

SEVERE ADVERSE REACTIONS TO IODINE CONTRAST MEDIA IN UROGRAPHY

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During urography (IVU) or any other kind of endographic examination, adverse reactions can develop during or immediately after intravascular application of iodine contrast media (ICM), some of which endanger the patients' health and life. The aim of the paper was to present adverse reactions of an organism to ICM. That is why the current interest in this problem has imposed to us a necessity to present this study.

In the period from January 1994 to December 2005, in a Specialized Department of the Institute of Radiology of the Clinical Centre Nis, 11.885 IVU were done. An urographic examination was performed with ionic or nonionic ICM of the same concentration (300 mg I/ml) or an approximate to it, in the dosage of 1,0 ml/kg. Before intravenous application (*iv*), ICM was heated to body temperature. Application of ICM was done through the braunile, as a slow bolus, in the course of 1-1,5 min.

In the series of 11.885 urographic examinations, there were severe adverse reactions in 17 patients (0,14% ili 1:699 IVU). There was no fatal outcome.

Adverse reactions at our clinic that could have ended up with lethal outcome, with proper and prompt treatment ended with satisfactory results, so they were registered as severe reactions. *Acta Medica Medianae* 2007;46(1):52-55.

Key words: *iodic contrast media, adverse reactions, urograph*

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Introduction

During urography (IVU) or any other kind of endographic examination, adverse reactions can develop during or immediately after intravascular application of iodine contrast media (ICM), of which some endanger the patient's health and life. Any, even the smallest amount of parenterally administered iodine contrast media can cause a series of adverse reactions and also death of a patient. There is not a single laboratory or clinical test which could predict adverse reactions of the organism to administered contrast media.

Idiosyncratic reactions can be classified into four grades of severity:

- minor reactions that usually require no treatment;
- intermediate reactions that normally respond to simple treatment;
- severe reactions that may endanger the patient's life and usually require intensive treatment; and
- fatal reactions, luckily, the least frequent, but unfortunately the most difficult complication that can happen during urographic

or any other kind of endographic examination. However, one exitus letalis occurs on ICM because of difficulty complexity and diversity of an accident, the legal legislator asks from the experts of forensic medicine, for answers regarding the new incident.

The chemical structure of ionic and non-ionic contrast media may explain why these agents react differently in the body. The general structure of current urographic and vascular iodine contrast media is shown in Figure 1.

So far, there have been many papers investigating adverse reactions to ICM (1-37). That is why the current interest of this problem has imposed to us a necessity for the compilation of this study.

Aims

The aim of this study was to consider adverse reactions of the organism to ICM, having in mind that in everyday professional work a majority of x-ray diagnostic procedures requires the use of ICM, so adverse effects are always present.

Material and methods

In the period from January 1994 to December 2005 in a Specialized Department of the Institute of Radiology of the Clinical Centre in Nis, 11.885 IVU were performed.

Based on the anamnesis and other patient's data, a possible premedication was determined and type of ICM that would be used for the urographic examinations or not due to counter indications.

The urographic examination was performed with ionic or nonionic ICM in the same concentration (300 mg I/ml) or close in a dosage of 1,0ml/kg of body weight of patient. Before intravenous application (iv), ICM was heated to body temperature. Application of ICM was done through the braunile as a slow bolus in 1-1,5 minutess.

Results of study

11.885 urographic findings were analyzed, 4.298 (63,48%) of which done with IVU ionic ICM and 4.298 (36,16%) with IVU nonionic ICM (Table 1).

In the series of 11.885 urographic examinations, there were 329 (2,77% or 1:36 IVU)

adverse reactions to ICM (Table 2). Severe reactions were registered in 17 patients (0,14% or 1:699 IVU), that is in 13 patients (0,17% or 1:583 IVU) to ionic iodine contrast media and in 4 patients (0,09% or 1:1.074 IVU) to the non-ionic contrast media (Table 2). There was no fatal outcome (Table 2).

Sever reactions to iodine contrast media occurred in the first five minutes of i.v. administration of iodine contrast media, and only one occurred in the 10th min of i.v. iodine contrast media administration, (Table 2). In our series of severe reactions to iodine contrast media during IVU examinations, there were 15 monosymptomatic severe reactions and 2 polysymptomatic severe reactions. Clinical presentation with the time severe reactions' occurrences is presented in Table 2. All severe reactions to the iodine contrast media in IVU could have ended fatally, but after timely administration of antishock therapy, severe reactions to the iodine contrast media were registered as severe reactions to ICM during IVU.

Table 1. Number of patients with and without preparation to ionic and nonionic iodine contrast media in 11.885 IVU

ICM	Preparation of patients	Number of patients	Percentage of preparation %	Number of adverse reactions	Percentage of adverse reactions - %
	not	7215	60,71	277	2,33
	yes	372	3,13	0	0
ionic		7587	63,84	277	2,33
	not	4216	35,47	51	0,43
	yes	82	0,69	1	0,01
nonionic		4298	36,16	52	0,44
Totally		11885	100	329	2,77

Table 2. Registered severe adverse reactions to ionic and nonionic iodine contrast media in 11.885 IVU

Ionic iodine contrast media
1. anaphylactic - nausea with urge to vomiting, cold sweat, cyanosis, oedema pulmonum, cardiac arrest, clinic death (reaction rising 20 seconds)
2. nausea with urge to vomiting, urtica, cold sweat, scratch in throat, hypotension (reaction rising in 30 seconds)
3. nausea with urge to vomiting, red face skin, cold sweat, sensation of suffocation, hypotension (reaction rising in 60 seconds)
4. cardiac pain (reaction rising in 60 seconds)
5. bronchospasm, difficulty breathing, cyanosis, tachycardia (reaction rising in 3 minutes)
6. urtica with cardiac pain (reaction rising in 4 minutes)
7. urtica, scratch in throat, bronchospasm, difficulty breathing, sensation of suffocation, hoarseness (reaction rising in 4 minutes)
8. cold sweat, tachycardia, pulse 112/min, hypertension 22/13 kPa (reaction rising in 3 minutes)
9. arrhythmia, hypotension (reaction rising in 5 minutes)
10. Quincke oedema with urtica skin face (reaction rising 5 minutes)
11. cardiac pain (reaction rising 5 minutes)
12. headache, sensation turbid in head, hypertension 30/12 kPa (reaction rising 30 minutes)
13. hypertension, bradycardia, cold sweat (reaction rising in 3 minutes)
Iodine non-ionic contrast media
1. anaphylactic - nausea with urge to vomiting, vomiting, cold sweat, red face skin, hyperaemia conjunctiva, patients' discomfort, hypotension, epi (reaction rising in 30 minutes)
2. buzzing in the ears, headache, cardiac pain (reaction rising in 5 minutes)
3. cardiac pain (reaction rising in 5 minutes cardiac patients, allergy to andol, brufen, b6, analgin)
4. Quincke oedema (reaction rising in 10 minutes)

Iodine Contrast Media	Schema ICM	Number iodine atoms	Number particle	Number osmolalitet
Ionic Iodine Monomer Contrast Media		3	2	1.5
Ionic Iodine Dimer Contrast Media		6	2	3
Nonionic Iodine Monomer Contrast Media		3	1	3
Nonionic Iodine Dimer Contrast Media		6	1	6

Figure 1. Iodine contrast media – number iodine atoms, number particle and number osmolalitet

Discussion

Reactions of the organism ICM are provoked by physical and chemical nature of ICM (chemical structure, concentration of iodine, osmolality of ICM etc.), the way ICM is applied, how fast it is applied, by the applied dosage of ICM, type of radiological examination and its techniques, with favoured factors as the patients state of health, age of the patient, psychic instability of the patient before and during the application of ICM, relation between the medical staff and the patient before and during the examination and etc.

Incidence of adverse reactions to ICM appear in less than 10%(23), 5-8% (37), 2-8% (17), 4-10%(26) of endographic examinations.

According to Ledic (1986) (22), during IVU, the incidence of adverse reactions to ICM following some authors, are 1,72% (Witten et al, 1973), 4,73% (Sehadi et Toniolo, 1980), 8,5% (Ansell, 1970) and 8,53% (Ochsner et al, 1962).

In our study of 11.855 IVU performed from January 1994 to December 2005, there were 329 (2,77% ili 1:36 IVU) allergic reactions to ICM registered, and severe reactions in 17 patients (0,14% ili 1:699 IVU), while there was no fatal outcome.

According to Bettmann (1990) (13), a difference between mortal incidence on ionic ICM and nonionic ICM does not exist. Katayama et al. (1990) (18) on the series of 337.647 endographic examinations, registered one lethal outcome onas

a reaction to ionic ICM and also one lethal outcome to nonionic ICM.

In our 11.885 IVU, there were no lethal outcomes. We explain that with the fact that adverse reactions, in a certain number of our patients, that could have ended with lethal outcome, with proper and prompt treatment ended with satisfactory results. They were registered as severe reactions. In addition, Ansell (1987) (1) thinks that the cause of low mortality during urographic examinations comes from proper and effective treatment of adverse reactions.

Conclusion

In the period from January 1999 to December 2005, 11.885 urographies were gathered, processed and analyzed in our study.

In one series of 11.885 urographies, adverse reactions were registered in 329 patients (2,77% ili 1:36 IVU), but severe reactions in 17 patients (0,14% or 1:699 IVU), that is in 13 patients (0,17% or 1:583 IVU) to the ionic iodine contrast media and 4 patients (0,09% ili 1:1.074 IVU) to the non-ionic iodine contrast media .

There were no adverse reactions with fatal outcome.

Adverse reactions at our clinic that could have ended up with lethal outcome, with proper and prompt treatment have ended with satisfactory results so they were registered as difficult reactions.

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NEŽELJENE REAKCIJE TEŠKOG STEPENA NA JODNO KONTRASTNO SREDSTVO U TOKU INTRAVENSKJE UROGRAFIJE

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Pri urografskom (IVU) ili bilo kojem drugom endografskom pregledu, mogu se u toku ili neposredno po intravenskoj aplikaciji jodnog kontrastnog sredstva (JKS) razviti neželjene reakcije, od kojih neke ugrožavaju zdravlje i život bolesnika. Cilj rada bio je da sagleda neželjene reakcije organizma na JKS, budući da u svakodnevnom profesionalnom radu velika većina rendgenodijagnostičkih postupaka iziskuje korišćenje JKS, pa su moguće neželjene posledice, naročito exitus letalis, stalno prisutne i aktuelne.

U periodu od januara 1994. do decembra 2005. godine, u Specijalističkoj službi Instituta za radiologiju Kliničkog centra u Nišu, urađeno je 11885 IVU. Urografski pregled je obavljan jonskim ili nejonskim JKS iste koncentracije (300 mgI / ml) ili njoj približnoj, u dozi 1,0 ml/kg telesne težine bolesnika. Pre intravenske (*i.v.*) aplikacije JKS je zagrejano na temperaturu tela. Aplikacija JKS odvijala se preko *i.v.* plasirane barunile, kao spori bolus, u vremenu od 1 do 1,5 minutes.

U seriji od 11885 urografija registrovano je alergoidnih reakcija teškog intenziteta kod 17 bolesnika (0,14% ili 1:699 IVU). Fatalnog ishoda nije bilo.

Neželjene reakcije koje su mogle da se završe letalnim ishodom, pravilnim i blagovremenim lečenjem završile su se povoljnim ishodom, pa su registrovane kao teške reakcije. *Acta Medica Medianae 2007;46(1):52-55.*

Ključne reči: jodno kontrastno sredstvo, neželjene reakcije, urografija