Appendix X

Radiological Contrast Media

Contrast media commonly used in conventional radiology are:

1. **Barium sulphate.** Available as paste, suspensions (of varying densities), powder (for making paste and dilute suspension).

- Used in various forms and amounts depending upon the study in investigating various conditions of the gastrointestinal tract.
- Various investigations include Barium swallow, upper GI studies, follow-through, enteroclysis, enema and oral contrast in CT scans.
- Used in single and double contrast studies. Double contrast studies also use other agents such as water, air and methylcellulose.

Contraindications, side effects and special precautions:

- Contraindicated in perforation of GI tract—can cause severe peritonitis.
- Constipation may occur after oral or rectal barium sulphate. Adequate hydration should be maintained.
- Rarely impaction, obstruction, appendicitis, cramping or diarrhoea. Accidental venous intravasation can lead to the formation of emboli.
- May be retained for years in closed cavities.
- ECG abnormalities during barium sulphate enemas.
- Accidental aspiration into the lungs can lead to pneumonitis or granuloma formation.
- Hypersensitivity reactions can occur due to the additives used in the formulation.

2. **Intravascular Iodine-based contrast media (water-soluble)**
   Ionic contrast media – Sodium and Meglumine Diatrizoate and Iothalamate.
   Non-ionic contrast media – Monomeric: Iohexol, Ioversol, Iopamidol; Dimeric: Iotrolan, Iodixanol. They are available in various iodine concentrations from 240 to 370 mg/ml, in 10, 20, 40, 50 and 100 ml.

- Broad range of indications in the form of intravascular and intracavitatory routes.
- Intravascular includes intravenous pyelogram (IVP), venography, angiography contrast enhanced CT scans, etc.
- Intracavitatory includes HSG, micturating cystourethrogram, fistulogram, etc.
- Dose varies from each investigation and case-to-case basis. In general, non-ionic media are better tolerated than ionic media and more non-ionic contrast can be used.
- Non-ionic media should be preferred for intravascular use whenever possible.

Contraindications, side effects and special precautions

- Contraindicated in patients with known hypersensitivity to a particular contrast agent. Special precautions to be taken in patients with history of allergy, asthma, previous generalized contrast medium reaction, etc. Premedication to avoid or minimize possible allergic reactions may be considered.
- Antihistamines should be given by a separate injection to avoid precipitation.
- Test dose before injection of the full dose has been employed but is not completely reliable. The patient should be kept under observation for 30 to 60 minutes following injection.
- Patients on adrenergic β blockers are more prone to severe adverse effects to contrast media.
- An interval of at least 48 hours should be allowed before studies are repeated especially in patients with reduced renal function.
- Preparatory dehydration is not necessary and may be dangerous in infants, young children, the elderly, presence of multiple myeloma and azotemic patients (especially those with polyuria, oliguria, diabetes, advanced vascular disease or pre-existing dehydration).
- Use with caution in patients with congestive heart failure.
- Special precaution to be taken in patients with cerebral thrombosis or embolism, primary or metastatic cerebral lesions, subarachnoid haemorrhage, increased intracranial pressure, arterial spasm, transient ischaemic attacks and in any condition when the blood-brain barrier is breached or the transit time of the contrast material is prolonged.
- The results of protein bound iodine and radioactive iodine uptake studies will not reflect thyroid functions for at least 16 days following administration of iodinated contrast media.
- Avoid in patients known or suspected to have pheochromocytoma.
- Contrast media by IV route can promote the phenomenon of sickling in individuals homozygous for sickle cell disease.
- Other risk factors include raised serum creatinine levels, particularly secondary to diabetic nephropathy, dehydration, congestive heart failure, age over 70 years, concurrent administration of nephrotoxic drugs, e.g. non-steroid anti-inflammatory drugs, hyperthyroidism, concomitant severe renal and hepatic disease, gout.
- Safety of contrast media for use in pregnancy has not been determined; the benefit to the patient should be carefully weighed against the possible risk to the fetus.
- Since contrast media are known to be excreted in breast milk, nursing should be stopped and alternate feeding substituted for 24 to 48 hours following administration.

Reactions to contrast media

Reactions occur at random and are generally unpredictable. Most of them recover when properly treated. The reactions are described as mild, moderate and severe.

Mild reactions: Flushing, nausea, arm pain, vomiting, headache, mild urticaria. They are mild in severity, of short duration, self-limiting, and require no specific treatment. Occasionally, Tab Chlorpheniramine 25 mg, Tab Diazepam 5 mg, or Tab Paracetamol 500 mg may be given.

Incidence of mild reactions is 5-15%. It is lower with non-ionic contrast media.

Moderate reactions: More serious degree of the mild symptoms, hypotension and bronchospasm. They disturb both the patient and the doctor but are not alarming. The incidence of these reactions is 0.5-2%. In case of non-ionic contrast, it is reduced to 1/4th.

Severe reactions: They include convulsions, unconsciousness, laryngeal oedema, severe bronchospasm, pulmonary oedema, severe cardiac arrhythmias and arrest, cardiopulmonary collapse. Treatment is urgent, since death can eventually occur. The incidence of deaths in ionic contrast media is 1 in 40,000 patients. It is absolutely essential to take informed consent of the patient before giving intravascular contrast agents. The patient should be shifted to ICU immediately.

Anaesthetist should be available. Trolley with oxygen, oral airways, nasal tubes, endotracheal tubes, facemask, ambu bag, sphygmomanometer and stethoscope, syringes, needles and tracheostomy set should be readily available.

Artificial respiration and cardiac massage by a DC defibrillator should be given. The incidence of severe reactions is 0.1% in ionic and 0.02% in non-ionic media.

(For details of management see Chapter 2 on Anaphylaxis and CPR)