Original Article

Anaphylactic Reactions of Ionic and Nonionic Contrasts during Coronary Angiogram

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ABSTRACT

Objective: To compare the acute anaphylactic reactions of ionic and nonionic contrasts in patients undergoing coronary angiogram.
Study Design: Experimental Study.
Place and Duration of Study: This study was conducted in Catheterization Laboratory of Punjab Institute of Cardiology, Lahore from 28th September 2007 to 27th March 2008.
Materials and methods: 200 patients undergoing coronary angiogram, admitted in Punjab Institute of Cardiology Lahore through outpatient department (OPD) and emergency ward were included. The socio demographic information like name, age sex and address were recorded. After taking informed consent, the patients were divided into two groups by using random numbers table before the procedure. First group received ionic and the second group received nonionic dye. All patients will undergo coronary angiogram & anaphylactic reactions were recorded.
Results: Out of 200 patients 153(76.5%) were male and 47(23.5%) were female .Age range was 32-75 yrs with mean age of 53.94±10.07 of study population .The study population was divided into two equal groups. First group 100 patients received Ionic dye while second group100 patients received Non ionic dye .Anaphylactic complications during coronary angiogram were more common in patients who received ionic contrast as compared to non ionic contrast group.
Conclusion: Anaphylactic complications during coronary angiogram were more common with ionic dye as compared to non ionic contrast.
Key words: Coronary angiogram, coronary artery disease, Ionic contrast agents, Nonionic contrast agents, anaphylactic reaction.

INTRODUCTION

Coronary angiogram is a crucial diagnostic tool with categorized indications laid down by American College of Cardiology along with American Heart Association1. It remains the clinical gold standard for determining the presence of significant coronary artery disease2. It is an invasive procedure and contrast agents used have serious risks.

Radiographic contrast agents currently used for coronary angiography produce a number of adverse effects 3. These agents differ in their ionic content, osmolality, viscosity, side-effect profile,4 and cost.

Ionic contrast agents used historically for coronary angiography are the high-osmolar meglumine and sodium salts of diatrizoic acid. These substances dissociate into cations and iodine containing anions, resulting in high serum osmolality (>1500 mOsm) than human plasma (300 mOsm).5

Nonionic contrast agents do not ionize in solution and provide more iodine-containing particles than ionic agents per milliliter of contrast . Their osmolality is substantially reduced (<850 mOsm) and do not chelate calcium, potentially leading to fewer side effects5. It is estimated that nonionic agents are used in 60 to 70 percent of current coronary angiographic procedures.

Anaphylactoid reactions include like hot flushing, rash, nausea, vomiting, hypotension, coronary spasm6 .It can cause nephropathy in high risk patients and sometime acute renal failure[7].

Coronary artery disease (CAD) is the most common cause of cardiovascular death all over the world. It is most commonly due to atherosclerosis.[8] The prevalence of CAD & its associated morbidity and mortality increase as age advances.[9] CAD has been shown to be more prevalent in males than females.[10]

Ischemic heart disease is at highest prevalence in Pakistani population[11]. Widely it is associated with other risk factors and our patients are at high risk during coronary angiogram.[12] Usually it takes more aggressive course in our people.[13] In our study we compared the complications of ionic and nonionic dye during coronary angiogram in our population.

MATERIALS AND METHODS

This study was conducted in Catheterization Laboratory of Punjab Institute of Cardiology, Lahore. It was randomized controlled trial, non probability purposive sampling. The study was conducted from 28th September, 2007 to 27th March, 2008. 200 patients were studied. The study population was divided into two groups.

Group I: 100 patients receiving Ionic dye.
Group II: 100 patients receiving Non ionic dye.

All patients undergoing coronary angiogram without previous history of allergies to dye and drugs were included. Patients with history of, nephrotoxicity allergies to dyes/ drugs, bronchial asthma, hyperthyroidism, pre-procedure hypotension, bradycardia and tachycardia were excluded.

Contrast induced anaphylactoid reaction occurring during or just after the procedure in catheterization laboratory. These are, hotflushing, rash, nausea, rigors, bronchospasm, bradycardia.

Patients were taken to Catheterization Laboratory after passing intravenous lines and applying chest electrodes for ECG monitoring during procedure. Blood pressure monitoring was done by connecting to pressure line and tip pressure displayed on the physiologic monitor at all times (except during actual contrast injections). Recording this baseline pressure before contrast administration serves as an important baseline reference point. Patients were explained about the expected time duration of procedure and complications .Also told him to tell immediately if feels any problem during procedure and react to doctor's advice and instruction if he says.

Immediate complications were noted for both groups patients and patients were given intravenous hydrocortisone, avil, metoclopramide and zantac accordingly for anaphylactic reactions. Additionaly intravenous 0.9% saline and dobutrex given for symptomatic hypotension.

Data were entered in the computer using S.P.S.S (statistical package for social sciences) version 10.0 for windows. Descriptive statistics were used to calculate mean ± SD for age, heart rate, blood pressure, urea, creatinine of the patient. Frequencies and percentages were calculated for sex and immediate anaphylactic complications .Chi square test was applied to find out the significance of difference in immediate complications of two groups. P ≤0.05 was taken as significant.

RESULTS

Out of 200 patients studied, 153(76.5%) were male and 47(23.5%) were female (Figure 1). First group with 11(11%) Male and 89(89%) Female patients, while second group with 64 (64%) Male and 36(36%)Female. Age range was 32-75 yrs with mean age of 53.94±10.07 yrs. of study population. 14 (7%) patients were below 40 years of age, 49 (24.5%) patients between age 40-49 years ,maximum patients 75 (37.5%)were in 50-59 years age ,43 (21.5%) patients between 60-69 years age and 19 (9.5%) patients were between 70-75 years.

In ionic group mean age was 51.05 ±9.08,and in non ionic mean age was 56.83 ±10.23 (p value <0.05), Mean urea was 26.74 ± 6.23 in ionic group and 26.29± 5.80 in non ionic group (P value 0.59). In ionic group mean serum creatinine was 0.80 ±0.1 and in non ionic group mean serum creatinine was 0.79 ± 0.1 (p value 0.45). Mean heart rate was 77.56 ± 3.01 in ionic group and 78.26 ± 4.96 in non ionic group (p value 0.23) .76 ±9.7 mmHg was mean of mean arterial pressure in ionic group and 102.03 ± 8.43 mmHg in non ionic group (p value0.01). (Table. 1).

Most common complication occurred during angiogram was sinus bradycardia which was observed in 15 (15%) of ionic group and 2 (2%) of non ionic group (p value 0.002).Nausea and vomiting occurred in 12 (12%) patients of ionic group and 2 (2%) patients of non ionic group (p value 0.01).

Table No. 1: Mean and S.D of variables of both groups.

Characteris-tics	Ionic dye group N=100		Non Ionic dye group N=100		p – value
	Mean	S.D	Mean	S.D	
Age	51.05	9.08	56.83	10.23	<0.05
Blood urea	26.74	6.23	26.29	5.80	0.59
Serum creatinine	0.80	0.1	0.79	0.1	0.45
Heart rate	77.56	3.01	78.26	4.96	0.23
Mean blood pressure	98.76	9.7	102.03	8.43	0.01

S.D.---Standard Deviation

Table No. 2: Comparison of immediate complications of both groups.

Complications	Ionic dye group		Non-Ionic dye group		P-Value
	N= 100	%	N= 100	%	
Emesis, nausea	12	12%	2	2%	0.01
Rigors & chills	8	8%	1	1%	0.035
Bronchospasm	7	7%	1	1%	0.065
Heat, flushing	8	8%	0		0.007
Sinus bradycardia	15	15%	2	2%	0.002

Rigors and chills occurred in 7 (7%) of patients of ionic group and 1 (1%) patient of non ionic group (p value 0.065).In ionic group 8 (8 %) patients developed flushing and 0 (0 %) patient developed in non ionic group (p value 0.007).Bronchospasm occurred in 8 (8%) patients of ionic group and 1 (1 %) patient of non ionic group(p value 0.035). (Table 2).

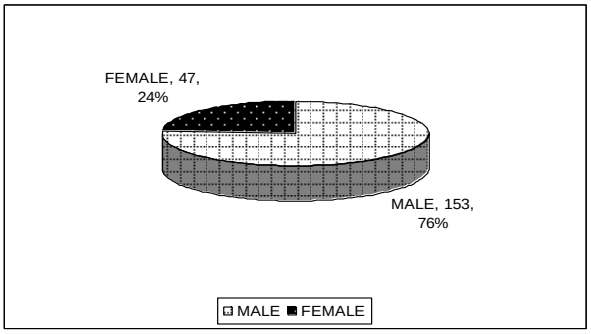

Figure No.1: Frequency & percentage of total population according to sex

DISCUSSION

In this study we compared the anaphylactic complications of ionic dye and non ionic dye used in patients undergoing coronary angiogram. We also measured the variables including age, blood pressure, heart rate, blood urea, serum creatinine in our study.

Michel E. Bertrand et al [14] in a Multicenter, Randomized, Double-Blind Study studied the potential merits and disadvantages of the use of ionic or nonionic contrast media. Hypersensitivity reactions (P=0.007) and adverse drug reactions (P=0.002) were significantly less frequent in the iodixanol group as compared to ioxalate group. In our study hypersensitivity reactions like nausea vomiting were observed in 12 patients of ionic and 2 patients of non ionic group (p value 0.07) ,heat flushing observed in 8 patients of ionic and in no patient of non ionic group (p value 0.007) ,rigors observed in 8 patients of ionic and 1 patient of non ionic group (p value 0.035)and bronchospasm observed in 8 patients of ionic and in no patient of non ionic group (p value 0.007).Collectively it was proved that hypersensitivity reactions were significantly less common in nonionic group patients than that of ionic group.

Paola Cutroneoa et al [15] reported suspected adverse reactions attributed to contrast media sent to the Sicilian Regional Centre from 1996 to 2006.

Out of 3471 reports involved CM , majority of reports described hypersensitivity reactions with immediate onset. Iopromide (52.5%),and iomeprol (11.9%) were the drugs with the highest number of reports.

So immediate hypersensitivity reactions are more common and significant with ionic group as compared to non ionic group patients as also proved in our data.

Juergens CP et al [16] to assess potential adverse effects of non-ionic and ionic contrast media. Allergic reactions occurred in 7 of 165 patients (4.2%) receiving ioxaglate had an allergic reaction as opposed 0.0% (0 of 124 patients) in the iopromide group (p=0.021). the ionic contrast agent ioxaglate was associated with the majority of allergic reactions. In our study hypersensitivity reactions like flushing observed in 8 % patients of ionic and in 0% of non ionic group (p value 0.007) ,rigors observed in 8% patients of ionic and 1% of non ionic group (p value 0.035) nausea vomiting were observed in 12% patients of ionic and 2% patients of non ionic group (p value 0.07) ,heat and bronchospasm observed in 8% patients of ionic and in 0% patient of non ionic group (p value 0.007).So overall it was evident that hypersensitivity reactions were significantly more common in ionic group than that of non-ionic group.

Gertz EW et al [17] in a multicenter randomized double-blind design study comparing ioxaglate (an ionic dimer) and iopamidol (a nonionic compound) and included 500 patients; 250 patients received ioxaglate and 250 iopamidol. There were 58 adverse reactions attributed to the contrast media in the ioxaglate group and 29 in the iopamidol group (p less than 0.001). Nausea or vomiting was present in 20 and 2 patients, respectively (p less than 0.0003). Allergic adverse reactions, such as bronchospasm, urticaria and itching, occurred in 15 of the ioxaglate group and only 1 of the patients receiving iopamidol (p less than 0.0007). Seven of the 52 ioxaglate-treated patients developed an allergic adverse reaction compared with none of the 77 in the iopamidol group (p = 0.001). In our study nausea vomiting were observed in 12% patients of ionic and 2% patients of non ionic group (p value 0.07) ,allergic reactions like bronchospasm observed in 8% patients of ionic and in 0% patient of non ionic group (p value 0.007) and heat flushing observed in 8% patients of ionic and in 0% patient of non ionic group (p value 0.007) proving that non-ionic contrast used during coronary angiography is significantly safer than ionic contrast media.

This study was carried out in a relatively small number of patients and it is possible that just one false positive result might change the level of significance while comparing the two groups. Hence, in order to obtain more accurate results, more number of patients should be studied in any future study.

CONCLUSION

Anaphylactic reactions during coronary angiogram were more common with ionic dye as compared to non ionic dye.

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