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 CATHETERIZATION LABORATORY ADVANCED

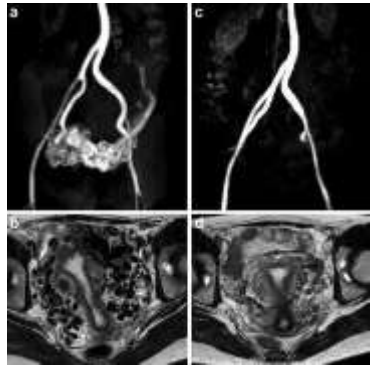
UNIT : 1

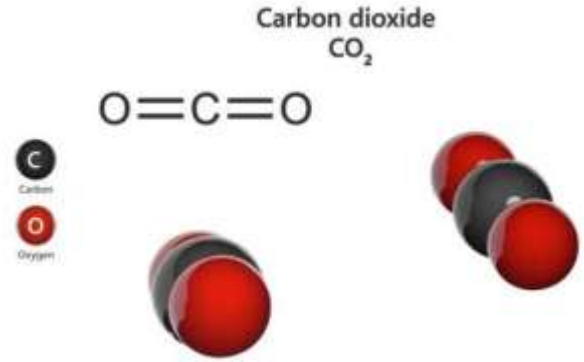
TOPIC : CARBON DIOXIDE ANGIOGRAPHY

FACULTY NAME : Ms. HARSHITHA S

Introduction

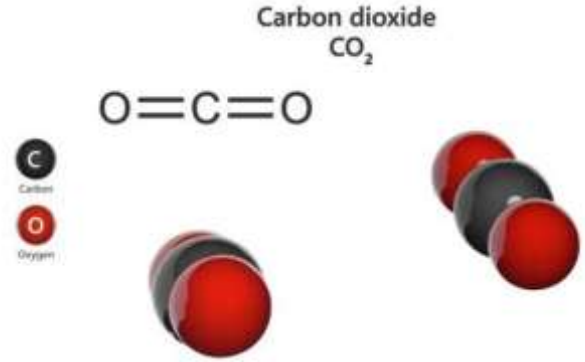
- Angiography requires contrast media to visualize blood vessels
- Conventional contrast agents are iodine-based
- Some patients cannot tolerate iodinated contrast
- Carbon Dioxide (CO_2) is an alternative intravascular contrast agent





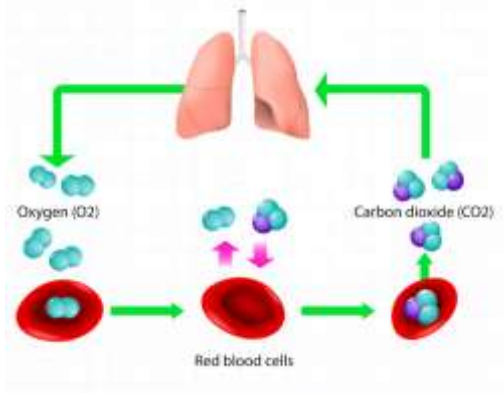
What is Carbon Dioxide Angiography?

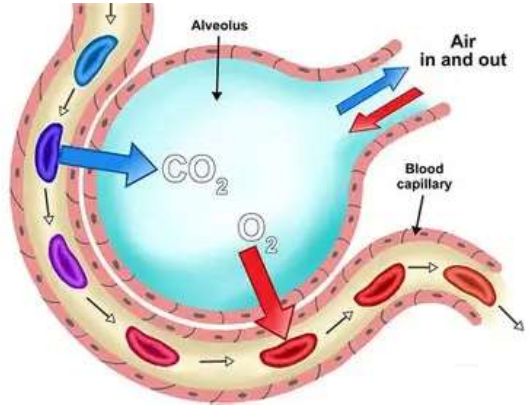
- A technique using medical-grade CO_2 gas as a contrast agent
- CO_2 displaces blood temporarily and creates negative contrast
- Visualized using digital subtraction angiography (DSA)
- Mainly used in vascular imaging



Properties of Carbon Dioxide

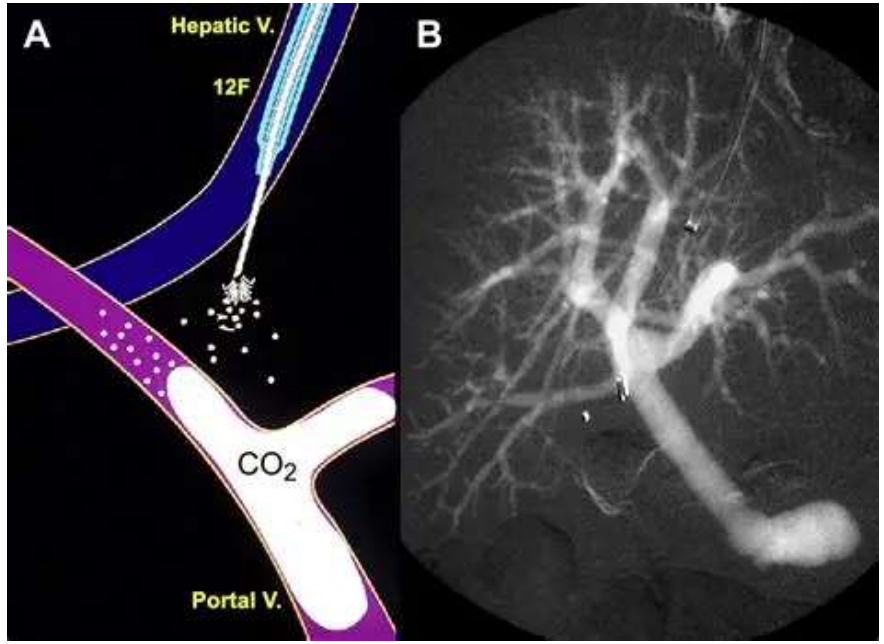
- Colorless, odorless, non-toxic gas
- Highly soluble in blood
- Rapidly eliminated via lungs
- Less viscous than liquid contrast
- Does not cause nephrotoxicity or allergic reactions





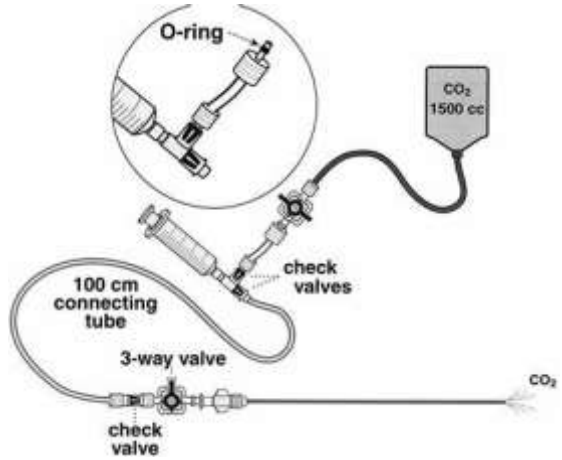
Principle of CO_2 Angiography

- CO_2 displaces blood inside vessels
- Acts as a negative contrast agent
- Images are captured using DSA
- Best visualized in dependent vessels



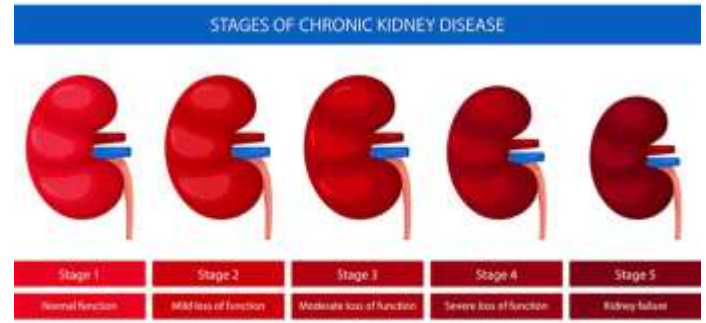
Equipment Required

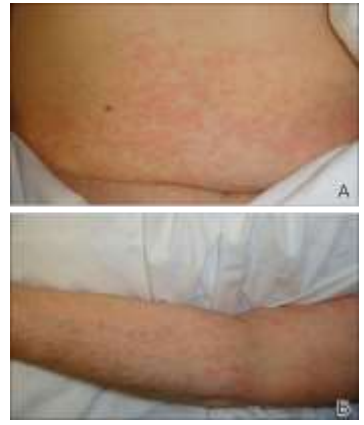
- Medical-grade CO_2 cylinder
- Pressure regulator
- CO_2 delivery system (closed system preferred)
- Catheters and sheaths
- Digital Subtraction Angiography (DSA) system
- Monitoring equipment (ECG, BP, SpO_2)



Indications for CO_2 Angiography

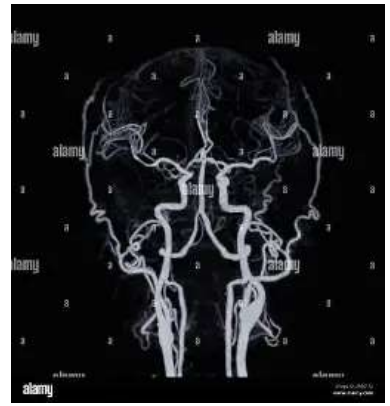
- Patients with contrast-induced nephropathy risk
- Chronic kidney disease (CKD)
- Allergy to iodinated contrast
- Peripheral arterial disease
- Renal artery imaging
- Inferior vena cava (IVC) studies

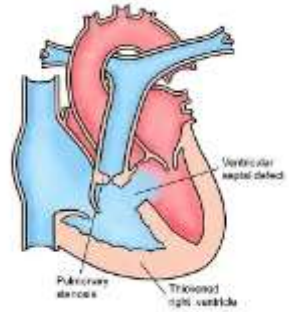




Contraindications for CO_2 Angiography

- Cerebral circulation imaging
- Coronary angiography
- Pulmonary angiography
- Right-to-left cardiac shunts
- Severe pulmonary hypertension
- Pregnancy (relative)



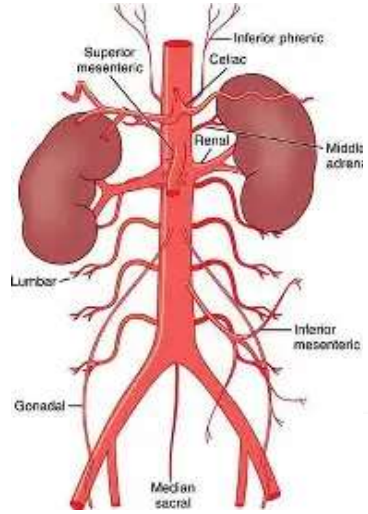


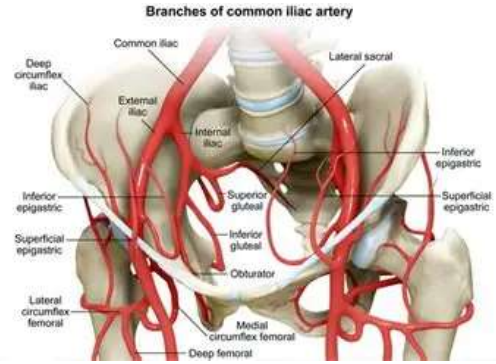
Normal coronary arteries on the left side of the heart

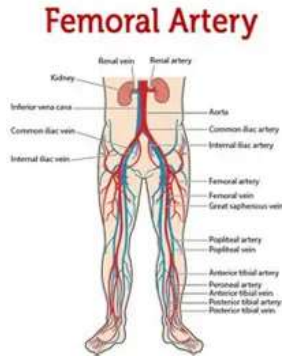
Normal coronary arteries on the right side of the heart

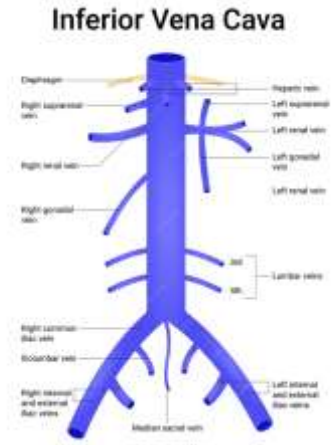
Commonly Imaged Vessels

- Abdominal aorta
- Renal arteries
- Iliac arteries
- Femoral arteries
- Inferior vena cava



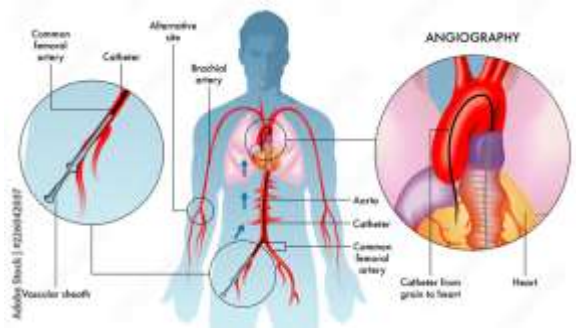






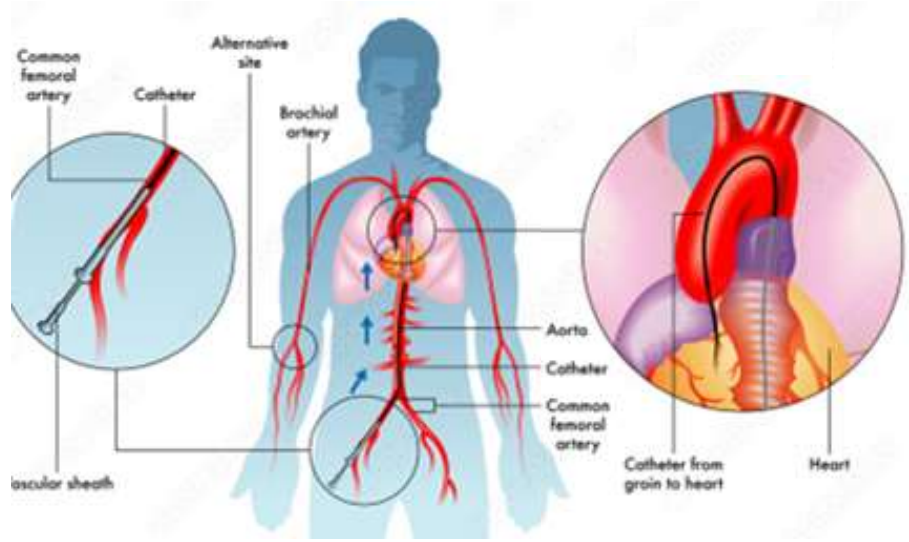
Procedure Steps

1. Patient preparation and consent
2. Vascular access
3. Catheter positioning
4. Controlled CO_2 injection
5. Image acquisition using DSA
6. Monitoring patient throughout procedure



Injection Technique

- Injected slowly and in controlled volume
- Usually 20–40 mL per injection
- Allow adequate time between injections
- Avoid air contamination
- Patient positioned properly to optimize imaging

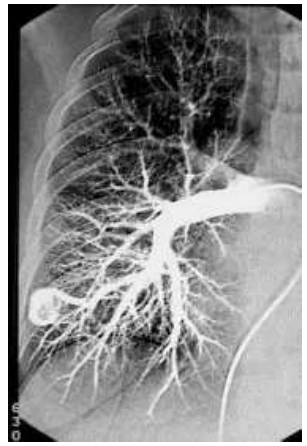


Advantages of CO_2 Angiography

- Safe in renal failure patients
- No allergic reactions
- Inexpensive compared to contrast media
- Rapid elimination from body
- Can be repeated multiple times

Limitations

- Poor image quality in some vessels
- Not suitable for coronary or cerebral arteries
- Requires experience and proper technique
- Patient discomfort may occur



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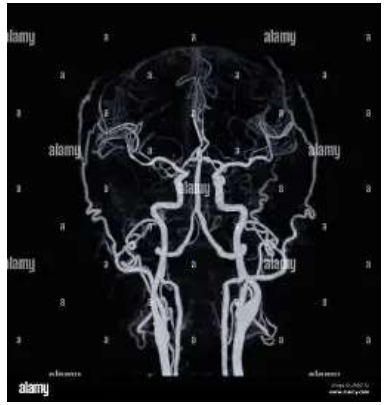
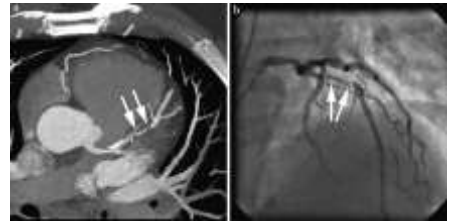




Complications

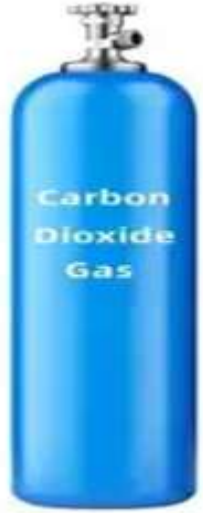
- Transient abdominal pain
- Nausea
- Dizziness
- Rare risk of gas embolism (if improper technique used)
- Hypotension (rare)





Safety Measures

- Use only medical-grade CO_2
- Closed delivery system
- Avoid air contamination
- Proper patient positioning
- Continuous patient monitoring
- Adequate time between injections



Clinical Importance

- Useful alternative in high-risk patients
- Expands imaging options in vascular procedures
- Reduces contrast-related complications
- Increasingly used in interventional cardiology & radiology

Summary

- CO_2 angiography is a safe and effective alternative
- Ideal for patients with renal impairment
- Requires proper technique and monitoring
- Cardiac technologists play a key role

Reference

- Radiopaedia: Thoracic Aortic Aneurysm. Radiopaedia.org.
- RSNA Radiographic: Chest CT Angiography for Acute Aortic Pathologic Conditions: Pearls and Pitfalls. Radiographic.
- MSD Manual: Thoracic Aortic Aneurysms. MSD Manual Professional Edition.

THANK YOU