FREQUENCY OF ACUTE ALLERGIC REACTIONS OF NON-IONIC IODINATED CONTRAST MATERIAL IN CHILDREN UNDER 14 YEARS

Zeenat Ullah[1], Asad Ali[2], Qurrat-Ul-Ain Ihsan[3]

Correspondence

[1]Zeenat Ullah, Radiology Technologist, Burns & Plastic Surgery Center Hayatabad, Peshawar

: +92-334-1555418

: zeenatullah090078601@gmail.com

[2]Student of Radiology, Wazir Muhammad Institute of Paramedical Technology, Peshawar

[3]Assistant Professor, Department of Radiology, Burns and Plastic Surgery Centre Hayatabad, Peshawar

How to cite this article

Ullah Z, Ali A, Ihsan QUA. Frequency of Acute Allergic Reactions of Non-ionic Iodinated Contrast Material in Children under 14 Years. J Wazir Muhammad Inst Paramed Tech 2023;3(1): 2-5

ABSTRACT

OBJECTIVES

The aim of our study was to find out the frequency of Acute Allergic Reactions to IV Nonionic Iodinated Contrast Material in children less than 14 years age patients at the Burns and plastic surgery center Hayatabad Peshawar. And to find out that the use of low-osmolality nonionic iodinated contrast material for imaging of pediatric patients is quite safe and to identify factors that may be helpful in predicting which pediatric patients are at increased risk of acute allergic-like reactions

METHODOLOGY

It was observational study conducted at the Burns and plastic surgery center Hayatabad Peshawar over six months. Patient's history was taken from the report and data was collected after completion of CT procedure. Acute allergic reactions were observed immediately after administration of contrast media. A Performa was used for the purpose of collecting information about allergic reactions of non-ionic contrast media from the patients. Non-ionic contrast used in the study was iopromide (Ultravist).

RESULTS

Total 310 patients were included in the study. Maximum scans were of brain region i.e. 47.1% and 0.3% scans were minimum in head and neck region. Acute allergic reactions to IV administration of low-osmolality non-ionic iodinated contrast material were documented in 13 pediatric patients including 6 males and 7 females. None of the patients experienced more than one acute allergic reaction over this study period. Mild acute allergic reactions included 5 instances of skin rash, 3 of itching, and 2 of nausea and 1 of vomiting, flushing and swelling.

CONCLUSION

The use of low-osmolality nonionic iodinated contrast material for imaging of pediatric patients is quite safe and considered to have fewer side effects. Acute allergic reactions are less frequent and typically are mild in intensity.

KEYWORDS: *Computed Tomography, Non-Ionic Contrast Media, Adverse Reactions, Vomiting, Flushing, Swelling, Nausea, Itching, Skin Rash*

INTRODUCTION

Contrast materials are chemicals that have an extremely high or extremely low atomic number or weight. As a result, they alter the density of the organ being studied by increasing or decreasing its density. Contrast agents aid in separating or creating a "contrast" between specific body parts and the surrounding tissue.[1] The requirement for chemicals that enhance the contrast of soft tissues and organs became clear with the development of X-rays in 1895. Unfortunately, early contrast materials (CMs) like bismuth or lead salts were excessively poisonous and were not recommended for usage. The first iodine-containing preparations for angiographic and pyelographic exams were employed as early as the 1920s. For all currently authorized iodinated contrast media, tri-iodobenzoic acid was first introduced in 1953. Tri-iodobenzoic acid derivatives were initially generated as high osmolality ionic molecules, then in the late 1960s, nonionic compounds with reduced osmolality were created.[2] All iodinated contrast agents are benzene ring derivatives, allowing the bond iodine to be concentrated intravenously for imaging while still being easily excreted by the kidney.[3] According to their osmolality, iodine-based contrast agents are categorized. The osmolality of low-osmolar substances is often somewhat higher than that of blood, whereas high-osmolar drugs significantly dissociate in aqueous solution.[4] Ionic ICM, which has one benzene ring monomer with three iodine atoms and a side chain with a carboxylic acid (-COOH) group, was the first type of ICM. Ionic ICM has an osmolality that is 5-7 times higher than normal serum. Hypertonic and high-osmolar ICM are the classifications given to ionic ICM. Non-ionic ICM, which likewise includes a benzene ring monomer with a variety of side chains containing polar alcohol (-OH) groups but no - COOH

groups, is the second generation of ICM. The osmolality is 2-3 times lower than that of normal serum due to its non-ionic properties, yet its radio opacity is similar. Monomeric non-ionic ICM are categorized as hypotonic or low-osmolar ICM in comparison to the osmolality of ionic ICM.[5] When intravenous (IV) administration is clinically indicated, nonionic iodinated contrast media are the only ones employed.[6] It was anticipated that ICM applications were made at least 100 million times annually.[7] Because people think it's much safer than ionic contrast, utilization of it is increasing. The choice between an ionic and a nonionic contrast agent is one that children must make with added complexity, thus precise scientific knowledge on the risk of contrast media is essential.[8] In contrast to sonography and magnetic resonance imaging, the incidence of ADRs is higher for contrast media used in X-ray-based imaging.[9] According to the amount of time that passed between the delivery of ICM and the onset of symptoms, the former appeared more than an hour after exposure, while the latter did so between 1 to 6 hours.[10] Ionic ICM has a greater incidence of ADRs (4.17–12.66%) than non-ionic ICM (0.69-3.13%), according to several studies. So, in recent years, non-ionic ICM have been employed primarily in X-ray-related research, particularly in CT and angiography.[11] According to Spring et al., there were 170 million contrast-enhanced radiological investigations conducted between 1978 and 1994. 22785 of these procedures were linked to mild or moderate side effects. 920 deaths that were attributed to intravascular contrast agents were reported, while 2639 patients had severe responses that were not fatal.[12] A classification system for allergic reactions to contrast media (CM) has been suggested by the American College of Radiology (ACR) Manual on Contrast Media.[13] Mild reactions include mild skin rash or hives, nausea, vomiting, swelling, itching, and flushing. persistent vomiting, abnormal cardiac rhythms, and other mild responses Shortness of breath or breathing problems, high or low blood pressure, Wheezing, Laryngeal edoema, facial edoema, and Breathing difficulties can be a sign of severe responses. Cardiac arrest, convulsions, contrast-induced nephropathy, and pulmonary edoema.[14] Certain circumstances raise the risk of an allergic or unfavorable reaction to iodine-based contrast agents. Earlier negative responses to iodine-based contrast materials, Heart issues and asthma history. a lack of fluids, sickle cell anemia, Pheochromocytoma, myeloma, thyrotoxicosis, pregnancy, and renal disease. Numerous sizable prospective or retrospective investigations have been carried out to assess the frequency and seriousness of acute allergic-like reactions associated with IV contrast agent administration in children.[15] It is believed that non-ionic iodinated contrast media have fewer negative effects. In this study, the frequency of Acute Allergic Reactions to IV Nonionic Iodinated Contrast Material in Children Under the Age of Fourteen will be statistically measured. and discover that it is fairly safe to image pediatrics patients using low-osmolality nonionic iodinated contrast material. Moreover, to pinpoint elements that might be useful in identifying which young individuals are more likely to experience severe allergic like reactions.

METHODOLOGY

This observational study was conducted at the radiology department of Hayatabad Medical Complex Peshawar from April to July. Data were collected from 310 patients included both male and female by purposive sampling technique. Calculated at on Raosoft software. All those patients whom age is below then 14 and have a procedure with nonionic iodinated contrast media were included in our study. And all those patients whom age is more than 14 also those patients who have a procedure but not with non-ionic iodinated contrast media were excluded from our study. Non-ionic contrast agent used in the study was Lopromide (Ultravist). All the patients fulfilling the inclusion criteria and visiting the above mentioned department were evaluated by the Performa. The standard 128 slice GE (General Electronic) CT scan machine was used. Patients' history was taken from the report and data was collected after completion of CT procedure. Acute allergic reactions were observed immediately after administration of contrast media. data analysis was done by SPSS 20.0 version.

RESULTS

Table 1: Gender Wise Distribution

Gender	f(%age)
Male	183(59.0%)
Female	127(41.0%)

Table 2: Distribution of Scan Region

Scan Region	f(%age)
Brain	146(47.1%)
Head+ Neck	01(0.3%)
Abdomen	45(14.5%)
Chest	42(13.5%)
Chest+Abdomen	14(04.5%)
Abdomen pelvis	15(04.8%)
Neck+Chest+ Abdomen	47(15.2%)

Table 3: Distribution According to Reactions Type

Reactions Type	f(%age)
Swelling	01(07.69%)
Skin Rash	05(38.4%)
Itching	03(23%)
Flushing	01(07.6%)
Nausea	02(15.3%)
Vomiting	01(07.6%)

Table 4: Frequency of Reactions According to Scan Region

Scan Region	Reaction		Total
	Yes	No	
Brain	07	140	147
Head+ Neck	0	01	01
Abdomen	03	42	45
Chest	0	41	41
Chest+ Abdomen	01	13	14
Abdomen+ Pelvis	01	14	15
Head+Chest+Abdomen	01	46	47

DISCUSSION

In this study out of 310 patients, acute allergic feedbacks to intravenous administration of nonionic iodinated contrast medium were recognized in only 13 pediatric patients including 6 men and 7 women. Many studies were conducted to evaluate the reaction rate of non-ionic contrast material. In 2013, in US Chand et al performed a study to determine the occurrence of adverse feedbacks to intravenous non-ionic iodinated contrast media in CT . He found that out of 423 cases only 17 adverse reactions were mild. Mild reactions were mainly characterized by nausea, vomiting, dizziness and rashes.[16] Another study was done by Carolyn et al. and they evaluated the frequency of acute allergic reactions .Allergic reactions occurred in 545 out of 84,928 patients injected with non-ionic iodinated contrast media. Out of 545 allergic reactions, 418 reactions were mild. Similar study was conducted by Jung et al who studied the cutaneous adverse responses (CARs) to nonionic contrast medium in Korea. Out of 47,338 examinees, 50 cases were categorized into CARs. CARs occurred in 24 males and 26 women.[17] Another study was performed by Dillman et al in 2007 who conducted a research to evaluate the frequency and strictness of acute allergic reactions of nonionic contrast media in children. Out of 11,306 patients, acute allergic reactions were documented in 20 of the patients: only 16 of them were considered as mild, 1 as moderate and 3 assevere.[18]

LIMITATIONS

The sample size is small and Study duration was not enough to collect the data.

CONCLUSIONS

It is concluded from the above discussion that the usage of low-osmolality nonionic iodinated contrast medium for imaging of pediatric patients is safe and considered to have fewer side effects. Acute allergic reactions of nonionic contrast agents were less in children and documented in 13 patients. Acute allergic responses are less frequent and classically are mild inconcentration.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

REFERENCES

1. Naeem MA, Rauf H, Razzaq R. Frequency of Acute and Late Reaction of Non-Ionic Iodinated Contrast Media in Contrast Enhanced Computed Tomography.
2. Boehm IB, Heverhagen JT. Physics of computed tomography: contrast agents. In Handbook of neuro-oncology neuroimaging 2016 Jan 1 (pp. 151-155). Academic Press.
3. Li X, Chen J, Zhang L, Liu H, Wang S, Chen X, Fang J, Wang S, Zhang W. Clinical observation of the adverse drug reactions caused by non-ionic iodinated contrast media: results from 109,255 cases who underwent enhanced CT examination in Chongqing, China. The British journal of radiology. 2015 Mar;88(1047):20140491.
4. Morzycki A, Bhatia A, Murphy KJ. Adverse reactions to contrast material: a Canadian update. Canadian Association of Radiologists Journal. 2017 May;68(2):187-93.
5. Chiu TM, Chu SY. Hypersensitivity reactions to iodinated contrast media. Biomedicines. 2022 Apr 30;10(5):1036.
6. Motosugi U, Ichikawa T, Sano K, Onishi H. Acute adverse reactions to nonionic iodinated contrast media for CT: prospective randomized evaluation of the effects of dehydration, oral rehydration, and patient risk factors. American Journal of Roentgenology. 2016 Nov;207(5):931-8.
7. Bottinor W, Polkampally P, Jovin I. Adverse reactions to iodinated contrast media. International Journal of Angiology. 2013 Sep;22(03):149-54.
8. Beckett KR, Moriarity AK, Langer JM. Safe use of contrast media: what the radiologist needs to know. Radiographics. 2015 Oct;35(6):1738-50.
9. Ha JY, Choi YH, Cho YJ, Lee S, Lee SB, Choi G, Cheon JE, Kim WS. Incidence and risk factors of nausea and vomiting after exposure to low-osmolality iodinated contrast media in children: a focus on preparative fasting. Korean Journal of Radiology. 2020 Oct;21(10):1178.
10. Bilò MB, Bignardi D. Iodinated contrast media hypersensitivity reactions: is it time to re-evaluate risk factors?. European Annals of Allergy and Clinical Immunology. 2022 Mar 1;54(2):51-2.
11. Wang L, Qiu H, Chen L, Liu H, Liu J, Yang Y, Sun Y, Deng Y, Liu H, Li X. Hemodynamic effects of intravenous bolus injection of iopromide 370 twice in abdominal contrast-enhanced CT and coronary CTA dual-site sequential examinations. Medical & Biological Engineering & Computing. 2023 Jan;61(1):179-94.
12. Zhai L, Guo X, Zhang H, Jin Q, Zeng Q, Tang X, Gao C. Non-ionic iodinated contrast media related immediate reactions: a mechanism study of 27 patients. Legal medicine. 2017 Jan 1;24:56-62.

13. Honda T, Kuriyama K, Kiso K, Kishimoto K, Tsuboyama T, Inoue A, Higashi M. Incidence rate of severe adverse drug reactions to nonionic contrast media at the National Hospital Organization Osaka National Hospital. Allergo Journal International. 2020 Nov;29(7):240-4.
14. Li X, Liu H, Zhao L, Liu J, Cai L, Liu L, Zhang W. Clinical observation of adverse drug reactions to non-ionic iodinated contrast media in population with underlying diseases and risk factors. The British journal of radiology. 2017 Feb;90(1070):20160729.
15. Suh YJ, Yoon SH, Hong H, Hahn S, Kang DY, Kang HR, Choi YH, Lee W. Acute adverse reactions to nonionic iodinated contrast media: a meta-analysis. Investigative Radiology. 2019 Sep 1;54(9):589-99.
16. Zhang B, Dong Y, Liang L, Lian Z, Liu J, Luo X, Chen W, Li X, Liang C, Zhang S. The incidence, classification, and management of acute adverse reactions to the low-osmolar iodinated contrast media Isovue and Ultravist in contrast-enhanced computed tomography scanning. Medicine. 2016 Mar;95(12).
17. An J, Jung H, Kwon OY, Kang Y, Lee JH, Won HK, Song WJ, Kwon HS, Cho YS, Moon HB, Kim TB. Differences in adverse reactions among iodinated contrast media: analysis of the KAERS database. The Journal of Allergy and Clinical Immunology: In Practice. 2019 Sep 1;7(7):2205-11.
18. Costello JR, Kalb B, Martin DR. Incidence and risk factors for gadolinium-based contrast agent immediate reactions. Topics in Magnetic Resonance Imaging. 2016 Dec 1;25(6):257-63.

CONTRIBUTORS

1. ***Zeenat Ullah*** **-** *Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Critical Revision; Supervision; Final Approval*
2. ***Asad Ali*** **-** *Data Acquisition*
3. ***Qurrat-Ul-Ain Ihsan*** **-** *Critical Revision*