ORIGINAL PAPER

Contrast Agents and Observing Patient Safety Programs in Radiology Departments in Kermanshah Province Hospitals in West of Iran

Fatemhe Amiri¹, Mohammad Rasoul Tohidnia¹, Somayeh Haydarizadi², Rasool Azmoonfar¹

¹Radiology and Nuclear Medicine Department, School of Paramedical Sciences, Kermanshah University of Medical Sciences, Kermanshah, Iran

²Department of Anatomy, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran

Corresponding author: Rasool Azmoonfar, Department of Radiology and Nuclear Medicine, School of Paramedical Sciences, Kermanshah University of Medical Sciences, Kermanshah, Iran Email: Azmoonfar@live.com. Phone: + 098-833-827-9697

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ABSTRACT

Introduction: Contrast agents play an important role in increasing the efficiency of diagnostic imaging techniques in the evaluation of vascular lesions, infections and tumors. Annually more than 70 million radiology tests performed using contrast agent materials in the world. Side effects of contrast agent can be life-threatening, so that observing safety guideline prescribed a key role in the patient's health.

Aim: The aim of this study was evaluation of compliance with the instructions in the use of contrast agent materials in Kermanshah province Hospitals, West in Iran. **Methods:** In this cross-sectional study, five centers that were active in the administration of contrast agents were studied. The data collection tool, a checklist containing 49 safety principle of contrast agent material was administered that after confirming its validity and reliability were used. Data were analyzed using SPSS16 software and findings were presented using descriptive and analytical statistics. **Findings:** Results showed that the average age of the participants in this study 33.66 years. 54% was male. 81.8% in the Radiology department and 18.2% were working in CT scan centers. 20.5% of prescribers the contrast agent assistant radiologist, and 79.5% was radiographer, respectively. 25% of them had passed training courses dealing with the acute effects of contrast agent. There was not a guideline to identify patients at high risk for adverse events and prevention and management of adverse reactions due to the side effects prescribing of contrast material in the imaging centers. This study showed that the overall safety of contrast agents in radiology departments only 2.3% appropriate and in 97.7% moderate.

Conclusion: The results showed that the Safety observance of the use of contrast agents is not acceptable in many cases. Pregnancy and lactation control, sterile techniques during catheterization in non-injectable contrast agent was not acceptable. Monitoring the patients, use safety box in case of emergency and skilled use of defibrillator; observe this safety issues was rarely taken into consideration by prescribers of injectable contrast agents. The centers survey shows that there isn't a standard guideline to identify patients at high risk and management of side effects of prescribed contrast agent.

Keywords: contrast agent, imaging centers, safety considerations, radiology.

1. INTRODUCTION

Drugs for prevention, diagnosis, or treatment of diseases in different dosages commonly used; adverse drug reactions (ADRs) after local or systemic administration of drugs are that can be have morphologic skin changes unintended and noxious with or without systemic involvement (1, 2, 3). The most injected pharmacological agents into human body is diagnostic contrast media (CM) that cause commonly adverse reactions considered unavoidable and unpreventable (1, 2). Hunt et al (4, 5) reported rate of severe reaction of contrast agent may lead to death when occur (3). Different study shows various prevalence rate and risk factors of ionic contrast media (7,

8, 9). The use of corticosteroids effectively reduces the serious effects of the contrast media (10, 11, 12). In approximately 75 million procedures annually intravascular pharmaceuticals Contrast media are used and most common injected into the human body (5). Production and administration of contrast agents subject to pharmaceutical provisions, therefore, guidelines and safety regulations in the use of contrast material for providing safe and high quality care to patients is essential (13). Besides the benefits of using contrast agents in increased diagnostic accuracy, administration of this drug, like any medicine, is not risk free. The risks of the use of intravenous contrast material are much

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higher than non-injectable contrast agents. Possible adverse reactions associated with the use of contrast agents, can be a wide range of symptoms from mild to extremely hazardous conditions to be followed (14). Renal toxicity, allergic reactions, anaphylaxis and localized tissue damage, causing major known complications of the use of injectable contrast material. Important risk factors in the rise of the reactions are previous reaction to contrast agents, allergy and age of the patient. Also, patients with a history of kidney failure, diabetes and pregnant women as the most at risk groups (15). Ready for immediate therapeutic interventions, guidelines for dealing with possible complications and access to equipment and drugs resuscitation the principles of management in the prevention of adverse effects of contrast material (4). In this regard, the UK Royal College of Radiology and the European Society of Urogenital Radiology (ESUR) published recommendations and guidelines for prevention, care management and administration of contrast materials. Studies in the UK radiology centers show that only 35% of the imaging centers have specific guidelines to identify high-risk patients that exposed to complications of contrast agents and on the other hand 77% of the centers are no protocols for faced with dangerous reactions (17). While some studies indicate poor awareness of contrast agent's prescribers to severe and dangerous reactions, as well as management these complications (5, 6). Some other studies show that Access to equipment and necessary drugs in the management of adverse reactions of contrast agents in imaging centers are not definitive and less than half of the administration of contrast material is performed by radiologists (20). This study was conducted regarding to need, as well as inaccessibility and lack of information from the current situation, identifying strengths and weaknesses imaging centers about the safety of contrast agent administration in imaging centers in Kermanshah University of Medical Sciences.

2. MATERIAL AND METHODS

In this cross sectional study, the statistical population included all technicians, undergraduate and graduate radiographers, assistants and radiologists working in radiology and CT-scan in Imam Reza and Imam Khomeini Hospitals, Kermanshah, Iran that participated in the preparation and administration of contrast material to patients. Data was collected through questionnaire and checklist, that validity by assessment and collect the opinions of 10 experts and faculty members in radiology science were done. Questionnaire reliability, by correlation method on ten samples was 85%. Checklist list consists of 49 closed questions that the safety of the administration of contrast agents assessed by targeted samples in the 2 field of the administration of injectable contrast material and non-injectable safety before, during and after administration by observing their performance. In total, in the first section, score 19-28 as an appropriate the safety observance, score 10-18 as moderate and 0-9 in the sample were considered too weak and in the second field, score 15-21 appropriate, score 8-14 moderate and 0-7 was considered weak respectively. After obtaining the necessary permits, by referring to the targeted centers, demographic information of targeted samples by filling out the anonymous questionnaire during the preparation, administration and after administra-

tion of contrast materials was completed. In order to increase the accuracy of in the recorded observations and completing the checklist, the performance of each sample, three times during the administration of contrast were observed and performance was most frequently as the research sample was recorded. In order to increase the accuracy in the recorded observations and completing the checklist, the performance of each individual, while three times the contrast administration were observed and performance was most frequently recorded as the research sample.

Finally, the collected data using SPSS 16 software was analyzed. The results by descriptive statistics such as mean, variance for of quantitative variables and frequencies and percentages for qualitative variables were presented. According to the data for further comparisons and analytical results the chi-square test was used. $p < 0.05$ was considered significant relationship in the test.

3. RESULTS

Results showed that the average age of the participants in this study 33.66 years. 54% was male. 81.8% in the radiology department and 18.2% were working in CT scan centers.

Figure 1. List of safety measures in the use of contrast agents for the patients injectable contrast agents

Biographies of patients before contrast agent injection
Control the history of disease prior to prepare the patient
Control patient preparation prior to injection
Complete consent form prior to contrast injection
Complete questionnaire to identify patients at high risk(PAR)
Attention to patient at risk
Preventive measures for patients at high risk
Educating patients about the possible side effects of administration of the contrast agent
Hygiene of contrast agent injection site
Control suction and oxygen therapy equipment function properly prior to contrast injection
Preparation and injection of contrast agents under the suitable temperatures
Observe speed injection
Use of sterile injection technique
Care of the needle stick
Use of safe disposal box after injection
Monitor the patient for 60 minutes after injection.
Encouraging patients to drink liquids after the test
Patient education about the intern to the usual diet
Skilled use of defibrillator
Control access to cardiopulmonary resuscitation Tralee before administration of contrast agent

Table 1. List of safety measures in the use of contrast agents for the patients injectable contrast agents according to above chart

Figure 2. List of safety measures in the use of contrast agents for the patients Non-inject able contrast agents

Biographies of patients before contrast agent injection
Check the history of disease prior to prepare the patient
Check patient preparation prior to injection
Check pregnancy and lactation in women prior to prescribing contrast
Educating patients about the possible side effects of prescribing the contrast agent
Health measures about preparing and administering the contrast agent
Control access to resuscitation Tralee, before administration of contrast
Attention to sterile techniques during catheterization
Check the Suction equipment, oxygen therapy and proper functioning of the pre- scribing the contrast agent
Patient education about the Back to the usual diet
Contrast agents used immediately after opening and preparation
Use of separate contrast agent for each patient
Preparation and prescribing contrast agents in appropriate concentration, tem- peratures and volume
Keeping remaining oral contrast agents in good condition
Care for the prevention of infection when using reusable equipment
Catheterization done by physician
Access to the resuscitation team if necessary
Encouraging patients to drink liquids after the test

Table 2. List of safety measures in the use of contrast agents for the patients Non-inject able contrast agents according to above chart

20.5% of prescribers the contrast agent assistant radiologist, and 79.5% was Radiographer, respectively. 25% of them had passed training courses dealing with the acute effects of contrast agent.

There was not a guideline to identify patients at high risk for adverse events and Prevention and management of adverse reactions due to the side effects prescribing of contrast material in the Imaging centers. This study showed that the overall safety of contrast agents in radiology departments only 2.3% appropriate and in 97.7% moderate. Figure 1 show these changes.

In the field of safety, the use of inject able contrast agents, maximum and minimum safety measure were abiding by prescribers in radiology department including obtaining consent from patients before administering intravenous contrast agent was 100% And observation for 60 minutes after injection 3/2%, respectively. Table 1 shows these factors.

The results showed that the safety of non-injectable contrast agents Maximum and minimum safety action that was observed in the sectors of imaging, including observe the patient sterile catheter technique in 100% of prescribers non-inject able contrast agent and storage of surplus non-inject able contrast agents in appropriate circumstances and patient education about the back to the usual diet and high fluid intake

Figure 3. Demographic information and work experience

after completion of the test was 4.5% in prescribers Respective. Table 2 shows these factors and Figure 2 show these changes.

The results indicated that there was a no significant relationship between demographic prescribers and retraining courses with the safety application of contrast agents. Figure 3 show these changes.

4. DISCUSSION

The findings of this study showed that generally, safety precautions are observed in the use of contrast agents in imaging centers was average (21). Due to the risk of life-threatening complications, especially in patients receiving intravenous administration of contrast agents, this level of safety precautions is observed in the use of contrast agents is not acceptable in any way (22). The lowest level of safety precautions is observed in the use of contrast agents in imaging centers, during the administration of intravenous contrast material to patients in relation to the non-completion questionnaire to identify patient at high risk and lack of direct monitoring patients for 30 to 60 minutes after injection (23). The result showed that in any of the centers there is no instruction to identify patients, who are at high risk for complications contrast material administration. While Namasivayam et al. (7) in his review reported that 35% of the radiology center of England, there are specific methods to identify patients at high risk (24). Because of like any medicine, administration of contrast agents is not risk-free and incidence of adverse reactions may belief-threaten. Therefore, administration of contrast material and prevention of side effects should be under certain pharmaceutical standards and regulations (25). According to findings lack of attention to maintenance of oral contrast material surplus in good condition, Failure to educate patients about the intern to the usual diet and High fluid intake after completion of the test was the weakest observed safety rules in the centers regarding non-inject able administration of contrast material to patients (26). Nevertheless, preparation, administration and maintenance of non-inject able contrast agents in health and a suitable environment, in prevention of transmission of infectious agents to patients and the incidence of adverse events prescribing this class of contrast agents is absolutely crucial (27).

5. CONCLUSION

According to the findings in the radiology Centers studied, safety precautions are observed in the use of contrast agents is not acceptable and design, implementation, control and

monitoring is not organized. Procedures and policies related to quality, patient education, control of infection, and safety should be developed and each imaging department or facility should have written policies, protocols, and procedures regarding administration of intravascular contrast media.

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