



الرنين المغناطيسي

CONTRAST MEDIA

Sawa University

جامعة ساوة الاهلية

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كلية التقنيات الصحية والطبية

Department of Radiology Tech.

قسم تقنيات الاشعة والسونار

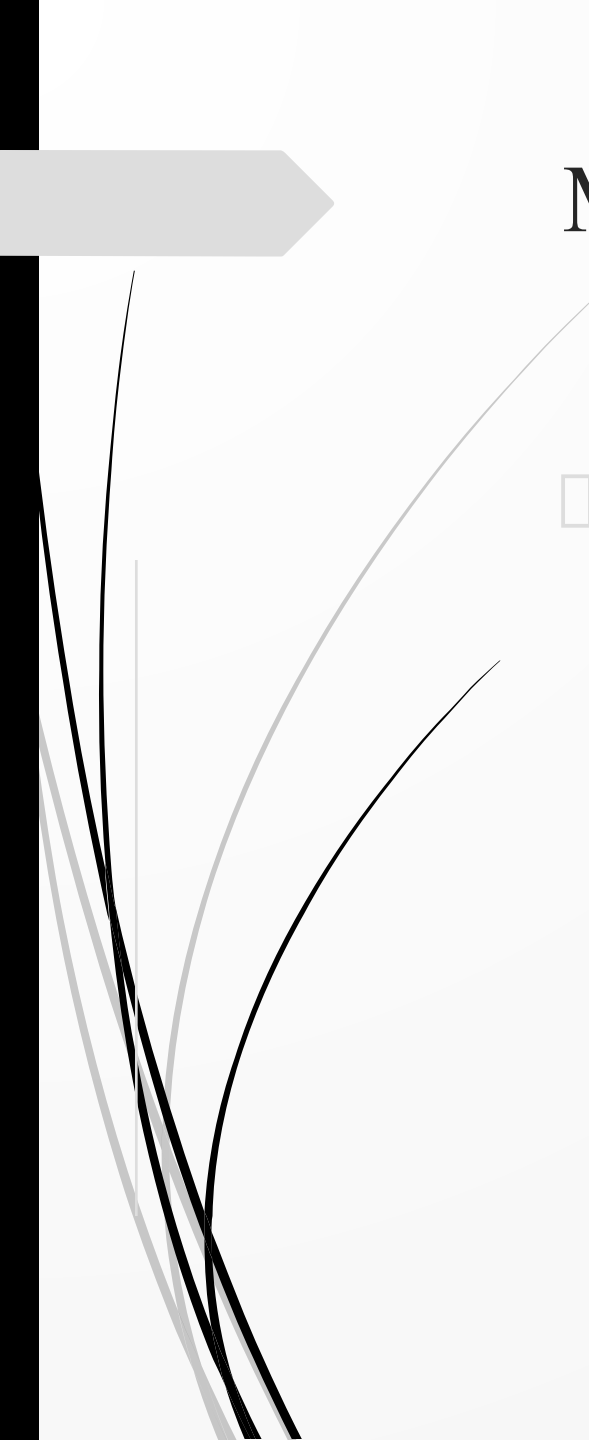
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المرحلة : الرابعة

الجانب النظري محاضرة رقم 6

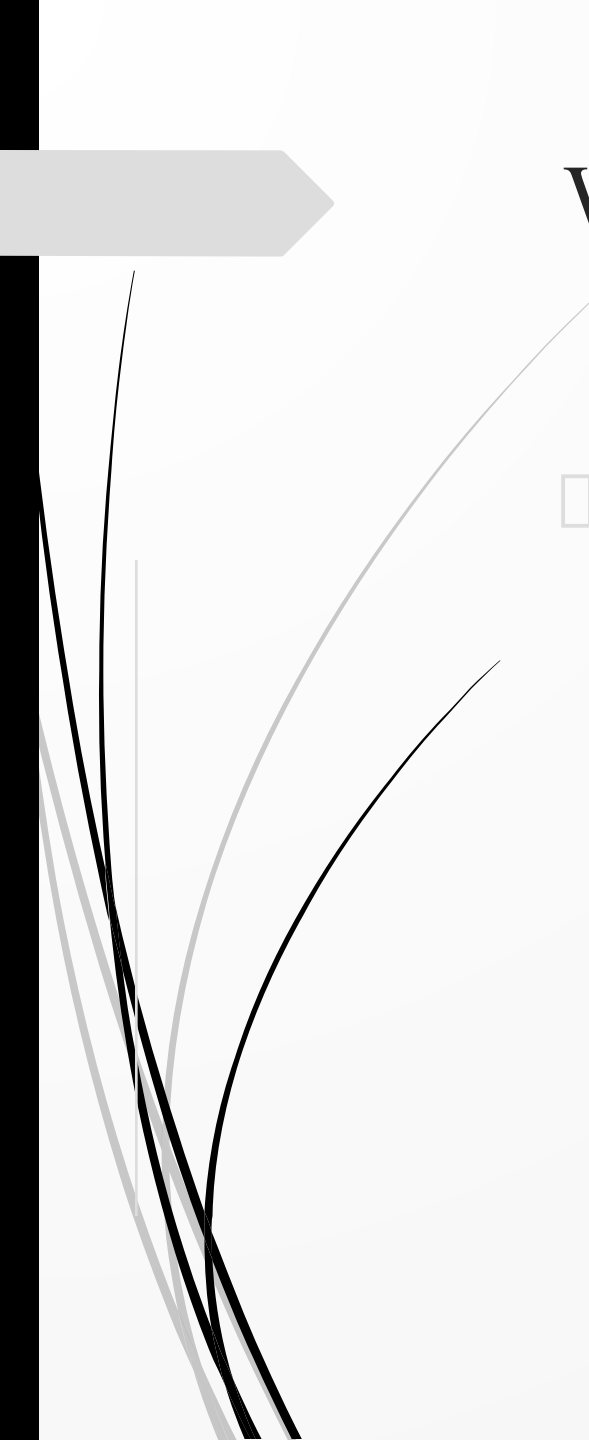
Lecture No.6 Theoretical

تدريسي المادة : المحاضر م. م. فاضل عوفي عواد



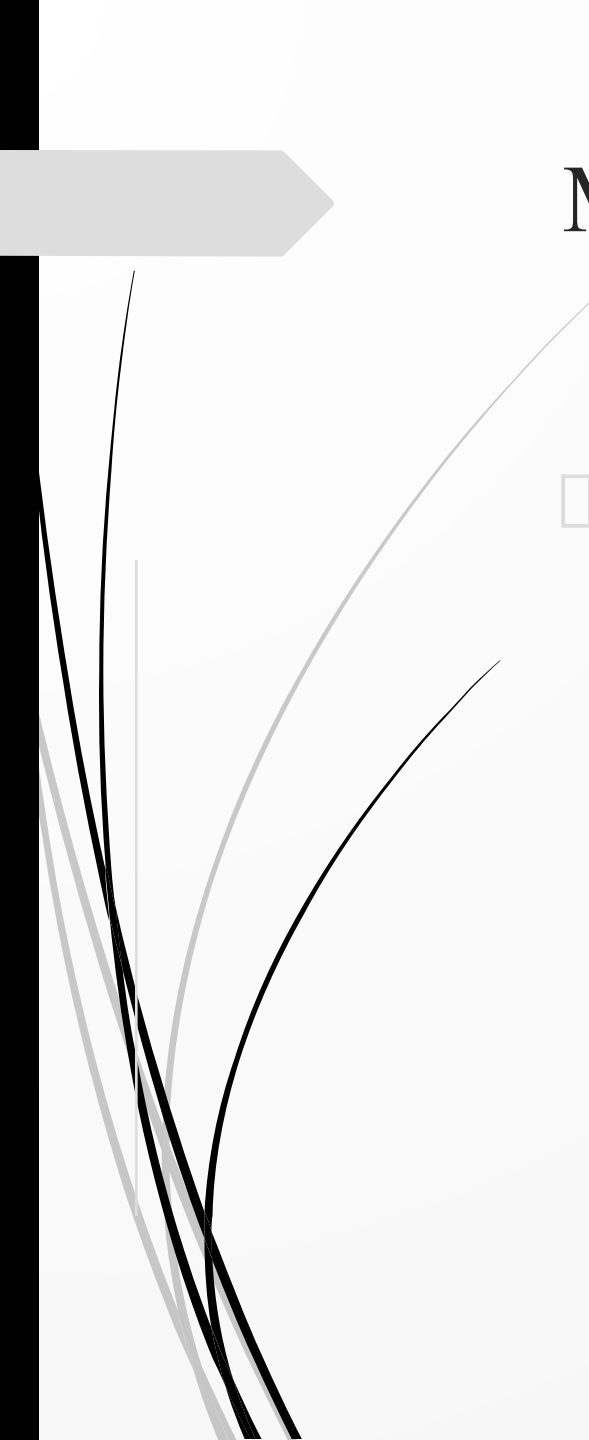
MRI Contrast Media

- Contrast media in MRI are chemical agents that alter the magnetic properties of nearby water protons, enhancing tissue contrast and improving visualization of pathology. They do not absorb X-rays like CT contrast agents, but instead modify relaxation times (T1, T2) to highlight specific structures.



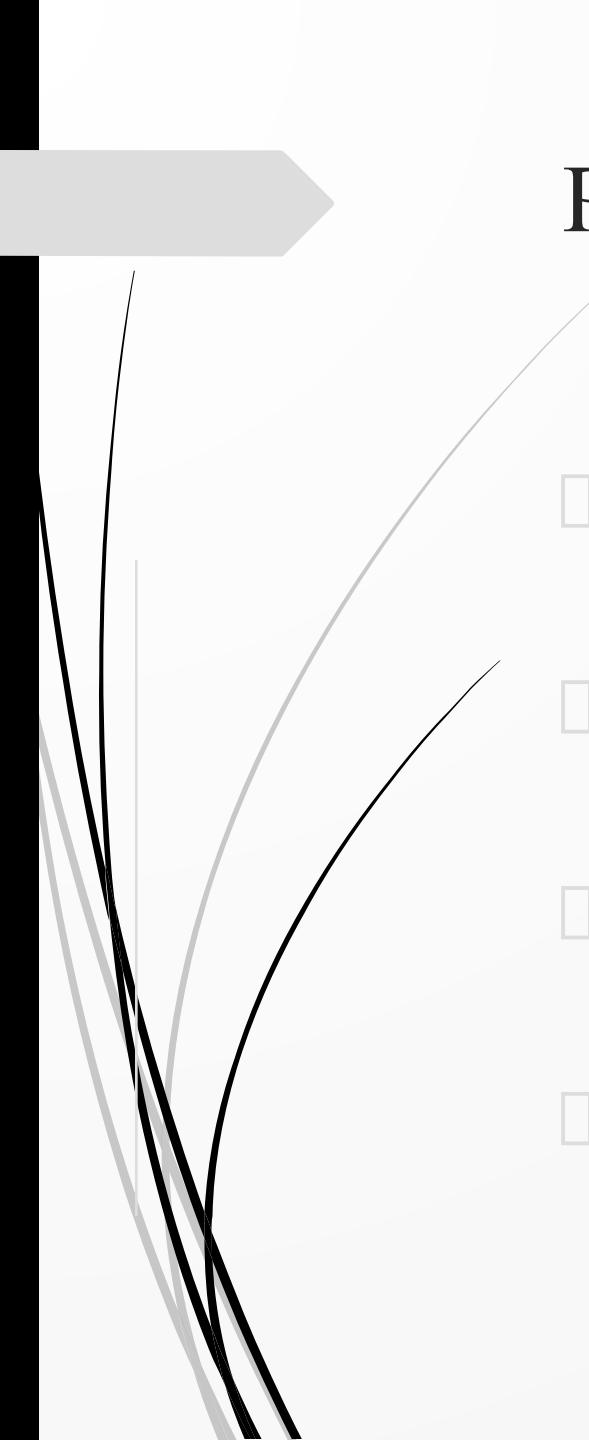
Why Use Contrast in MRI?

- MRI contrast is used to improve lesion detection, characterize tumors, evaluate vascular structures, and differentiate normal from abnormal tissue. It helps in distinguishing between inflammation, infection, and neoplastic lesions.



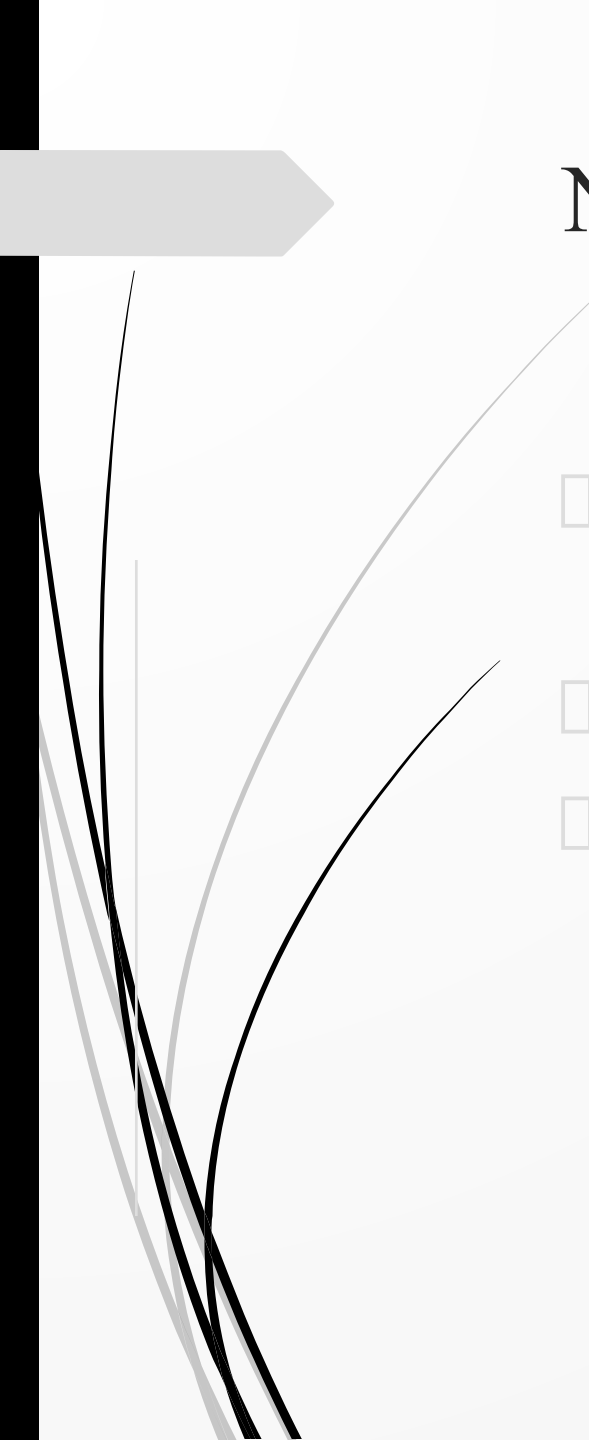
Mechanism of Action

- Most MRI contrast agents act by shortening the relaxation times of nearby hydrogen protons. Positive agents (like gadolinium) shorten T1 relaxation, making tissues appear brighter, while negative agents shorten T2 relaxation, causing signal loss and darker appearance.



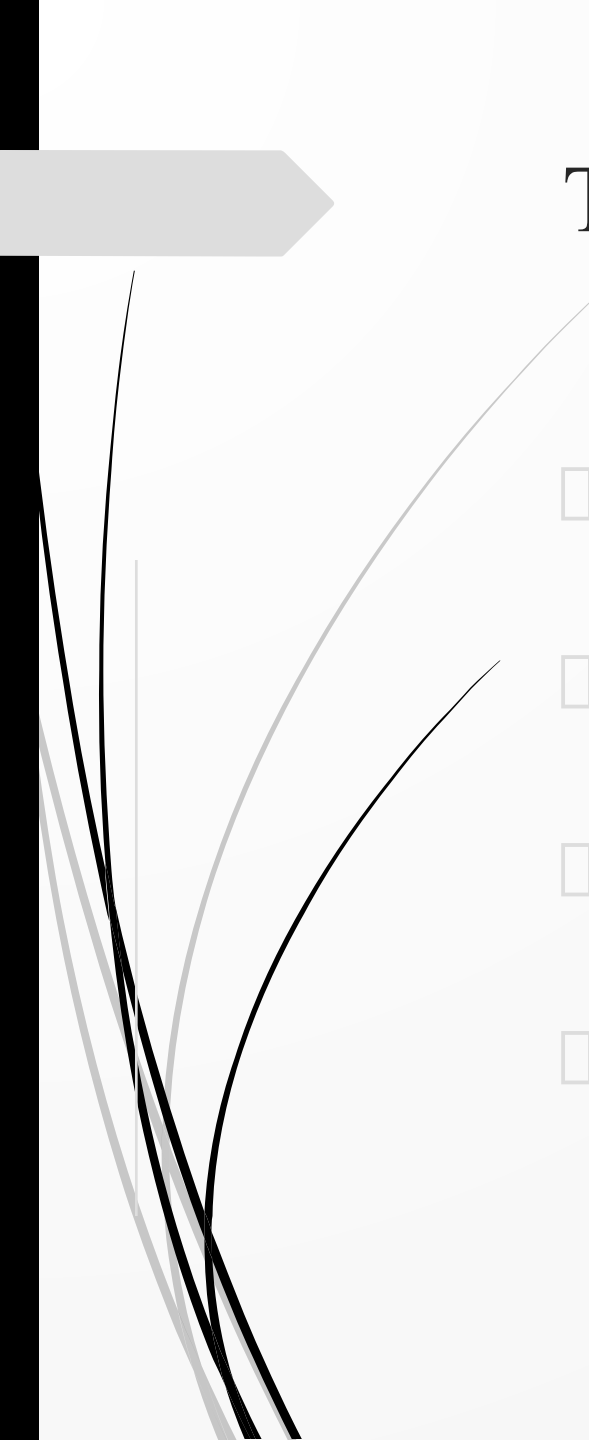
Positive Contrast Media

- These agents increase signal intensity and appear bright on T1-weighted images.
- • Gadolinium-based contrast agents (GBCA) are the most common.
- • They are paramagnetic and influence local magnetic fields.
- • Used in brain, spine, and vascular imaging.



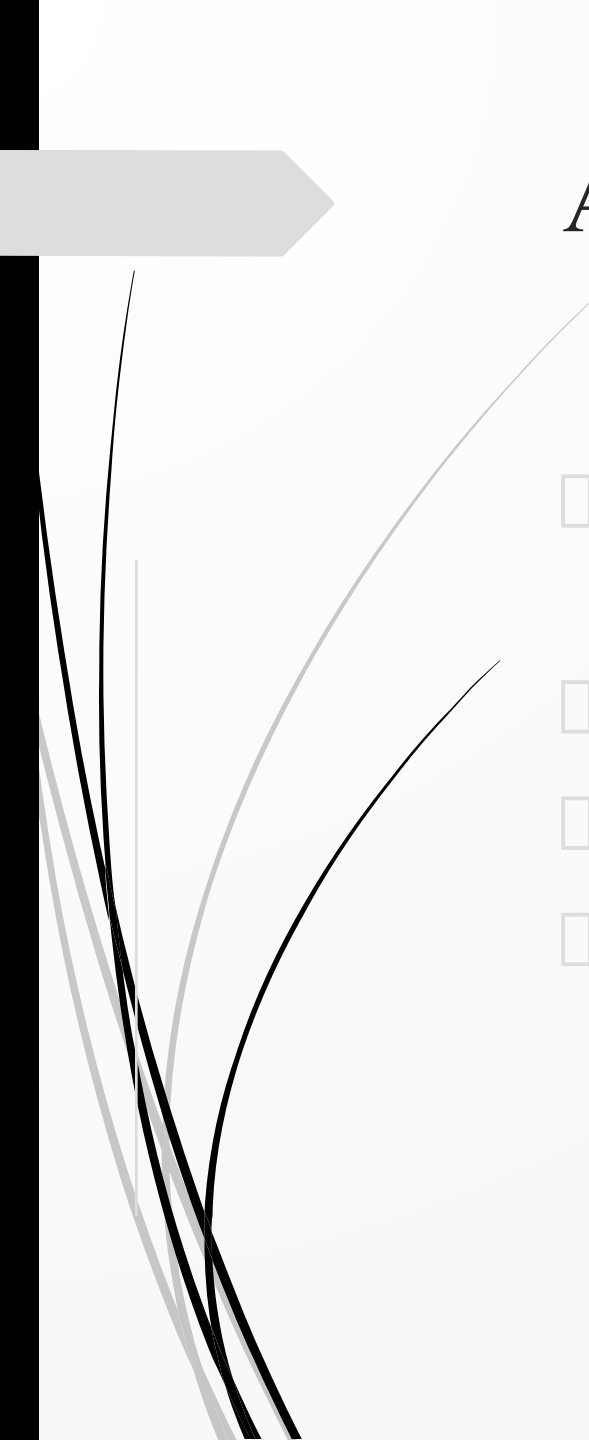
Negative Contrast Media

- These agents decrease signal intensity, appearing dark on images.
- • Examples include iron oxide nanoparticles and air.
- • Useful in bowel MRI and liver imaging for highlighting structures surrounded by fluid.



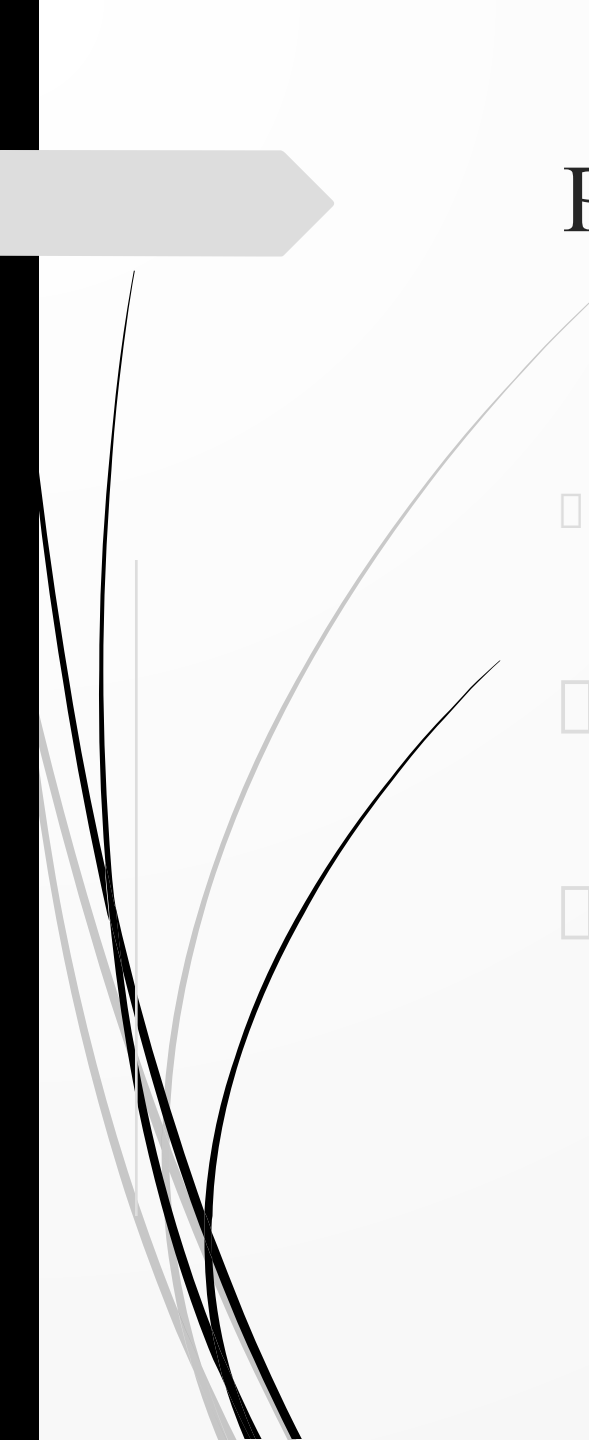
Types of Gadolinium Agents

- Gadolinium-based agents are divided into two main classes:
 - 1. Linear chelates: simpler chemical structure, slightly higher risk of dissociation.
 - 2. Macrocyclic chelates: cage-like structure, more stable and safer.
- Macrocyclic agents are preferred due to reduced risk of toxicity.



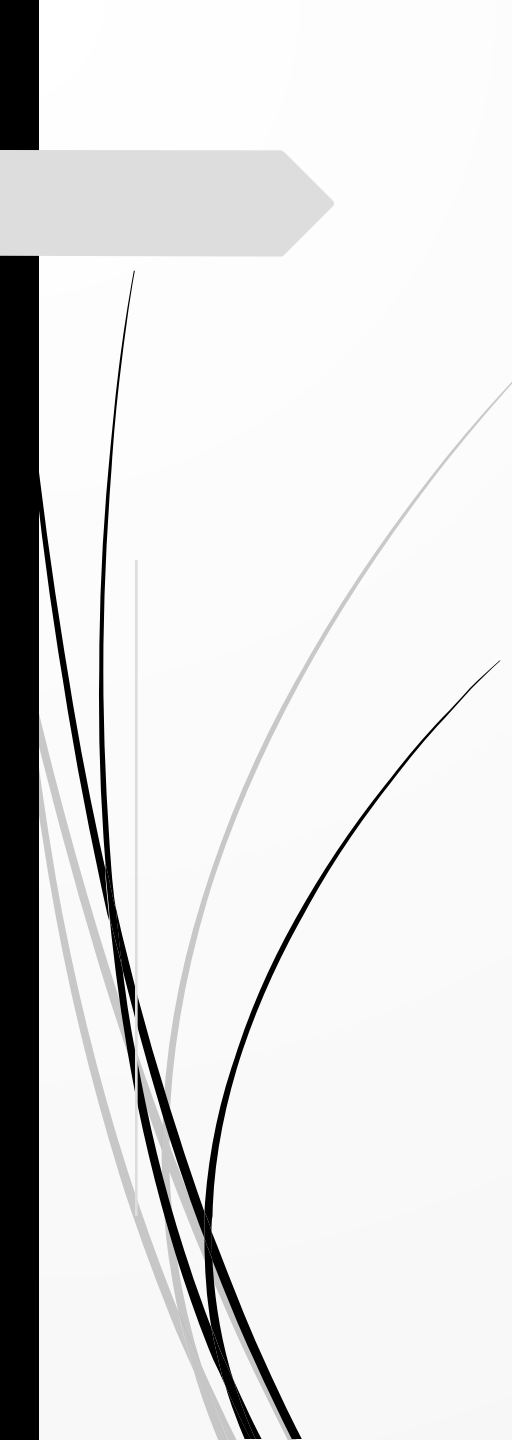
Administration of Contrast

- • Most agents are administered intravenously, usually via an automated injector.
- • Standard dose: 0.1 mmol/kg body weight.
- • Should be injected slowly and followed by a saline flush.
- • Always check patient renal function before injection.



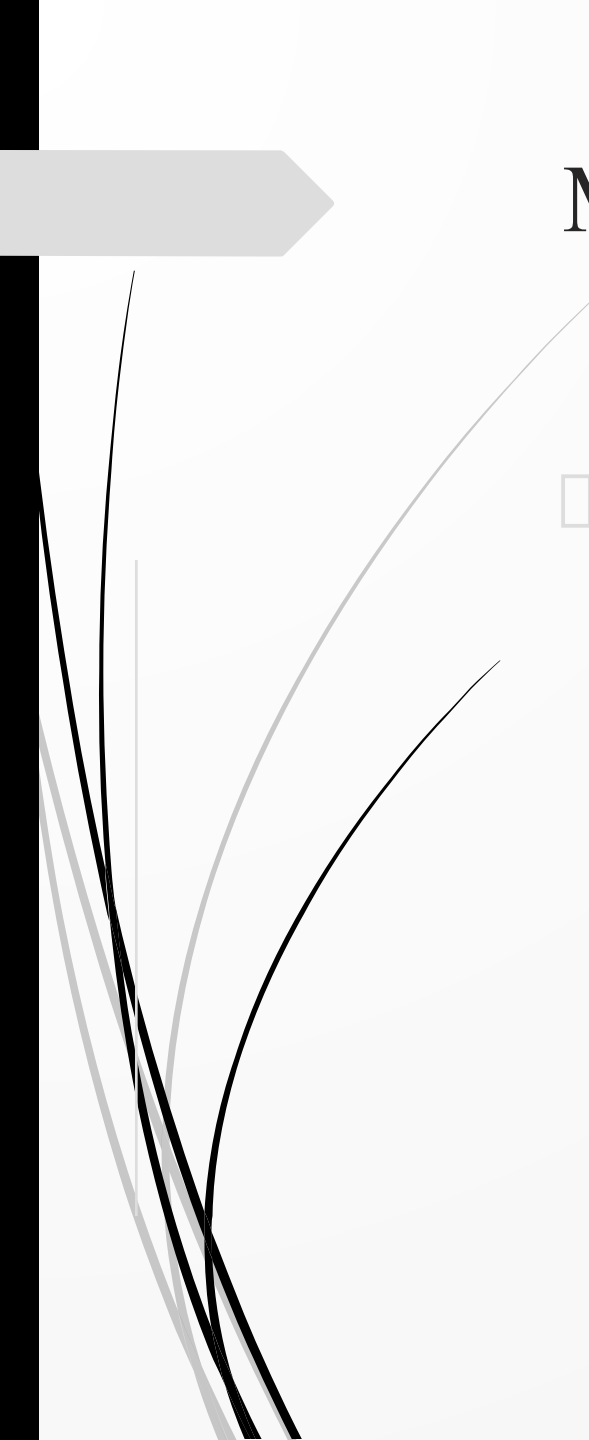
Patient Safety and Precautions

- ❑ • Gadolinium contrast is generally safe, but can rarely cause adverse reactions such as nausea or rash.
- ❑ • In patients with severe renal failure, it may cause Nephrogenic Systemic Fibrosis (NSF).
- ❑ • Always review patient history, allergies, and kidney function.



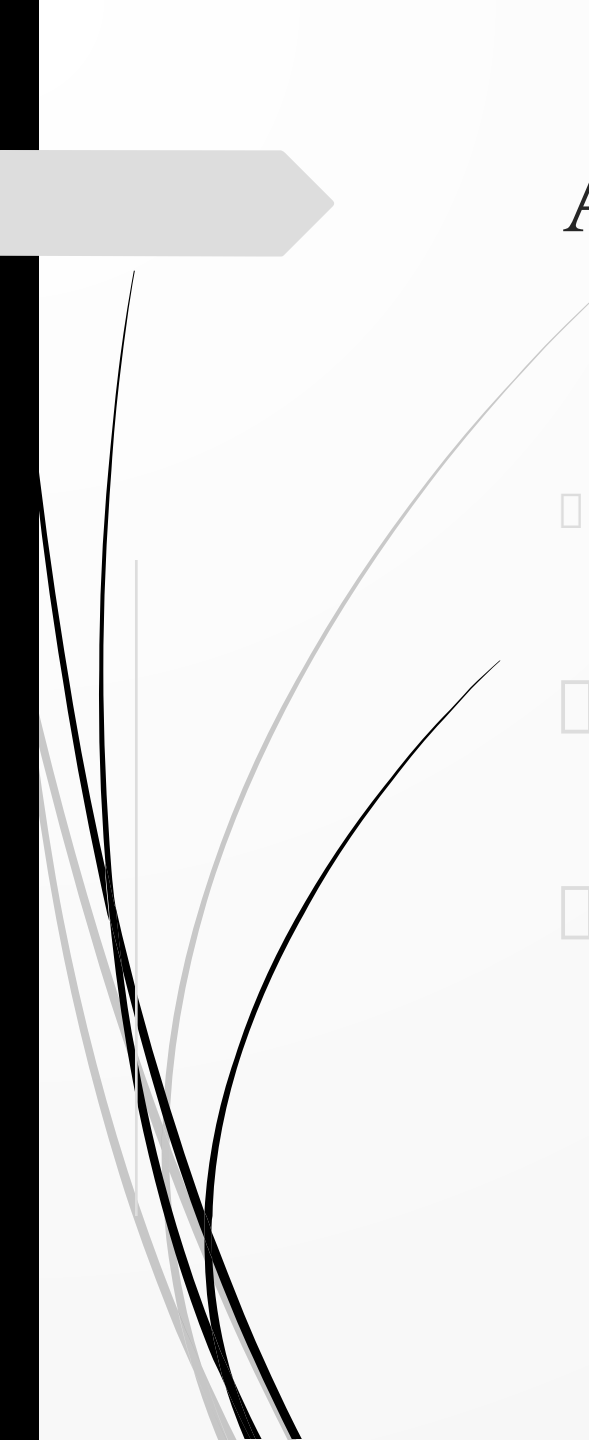
Contraindications

- ❑ • Known hypersensitivity to gadolinium-based agents.
- ❑ • Severe renal impairment (GFR < 30 mL/min).
- ❑ Haematological disorders
- ❑ • Sickle cell anaemia
- ❑ • Pregnancy: use only if absolutely necessary and benefits outweigh risks.



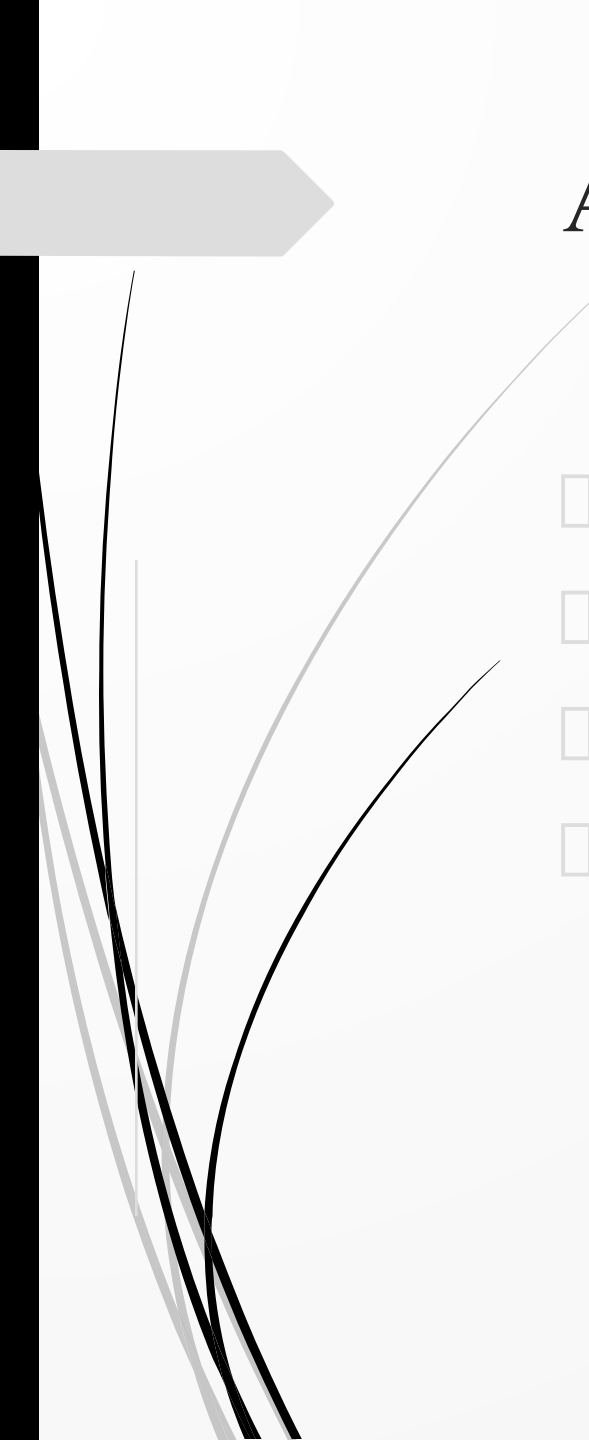
Magnetization Transfer Contrast (MTC)

- MTC is an advanced technique that uses the interaction between free water protons and protons bound to macromolecules. By applying specific RF pulses, the magnetization of macromolecules is transferred to free water, changing tissue contrast. This helps in detecting demyelination and tissue changes in the brain and spinal cord.



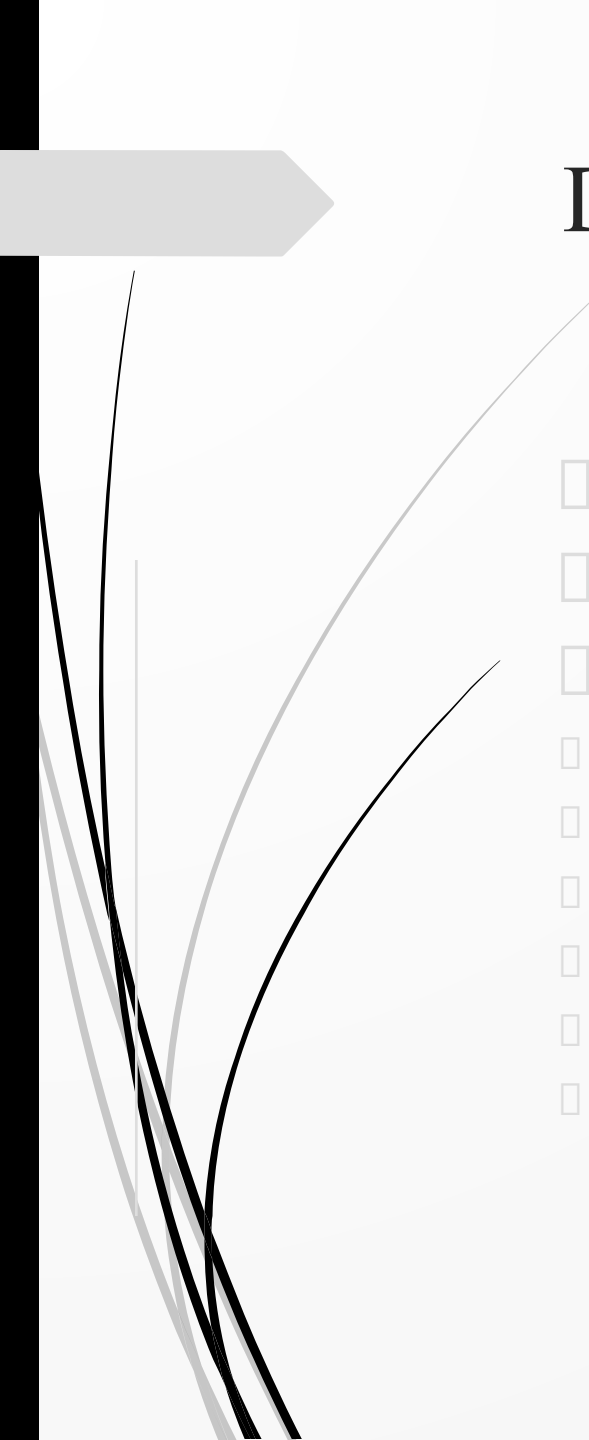
Applications of MTC

- • Brain imaging: improves detection of white matter lesions.
- • Spinal cord imaging: enhances visibility of plaques in multiple sclerosis.
- • Muscle and cartilage imaging for subtle tissue differences.



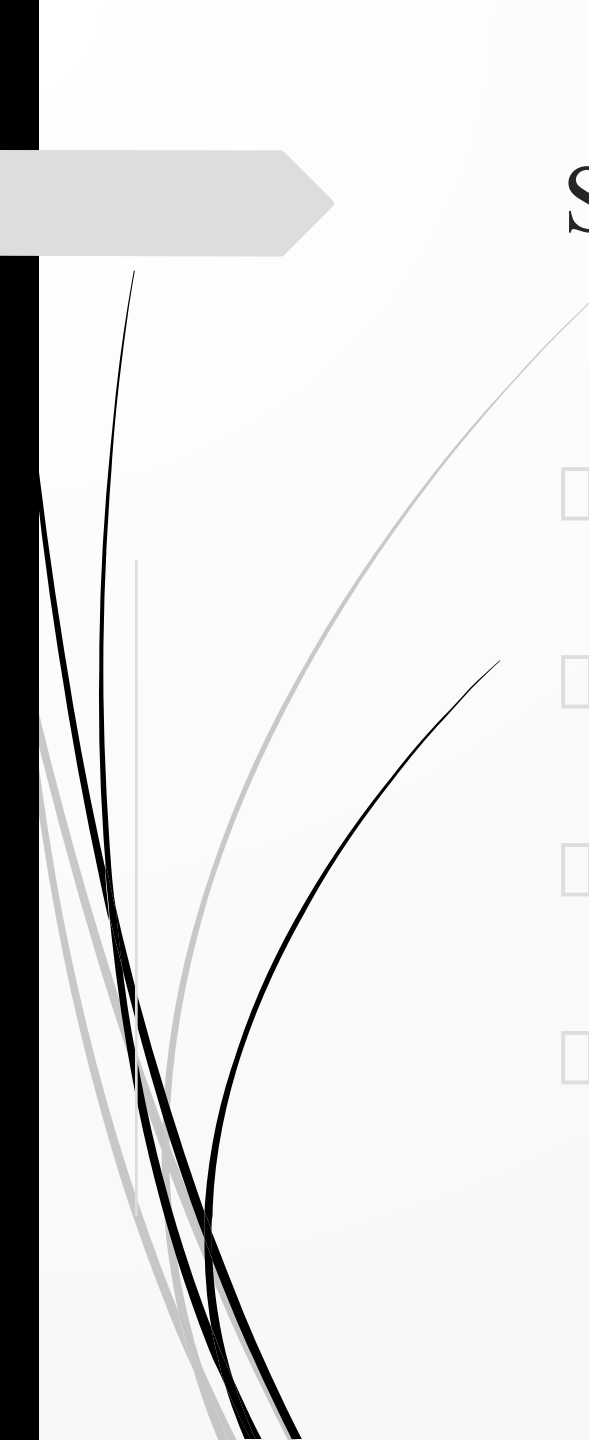
Advantages of MRI Contrast

- • Enhances diagnostic accuracy.
- • Improves visualization of tumors and vascular structures.
- • Provides functional and perfusion information.
- • Aids in post-surgical evaluation.



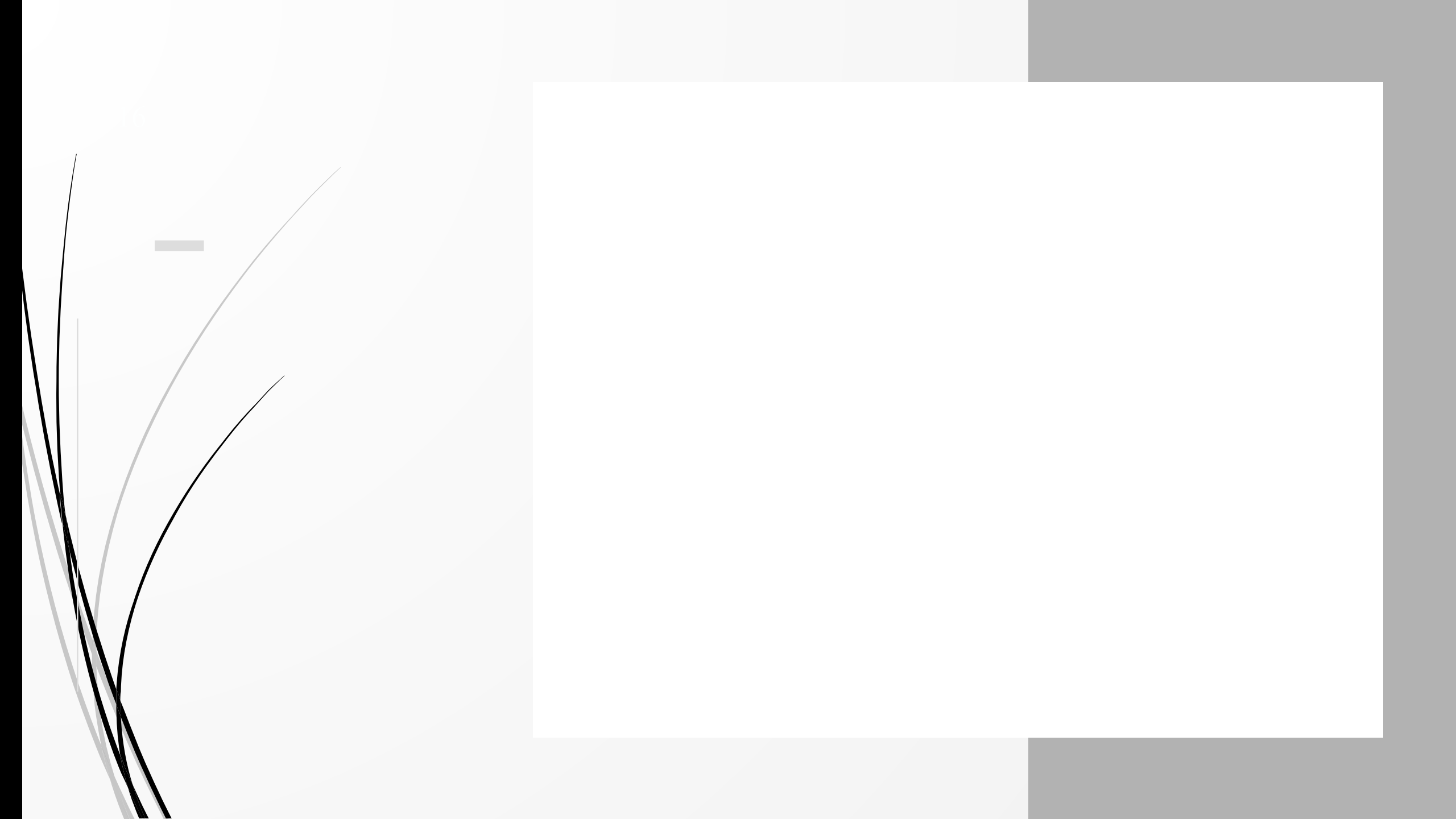
Disadvantages and Risks

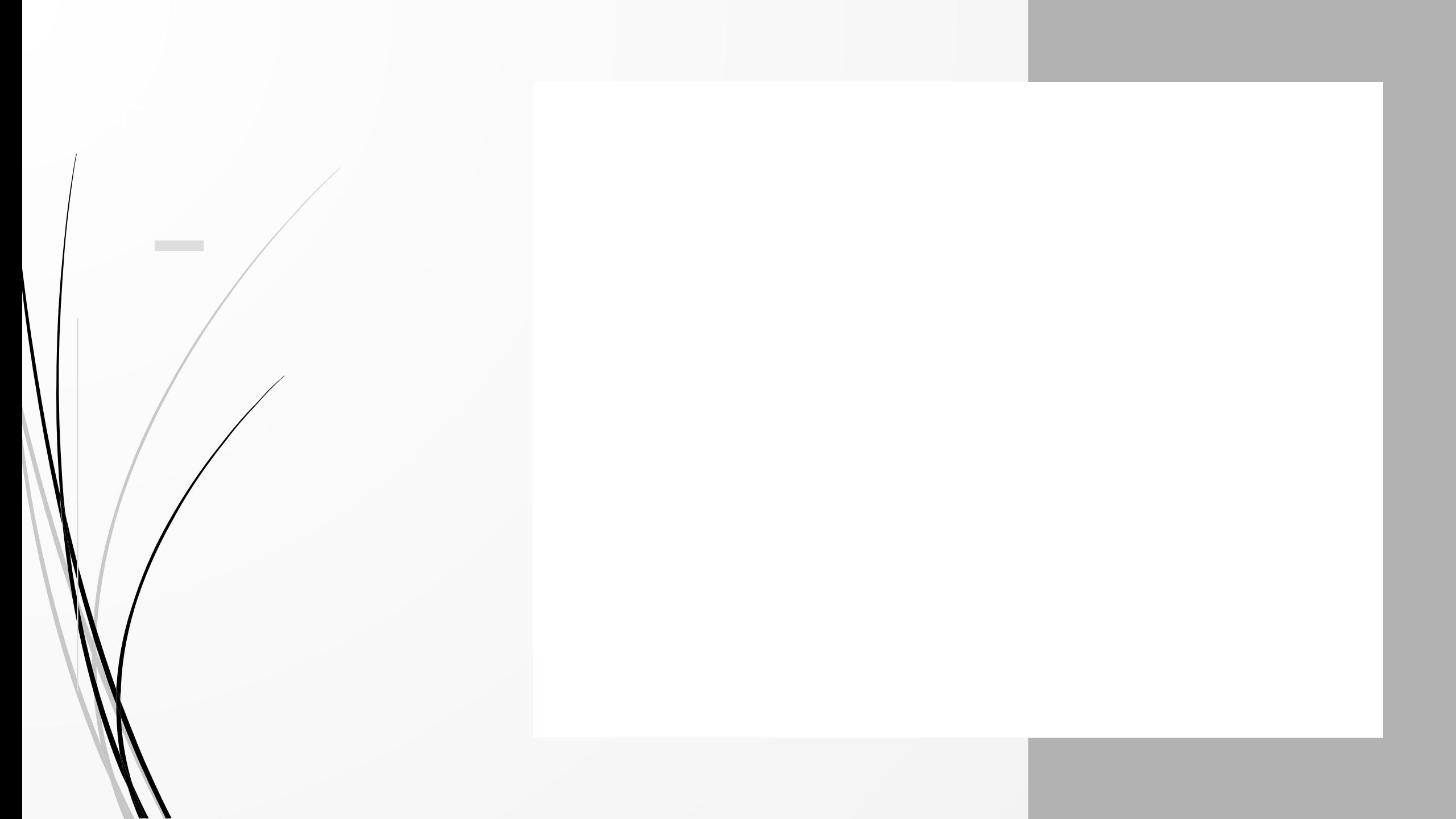
- ❑ • Possible allergic reactions or discomfort at injection site.
- ❑ • Risk of NSF in renal failure.
- ❑ • Cost and time considerations for contrast studies.
- ❑ • A slight transitory increase in bilirubin and blood iron
- ❑ • Mild transitory headaches
- ❑ • Nausea • Vomiting
- ❑ • Hypotension
- ❑ • Gastro-intestinal upset.
- ❑ Rash

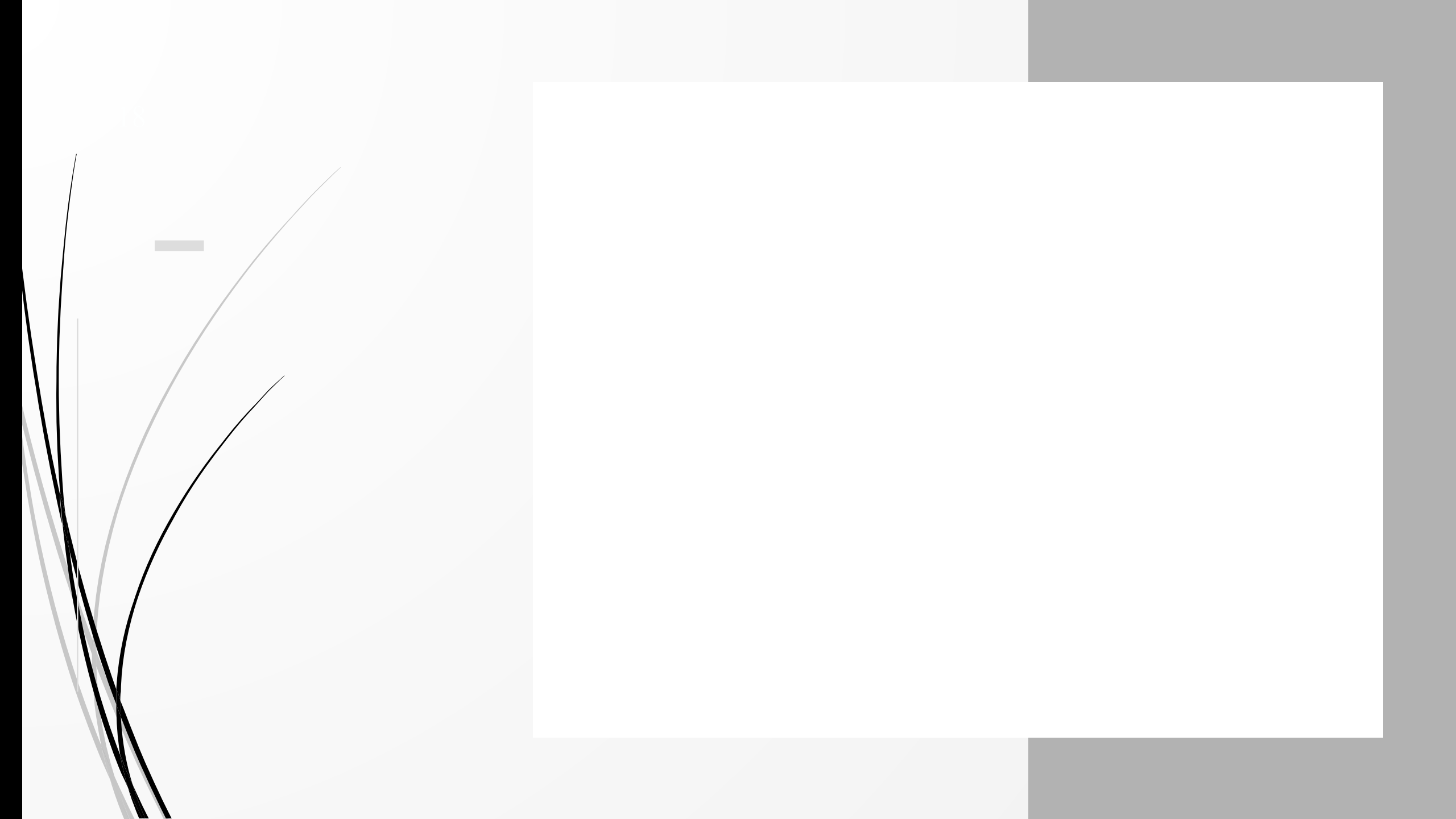


Summary

- ❑ • MRI contrast media modify relaxation times to highlight tissues.
- ❑ • Positive agents (Gadolinium) brighten images; negative agents darken them.
- ❑ • Proper administration and patient safety screening are essential.
- ❑ • MTC adds advanced diagnostic contrast for complex tissues.









*Thank
You*