SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai

DEPARTMENT OF CARDIAC TECHNOLOGY

COURSE NAME: CARDIAC CATHERIZATION LABORATORY

ADVANCED

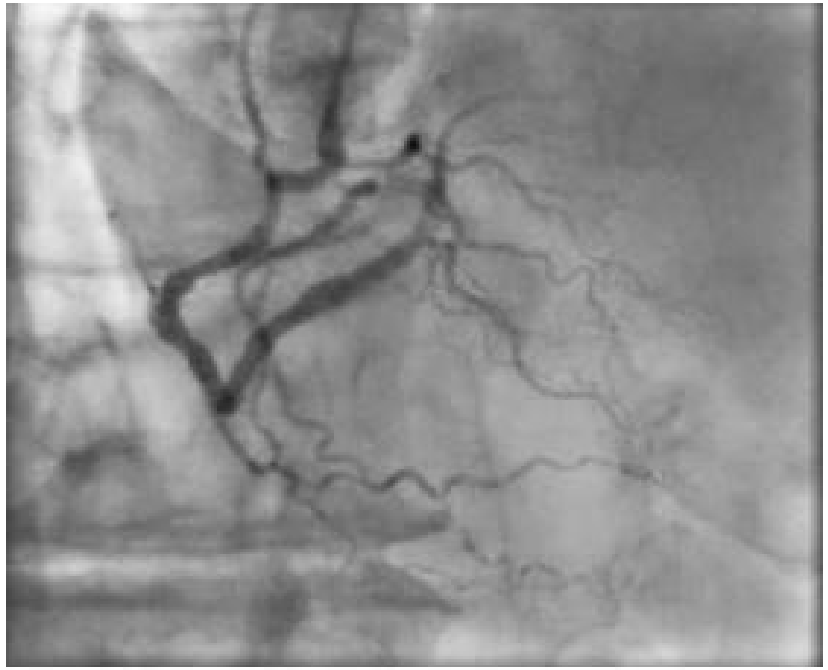
UNIT : 1

TOPIC : CONTRAST AGENT

FACULTY NAME: Ms. HARSHITHA S

Why Do We Need Contrast in Coronary Angiography?

- X-rays are attenuated similarly by blood and myocardium → vessels invisible
- Iodinated contrast: high atomic number (Z = 53) → strong X-ray attenuation
- Provides luminal opacification of coronary arteries
- Essential for detecting stenosis, thrombus, collaterals, anomalies



Ideal Properties of an Angiographic Contrast Agent

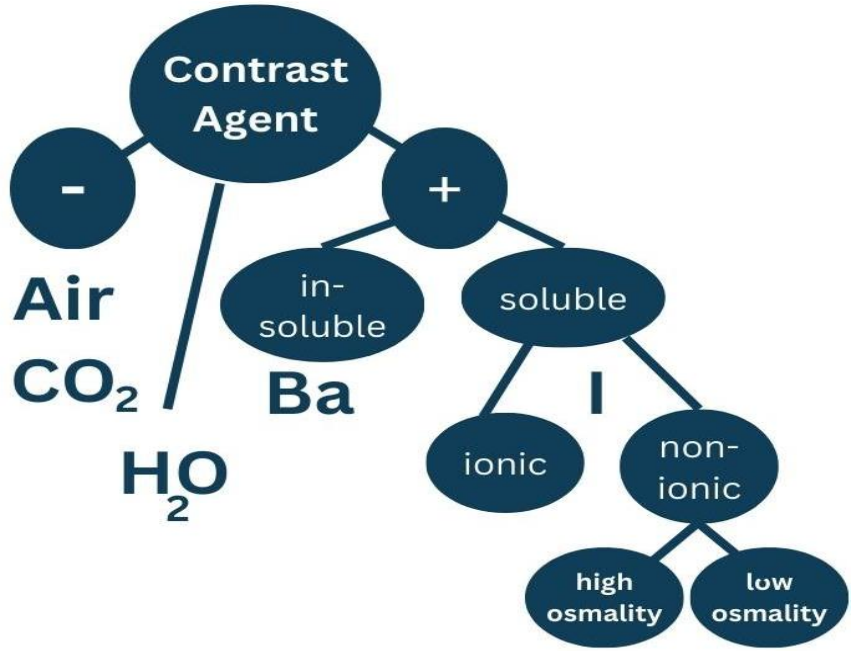
- Low osmolality (close to plasma: 290–300 mOsm/kg)
- Low viscosity (easy injection through small catheters)
- Non-ionic
- Rapid renal excretion
- Minimal chemotoxicity and endothelial effects
- Cost-effective

Evolution of Contrast Agents

Generation	Example	Osmolality	Ionic?	Year Introduced
1st (HOCM)	Diatrizoate (Urografin)	1500–2100 mOsm/kg	Ionic	1950s
2nd (LOCM)	Ioxaglate (Hexabrix)	580–600 mOsm/kg	Ionic dimer	1980s
3rd (IOCM)	Iodixanol (Visipaque)	290 mOsm/kg (iso)	Non-ionic dimer	1996
Modern non-ionic LOCM	Iohexol (Omnipaque), Iopamidol (Isovue), Iomeprol (Iomeron), Ioversol (Optiray)	600–900 mOsm/kg	Non-ionic monomer	1980s–present

Classification by Osmolality

- High-osmolar contrast media (HOCM): >1500 mOsm/kg → almost obsolete for coronary work
- Low-osmolar contrast media (LOCM): 600–900 mOsm/kg → current standard
- Iso-osmolar contrast media (IOCM): ~290 mOsm/kg → iodixanol only



Key Physicochemical Differences

Agent	Iodine (mg/mL)	Osmolality	Viscosity (cP at 37°C)	Type
Iodixanol	320	290	11.8	Iso-osmolar dimer
Iohexol	350	844	10.4	LOCM monomer
Iopamidol	370	796	9.4	LOCM monomer
Iomeprol	400	726	11.6	LOCM monomer

Adverse Effects of Contrast Agents

- Contrast-Induced Nephropathy (CIN / CI-AKI)
- Anaphylactoid (allergic-like) reactions
- Cardiovascular effects (bradycardia, QT prolongation, ventricular fibrillation — especially HOCM)
- Pain and heat sensation (HOCM >> LOCM)
- Endothelial dysfunction and thrombosis risk (ionic > non-ionic)

Practical Choice in the Cath Lab Today

Clinical Scenario	Recommended Agent
Routine diagnostic angio	Any non-ionic LOCM (iohexol, iopamidol, iomeprol)
High contrast load expected (>200 mL)	Iomeprol 400 or iodixanol
eGFR <30 mL/min or diabetes + proteinuria	Iodixanol (Visipaque) or iopamidol
Emergency PCI (hemodynamic instability)	Lowest viscosity agent available (iopamidol 370)
Known severe allergy	Premedicate + same-day steroid protocol

Summary

- All modern coronary contrast agents are non-ionic LOCM or IOCM
- LOCM are safe and cost-effective for the majority of patients
- Use IOCM (iodixanol) in highest renal risk patients
- Volume minimization and hydration remain the cornerstone of CIN prevention
- Always have anaphylaxis kit ready (epinephrine, fluids, steroids)

Reference

- https://www.scribd.com/presentation/434640059/Contrast-Agents-Cath-Lab-Anaphylatic-Shock-paramed

THANK YOU