Republic of Iraq
Ministry of Higher Education
Al-Mustaqbal University
Radiology Techniques Department
Second Stage \ Special Radiological Procedures-1

Lecture No. (1)

Intravascular contrast media & *Adverse effect on specific organs*

By

Dr. Samer Adnan

M.RT Ali Hani

M.RT Hussein Ayyed

Historical development of radiographic agent

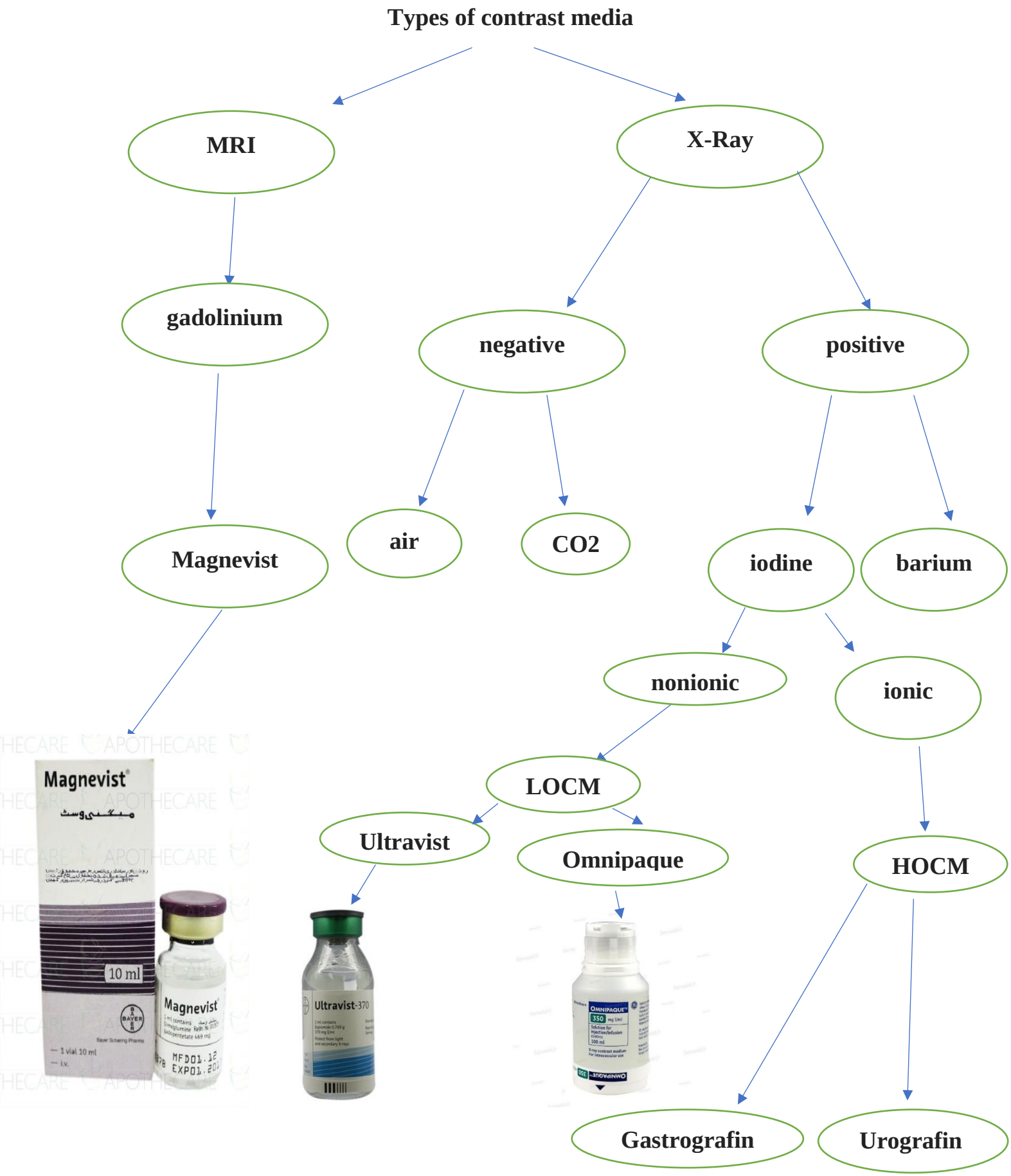
- Radiographic contrast has been used for over a century to enhance the contrast of radiographic images.
- In 1896, in the year after X-rays were discovered, inspired air became the first recognised contrast agent in radiographic examinations of the chest.
- The first report of opacification of urinary tract after I.V injection of contrast agent appeared in 1923 using an I.V injection of 10% of sodium iodide solution, which was at that time prescribed for of syphilis and was execrated in the Urine

Contrast media are chemical substances used to enhance the visibility of internal structures in X-ray -based imaging techniques such as **computed tomography** (CT), Conventional radiography, and fluoroscopy also used in magnetic resonance imaging (MRI).

Contrast materials enter the body in three ways. They can be:

1. **Orally** such as (barium swallow, barium meal, and barium follow through)
2. **Rectally** such as (barium enema)
3. **Intravenous** in most radiological examination
4. **Intra-arterial** such as (coronary angiography)

Q/What are types of contrast media?



*Radiocontrast agents are typically **iodine**, or more rarely **barium-sulphate.**

Contrast absorbs external X-rays, resulting in decreased exposure on the X-ray detector so **appear bright**.

*Magnetic resonance imaging (MRI) contrast media are most commonly **gadolinium** contrast agents such as **Magnevist**.

Low osmolality contrast media (LOCM): is non-ionic iodinated radiological contrast media such as **Omnipaque** and **Ultravist** used in most radiological examination.

*The **low**- osmolar (LOCM) and **iso-osmolar** contrast media are 5–10 times safer than the **HOCM.**

Adverse effect of I.V 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.

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 one of the most serious adverse effects associated with the use of intravascular contrast media and is **defined as an impairment of renal function** so **must prepare** blood urea and serum creatinine tests before the examination.

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

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

1. **Previous contrast reaction**—Associated with a sixfold (6) increase in reactions to contrast medium.

Determine the exact nature and specific agent used.

2. **Asthma**—A history of asthma associated with a 6- to 10-fold increase in the risk of severe reaction.

3. **Previous allergic reaction** —requiring medical treatment

Determine the nature of the allergies and their sensitivity.

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

1. Consider an alternative test not requiring iodinated contrast.

2. If the injection is considered necessary:

(a) for previous reactors to iodinated contrast, use a different non-ionic low- or iso-osmolar contrast to that used previously.

(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.

-Only small amounts of intravenous contrast medium reach the breast milk during lactation, approximately **0.5%** of the dose received by the mother. It is considered safe for both mother and infant to continue breast-feeding after iodinated contrast administration