CECT versus NCCT in the management of lower ureteric stones - A comparative study

[1]Samia Mohan, Assistant Professor, Department of General Surgery, Acharya Shri Chander College of Medical Sciences and hospital, Jammu.

[2]Akshat Sudhanshu, Mch, Paediatric Surgery, Department of General Surgery, Acharya Shri Chander College of Medical Sciences and hospital, Jammu.

[3]Rishabh Gupta, Postgraduate student, Department of General Surgery, Acharya Shri Chander College of Medical Sciences and hospital, Jammu.

[4]Kuldeep Singh Mehta, Professor and head, Department of General Surgery, Acharya Shri Chander College of Medical Sciences and hospital, Jammu.

Corresponding Author: Samia Mohan, Assistant Professor, Department of General Surgery, Acharya Shri Chander College of Medical Sciences and hospital, Jammu.

How to citation this article: Samia Mohan, Akshat Sudhanshu, Rishabh Gupta, Kuldeep Singh Mehta, "CECT versus NCCT in the management of lower ureteric stones - A comparative study", IJMACR- September – October - 2022, Vol – 5, Issue - 5, P. No. 74 – 81.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Functional studies in the form of contrast enhanced computed tomography and intravenous urography have been popularly used in the past in the evaluation as well as management of patients presenting with symptoms of ureteric colic.

Invariably, patients of ureteric stones were at a time subjected to these studies. The role of CECT along with the benefits over plain CT needs further study.

Keywords: Computed tomography, contrast enhanced computed tomography, functional studies.

Introduction

Ureteric calculi is one of the common complaints which causes a patient to rush to the emergency with sudden agonizing pain in the flanks. Imaging is sought which accounts for expenditure as well as radiation and dye exposure to the patient, sometimes repeatedly. In this study, we try to decide whether functional studies are warranted in a patient with ureteric stones.

Materials and method

The study was conducted in the Department of Surgery and Urology, Government Medical College, Jammu and patients of lower ureteric stones were divided into two groups:

First group included patients of lower ureteric stone who were operated following only ultrasound and non-contrast computed tomography (NCCT).

Second group included patients who underwent ultrasound along with contrast enhanced computed tomography

All patients of lower ureteric stones admitted from 1st November 2015 to 31st October 2016 were included in this study.

Selection criteria

All patients with

Solitary lower ureteric stone greater than or equal to 5mm.

Normal parenchymal thickness of ultrasound.

Mild to moderate hydronephrosis on ultrasound.

Exclusion criteria

Bilateral renal disease.

Active urinary tract infection.

Renal failure.

Solitary kidney.

Severe hydronephrosis.

Pregnancy.

Method

A total of 80 Patients who presented in the Department of Surgery Emergency and Urology with lower ureteric stone greater than or equal to 5mm. on ultrasound, after 24 hours of initial management with analgesics and antispasmodics, underwent non-contrast computed tomography in one group and functional study in form of CECT in other group, preoperatively. The intraoperative and postoperative details of both the groups following ureteroscopic removal of stone have been compared to determine the role of functional studies.

In addition to history, clinical examination and routine laboratory investigations, plain abdominal radiograph, urine culture and abdominal ultrasonography with parenchymal thickness at each pole was performed in all patients.

Conclusion

In our study most of the patients in Group I were in age group of 20-39 years (24, 60%), while most of the patients in Group II were in age Group of 30-49 years (25, 62.50%). Mean age of patients in Group I was 39.75 years and mean age of patients in Group II was 37.72% which was comparable in both the groups (p=0.48, not significant). In a study conducted by Greenstein A, Beri A, Sofer M, et al. (1), the mean age of patients in NCCT group was 49 years and in CECT group was 45.7 years, in a similar study done by Hammad M et al. (2004), the mean age of patients in both the group was 37.9 years and 38.2 years respectively. In the study by Feroze S, Singh B, Gojwari T, et al. (2), the mean age of patients was 45.48 years and 42.37 years in the Ncct and Cect/ivu group respectively. As is evident from above discussion the mean age of patients in our study was comparable to rest of earlier studies.

In our study in Group I, Female predominance was observed with Female: Male ratio of 0.85:1, While in

Group II Male dominated with Male: Female ratio of 1.10:1. Statistically, there was no significant difference between the two groups. The overall sex ratio (Male: Female) was 0.77:1. In the study by Ather MH, Faruqui N, Akhtar S, et al. (3), the Male: Female ratio was 3.15:1, while in the study done by Feroze S, Singh B, Gojwari T, et al. (2), the Male: Female ratio was 2.12:1, In a later study conducted by Khan N, Anwar Z, Zafar AM, et al. (4) the Male: Female ratio was 1.67:1. Clearly in our study Females have dominated the study, while in other studies Male preponderance is observed.

In our study, BMI (Body mass index) of majority of patients in both the groups was normal. Only 1 (2.50%) patient in Group I and 4 (10%) patient in Group II were overweight (BMI 25-29.9). No patient had BMI <18.5 kg/m^2 (underweight) or >30 kg/m^2 (obesity). Statistically, there was no significant difference between the two groups (p=0.35).

Majority of patients in Group I had ASA Grade I 87.5% (n=35), only 12.5% (n=5) patients had ASA grade II, Similarly in Group II 82.5% (n=33) Patients were ASA Grade I and 17.5% (n=7) were ASA Grade II. Statistically, there was no significant difference between the two groups (p=0.75).

In both Groups I and II, equal number of patients 17.5% (n=7) each, had Hypertension and one patient (2.5%) in both the groups had diabetes mellitus. Statistically, there was no significant difference between the two groups (p=1.00).

Presenting chief complaints in Group I was Pain Left Lumbar region in 52.5% of patients (n=21) and Pain Right Lumbar region in 47.5% of patients (n=19). In Group II, 55% patients (n=22) presented with pain Left Lumbar region and 45% patients (n=18) presented with pain in Right Lumbar region. There is a slight preponderance of Pain Left Lumbar region as a chief complaint then Pain in Right Lumbar region. Statistically, there was no significant difference between the two groups (p=1.00).

In Group I, ultrasonography showed the site of calculus to be Left Lower Ureter in 50% of patients (n=20), Right Lower Ureter in 35% patients (n=14), Right VUJ 10% (n=4), Left VUJ 5% (n=2). In Group II, site of calculus was Left lower Ureter in 52.5% of patients (n=21), Right Lower Ureter in 42.5% of patients (n=17), 2.5% (n=1) right VUJ and 2.5% (n=1) Left VUJ. Clearly according to ultrasonography, most common site of calculus in our study is Left ureter. Statistically, there was no significant difference between the two groups (p=1.00).

In Group I, on ultrasonography mean calculus size was 8.88 mm with a range of 5.8 to 14 mm, while in Group II, mean stone size was 9.07 with a range of 5 to 14 mm. Statistically, there was no significant difference between the two groups (p=0.69). All the patients in the two groups had Grade 1 hydronephrosis.

The ultrasonographic findings were comparable to NCCT findings in Group I and CECT findings in Group II. The mean calculus size in the NCCT group was 8.6 mm while in CECT group was 9.073 mm. In the study done by Greenstein A, Beri A, Sofer M, et al. (1) mean calculus size according to Ncct was 10. 2mm and Cect was 10.1 mm. In the study in Hammad M et al. (2004), the mean stone size according to NCCT was 9 mm and CECT was 11 mm, similar study conducted by Feroze S, Singh B, Gojwari T, et al. (2) showed mean calculus size of 9 mm according to NCCT and 11 mm according to CECT. Recent study conducted by Lee DH, Chang IH, Kim JW, et al. (5) had a mean calculous size of 6.9 mm on NCCT and 9.1 mm on CECT.

The mean value of hemoglobin in was 10.65g/dl in group I and 10.69g/dl in group II, which is comparable in both the groups. The mean serum creatinine in Group I was 0.71mg/dl and in Group II was 0.68mg/dl, which is comparable in both the groups. Rest of the laboratory parameters were also comparable with non-significant p value in all the parameters. The site of calculus according to NCCT in Group I was Left lower Ureter in 50 % of patients (n=20), Right lower Ureter in 35% of patients (n=14), Right VUJ in 10% of patients (n=4) and Left VUJ in 5% of patients (n=2), while in CECT Group Left lower Ureteric stone was found in 50%of patients (n=20), Right lower ureter in 42.5% of patients (n=17), Right VUJ in 2.5% of patients (n=1), Left VUJ 5% of patients (n=2). Clearly as previously discussed like in ultrasound the most common site for calculus is Left lower ureter both in NCCT and CECT Groups.

In Group I, impacted stones were present in 16 (40%) patients, while in Group II, they were present in 18 (45%) patients. Statistically, the difference between the two groups was not significant (p=0.82).

In our study in Group I, ureteral dilatation was required in 20 (50%) patients, while in Group II, it was required in 16 (40%) patients. Statistically, the difference between the two groups was not significant (p=0.50).

In Group I, round ureteric orifice was found in 16 (40%) patients and silt-like in 24 (60%) patients, while in Group II, round ureteric orifice was found in 14 (35%) patients and silt-like in 26 (65%) patients. Statistically,

the difference between the two groups was not significant (p=0.81).

In Group I, DJ stent was used in 30 (75%) patients, while in Group II, it was used in 28 (70%) patients. Statistically, the difference between the two groups was not significant (p=0.80).

In Group I and Group II, C-Arm was used in 1 (2.50%) patient each. Statistically, both the groups were comparable (p=1.00). In a study done by Weizer AZ, Auge BK, Silverstein AD, et al. (6) residual stone was observed in 10% of patients, stricture in 1.2% patients and silent obstruction was seen in 2.9% patients. In a similar study done by Karadag MA, Tefekli A, Altunrende F, et al. (7), residual stones were detected in 5% of patients while stricture and silent obstruction was observed in 0.75 and 0.3% patients respectively.

Result

In this study, the patients who underwent functional studies and patients who underwent plain CT had comparable rates of DJ stent placement and need for use of C-arm while undergoing URS for lower ureteric calculus. The two groups were comparable and no added advantage was seen with functional studies as outcome remains same, in comparable groups.

Observations

Table 1: Age wise comparison of Group I and Group II

Age group (in years)	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
20 – 29	8	20.00	9	22.50
30 – 39	16	40.00	14	35.00

40 – 49	6	15.00	11	27.50
50 – 59	4	10.00	3	7.50
60 – 69	4	10.00	3	7.50
≥ 70	2	5.00	0	0
Total	40	100.00	40	100.00
Mean age in years ± Standard deviation (Range)	39.75±14.02 (20 – 75)		37.72±11.59 (20 – 65)	
p-value (Student's t-test)	0.48 (Not significant)			

Table 2: Sex wise comparison of Group I and Group II

Sex	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
Male	14	35.00	21	52.50
Female	26	65.00	19	47.50
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	0.17 (Not significant)			

Table 3: Comparison of Group I and Group II according to body mass index

BMI (kg/m^2)	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
18.5 – 24.9 (Normal weight)	39	97.50	36	90.00
25 – 29.9 (Overweight)	1	2.50	4	10.00
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	0.35 (Not significant)			

Table 4: Comparison of Group I and Group II according to ASA Grade

ASA Grade	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
Grade I	35	87.50	33	82.50
Grade II	5	12.50	7	17.50
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	0.75 (Not significant)			

Table 5: Comparison of Group I and Group II according to chief complaints

Chief complaints	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
Pain left lumbar region	21	52.50	22	55.00
Pain right lumbar region	19	47.50	18	45.00
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	1.00 (Not significant)			

Table 6: Comparison of Group I and Group II according to comorbidity

Comorbidity		Group I (NCCT) (n=40)		Group II (CECT) (n=40)		p-value
		No.	%	No.	%	(Fisher's exact test)
Hypertension	Yes	7	17.50	7	17.50	1.00
	No	33	82.50	33	82.50	(Not significant)
Diabetes mellitus	Yes	1	2.50	1	2.50	1.00
	No	39	97.50	39	97.50	(Not significant)

Table 7: Comparison of mean laboratory parameters of Group I and Group II

Laboratory parameters	Group I (NCCT) (n=40)	Group II(CECT) (n=40)	p-value (Student's t-test)
	Mean ± Standard deviation	Mean ± Standard deviation	
Haemoglobin (%)	10.65 ± 0.98	10.69 ± 0.90	0.84[*]
TLC (per mm^3)	7255 ± 929.28	7367.5 ± 896.54	0.58[*]
Serum creatinine (mg/dL)	0.71 ± 0.10	0.68 ± 0.10	0.18[*]
PTI	95.55 ± 4.88	95.41 ± 4.42	0.89[*]
Serum sodium (mEq/L)	146.67 ± 4.20	145.7 ± 4.07	0.29[*]
Serum potassium (mEq/L)	4.51 ± 0.30	4.44 ± 0.31	0.30[*]

[*]Not significant

Table 8: Comparison of site of calculi according to ultrasonography results in Group I and Group II

Site of calculi	Group I(NCCT) n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
Left lower ureter	20	50.00	21	52.50
Right lower ureter	14	35.00	17	42.50
Left VUJ	2	5.00	1	2.50
Right VUJ	4	10.00	1	2.50
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	1.00 (Not significant)			

Table 9: Comparison of mean size of ureteric stones according to USG in Group I and Group II

Ureteric stones	Group I(NCCT) (n=40)	Group II (CECT) (n=40)	p-value (Student's t-test)
	Mean ± Standard deviation	Mean ± Standard deviation	
Size (Range) (mm)	8.88±1.94, (5.8 – 14)	9.07±2.37, (5 – 14)	0.69[*]

Not Significant*

Table 10: Comparison of mean size of calculus according to NCCT in Group I and CECT/IVU in Group II

Ureteric stones	Group I(NCCT) (n=40)	Group II (CECT) (n=40)	p-value (Student's t-test)
	Mean ± Standard deviation(mm)	Mean ± Standard deviation(mm)	0.69[*]
Size (mm)	8.6 ± 1.94	9.073 ± 2.3	

Table 11: Comparison of site of calculi through NCCT in Group I and CECT/IVU in Group II

Site of calculi	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
Left lower ureter	20	50.00	20	50.00
Right lower ureter	14	35.00	17	42.50
Left VUJ	2	5	2	5
Right VUJ	4	10.00	1	2.5
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	1.00 (Not significant)			

Table 12: Comparison of Group I and Group II according to presence of impacted stones

Impacted stones	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
Yes	16	40.00	18	45.00
No	24	60.00	22	55.00
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	0.82 (Not significant)			

Table 13: Comparison of Group I and Group II according to ureteral dilatation in two groups

Ureteral dilatation	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
Yes	20	50.00	16	40.00
No	20	50.00	24	60.00
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	0.50 (Not significant)			

Table 14: Comparison of Group I and Group II according to shape of orifice

Shape of orifice	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
Round	16	40.00	14	35.00
Silt-like	24	60.00	26	65.00
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	0.81 (Not significant)			

Table 15: Comparison of Group I and Group II according to use of DJ stent

Use of DJ Stent	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
Yes	30	75.00	28	70.00
No	10	25.00	12	30.00
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	0.80 (Not significant)			

Table 16: Comparison of Group I and Group II according to use of C-Arm fluoroscopy machine

Use of C-Arm Fluoroscopy Machine	Group I (NCCT) (n=40)		Group II (CECT) (n=40)	
	No.	%	No.	%
Yes	1	2.50	1	2.50
No	39	97.50	39	97.50
Total	40	100.00	40	100.00
p-value (Fisher's exact test)	1.00 (Not significant)			

References

1. Greenstein A, Beri A, Sofer M, Matzkin H. Is intravenous urography a prerequisite for renal shockwave lithotripsy? J Endourol 2003; 17(10): 835-9.

2. Feroze S, Singh B, Gojwari T, Manjeet S, Athar B, Hamid H. Role of non-contrast spiral computerized tomography in acute ureteric colic. Indian J Urol 2007; 23(2): 119-21.

3. Ather MH, Faruqui N, Akhtar S, Sulaiman MN. Is an excretory urogram mandatory in patients with small to medium-sized renal and ureteric stones treated by extra corporeal shock wave lithotripsy? BMC Med 2004; 2: 15.

4. Khan N, Anwar Z, Zafar AM, Ahmed F, Ather MH. A comparison of non-contrast CT and intravenous urography in the diagnosis of urolithiasis and obstruction. African J Urology 2012; 18(3): 108-11.

5. Lee DH, Chang IH, Kim JW, Chi BH, Park SB. Usefulness of nonenhanced computed tomography for diagnosing urolithiasis without pyuria in the emergency department. BioMed Res Inter 2015; Article ID 810971.

6. Weizer AZ, Auge BK, Silverstein AD, et al. Routine postoperative imaging is important after ureteroscopic stone manipulation. J Urol 2002; 168: 46.

7. Karadag MA, Tefekli A, Altunrende F, et al. Is routine radiological surveillance mandatory after uncomplicated ureteroscopic stone removal? J Endourol 2008; 22: 261.

8. Masarani M, Dinneen M. Ureteric colic: new trends in diagnosis and treatment. Postgrad Med J 2007; 83 (981): 469-72.

9. Nayyar R, Khattar N, Sood R. Functional evaluation before stone surgery: Is it mandatory? Indian J Urol 2012; 28: 256-62.

10. Fulgham PF, Assimos DG, Pearle MS, Preminger GM. Clinical effectiveness protocols for imaging in the management of ureteral calculous disease: AUA Technology Assessment. J Urology 2013; 189: 1203-13.

11. Villa L, Giusti G, Knoll T, Traxer O. Imaging for urinary stones: Update in 2015. European Urol Focus 2016; 2(2): 122-29.