Original Article

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New Generation Contrast Media and Renal Saftey

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Abstract

Background: With the advancement in radiological interventions and diagnostic imaging iodinated contrast has an important role to play. Research and advancement in contrast media safety makes this pharmaceutical agent safe to use in daily practice. Our study is done to assess the safety of present generation iodinated contrast media over the kidneys in patients with heterogenous clinical setting undergoing contrast enhanced CT with serum creatinine and e-GFR as a tool for renal function assessment. The study concludes low-osmolar non – ionic contrast is safe in general population; however, we would advise judicious use of intravenous low-osmolar non-ionic contrast in patients with associated comorbid conditions due to mild but insignificant rise in serum creatinine values. **Subjects and Methods:** Prospective study done with 158 patients undergone computed tomography with Low-osmolar non-ionic iodinated contrast media. Sr,creatinine and eGFR are obtained. **Results:** Age of the patient does not have direct influence on percentage of creatinine variation where as cormorbid conditions of the patient has. **Conclusion:** Incidence of contrast induced nephropathy among the general population is negligible however judicious use of contrast media is necessary in patients with cormorbid conditions.

Keywords: Contrast induced nephropathy; low-osmolar contrast media.

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Abbrevations: e-GFR = estimated glomerular filtration rate, sr. creatitine = serum creatinine, DM = Diabetes mellitus, HTN = Hypertension, CT = Computed tomography, CIN = Contrast induced nephropathy.

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Introduction

The role of iodinated contrast in medical diagnostic imaging and intervention procedures are inevitable. Their value has been long recognised as attested by their increased usage in various diagnostic and intervention procedures. Under normal circumstance nearly all the intravenous contrast media are eliminated through kidneys. The purpose of this study is to evaluate the renal safety of present-day contrast media in patients with heterogenous clinical settings using serum creatinine and e-GFR.

Subjects and Methods

This is a prospective study done with 158 patients at A.J. Institute of Medical sciences between 2011-2014 undergone computed tomography with Low-osmolar non-ionic iodinated contrast media (Iopromide) with iodine strength 350mg/ml and is given as per the standard regime i.e., 1 - 2 ml/ kg. Sr, creatinine is evaluated in the subjects blood sample collected 4-6hrs before and 48-72hrs after procedure. eGFR is calculated using Cockcroft-Gault formula1.

Collected data were also analysed for sensitivity, specificity, positive predictive value and chi-square test. P-value <0.05 are considered significant and P – value >0.05 are considered insignificant.

Results

Table 1: Influence of Age Over Creatinine Variation

Creatinine Variation	Age in Years							Total
	19 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 – 90	
0 – 5 %	2	3	9	6	5	2	0	27
6 – 10 %	1	3	5	13	9	5	0	36
11 – 15 %	4	5	7	14	11	4	1	46
16 – 20 %	6	2	12	2	7	3	1	33
21 – 25 %	2	3	4	1	5	1	0	16
Total	15	16	37	36	37	15	2	158

CHI – Square Test Value: 26.70 P-value : 0.31

The above table and column chart [Figure 1] represent the comparison of age with the creatinine variation to know the influence of age over the variation in creatinine value. The statistical analysis using Pearson Chi-Square test with value of 26.70 and P-value 0.31 confirms that age does not have direct influence on percentage of creatinine variation when using non-ionic contrast.

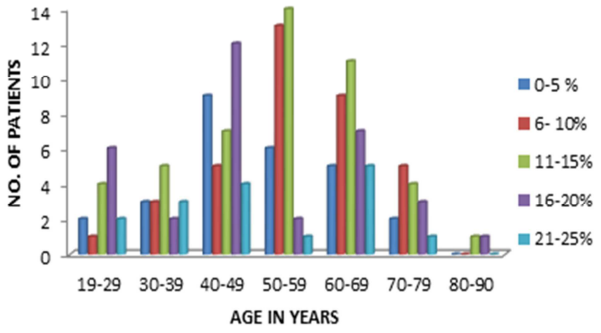

Figure 1: Influence of Age Over Creatinine Variation

Table 2: Comorbid Conditions Over Creatinine Variation

Creatinine variation	Comorbid Conditions				Total
	Absent	DM	HTN	BOTH	
0 – 5 %	27	0	0	0	27
6 – 10 %	24	8	0	4	36
11 – 15 %	32	7	1	6	46
16 – 20 %	22	10	1	0	33
21 – 25 %	2	9	0	5	16
Total	107	34	2	15	158

CHI – Square Test Value: 44.70 P – VALUE: 0.0001

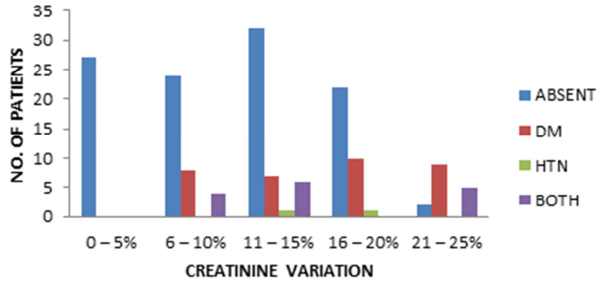

Figure 2: Creatinine Variation.

The above table and column chart [Figure 2] analysis the incidence of contrast induced nephropathy and percentage of creatinine variation among the study population with associated comorbid conditions. There is no incidence of contrast induced nephropathy among the study population with associated comorbid conditions. However, the statistical analysis with Pearson Chi-Square test value 44.70 and P-value 0.0001 confirms that subjects with comorbid conditions have direct influence on percentage variation on creatinine value. It is evident from the column chart that majority of population among the higher percentage (21 – 25%) creatinine variation group are with Diabetes or both Diabetes and Hypertension.

Discussion

Contrast-induced nephrotoxicity (CIN) is a sudden deterioration in renal function following the recent intravascular administration of iodinated contrast medium in the absence of another nephrotoxic event. Low and iso-osmolar contrast is relatively safe in comparison with high-osmolar contrast media.[2,3] Unfortunately, very few published studies adequately isolate patients undergoing contrast enhanced CT in whom iodinated contrast medium exposure is the only nephrotoxic event.[4-7] CIN appears within 48 hours after the administration of radiographic contrast media and is maintained for 2–5 days.[8] An overall incidence of CIN in the general population is reported to be 0 –2.3%.[9]

There are no standard criteria for the diagnosis of CIN; criteria used in the past have included percent change in the baseline serum creatinine (e.g., an increase of variously 25% to 50%) and absolute elevation from baseline serum creatinine (e.g., an increase of variously 0.5 to 2.0 mg/dL).[10,11] One of the most commonly used criteria has been an absolute increase of 0.5 mg/dL.

The risk of developing contrast-induced nephropathy is influenced by diabetes, hypertension, age and reduced eGFR.[12] The risk of CIN was found to be 0.6% in patients with eGFR greater than 40 mL/min/1.73m2 and 4.6% in patients with an eGFR of 30 to 40 mL/min/1.73m2.[13] The CIN rate was 7.8% with an eGFR > 30 mL/min/1.73m2.

We in our study have aimed at analysing changes in renal functions in patients with heterogenous clinical settings undergoing computed tomography with low-osmolar iodinated contrast media keeping serum creatinine and eGFR as baseline investigation.

The major preventive action against CIN is to ensure adequate hydration.[14] We during our study maintained adequate hydration with 0.9% normal saline infusion at 100 mL/hr, beginning 6 to 12 hours before and continuing 4 to 12 hours after intravascular iodinated contrast medium administration for the inpatient and oral hydration for outpatients with comorbidity such as diabetes and hypertension.[15]

Among the 158-study population 110(69.6%) were male patients and 48 (30.4%) were female patients with wide range of age distribution. Among the 158 patients 34 are diabetic, 2 are hypertensive, 15 had both diabetes and hypertension, rest of the 107 patients did not had any comorbidities. The percentage increase in serum creatinine did not had any direct relation to the age or sex. However, the statistical analysis [Table 2] with value 44.70 and P-value 0.0001 confirms that subjects with comorbid conditions have direct influence on percentage variation on creatinine value but insignificant rise to term it as contrast induced nephropathy.

Conclusion

After a thorough evaluation of 158 patients with heterogenous clinical setting who has undergone contrast enhanced computed tomography with lowosmolar non-ionic intravenous contrast, we can conclude that incidence of contrast induced nephropathy among the general population is negligible and the use of lowosmolar non – ionic contrast is safe in such patients.

However, we would advise judicious use of intravenous lowosmolar non-ionic contrast in patients with associated comorbid conditions like Diabetes mellitus and hypertension, since we saw a mild but insignificant rise in serum creatinine values in such patients.

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