Radiology Techniques Department

Special Radiological Procedures-1

lecture 2

Adverse effect of I.V water soluble contrast media on specific organs

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Adverse effects of intravenous water-soluble contrast media

*Adverse reactions after administration of **non-ionic iodinated** contrast media are **rare**, occurring in **less than 1%** of all patients. Of these reactions, the vast majority are **mild** and self-limiting.

*The incidence of **moderate** or **severe** non-ionic contrast reactions is **less than 0.001%.**

Toxic Effects on Specific Organs

Vascular Toxicity

Venous

1. Pain at the injection site usually result from extravenous leak.

2. Transient pain extending up the arm due to stasis of contrast medium in the vein. May be relieved by abducting the arm.

3. Delayed limb pain due to thrombophlebitis as a result of the toxic effect on endothelium.

Arterial

Arterial **endothelial damage** and **vasodilatation** are mostly related to high osmolality. Contrast medium injected during peripheral arteriography often causes a **sensation of heat** or, occasionally, **pain**.

Soft-Tissue Toxicity

- **Pain**, **swelling**, **erythema**, and even **sloughing of skin** may occur from extravasated contrast medium. The risk is increased when **pumps** are used to inject **large volumes** of contrast medium during computed tomography (CT) examinations.

- Treatment should consist of the application of **cold packs** and **elevation of the limb**.

- a surgical referral may be needed in the case of **skin blistering**, **paraesthesi**a, **altered tissue perfusion** or **pain lasting more than 4 h.**

Cardiovascular Toxicity

1. Intracoronary injection of contrast media may cause significant **disturbance of cardiac rhythm**.

2. **Increased vagal activity** may result in depression of the sinoatrial and atrioventricular nodes, causing bradycardia or asystole.

3. Injection of hypertonic contrast medium causes significant fluid and ion shifts.

Immediately after injection there is a significant increase in serum osmolality. This causes an influx of water from the interstitial space into the vascular compartment, an increase in blood volume, an increase in cardiac output, and a brief increase of systemic blood pressure. Peripheral dilatation may cause a more prolonged fall of blood pressure. Injection into the right heart or pulmonary artery causes transitory pulmonary hypertension and systemic hypotension; injection

into the left ventricle or aorta causes brief systemic hypertension, followed by a more prolonged fall.

Thyroid Function

*Iodinated contrast media may rarely cause thyroid dysfunction.

1. Intravascular contrast should not be given if the patient is hyperthyroid.

2. Avoid thyroid radio-isotope tests and treatment for 2 months after iodinated contrast medium administration.

Nephrotoxicity

Contrast-induced nephropathy (CIN) is defined as an impairment of renal function due to adverse effects reaction of intravascular contrast media so must **prepare** blood urea and serum creatinine tests before the examination.

(urine output <0.5 mLkg−1h−1 for 6 h, and/or increase in serum creatinine by >25 μmolesL−1 within 48 h, and/or increase in serum creatinine >50% baseline value within a week of administration) in the absence of an alternative aetiology. In those affected, the serum creatinine concentration starts to rise within the first 24 h, reaches a peak by 2–3 days, and usually returns to baseline by 3–7 days. In rare cases patients may need temporary or permanent dialysis.

It was hoped that the iso-osmolar contrast agents might be less nephrotoxic than LOCM; however, clinical trials have so far yielded conflicting results. CIN has a complex aetiology, and the positive

benefit of reduction in osmolarity achieved with iso-osmolar contrast medium may be negated by other factors.

There are a number of predisposing factors in CIN:

1. The single most important risk factor is **preexisting impairment of renal function**; patients with normal renal function are at very low risk.

2. Heart failure

3. Hypovolaemia

4. Sepsis

5. Age >75 years

6. High dose of contrast medium

7. Renal transplant

8. Intraarterial administration of contrast

Adverse reactions can be classified in terms of severity as:

1. **Mild**: **Nausea**, vomiting, urticaria

2. **Moderate**: **Mild bronchospasm**, vasovagal reaction, tachycardia, diffuse erythema

3. **Severe**: **moderate or severe bronchospasm**, Cardiovascular collapse, laryngeal oedema, loss of consciousness or seizure.

Q/ It is essential that before administration of iodinated contrast, every patient must be specifically asked whether they have a history of:

1. **Previous contrast reaction**—Associated with a 6-fold increase in reactions to contrast medium.

2. **Asthma**—associated with a 6- to 10-fold increase in reactions to contrast medium.

3. Previous allergic reaction requiring medical treatment.

Q/ Precautions for Patients at Increased Risk of Anaphylactoid Iodinated Contrast Reaction

1. Use an alternative test not requiring iodinated contrast.

2. If an injection is necessary:

(a) use a non-ionic low osmolar contrast agent.

(b) maintain close supervision.

(c) leave the cannula in place and observe for 30 min.

(d) be ready to promptly treat any adverse reaction, and **ensure that emergency drugs and equipment are ready.**

Other Situations

Pregnancy—Iodinated contrast may be given if the clinical situation dictates.

Lactation—No special precaution is required.

Thyrotoxicosis—Intravascular contrast should not be given if the patientis hyperthyroid. Avoid thyroid radio-isotope tests and treatment for 2 months after iodinated contrast medium administration.

Contrast material for use in MRI. These may be classified under three headings:

1. Ferromagnetic—unsafe for clinical use as MRI contrast agents.

2. Paramagnetic—e.g. gadolinium contrast agents are by far the most widely used MRI contrast agents. shortening the T1 relaxation time and hence (white) on T1images.

3. Superparamagnetic—e.g. particles of iron oxide (Fe3O4). This cause shortening the T2 relaxation time, and hence (black) on T2 images.