

MAGNETIC RESONANCE IMAGING (MRI) PATIENT PREPARATION GUIDELINES

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Abstract. Magnetic Resonance Imaging (MRI) is a non-invasive diagnostic technology that utilizes strong magnetic fields and radiofrequency waves to create detailed images of the body's internal structures. Proper patient preparation is essential to ensure the highest image quality, , and diagnostic accuracy. Preparation steps include the removal of metal objects[1,2], adherence to specific clothing guidelines, management of diet and medication, addressing psychological concerns such as claustrophobia, and considering special protocols for pregnant patients. Additional preparation is necessary when contrast agents are used. This paper provides an in-depth review of the complete MRI preparation process, including a detailed checklist, a schematic figure description[3], and extensive guidelines to support healthcare professionals in optimizing MRI practices.

Key words: patient safety, psychological support strategies, cochlear implants, insulin pumps, skeletal structures.

INTRODUCTION

Magnetic Resonance Imaging (MRI) represents one of the most advanced and indispensable diagnostic tools in modern medicine. Unlike X-ray or CT imaging, MRI does not rely on ionizing radiation, but rather uses powerful magnetic fields and radiofrequency (RF) pulses to stimulate hydrogen atoms within the body. These atoms emit signals, which are then detected and processed by a computer to create high-resolution, cross-sectional images of organs[4,5], tissues, and The non-invasive nature of MRI makes it particularly valuable for repeated imaging and for evaluating soft tissues, such as the brain, spinal cord, muscles, joints, and internal organs.

MRI technology has evolved significantly since its introduction in the 1970s. Today, a wide variety of MRI scanners exist, ranging from low-field open MRI machines designed for claustrophobic patients to high-field 3 Tesla (3T) machines capable of producing extremely detailed images suitable for complex diagnoses. Despite these technological advancements, the quality and reliability of MRI scans depend heavily on the patient's preparation prior to the procedure.

Proper preparation minimizes artifacts, reduces patient anxiety, and helps to avoid unnecessary delays or scan repetitions. Failure to adhere to preparation guidelines can result in poor image quality, misdiagnoses, or even patient harm, particularly if incompatible medical implants are involved[6,7]. Therefore, understanding and implementing standardized preparation protocols is crucial for radiologists, technologists, and healthcare providers.

This paper systematically explores the detailed steps involved in MRI preparation, aiming to provide a comprehensive resource for both medical professionals and patients. Emphasis is placed on eliminating safety risks, enhancing comfort, and ensuring the production of diagnostically useful images. Special attention is given to contrast-enhanced MRI procedures, which require additional considerations[8,9,10].

In the following sections, each critical aspect of MRI preparation will be discussed in depth, including personal item management, clothing recommendations, fasting and medication guidelines, psychological support strategies, and pregnancy-related concerns. Furthermore, a structured checklist will be provided for practical application, accompanied by figure descriptions that visually support the procedural recommendations.

MRI scans are sensitive procedures where the success of the imaging heavily relies on appropriate patient preparation. This section covers every critical element that must be addressed before the patient enters the scanner, ensuring both the safety of the individual and the quality of the resulting images

Before undergoing an MRI, patients must remove all personal items, particularly those containing any form of metal. The strong magnetic field generated during an MRI scan can interact with metallic objects, leading to potential dangers, image artifacts, and even personal injury. Metal can distort the magnetic field, resulting in unclear or unreadable images, which could compromise the diagnosis.

Items that patients must remove include:

- Jewelry (rings, necklaces, bracelets, earrings, piercings)
- Watches and fitness trackers
- Hairpins, clips, and wigs containing metallic parts
- Dentures with metal components
- Eyeglasses with metal frames
- Hearing aids
- Credit cards (which can be demagnetized)
- Cell phones and electronic devices

Special attention must also be given to medical implants and devices. Some implants, such as pacemakers, cochlear implants, insulin pumps, and certain prosthetic devices, are not MRI-compatible. Before scheduling an MRI, patients should disclose any implants to their healthcare provider. Moreover, tattoos and permanent makeup containing metallic pigments can heat up during MRI procedures, causing discomfort or burns. Patients should inform the radiology staff if they have any tattoos.

Patients undergoing MRI scans should wear comfortable clothing free of any metal. Metal fasteners, zippers, snaps, hooks, or decorative elements can cause artifacts on images and pose safety risks. Hospitals often provide gowns to ensure compliance, but if patients wear their clothes, they must meet specific requirements.

Ideal clothing includes: cotton T-shirts and pants without metallic threads, sportswear (free from zippers or metal logos), elastic waistbands instead of belts, metal-free bras (sports bras are recommended).

Special caution should be taken with modern athletic clothing, which may contain metallic fibers for “performance” features like moisture-wicking or anti-odor properties. Such garments must be avoided. Shoes are generally removed, but socks may be worn unless otherwise instructed. Patients should also be reminded to remove any makeup, as certain cosmetics contain metallic particles that can interfere with imaging.

Special Populations: Pediatric patients often feel more comfortable wearing their own familiar clothes, and elderly patients may need assistance changing clothing appropriately.

Dietary and Medication Instructions

Depending on the type of MRI scan, patients may need specific dietary restrictions. Generally:

Routine MRI (e.g., brain, spine, joints): No dietary restrictions.

Abdominal or Pelvic MRI: Patients may be asked to fast for 4–6 hours to reduce stomach and bowel movements, which can interfere with imaging.

Cardiac MRI: Fasting is typically required, and patients may need to avoid caffeine 12–24 hours beforehand to prevent heart rate variability.

Medication management is equally important:

- Most routine medications can be taken as usual.

- For sedation or anti-anxiety medications, specific timing and dosages should be discussed with the medical team.
- Diabetic patients may need to adjust their insulin or oral hypoglycemic medications due to fasting instructions.

Patients should always bring a list of current medications and disclose any allergies, especially to contrast agents.

Managing Anxiety and Claustrophobia-MRI scanners, especially closed-bore systems, can cause anxiety and claustrophobia in some patients. Up to 5–10% of patients may experience significant distress, leading to incomplete scans or refusal to complete the procedure.

Preparation strategies include:

Pre-scan education: Explaining what to expect (no pain, duration, machine noises).

Music or headphones: Providing audio distraction during the scan.

Mirror glasses: Allowing patients to see outside the bore.

Sedation: In severe cases, light sedation may be administered under supervision.

Open MRI alternatives: For severely claustrophobic patients, an open MRI system may be considered.

Effective communication between technologists and patients is crucial. Staff should adopt a calm, empathetic approach and allow the patient to use a panic button if needed.

Pregnancy Considerations

MRI is generally considered safe during pregnancy because it does not use ionizing radiation. However, specific precautions are taken:

First Trimester: Non-urgent MRIs are often postponed unless medically necessary due to the critical period of organogenesis.

Second and Third Trimesters: MRI is safer and commonly performed if needed.

Contrast agents like gadolinium should be avoided unless absolutely necessary, as gadolinium can cross the placenta and has been associated with rare but serious side effects.

Pregnant patients must always inform the MRI staff about their pregnancy status. If contrast is essential, informed consent detailing potential risks must be obtained.

Special Preparation for Contrast MRI

Magnetic Resonance Imaging (MRI) with contrast agents, most commonly gadolinium-based contrast agents (GBCAs), enhances the visibility of internal structures and vascular tissues. However, the use of contrast agents introduces additional considerations that require special preparation to ensure patient safety and diagnostic effectiveness.

Understanding Contrast Agents

Gadolinium is a rare earth metal that possesses strong magnetic properties, making it ideal for MRI contrast enhancement. However, free gadolinium is toxic; thus, it is chemically bound to a carrier molecule to form a safer complex for human use. Despite this safety measure, GBCAs can pose risks, especially in certain patient populations.

Benefits of Contrast MRI:

- Better differentiation between normal and pathological tissues
- Enhanced visualization of blood vessels (angiography)
- Improved detection of tumors, inflammation, and infections

Risks Associated with Contrast MRI:

- Allergic reactions (rare)

- Nephrogenic Systemic Fibrosis (NSF) in patients with severe kidney dysfunction
- Minor side effects such as nausea, headache, dizziness

Screening for Renal Function

Before administering contrast agents, it is crucial to evaluate the patient's renal function. This can be assessed through:

- Serum Creatinine Test
- Estimated Glomerular Filtration Rate (eGFR)

Patients with an eGFR <30 mL/min/1.73 m² are at higher risk for NSF and often require alternative imaging techniques or non-contrast MRI.

Special attention must be given to patients who have: Chronic kidney disease (CKD), Diabetes mellitus, History of kidney transplantation, Use of nephrotoxic medications. If necessary, pre- and post-procedural hydration protocols may be employed to help protect renal function.

Informed Consent Process

Obtaining informed consent is mandatory before proceeding with contrast-enhanced MRI. The consent form should include:

- Explanation of the need for contrast
- Discussion of potential benefits and risks
- Alternatives if the patient refuses contrast
- Assurance that the patient can withdraw consent at any time

The healthcare provider must verify patient understanding and answer any questions before signing.

Fasting Instructions for Contrast MRI -Fasting requirements vary depending on institutional policies and the specific contrast agent used. Generally:

- Patients may be instructed to fast for 2–4 hours before the scan.
- Fasting helps reduce nausea and the risk of aspiration in case of an adverse reaction.
- Hydration is encouraged unless contraindicated.

Management of Allergic Reactions-Although allergic reactions to GBCAs are rare (approximately 0.07–2.4% incidence), facilities must be prepared to manage them. Preparations include:

- Screening patients for a history of allergies, especially to previous contrast media
- Having emergency medications readily available: epinephrine, antihistamines, corticosteroids
- Close monitoring immediately after contrast administration

For patients with known contrast allergies, premedication protocols with antihistamines and corticosteroids may be initiated prior to the scan.

Table 1: MRI Preparation Checklist

Step	Action	Notes
Personal Items	Remove jewelry, electronics, metal objects	Important for safety and image clarity
Clothing	Wear metal-free, comfortable clothing	Hospital gowns preferred
Dietary Instructions	Follow fasting guidelines if applicable	Especially important for abdominal or cardiac MRI
Medication	Continue usual meds unless	Adjust for diabetic patients

Step	Action	Notes
	instructed otherwise	
Implant Screening	Disclose any implants, prosthetics, or devices	Check MRI-compatibility certificates
Anxiety Management	Offer sedatives or open MRI option if needed	Use music or mirror glasses for comfort
Pregnancy	Inform staff if pregnant	Special considerations for contrast use
Renal Function (Contrast MRI only)	Test serum creatinine/eGFR	Avoid contrast if eGFR <30 mL/min/1.73m ²
Informed Consent (Contrast MRI only)	Obtain signed consent form	Explain risks and alternatives
Post-Procedure Monitoring	Observe patient after contrast administration	Emergency preparedness for allergic reactions

CONCLUSION

Proper patient preparation for MRI is an essential component in achieving optimal diagnostic imaging results while maintaining patient safety and comfort. MRI procedures, whether with or without contrast enhancement, require a multidisciplinary approach involving careful screening, education, and personalized patient care strategies[11,12].

With the advent of more powerful MRI machines and advanced imaging techniques, patient preparation protocols have also evolved, focusing not only on safety but also on enhancing patient experience. Tailored approaches for pediatric, elderly, pregnant, and high-risk patients are crucial in today's radiology practices.

Ultimately, meticulous preparation benefits both healthcare providers and patients by ensuring higher quality images, reducing repeat scans, and minimizing the risk of adverse events.

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