Summary of recommendations

Chapter 1 Prevention of Iodine-Induced Hyperthyroidism after Iodine-Based Contrast Media Administration

Clinical question

What are strategies for the prevention of iodine-induced thyroid dysfunction in:

- Patients with a history of cardiovascular disease and/or more than 65 years old
- Patients with a history of thyroid problems (goitre, hyperthyroidism, hypothyroidism)
- Patients who receive radioactive iodine treatment of the thyroid

Recommendations

Do not routinely measure the thyroid function before administration of iodine-based contrast media.

Consider measurement of thyroid function in high-risk patients for iodine-induced hyperthyroidism, especially in subjects older than 65 years and those with severe cardiovascular morbidity.

Consider prophylactic treatment prescribed by an internal medicine specialist in selected patients with subclinical hyperthyroidism receiving iodine-based contrast media (e.g., patients older than 65 years or with severe cardiovascular morbidity), starting one day before contrast administration and continuing for 14 days, consisting of thiamazole 30 mg once daily, with possible addition of potassium perchlorate 500 mg twice daily.

Avoid isotope imaging of the thyroid and/or radioactive iodine treatment for 4 to 8 weeks after iodine-based contrast media injection or withhold iodine-based contrast media administration 4 to 8 weeks before planned isotope imaging of the thyroid or radioactive iodine treatment.

Chapter 2 Safe Use of Contrast Media during Pregnancy

Clinical question

What is the safety profile of contrast media (iodine-based contrast media or gadolinium-based contrast agents) during pregnancy for mother and child?

Recommendations

Do not withhold a pregnant patient imaging with iodine-based contrast media when this is medically indicated.

Be cautious with gadolinium-based contrast agents due to potential risks to the foetus.
Only use contrast agents when the benefits clearly outweigh the possible risks.

Chapter 3 Safe Use of Contrast Media during Lactation

Clinical question

What is the safety profile of contrast media (iodine-based contrast media or gadolinium-based contrast agents) during the lactation period for mother and child?

Recommendations

Due to the limited amount of excretion of into breast milk, the guideline development group believes it is safe to continue breastfeeding after administration of contrast media.

If patients wish to discontinue breastfeeding (shared decision making), a discontinuation of 24 hours is sufficient.

Chapter 4 Safe Use of Contrast Media in Patients with Rare Diseases

Module 4.1 Safe Use of Contrast Media in Patients with Multiple Myeloma

Clinical question

Which prevention strategies are effective to prevent contrast-associated acute kidney injury (CA-AKI) in patients with Multiple Myeloma?

Recommendations

Always consider the general principles for prevention of acute kidney injury that were published in the guideline Safe Use of Contrast Media, Part 1:

- Optimal nephrology care should be the primary goal in all chronic kidney disease patients, with attention to hydration status and medication use.
- Aim for clinical euvolemia, using normal saline or Ringer's lactate, before administration of intravascular iodine-based contrast media, regardless of eGFR.
- Consider patients with an eGFR <30 ml/min/1.73m^2 at risk for CA-AKI.
- Consult a nephrologist/internist for patients with an eGFR <30 ml/min/1.73m^2.

Determine in each patient with multiple myeloma whether administration of iodine-based contrast media is indicated or if an alternative imaging technique is possible.

- Apply the same precautions to prevent contrast-associated acute kidney injury (CA-AKI) in patients with multiple myeloma as in subjects without this disease, if there are no additional risk factors associated with multiple myeloma for development of acute renal insufficiency.
- For (euvolemic) patients with an eGFR <30 ml/min/1,73m2 undergoing intravascular administration of iodine-based contrast media prehydrate with 3ml/kg/h NaHCO3 1.4% for 1h (or a total of 250ml) pre-CM administration.

In selected patients with additional risk factors associated with multiple myeloma for development of acute renal insufficiency (e.g., hypercalcemia, light chain cast nephropathy, amyloidosis), close consultation between the haematologist and imaging physician is needed to ensure an optimal risk-benefit balance, including whether administration of contrast media is warranted and if preventive measures are needed.

Module 4.2 Safe Use of Contrast Media in Patients with Pheochromocytoma or Paraganglioma

Clinical question

What safety strategy should be used for contrast media administration in patients with pheochromocytoma or paraganglioma (PPGL)?

This clinical question includes the following underlying question:

- How should intra-arterial and intravenous contrast administration be applied in patients with pheochromocytoma or paraganglioma?

Recommendations

Prophylactic treatment with an α-adrenergic receptor blocker ($\pm$ β-adrenergic receptor blocker) is not indicated before intravenous administration of iodine-based contrast media in patients with pheochromocytoma or paraganglioma.

Prophylactic treatment with an α-adrenergic receptor blocker ($\pm$ β-adrenergic receptor blocker) is not indicated before intra-arterial administration of iodine-based contrast media in patients with pheochromocytoma or paraganglioma.

Gadolinium-based contrast agents and ultrasound contrast agents may be safely used in patients with pheochromocytoma or paraganglioma.

Module 4.3 Safe Use of Contrast Media in Patients with Myasthenia Gravis

Clinical question

What is role of contrast media in patients with exacerbations of myasthenia gravis after contrast media administration?

Recommendations

Do not withhold contrast media to patients with myasthenia gravis, as the risk of a contrast media induced myasthenic exacerbation is very low.

Module 4.4 Safe Use of Contrast Media in Patients with Systemic Mastocytosis

Clinical question

Which strategies are effective in preventing hypersensitivity reactions and anaphylactic shock in patients with systemic mastocytosis after contrast media administration?

Recommendations

Do not withhold iodine-based contrast media or gadolinium-based contrast agents in patients with systemic mastocytosis.

Recommendation for administration of contrast media in patients with systemic mastocytosis:

- Continue maintenance anti- allergic medication (e.g., H1-/H2-antihistamines)
- Be vigilant to react to a possible hypersensitivity reaction
- Observe the patient ≥ 30 min with IV in place
- In case of an allergic reaction, refer to a drug allergy specialist

Chapter 5 Safe Time Intervals between Contrast-Enhanced Studies

Module 5 Multiple Examinations with Contrast Media in Patients with Normal or Reduced Renal Function

Clinical question

What is a safe time interval in patients with normal and reduced renal function between two radiological or cardiological examinations with contrast media?

What is a safe time interval in patients with reduced renal function between:

1 Two examinations using enhanced imaging with iodine-based contrast media?
2 Two examinations using enhanced imaging with gadolinium-based contrast agents?
3 Two examinations using enhanced imaging with an iodine-based contrast medium and a gadolinium-based contrast agent?

This question contains the following subgroups:

- Elective CT/Angio/MRI in patients with normal renal function (eGFR >60 ml/min/1.73m^2)

- Elective CT/Angio/MRI in patients with moderately reduced renal function (eGFR 30-60 ml/min/1.73m^2)
- Elective CT/Angio/MRI in patients with severely reduced renal function (eGFR < 30 ml/min/1.73m^2)
- CT/Angio/MRI in emergency or life-threatening situations

Recommendations

1. Safe time intervals in enhanced imaging with iodine-based contrast media

Consider a waiting time between **elective** contrast-enhanced CT or (coronary) angiography with successive iodine-based contrast media administrations in patients with **normal renal function** (eGFR >60 ml/min/1.73m^2) of:

- Optimally 12 hours (near complete clearance of the previously administered iodine-based contrast media)
- Minimally 4 hours (if clinical indication requires rapid follow-up)

Consider a waiting time between **elective** contrast-enhanced CT or (coronary) angiography with successive iodine-based contrast media administrations in patients with **moderately reduced renal function** (eGFR 30-60 ml/min/1.73m^2) of:

- Optimally 48 hours (near complete clearance of the previously administered iodine-based contrast media)
- Minimally 16 hours (if clinical indication requires rapid follow-up)

Consider a waiting time between **elective** contrast-enhanced CT or (coronary) angiography with successive iodine-based contrast media administrations in patients with **severely reduced renal function** (eGFR < 30 ml/min/1.73m^2) of:

- Optimally 168 hours (near complete clearance of the previously administered iodine-based contrast media)
- Minimally 60 hours (if clinical indication requires rapid follow-up)

In **emergency or life-threatening situations**, employ less waiting time between contrast-enhanced CT or (coronary) angiography with successive iodine-based contrast media administrations.

2. Safe time intervals in enhanced imaging with gadolinium-based contrast agents

Consider a waiting time between **elective** contrast-enhanced MRI with successive gadolinium-based contrast agent administrations in patients with **normal renal function** (eGFR >60 ml/min/1.73m^2) of:

- Optimally 12 hours (near complete clearance of the previously administered gadolinium-based contrast agent)

- Minimally 4 hours (if clinical indications require rapid follow-up)

Consider a waiting time between **elective** contrast-enhanced MRI with successive gadolinium-based contrast agent administrations in patients with **moderately reduced renal function** (eGFR 30-60 ml/min/1.73m^2) of:

- Optimally 48 hours (near complete clearance of the previously administered gadolinium-based contrast agent)
- Minimally 16 hours (if clinical indications require rapid follow-up)

Consider a waiting time between **elective** contrast-enhanced MRI with successive gadolinium-based contrast agent administrations in patients with **severely reduced renal function** (eGFR < 30 ml/min/1.73m^2) of:

- Optimally 168 hours (near complete clearance of the previously administered gadolinium-based contrast agent)
- Minimally 60 hours (if clinical indications require rapid follow-up)

In **emergency or life-threatening situations,** employ less waiting time between contrast-enhanced MRI with successive gadolinium-based contrast agent administrations.

3. Safe time intervals in enhanced imaging with an iodine-based contrast medium and a gadolinium-based contrast agent

When combining contrast-enhanced CT or (coronary) angiography with an iodine-based contrast medium and contrast-enhanced MRI with a gadolinium-based contrast agent on the same day in **elective** situations, it is better to start with the MRI examination, unless the CT examination is intended for the kidneys, ureters, or bladder (CT Urography).

Consider a waiting time between **elective** contrast-enhanced MRI with a gadolinium-based contrast agent and contrast-enhanced CT or (coronary) angiography with an iodine-based contrast medium in patients with **normal renal function** (eGFR >60 ml/min/1.73m^2) of:

- Optimally 6 hours (near complete clearance of the effects of the previously administered gadolinium-based contrast agent)
- Minimally 2 hours (if the clinical indication requires rapid follow-up)

Consider a waiting time between **elective** contrast-enhanced MRI with a gadolinium-based contrast agent and contrast-enhanced CT or (coronary) angiography with an iodine-based contrast medium in patients with **moderately reduced renal function** (eGFR 30-60 ml/min/1.73m^2) of:

- Optimally 48 hours (near complete clearance of the previously administered gadolinium-based contrast agent)

- Minimally 16 hours (if the clinical indication requires rapid follow-up)

Consider a waiting time between **elective** contrast-enhanced MRI with a gadolinium-based contrast agent and contrast-enhanced CT or (coronary) angiography with an iodine-based contrast medium in patients with **severely reduced renal function** (eGFR < 30 ml/min/1.73m^2) of:

- Optimally 168 hours (near complete clearance of the previously administered gadolinium-based contrast agent)
- Minimally 60 hours (if the clinical indication requires rapid follow-up)

When combining contrast-enhanced CT or (coronary) angiography with an iodine-based contrast medium and contrast-enhanced MRI with a gadolinium-based contrast agent on the same day in **emergency or life-threatening situations**, employ no waiting time and perform back-to-back examinations.

Chapter 6 Prevention of Contrast-Induced Encephalopathy

Clinical question

Which strategies are effective for prevention of Contrast-Induced Encephalopathy (CIE)?

Recommendations

Health care providers should be aware of the existence of Contrast-Induced Encephalopathy (CIE) following iodine-based contrast media administration.

Adequate prevention strategies have not been investigated in detail.

General advice for clinical practice:

1. Minimize the amount of iodine-based contrast media as much as possible during endovascular interventions.
2. Consider to hydrate patients with severe renal dysfunction (eGFR <30 ml/min/1.73m2) receiving iodine-based contrast media (see protocol in Safe Use of Contrast Media Part 1).
3. Closely monitor patients the first six hours after endovascular interventions for neurological symptoms and consult a neurologist immediately in case of neurological symptoms.
4. Depending on the clinical symptoms of contrast-induced encephalopathy, treatment with antiepileptic drugs, corticosteroids, intravenous hydration, and/or mannitol may be recommended.

Chapter 7 Follow-up Strategies after Hypersensitivity Reactions to Contrast Media

Module 7.1 In Vitro Tests in Patients with Hypersensitivity Reactions to Contrast Media (update of module 3 in guideline part 2)

Clinical question

What is the diagnostic value of serum and/or urine testing for contrast media induced hypersensitivity reactions?

Recommendations

Measure serum tryptase, preferably between 1-2 hours (range 15 minutes to 4 hours) from the start of all moderate to severe immediate hypersensitivity reactions to contrast media. This measurement serves as a baseline for further allergologic examinations.

*See also flow charts

Basophil activation tests are reserved for selected patients with moderate to severe acute hypersensitivity reactions and are only available in specialized drug allergy centres.

For nonimmediate hypersensitivity reactions there are no meaningful *in vitro* diagnostic tests available in the Netherlands.

Module 7.2 Diagnostic Value of Skin Testing for Hypersensitivity Reactions to Contrast Media (update of module 4 in guideline part 2)

Clinical question

What should be done in patients with a history of hypersensitivity reactions after contrast media administration to decrease the risk of developing a recurrent hypersensitivity reaction?

Recommendations

Refer the patient to a drug allergy specialist to perform skin tests for the suspected culprit and several commonly used alternatives, ideally within 6 months after the hypersensitivity reaction.

Refer the following patient groups:

- Moderate to severe immediate hypersensitivity reactions to a contrast medium
- Severe mucocutaneous non-immediate hypersensitivity reactions to a contrast medium
- Hypersensitivity reactions to two or more different contrast media (e.g., two different iodine-based contrast media or gadolinium agents, or an iodine-based contrast medium and a gadolinium-based contrast agent)
- All patients with breakthrough hypersensitivity reactions despite premedication with corticosteroids and/or H1-antihistamines

*See also flow charts

Always specify the used contrast medium in the referral to the drug allergy specialist.

Module 7.3 Risk Factors for Hypersensitivity Reactions to Contrast Media (update of module 5.1 in previous guideline)

Clinical question

Which patients are at increased risk of developing hypersensitivity reactions after contrast media administration?

Recommendations

Only consider a previous hypersensitivity reaction after contrast media administration a relevant risk factor for developing a new hypersensitivity reaction.
*See also flow charts

Module 7.4 Prophylactic Measures for Prevention of Recurrent Hypersensitivity Reactions to Contrast Media (update of module 5.2 of previous guideline)

Clinical question

Which prophylactic measures should be taken in patients at increased risk of hypersensitivity reactions to contrast media?

This question contains the following patient categories:

I Patients with previous immediate (acute) hypersensitivity reactions to iodine-based contrast media or gadolinium-based contrast agents
II Patients with a previous breakthrough reaction to contrast media
III Patients with previous hypersensitivity reactions to multiple contrast media
IV Patients with previous nonimmediate (delayed) hypersensitivity reactions to iodine-based contrast media or gadolinium-based contrast agents

In addition, the following subjects were elaborated:

V Cross-reactivity between contrast media
VI Documentation of hypersensitivity reactions

Recommendations

In all patients with a (documented) history of a hypersensitivity reaction to an iodine-based contrast medium or a gadolinium-based contrast agent, consider an alternative imaging modality. When this is not possible, consider performing an unenhanced exam, but only if the reduction in diagnostic quality is acceptable.
*See also flow charts

I Patients with previous immediate (acute) hypersensitivity reactions to iodine-based contrast media or gadolinium-based contrast agents

In patients with a (documented) history of a **mild immediate** hypersensitivity reaction to an iodine-based contrast medium or a gadolinium-based contrast agent:

- Treat these patients as any other patient because of the low risk of developing a moderate or severe reaction

*See also flow charts

In patients with a (documented) history of a **moderate or severe** hypersensitivity reaction to iodine-based contrast media or gadolinium-based contrast agents

- Postpone imaging and refer the patient to a drug allergy specialist

If there is no time to refer the patient to a drug allergy specialist:

- Choose a different iodine-based contrast medium or gadolinium-based contrast agent if the culprit contrast medium is known*
- Consider a test dose by first giving 10% of the total contrast dose and observing the patient for >15 minutes; particularly with severe reactions and/or unknown culprit
- Observe the patient ≥ 30 min with IV in place
- Be vigilant to react to a possible new hypersensitivity reaction

*See also flow charts

II Patients with a previous breakthrough reaction to contrast media

In patients with a breakthrough hypersensitivity reaction to iodine-based contrast media or gadolinium-based contrast agents, always refer to a drug allergy specialist for skin testing with a panel of different iodine-based contrast media or gadolinium-based contrast agents.
*See also flow charts

III Patients with previous hypersensitivity reactions to multiple contrast media

In patients with hypersensitivity reactions to multiple iodine-based or gadolinium-based contrast media (either two or more different iodine-based contrast media or gadolinium-based contrast agents or to an iodine-based contrast medium and a gadolinium-based contrast agent) apply the same as above, but always refer the patient to a drug allergy specialist.
*See also flow charts

IV Patients with previous nonimmediate (delayed) hypersensitivity reactions to iodine-based contrast media or gadolinium-based contrast agents

- Do **not** give iodine-based contrast media or gadolinium-based contrast agents to a patient with a previous (suspected) severe nonimmediate skin eruption with danger signs**
- Refer the patient immediately to a drug allergy specialist

*See also flow charts

In patients with a history of a mild-moderate nonimmediate skin eruption without danger signs**:

- Choose a different iodine-based contrast medium or gadolinium-based contrast agent if the culprit contrast medium is known*
- Instruct the patient in case of a recurrent reaction to take pictures of the skin lesions and contact the radiology or cardiology department for feedback

*See also flow charts

* Consider cross-reactivity of contrast media (see Tables 7.4.1 and 7.4.2) and an increased risk for NIHR with use of iso-osmolar ICM.

** Danger signs: erosive and/or haemorrhagic lesions, blistering and skin disruption, mucosal involvement, extracutaneous organ involvement (high fever, abnormal liver / kidney values, lymphadenopathy)

V Cross-reactivity between contrast media

Cross-reactivity is most relevant in *allergic* hypersensitivity reactions.
It occurs with a higher frequency among:

- Iodine-based contrast media with a *N*-(2,3 hydroxypropyl)-carbamoyl side chain
- Macrocyclic gadolinium-based contrast agents

The drug allergy specialist determines through skin testing with a panel of different iodine-based contrast media and gadolinium-based contrast agents:

- The allergic nature of the hypersensitivity reaction
- Cross-reactivity between contrast media
- Suggestions for safe alternative contrast media

VI Documentation of hypersensitivity reactions

The physician responsible for the administration of the contrast medium should accurately document the hypersensitivity reaction in the imaging report.

The physician responsible for the administration of the contrast medium or the drug allergy specialist should accurately document the hypersensitivity reaction in the electronic patient dossier.

It is essential that reporting should be based on the name of the *specific* contrast medium and be done by *physicians or drug allergy specialists* with experience in the use of contrast media.

After all hypersensitivity reactions to contrast media, the following should be registered:

- The place, date, and time of CM administration - in the imaging report and in the electronic patient record.
- The specific contrast medium name and dose (volume, concentration) - in the imaging report and in the electronic patient record.
- The type of hypersensitivity reaction, immediate or non-immediate - in the imaging report and in the electronic patient record.
- All patient symptoms and vital signs (blood pressure, pulse, respiration rate, oxygen saturation) - in the imaging report and in the electronic patient record.
- The treatment given and the response of the patient to the treatment - in the imaging report and in the electronic patient record.
- Any clinical follow-up and advice on the need for future premedication - in the imaging report and in the electronic patient record.
- Any results of the consultation with a drug allergy specialist on future CM administration - in the electronic patient record.

The physician responsible for the administration of the contrast medium or the drug allergy specialist should accurately document severe or unusual hypersensitivity reactions to the National Pharmacovigilance Authority LAREB.

Chapter 8 Analytical Interference of Contrast Media on Clinical Laboratory Tests

Clinical question

How can contrast media interfere with commonly performed laboratory tests?
1 Iodine-based contrast media' interference
2 Gadolinium-based contrast agents' interference

Recommendations

Blood Analysis

Be aware that the potential interference of contrast media on laboratory tests is crucial to prevent adverse patient work-up. As with all laboratory tests, the results should be interpreted in relationship with the patient's medical history and clinical examination.

Consult the laboratory specialist if there are any discrepancies between clinical presentation and laboratory tests.

Perform clinical laboratory testing prior to administrating contrast media or delay blood collection for non-emergency clinical laboratory testing* for:
- At least 4 hours and optimally 12 hours after administration of the contrast medium in patients with normal kidney function (eGFR > 60 mL/min/1.73 m^2)
- At least 16 hours and optimally 48 hours after administration of the contrast medium in patients with reduced kidney function (eGFR 30-60 mL/min/1.73 m^2)

- At least 60 hours and optimally 168 hours after administration of the contrast medium in patients with reduced kidney function (eGFR < 30 mL/min/1.73 m^2)

*See also Chapter 5 Safe time intervals

Urine Analysis

Perform urine clinical laboratory tests prior to contrast media administration. Another option is to delay urine collection for at least**:

- At least 24 hours after administration of the contrast medium in patients with normal kidney function (eGFR > 60 mL/min/1.73 m^2)
- At least 48 hours after administration of the contrast medium in patients with reduced kidney function (eGFR 30-60 mL/min/1.73 m^2)
- At least 168 hours after administration of the contrast medium in patients with reduced kidney function (eGFR < 30 mL/min/1.73 m^2)

** based on near complete clearance of contrast media

Chapter 9 Gadolinium Deposition after Administration of Gadolinium-Based Contrast Agents

Module 9.1 Gadolinium Deposition in the Brain and Body

Clinical question

What is the effect of gadolinium deposition in the brain and body?

Recommendations

To date, even though there is evidence that gadolinium is deposited in tissues, there is no evidence of clinical symptoms nor harm associated with gadolinium deposition in the brain and body.

Ensure a strict indication for gadolinium-enhanced MRI and only use EMA-approved gadolinium-based contrast agents in all patients to minimize possible gadolinium deposition.

*See also module 9.2 Strategies for Dose Reduction of Gadolinium-Based Contrast Agents

This guideline committee supports the ACR Committee on Drugs and Contrast Media's suggested terminology of Symptoms Associated with Gadolinium Exposure (SAGE) for self-reported symptoms and signs.

Module 9.2 Strategies for Dose Reduction of Gadolinium-Based Contrast Agents

Clinical question

In which way can the dose of gadolinium be reduced / minimized without compromising diagnostic accuracy?

The following categories were defined:

I Potential dose-reduction strategies for neuroimaging with gadolinium-based contrast agents
II Potential dose-reduction strategies for cardiovascular imaging with gadolinium-based contrast agents
III Potential dose-reduction strategies for musculoskeletal imaging with gadolinium-based contrast agents
IV Potential dose-reduction strategies for abdominal imaging with gadolinium-based contrast agents
V Potential dose-reduction strategies for breast imaging with gadolinium-based contrast agents

Recommendations

I Potential dose-reduction strategies for neuroimaging with gadolinium-based contrast agents

Findings of the LEADER-75 trial indicate that the dose of gadolinium-based contrast agents (gadobutrol) may be reduced to up to 75% of the standard dose (0.075 mmol/kg bodyweight (equivalent to 0.075 ml/kg bodyweight)) in patients with suspected brain lesions.

The use of deep learning based methods for gadolinium dose reduction in patients suspected with brain metastasis is not recommended based on the current literature.

II Potential dose-reduction strategies for cardiovascular imaging with gadolinium-based contrast agents

The use of standard dose imaging is recommended in patients with clinical indications for the administration of gadolinium-based contrast agents in in cardiac MRI.

Non-CE MRA techniques (e.g., time-of-flight MRA) and are widely available and can be used for accurate evaluation of stenosis grade of the supra-aortic vasculature.

Non-CE ECG-gated MRA sequences are widely available and recommended over (low-dose) CE MRA techniques for the evaluation of aortic dimensions.

III Potential dose-reduction strategies for musculoskeletal imaging with gadolinium-based contrast agents

The use of standard dose imaging is recommended in patients with clinical indications for the administration of gadolinium-based contrast agents in musculoskeletal imaging.

IV Potential dose-reduction strategies for abdominal imaging with gadolinium-based contrast agents

Prostate

There is increasing evidence that biparametric (T2w + DWI) protocols may be used as an alternative to multiparametric (T2w + DWI + DCE) protocols for the detection of prostate cancer.

Liver

The use of standard dose imaging is recommended in patients with clinical indications for the administration of gadolinium-based contrast agents in liver MRI.

V Potential dose-reduction strategies for breast imaging with gadolinium-based contrast agents

The use of standard dose imaging is recommended in patients with clinical indications for the administration of gadolinium-based contrast agents in breast MRI.