the risk of recurrence, preventative therapy might be initiated. In suspected cases of acute renal urolithiasis and acute flank pain, computed tomography (CT) of the kidney, ureter and bladder (KUB) is being employed more and more in place of intravenous urography or KUB radiography due to its higher accuracy. Another technique called abdominal x-ray (KUB) is used for identification of renal stones. However, its use is limited due to little information rendered by radiolucent calculi. Other factors such as abdominal organs, bowel gas and bon pelvis also hinders proper visualization through KUB. Thus, KUB is used mostly when CT scan is positive and location of stone is already known [4]. The Guidelines for European Association of Urological Surgeons (EAU), RCR and BAUS have said that CT KUB is now an investigative standard for the presumption of ureteric colic [2, 3].

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Nonenhanced CT is a highly good diagnostic technique to measure urolithiasis and it was characterized as the best imaging technique to confirm urolithiasis diagnosis [5, 6] And NECT is successful in identifying other than renal-colic-causing stones. It takes less time than intravenous urography (IVU), and it decreases the risk of problems with intravenous contrast mediums in especially individuals with obstructive calculus [8, 9].

MATERIALS AND METHOD

The present study was Cross Sectional conducted from December 2020 to March 2021 at a Tertiary care hospital, Gujranwala Division. The Convenient sampling technique was used and total 138 cases of suspected acute renal colic were identified from records and included in the study. After explaining the purpose of study, written consents were taken from the participants. All the patients underwent CT KUB as part of their examination for acute renal colic. The 64 Slices CT Machine was used. The demographic data, radiological data, clinical information and follow up data were recorded for each patient. The reports were reviewed by radiologists. Case was declared as positive when high attenuation calculi was detected in kidneys, ureter or bladder. The maximal axial measurement of calculus and timing of CT KUB examination were also noted. Moreover, any abnormalities associated with pain of patient and found on CT KUB were also recorded. The statistical package for social sciences (SPSS) v.17 was used to perform descriptive analysis.

Inclusion Criteria

- Participant suspected with acute renal colic.
- Symptomatic patients having clinical features of renal colic.
- Both genders were selected.

Exclusion Criteria

- Patients came with complain of other comorbidities having irrelevant features were excluded.
- Asymptomatic patient.

RESULTS

The Table 1 shows demographics of patients. The characteristics for patients with acute findings and no findings have been compared. There were 91 (53.5%) male and 79 (46.5%) females included in the present study. Out of 170 patients, only 140 were indicated with acute findings, whereas 30 individuals showed no acute findings.

It is evident that analog pain scale for patients with acute findings was more than that found for individuals with no findings. The patients associated with acute findings had higher frequency of dysuria as compared to individuals with no findings. The temperature, creatinine, leukocytes and c-reactive protein for patients with acute findings were found to be higher as compared to the individuals with no findings. However, heart rate and renal clearance for individuals with no findings were greater than the patients with acute findings.

Table-1: Stone Size

Stone Size	Frequency	Percent
2.5 to 3.5 cm	13	7.6
3.6 to 4.5 cm	41	24.1
4.6 to 5.5 cm	56	32.9
5.6 to 6.5 cm	30	17.6
Missing	30	17.6
Total	170	100

Table-2: Stone Location

Stone Location	Frequency	Percent
Ureteropelvic junction	**47**	**27.6**
Ureterovesical junction	**46**	**27.1**
Near the pelvic brim	**47**	**27.6**
Missing	**30**	**17.6**
Total	**170**	**100**

Table-3: Age Distribution

Age	Frequency	Percent
15 to 30 years	26	15.3
31 to 40 years	29	17.1
41 to 50 years	29	17.1
51 to 60 years	36	21.2
above 60 years	50	29.4
Total	170	100

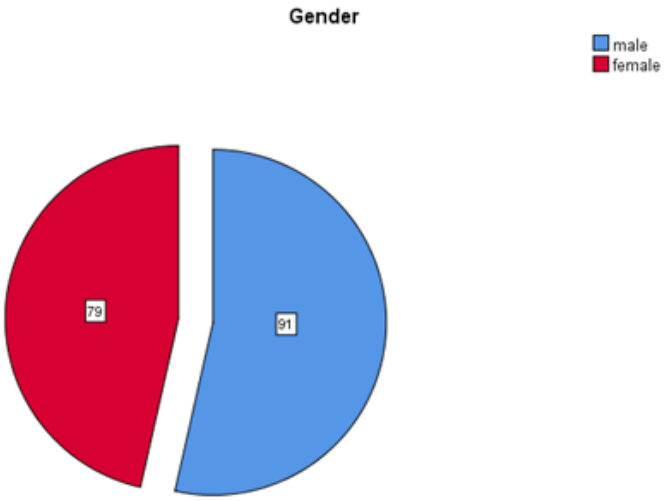

Fig-1: Gender Distribution

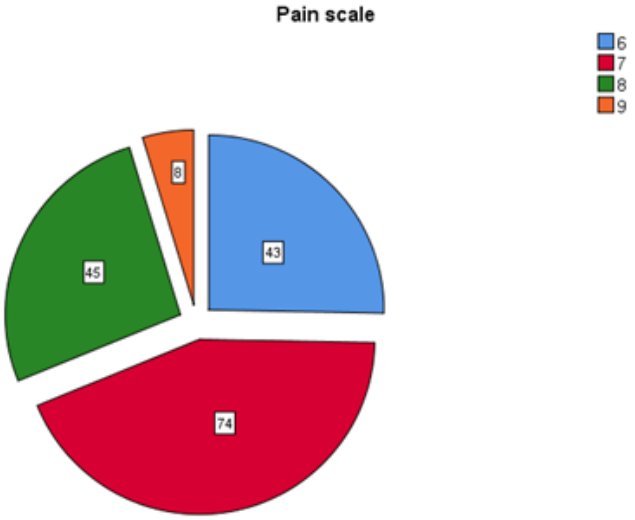

Fig-2: Pain Scale

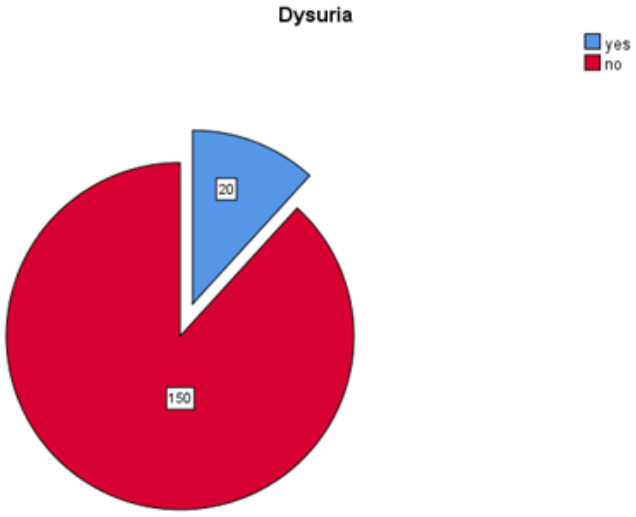

Fig-3: Shows Dysuria Findings

Table-4: Gender and Stone location

Gender * Stone location Crosstabulation

			Stone location			Total
			Ureteropelvic junction	Ureterovesical junction	Near the pelvic brim	
Gender	male	Count	29	24	25	78
		% within Gender	37.20%	30.80%	32.10%	100.00%
	female	Count	18	22	22	62
		% within Gender	29.00%	35.50%	35.50%	100.00%
Total		Count	47	46	47	140
		% within Gender	33.60%	32.90%	33.60%	100.00%

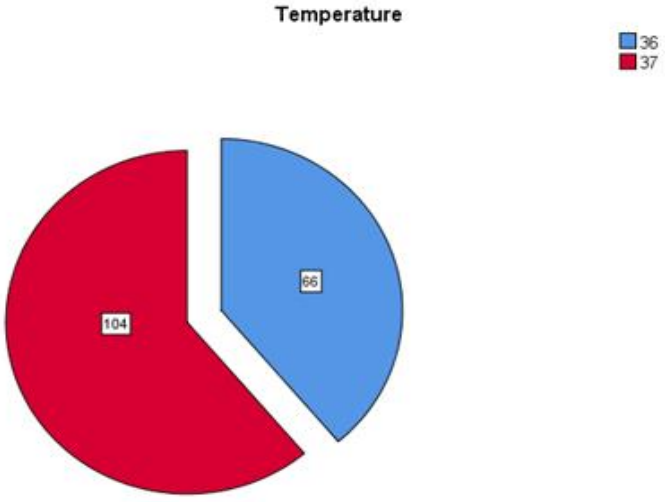

Fig-4: Temperature findings

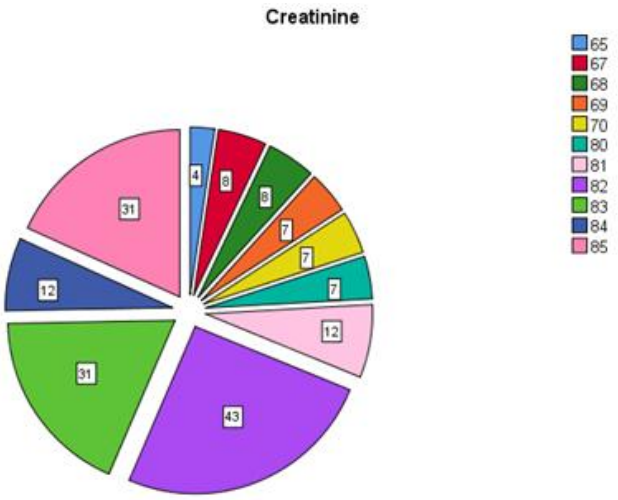

Fig-5: shows Creatinine levels

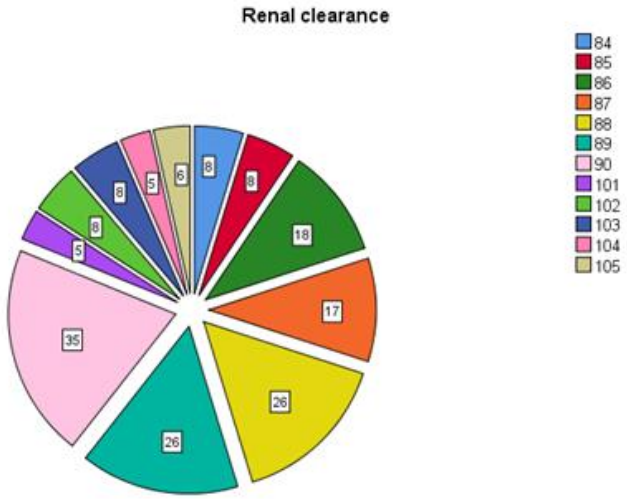

Fig-6: Simple Pie Chart showing Renal Clearance findings

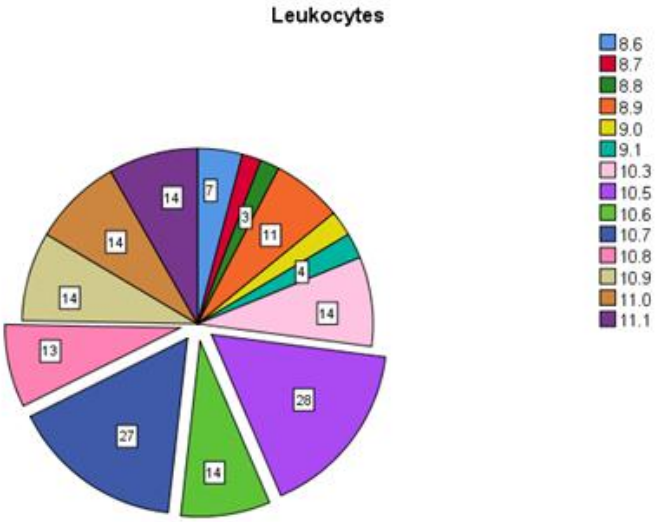

Fig-7: Leukocytes

DISCUSSION

Renal colic refers to acute and chronic loin pain that results from urinary stone obstruction. The hinderance in ureter causes pain. The yearly incidence of renal colic is 0.5 to 1 in 1000 individuals. It is a common clinical presentation in accidents and emergency department. It is mostly apparent with acute flank pain. The most common reason of renal colic is renal stones, which have lifetime incidence of 12% [11]. It is highly common in patients with age range of 30-60 years. On the basis of gender, it has high occurrence rate in males. According to an estimation, males are three times more prone to renal stones as compared to females. The recurrence of symptoms is also very common. It has been estimated to effect 50% of patients within time of 5 years. Consequently, the economic impact of renal colic is extremely high with approximately 2 billion per annum in only USA [10].

Radiological imaging has wide acceptance for assisting in management of individuals with acute renal colic. The traditional approach of imaging involves plain radiography, IVU and ultrasound. The applicability of unenhanced CT for speedy and adequate diagnosis of patients with acute flank pain was initially documented in 1995. In the last several years, CT KUB has emerged as the preferred imaging method due to its better accuracy. This approach has been supported by tremendous research works [12].

CT KUB has many merits over other imaging protocols. There is no requirement of intravenous contrast, high sensitivity for detection of ureteral calculi, less examination time and differentiating ability between various causes of flank pain [13]. Other methods are associated with problems of inappropriate quality and potential complications related with intravenous contrast. This includes anaphylactic reactions, nephrotoxicity, and allergic reactions. Previous research works have advocated the use of CT

due to reduction in time for patients spent in emergency department [14]. Although the benefits of CT have long been advocated, its use is still under question. Thus, extensive research is required to understand its actual applicability [15]. CT KUB also enables the classification of stones in accordance with their diameter, density and volume. This classification helps in adopting appropriate and effective management strategy. The modernized technique further helps in identification of stones made up of uric acid and xanthine. Anyhow, it does not help in detection of stones made up of indinavir. On the other hand, several disadvantages have been associated with the use of CT KUB. It has slightly high radiation dose as compared to intravenous urography. As recurrence rate for renal stones is 50% in 5 years and 70% in 10 years, this imposes the risk of repeated exposure of radiations due to imaging [12].

In the present research work, several signs were recorded as primary indicators of renal stone. This included hydroureter, renal enlargement, decreased renal attenuation, hydronephrosis, periureteral stranding, asymmetric perinephric stranding and tissue rim sign [16]. The factors of stone size, patient symptoms and stone location are responsible for deciding urological intervention. The stone size of less than 5mm has high probability of resolving or passing out of the ureter[5]. However, the stones with greater size and perplexing locations need to be removed through intervention. CT KUB is extremely helpful in indicating stone size and locations, which in turn aids in predicting the need of urological intervention [17].

CT KUB is extremely helpful in diagnosing causes of acute flank pain, whether it is renal stone or any other reason. Renal stone is thought to cause 33% of cases with acute flank pain. About 45% of cases of flank pain occur due to other reasons such as genitourinary, gynecological or gastrointestinal issues. The findings of present research work have illustrated adequate differential detection of renal stone and other causes of flank pain [18].

The female patients with renal colic show diagnostic issues. It is evident that male had higher rate for stone disease as compared to female patients. Most of the females with flank pain may have gynecological abnormalities and need extensive assessment [14]. Thus, such patients need initial evaluation by combination with plain radiography (KUB) to avoid unnecessary radiations of CT. The combination of CT with KUB can bring about positive outcomes for radiology workflow and budgets. It can also radically change diagnostic process and cost attributes [19]. CT KUB is thought to be highly cost-effective as compared to other diagnostic methods due to reduced time required for assessment, lack of administration of intravenous contrast and radiographic equipment [20].

CONCLUSION

The present study shows the feasibility and applicability of CT KUB in evaluation of renal colic. Apart from diagnosing renal stones, CT KUB is able to diagnose other unexpected findings also. The use of CT KUB can be beneficial in terms of managing the cases of renal colic with high efficiency, and less cost and time.

Conflict of Interest: Nil

Funding Resources: Nil

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