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Original Research Article

Incidence of Contrast Induced Nephropathy in Diabetes Mellitus Patients Undergoing Contrast Enhanced Computed Tomography

Dr. Ranjit Kaur[1], Dr. Ashish Thakur[1*]

[1]Medical Officer Civil Hospital Rajgarh, Himachal Pradesh, India

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Abstract: ***Introduction:*** Iodinated contrast media are being used increasingly for therapeutic and diagnostic procedures intravenous and intraarterially. This has led to the increased incidence impairment of renal function after the administration of contrast media especially in high risk population. The concept of CIN was first described during the 1950s by Bartel *et al.* [1]. Treatment of Contrast induced Nephropathy is mainly supportive, consisting of careful fluid and electrolyte management, although dialysis may be required in some cases. The limitation in the available treatment options makes prevention and early diagnosis the cornerstone of management. ***Methods:*** All the patients above 18 yrs. of age are planned for CECT and willing to participate in the study are selected. Total of 200 patients are selected. After taking informed consent. Selected patients underwent CECT with intravenous contrast. Similar contrast media was used in all patients i.e., LOCM (Iohexol)/ Volume used was 1.5ml/Kg body weight. All routine blood parameters were sent including pre procedure BUN, serum creatinine. After CECT, patients were followed up with repeat blood sample for BUN, serum creatinine on day 3rd/ day 5th to assess any rise of Serum creatinine > 0.5mg/dl. ***Result:*** Total of 31 of 200 patients was diabetic. Of these 7 developed CIN. In our study, 32% of CIN+ positive patients had diabetes. Diabetes was significantly associated with incidence of CIN (P=0.004). ***Conclusion:*** Contrast induced nephropathy is more in patients with co morbidities and especially diabetes mellitus. As diabetes mellitus is already a leading cause of nephropathy, contrast in such patients make the picture even worse and lead to nephropathy in a larger portion of people.

Keywords: Incidence Induced, Nephropathy, Diabetes Mellitus.

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INTRODUCTION

Iodinated contrast media are being used increasingly for therapeutic and diagnostic procedures intravenous and intraarterially. This has led to the increased incidence impairment of renal function after the administration of contrast media especially in high risk population. This post contrast impairment in renal functions is called as Contrast-induced nephropathy (CIN). CIN is a serious, underdiagnosed complication of radiographic procedures and leads to deterioration of kidney functions. The concept of CIN was first described during the 1950s by Bartel *et al.* [1] in a patient whom following 48 hrs after intravenous urography patient landed in anuria and acute renal failure required haemodialysis support. McCullough *et al.* [2] found serum creatinine increases to peak value by 3-5 days after contrast exposure followed by returns to baseline or near baseline value within 1-3 weeks. An alternative definition proposed by Harjai *et al.* [3] aims to classify CIN in patients undergoing intraarterial contrast according to three grades corresponding to three relative and absolute creatinine rise cut-of. Further, they made a nephropathy grading system to predict 6-month MACEs and all-cause mortality after PCI. Treatment of Contrast induced Nephropathy is mainly supportive, consisting of careful fluid and electrolyte management, although dialysis may be required in some cases. The limitation in the available treatment options makes prevention and early diagnosis the cornerstone of management. Avoiding unnecessary contrast exposure and choosing non contrast procedure where ever feasible. Several pharmacological agents have been tested with variable results and thus require further evaluation and testing. Among the pharmacological agents tested, prior treatment of patients with antioxidants, such as N-acetylcysteine [4, 5] and ascorbic acid as well as dopamine [7] and

***Corresponding Author:** Dr. Ashish Thakur

fenoldopam (a selective dopamine-1 agonist) [6] has been evaluated in clinical trials of CIN, with conflicting results [8, 9]. Among these agents, dopamine, fenoldopam have been tried for patients undergoing intraarterial contrast.

METHODS

All the patients above 18 yrs. of age admitted in medicine indoor ward of Indra Gandhi Medical College, Shimla who are planned for CECT and willing to participate in the study are selected.

Total of 200 patients are selected over time period of one year (01.01.2018 – 30.04.2019) after taking informed consent. This was a hospital based observational cross-sectional study. Selected patients underwent CECT with intravenous contrast. Similar contrast media was used in all patients i.e., LOCM (Iohexol)/Volume used was 1.5ml/Kg body weight. All routine blood parameters were sent including pre procedure BUN, serum creatinine. After CECT, patients were followed up with repeat blood sample for BUN, serum creatinine on day 3rd/ day 5th to assess any rise of Serum creatinine > 0.5mg/dl.

Patient were taken in CIN positive group if Serum creatinine rises by >0.5mg/dl compared to the pre procedure value by day five. Patients were followed up till day 5th to assess for persistent rise or fall of serum creatinine. eGFR of these three serum creatinine values were calculated using CKD-EPI formula.

Also, the associated risk factors profile of patients including : age, sex, weight, provisional diagnosis, use of nephrotoxic drugs, requirement of inotropes, sepsis, dehydration, iv fluids, history of HTN, DM, CAD, Heart failure, smoking, previous contrast exposure were studied in patients with persistent rise of serum creatinine by day 5th.

STATISTICAL ANALYSIS

Data were presented as frequency, percentage, mean, and/or standard deviation wherever applicable. Categorical variables between two groups were compared using Chi square test. Student t-test was used to compare quantitative variables between 2 groups. P value <0.05 was considered significant. Statistical analysis was performed using SPSS v21.

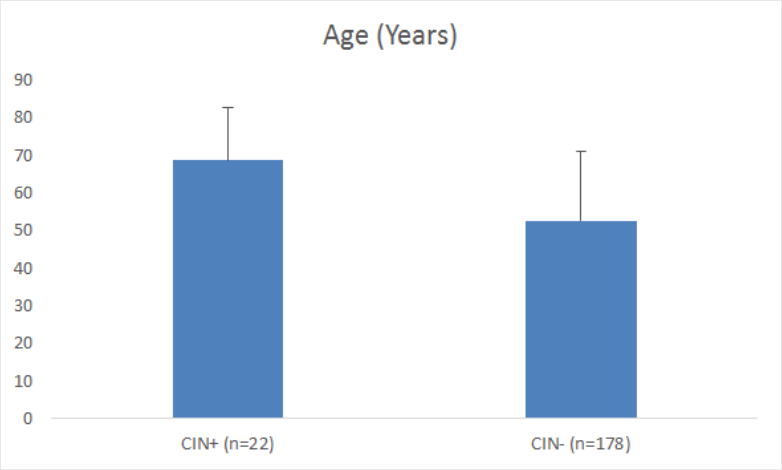
RESULTS

Age Distribution

Our study observed that mean age of the patients who developed CIN was significantly higher than the patients who did not develop CIN (68.59±13.99 vs. 52.63±18.35; P<0.0001)

Comparison of age

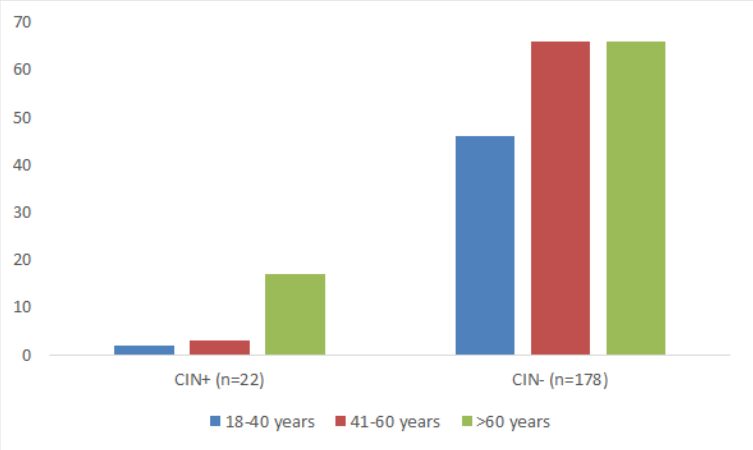
	CIN+ (n=22)	CIN- (n=178)
Age (Years)	68.59±13.99	52.63±18.35
P Value	<0.0001	



Our study also observed 77% of the CIN+ patients aged more than 60 years. Elderly age was significantly associated with increasing incidence of CIN.

Age-group based comparison

Age group	CIN+ (n=22)	CIN- (n=178)	P Value
18-40 years	2	46	0.01
41-60 years	3	66	
>60 years	17	66	

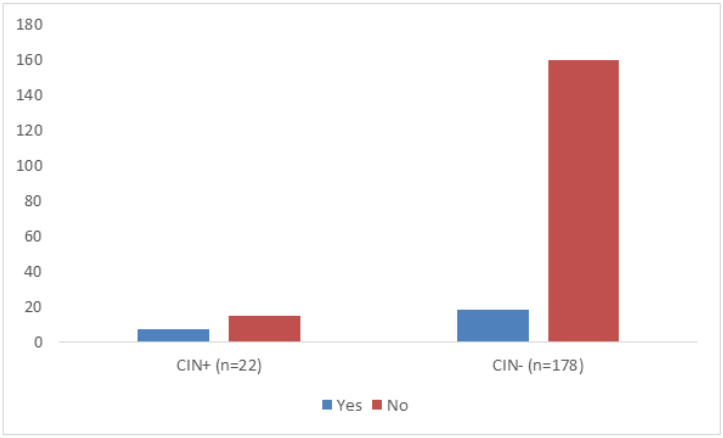


Diabetes Mellitus

Total of 31 of 200 patients were diabetic. Of these 7 developed CIN. In our study, 32% of CIN+ positive patients had diabetes. Diabetes was significantly associated with incidence of CIN (P=0.004).

Diabetes mellitus

	CIN+ (n=22)	CIN- (n=178)	P Value
Yes	7	18	0.004
No	15	160	



Diabetes Mellitus

DISCUSSION

Mean age of patients found in CIN group was 68.5±13.9 years (p = <0.0001). 77% of these patients aged >60years. 9% patients were between age group 18-40 years and 13% were between 41-60 years (p= 0.01). A few studies have found age older than 70 years to be an independent predictor of CIN in multivariate analysis seen after PCI. Mehran *et al.* [10, 11] similarly, found eight variables for patients who underwent PCI, out of which age >75years was one of moderate risk variable. Age >65 yrs. (mean age 59years) had higher incidence of CIN (Odds ratio of 6.3, 95% CI with p value 0.01).

CIN was seen more in patients with underlying different comorbidities like Hypertension, Diabetes Mellitus, Heart failure, Coronary artery disease. In our study, 36 patients were hypertensive, 25 patients were suffering from diabetes mellitus, 41 patients had heart failure, 10 patients had CAD and were on treatment for the same. 45% of hypertensive patients (p = 0.001). 32% of diabetic patients (p = 0.004), 41% of heart failure (p = 0.012), 14% of CAD patients (p = 0.049) developed contrast induced nephropathy. Our study found higher incidence of CIN in comorbid conditions as compared to a study conducted by Lee *et al.* [12] where they found incidence of CIN as 11.9% for DM; 13.7% for HTN; 1.7% for CHF. Bhatt S *et al.* [13] found CIN incidence in 6% and 4% patients of DM and HTN respectively.

Diogo *et al.* [14] showed CIN in 35 of 410 patients (8.5%) and found positive correlation between CIN and diabetes mellitus (OR = 2.15; 95%CI 1.35-4.06; *p* = 0.02), heart failure (OR = 2.23; 95%CI 1.18-

8.8; p = 0.022), and renal failure (OR = 3.36; 95%CI 1.57).

CONCLUSION

Contrast induced nephropathy is more in patients with co morbidities and especially diabetes mellitus. As diabetes mellitus is already a leading cause of nephropathy, contrast in such patients make the picture even worse and lead to nephropathy in a larger portion of people.

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