



# DRUGS AND MEASURES FOR THE TREATMENT OF A CONTRAST MEDIUM REACTION

A major prerequisite for using CM is a constant preparedness for the treatment of CM reactions. This includes the availability of trained medical personnel, the necessary equipment and appropriate drugs. Current recommendations for treating CM reactions are compiled in table 19.

A similar compilation was published by Bush and Swanson [106]. CM reactions have become very rare with the new, nonionic preparations; however, the need to be prepared for their treatment should never be neglected. One easily overlooked aspect is the expiry date on the preparations to be used for the treatment of such reactions.

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## Notes on the prophylaxis and therapy of X-ray contrast medium adverse effects

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### Precautions for a contrast medium injection are:

- Explain to the patient about the examination and risk
- Create an anxiety-free examination atmosphere
- Ensure that first-line drugs and instruments are available
- Make sure that the patient is well hydrated
- Determine whether the patient is at risk of any contrast medium reaction
- Patients at risk should be carefully monitored during the examination
- When absorption or leakage into the circulation is possible (for example after intracavitary use), take the same precautions as for intravascular administration

## Main risk factors\* and prophylactic measures on use of X-ray contrast media

Adverse reaction	Risk factors/Conditions
<b>Previous generalised contrast medium reaction</b>	<ul style="list-style-type: none"> <li>• Previous adverse reaction, either moderate (e.g. urticaria, bronchospasm, moderate hypotension) or severe (e.g. convulsions, severe bronchospasm, pulmonary oedema, cardiovascular collapse) – anaphylactoid reactions</li> <li>• Asthma</li> <li>• Allergy requiring medical treatment</li> </ul>
<b>Contrast medium induced nephrotoxicity</b>	<ul style="list-style-type: none"> <li>• Raised s-creatinine levels, particularly secondary to diabetic nephropathy</li> <li>• Dehydration</li> <li>• Congestive heart failure</li> <li>• Concurrent administration of nephrotoxic drugs, e.g. non-steroid anti-inflammatory drugs</li> <li>• Age over 70 years old</li> </ul>
<b>Lactic acidosis</b>	Patients treated with biguanide-type antidiabetics
<b>Anxiety</b>	Nervousness, sweating etc.
<b>Iodine induced hyperthyroidism</b>	<ul style="list-style-type: none"> <li>• Patients with Graves' disease</li> <li>• Multinodular goiter with thyroid autonomy, especially elderly patients and patients living in areas of iodine deficiency</li> </ul>
<b>Extravasation</b>	<ul style="list-style-type: none"> <li>• Power injector with insufficient fixation of needle placement</li> <li>• Fragile or damaged veins</li> <li>• Malposition of sheath or catheter</li> </ul>
<b>Risk for late reaction (1 hour to 7 days)</b>	<ul style="list-style-type: none"> <li>• Previous contrast medium reaction</li> <li>• Interleukin-2 treatment</li> </ul>
<b>Hypotension</b>	Dehydration

\* For complete information about possible risk factors, please refer to package-inserts, textbooks on contrast media or ESC/ESUR-guidelines for instance.

**Table. 19.** Recommendations for treating contrast media reactions

Measures to reduce the risk	
	<ul style="list-style-type: none"> <li>• Nonionic, low osmolal contrast media should be standard and the only one given under these circumstances</li> <li>• Corticosteroids may be given:               <ul style="list-style-type: none"> <li>• Prednisolone 30 mg orally 2 hours or Methylprednisolone 32 mg orally 12 and 2 hours before contrast medium; in case of urgency up to 250 mg Methylprednisolone may be given i.v.; solid data are lacking, therefore individual considerations need to be taken into account (e.g. severity of previous reactions)</li> </ul> </li> <li>• Effects of antihistamines [H1 and H2] are not definitely proven, but mostly used in clinical practise</li> </ul>
	<ul style="list-style-type: none"> <li>• Make sure that the patients is well hydrated [give at least 100 mL (oral, e.g. soft drinks) or intravenous (normal saline) depending on the clinical situation) per hour starting 12 (at least 4 hours) before to 12 hours after contrast administration – in warm areas increase the fluid volume]</li> <li>• Use nonionic, low osmolal contrast media</li> <li>• Stop administration of nephrotoxic drugs for at least 24 hours</li> <li>• Consider alternative imaging techniques, which do not require the administration of iodinated contrast media</li> </ul>
	<ul style="list-style-type: none"> <li>• S-creatinine level measurement &lt; 1 week</li> <li>• S-creatinine normal               <ul style="list-style-type: none"> <li>– Stop biguanide intake, give contrast medium</li> </ul> </li> <li>• S-creatinine abnormal               <ul style="list-style-type: none"> <li>– Consider alternative imaging techniques, which do not require the administration of iodinated contrast media</li> <li>– Stop biguanide intake, postpone contrast medium examination 48 hours</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>• Talk to the patient, try to generate a positive, low-stress atmosphere;</li> <li>• Consider benzodiazepines only if non-pharmacologic measures do not work</li> </ul>
	<ul style="list-style-type: none"> <li>• Contrast media exposure should be limited to emergency procedures;               <ul style="list-style-type: none"> <li>– in these cases thyreostatic therapy needs to be initiated before contrast media (CM) exposure and iodine uptake needs to be blocked by Natriumperchlorat;</li> <li>– in all other cases diagnostics and treatment of hyperthyreoidism needs to come first and the examination using contrast media has to be delayed until thyroid hormones returned to normal</li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>• Appropriate injection site, careful injection with use of appropriate sized cannula</li> <li>• Prefer nonionic contrast medium in combination with power injector</li> </ul>
	Patient should be informed and observed
	Hydrate adequately

## First line treatment of contrast medium adverse reactions

The table only lists measures to be taken by attending physicians; if needed, additional treatment should be left to a resuscitation team.

General: All patients in whom intravascular iodinated contrast medium administration is planned should have a tested venous line prior to the start of the examination.

Acute adverse reactions (<1 hour)	
<b>Nausea/Vomiting</b>	<p><b>Moderate, transient:</b> Supportive treatment</p> <p><b>Severe, protracted:</b> Appropriate antiemetic drugs (e.g. ondansetron, dimenhydrinat*) should be considered</p>
<b>Urticaria</b>	<p><b>Scattered, transient:</b> Supportive treatment including observation</p> <p><b>Scattered, protracted:</b> Appropriate H1-antihistamine (e.g. clemastine*) preferably intravenously (intramuscularly if no other option and timely treatment needed) should be considered. Drowsiness and/or hypotension may occur.</p> <p><b>Profound:</b> Consider Adrenaline 1:1000, 0.1–0.3 mL (0.1–0.3 mg) intravenously in adults, 0.01 mg/kg intravenously up to 0.3 max. in children. Repeat as needed. Alternative routes are intramuscularly or intraosseously, if no intravenous line is in function.</p>
<b>Bronchospasm</b>	<ol style="list-style-type: none"> <li>Oxygen by mask (6–10 l/min)</li> <li>β-2-agonist metered dose inhaler, 2–3 deep inhalations (e.g. salbutamol*)</li> <li>Adrenaline intravenously dependent on blood pressure and severity <ul style="list-style-type: none"> <li><b>Normal blood pressure</b> 1:1000, 0.1–0.3 mL (0.1–0.3 mg) [use smaller dose in a patient with coronary artery disease or elderly patient], in children: 0.01 mg/kg; max dosage: 0.3 mg</li> <li><b>Decreased blood pressure (&lt; 90 mmHg systolic)</b> 1:1000, 0.5 mL (0.5 mg), in children: 0.01 mg/kg, max. dosage: 0.3 mg</li> </ul> </li> <li>Intravenous bolus of corticosteroid, e.g. Prednisolon, 250 mg</li> <li>For further treatment: resuscitation team</li> </ol>
<b>Laryngeal edema</b>	<ol style="list-style-type: none"> <li>Oxygen by mask (6–10 l/min)</li> <li>Intravenous adrenaline (1:1000), 0.1–0.3 mL (0.1–0.3 mg) for adults, repeat as needed</li> <li>Intubation via resuscitation team</li> <li>Intravenous bolus of corticosteroid, e.g. Prednisolon, 250 mg</li> </ol>
<b>Hypotension</b>	<p><b>Isolated hypotension</b></p> <ol style="list-style-type: none"> <li>Elevate patient's legs</li> <li>Oxygen by mask (6–10 l/min)</li> <li>Intravenous fluid: rapidly, normal saline or lactated Ringer's solution</li> <li>If unresponsive: adrenaline: 1:1000, 0.1–0.3 mL (0.1–0.3 mg) intravenously, repeat as needed</li> </ol> <p><b>Vagal reaction (hypotension and bradycardia)</b></p> <ol style="list-style-type: none"> <li>Elevate patient's legs</li> <li>Oxygen by mask (6–10 l/min)</li> <li>Atropine 0.5–1.0 mg intravenously, repeat if necessary after 3–5 min, to 3 mg total (0.04 mg/kg) in adults, in pediatric patients give 0.02 mg/kg intravenously (max. 0.6 mg per dose) repeat if necessary to 2 mg total</li> <li>Intravenous fluids: rapidly, normal saline or lactated Ringer's solution</li> </ol> <p><b>Hypotension and tachycardia</b></p> <ol style="list-style-type: none"> <li>Elevate patient's legs</li> <li>Intravenous fluids: rapidly, normal saline or lactated Ringer's solution</li> <li>Oxygen by mask (6–10 l/min)</li> </ol>
<b>Anaphylactoid generalized reaction</b>	<ol style="list-style-type: none"> <li>Call for resuscitation team</li> <li>Suction of airways as needed</li> <li>Elevate patient's legs if hypotensive</li> <li>Oxygen by mask (6–10 l/min)</li> <li>Intravenous adrenaline (1:1000), 0.1–0.3 mL (0.1–0.3 mg) in adults. Repeat as needed. In pediatric patients 0.01 mg/kg to 0.3 mg max. dose</li> <li>Intravenous fluids rapidly (e.g. normal saline, lactated Ringer's)</li> <li>Intravenous bolus of corticosteroid, e.g. Prednisolon, 250 mg</li> <li>H1-blocker e.g. diphenhydramine* 25–50 mg intravenously</li> </ol>
<b>Seizures, Convulsions</b>	<p>Diazepam* 5–10 mg rectally (or intravenously); or alternative (if available): Lorazepam, 2 mg</p>

Table. 19. Continuation

### Late adverse reactions (1 hour to 7 days)

Symptomatic and similar to the management of other drug-induced skin reactions

<b>Extravasation</b>	<ul style="list-style-type: none"><li>• Conservative management is adequate in most cases<ul style="list-style-type: none"><li>– limb elevation</li><li>– apply ice packs</li><li>– careful monitoring</li></ul></li><li>• If a serious injury is suspected, seek the advice of a surgeon</li></ul>
<b>Iodine induced hyperthyroidism</b>	<ul style="list-style-type: none"><li>• Very late reaction (several days/weeks)</li><li>• Seek the advice of an endocrinologist</li></ul>
<b>Contrast medium induced nephrotoxicity</b>	<ul style="list-style-type: none"><li>• Symptomatic</li><li>• Close monitoring as in any other patient with reduced renal function (due to other causes) – Consult a nephrologist</li><li>• Dialysis seems to have no effect on the incidence on contrast media induced nephropathy</li></ul>
<b>Lactic acidosis</b>	<ul style="list-style-type: none"><li>• Monitor renal function (serum creatinine), serum lactic acid and pH of blood</li><li>• Look for symptoms of lactic acidosis (vomiting, somnolence, nausea, epigastric pain, anorexia, hyperpnea, lethargy, diarrhea and thirst). Blood test results indicative of lactic acidosis: pH &lt; 7.25 and lactic acid &gt; 5 mmol</li></ul>

\* The drugs available may vary from country to country.

**Table. 19.** Continuation

**Keep in mind that even a “harmless” reaction e.g. nausea may result in an anaphylactoid generalized reaction. Every patient should always be kept under supervision during and right after contrast medium injection. High-risk patients should be monitored longer than low-risk patients.**

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