

SUMMARY OF PRODUCT CHARACTERISTICS

1 NAME OF THE MEDICINAL PRODUCT

Iohexol 350 mg I/ml solution for injection

2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Active substance	Concentration	Content per ml
Iohexol (INN)	350 mg I/ml	755 mg equivalent 350 mg I

For the full list of excipients see section 6.1.

Iohexol is a non-ionic, monomeric, tri-iodinated, water-soluble X-ray contrast agent (Iohexol in a concentration of 140 mg I/ml is isotonic with blood and tissue fluid). The pH is 6.8 to 7.6 for all solutions.

The osmolality and viscosity of Iohexol are as follows:

Concentration	Osmolality	Viscosity (mPa s)
	(mOsm/kg H ₂ O 37°C)	20°C
350 mg I/ml	887	23.1

Method: vapour pressure osmometry

3 PHARMACEUTICAL FORM

Solution for injection

Iohexol is supplied ready for use as a clear, colourless to pale yellow, sterile aqueous solution.

4 CLINICAL PARTICULARS

4.1 Therapeutic indications

This medicinal product is for diagnostic use only.

X-ray contrast medium for use in adults and children for urography, phlebography, i.v. DSA, CT, arteriography, cardioangiography and i.a. DSA. Myelography.

For use in body cavities: Arthrography, ERP/ERCP, herniography, hysterosalpingography, sialography and use in the G-I tract.

Contrast-enhanced mammography (CEM) in adults to evaluate and detect known or suspected lesions of the breast, as an adjunct to mammography (with or without ultrasound) or as an alternative to magnetic resonance imaging (MRI) when MRI is contraindicated or unavailable.

4.2 Posology and method of administration

The dosage depends on the type of investigation and the technique used. Usually the same iodine concentration and volume is used as for other iodinated X-ray contrast media in current use.

Adequate hydration should be assured before and after administration as for other contrast media.

For intravenous, intra-arterial and intrathecal use, and use in body cavities.

The following dosages may serve as a guide:

Guidelines for intravenous use

Indication	Concentration	Volume	Comments
Urography Adults	300 mg I/ml or 350 mg I/ml	40-80 ml 40-80 ml	
Children < 7 kg	240 mg I/ml or 300 mg I/ml	4 ml/kg b.w. 3 ml/kg b.w.	
Children > 7 kg	240 mg I/ml or 300 mg I/ml	3 ml/kg b.w. 2 ml/kg b.w.	
Phlebography (leg)	240 mg I/ml or 300 mg I/ml	20-100 ml/leg	
Digital subtraction angiography Adults	140 mg I/ml 300 mg I/ml or 350 mg I/ml	Up to 3 ml per kg body weight 20 - 60 ml/inj. 20 - 60 ml/inj	
Children	140 mg I/ml	Dependent upon age, weight and pathology	
Contrast-enhanced mammography (CEM)	300 mg I/ml or 350 mg I/ml	Dose (per kg body weight) 1.5 mL/kg b.w. 1.3 mL/kg b.w.	
CT enhancement			

Adults	140 mg I/ml or 240 mg I/ml or 300 mg I/ml or 350 mg I/ml	100 -400 ml 100-250 ml 100-200 ml 100-150 ml	
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Guidelines for intra-arterial use:

Indication	Concentration	Volume	Comments
Arteriographies			
Arch aortography	300 mg I/ml	30-40 ml/inj.	
Selective cerebral	300 mg I/ml	5-10 ml/inj.	
Aortography	350 mg I/ml	40-60 ml/inj.	
Femoral	300 mg I/ml or 350 mg I/ml	30-50 ml/inj.	
Various	300 mg I/ml	depending on type of examination	
Cardioangiography			
Adults			
Left ventricle and aortic root inj	350 mg I/ml	30-60 ml/inj.	
Selective coronary arteriography	350 mg I/ml	4-8 ml/inj.	
Children	300 mg I/ml or 350 mg I/ml	Dependent upon age, weight and pathology (max 8 ml/kg b.w.)	
Digital subtraction angiography			
Adults	140 mg I/ml or 240 mg I/ml or 300 mg I/ml	4 - 10 ml/inj. 1 - 15 ml/inj. 1 - 15 ml/inj.	
Children	140 mg I/ml	Dependent upon age, weight and pathology	

Guidelines for intrathecal use:

Indication	Concentration	Volume	Comments
Lumbar and thoracic myelography (lumbar injection)	240 mg I/ml	8 - 12 ml	
Cervical myelography (lumbar injection)	240 mg I/ml or 300 mg I/ml	10-12 ml 7 - 10 ml	
Cervical myelography (lateral cervical injection)	240 mg I/ml or 300 mg I/ml	6 - 10 ml 6 - 8 ml	
CT cisternography	240 mg I/ml	4 - 12 ml	

(lumbar injection)			
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To minimize possible adverse reactions a total dose of 3 g iodine should not be exceeded.

Guidelines for body cavities:

Indication	Concentration	Volume	Comments
Arthrography	240 mg I/ml or 300 mg I/ml or 350 mg I/ml	5 - 20 ml 5 - 15 ml 5 - 10 ml	
ERP/ERCP	240 mg I/ml	20 - 50 ml	
Herniography	240 mg I/ml	50 ml	
Hysterosalpingography	240 mg I/ml or 300 mg I/ml	15 - 50 ml 15 - 25 ml	
Sialography	240 mg I/ml or 300 mg I/ml	0.5 - 2 ml 0.5 - 2 ml	
Gastrointestinal studies	350 mg I/ml	10-20 ml	

For doses not possible using this product, there are other products available with Iohexol dosages lower than 300 mg I/ml 647 mg/ml.

For elderly patients, patients with hepatic and/or renal impairments, the usual/proposed doses for adults can be used.

4.3 Contraindications

- Hypersensitivity to the active ingredient, other iodine X-ray media, or to any of the excipients listed in section 6.1.
- Manifest thyrotoxicosis.

There are no clear, absolute contraindications for the use of non-ionic uro-angiographic contrast media.

4.4 Special warnings and precautions for use

Special precautions for using non-ionic monomeric contrast media in general

Hypersensitivity

A positive history of allergy, asthma or untoward reactions to iodinated contrast media indicates the need for special caution. Any application of contrast media should, therefore, be preceded by a detailed medical history, in patients with allergic diathesis and in patients with known hypersensitivity reactions a very strict indication is required.

Premedication with corticosteroids or histamine H₁ and H₂ antagonists might be considered in patients at risk for intolerance, they may however not prevent anaphylactic shock, they may actually mask initial symptoms. In patients with bronchial asthma especially the risk of bronchospasm is increased.

The risk of serious reactions in connection with use of Iohexol is regarded as minor. However iodinated contrast media may provoke serious, life-threatening, fatal anaphylactic/anaphylactoid reactions or other manifestations of hypersensitivity.

Independent of quantity and route of administration, symptoms such as angio-oedema, conjunctivitis, coughing, pruritus, rhinitis, sneezing and urticaria may be indicative of a serious anaphylactoid reaction requiring treatment.

A course of action should therefore be planned in advance, with necessary drugs and equipment, medical experience and skilled personnel available for immediate treatment, should a serious reaction occur. In imminent state of shock, administration of the contrast medium must be terminated immediately and - if necessary - specific intravenous treatment must be initiated. It is advisable always to use an indwelling cannula or catheter for quick intravenous access throughout the entire X-ray procedure.

Patients using beta-adrenergic blocking agents, particularly asthmatic patients, may have a lower threshold for bronchospasm and are less responsive to treatment with beta agonists and adrenaline, which may necessitate the use of higher doses. These patients may also exhibit atypical symptoms of anaphylaxis. These could be misconstrued as a vagal reaction.

Usually, hypersensitivity reactions become manifest as minor respiratory or cutaneous symptoms such as mild difficulties of breathing, skin reddening(erythema), urticaria, pruritus or facial oedema. Severe reactions such as angioedema, subglottis oedema, bronchial spasms and shock are rare.

These reactions usually occur within one hour following application of the contrast medium. In rare cases, hypersensitivity may occur (after hours or days), but these cases are rarely life threatening, and mainly affect the skin.

Hydration

Adequate hydration should be assured before and after contrast media administration. If necessary, the patient should be hydrated intravenously until excretion of the contrast medium is complete. This applies especially to patients with dys- and paraproteinaemias like multiple myeloma, diabetes mellitus, renal dysfunction, hyperuricaemia as well as to infants, small children, elderly patients and patients in bad general condition. In patients at risk the water and electrolyte metabolism must be controlled and symptoms of a dropping serum calcium level must be taken care of. Due to the risk of dehydration, induced by diuretics, at first water and electrolyte rehydration is necessary to limit the risk of acute kidney injury.

Cardio-circulatory reactions

Care should also be taken in patients with serious cardiac disease /cardio-circulatory disease and pulmonary hypertension as they may develop haemodynamic changes or arrhythmias. This is especially applicable following intracoronary, left and right ventricular application of contrast media (see also section 4.8).

Patients with cardiac insufficiency, severe coronary heart disease, instable angina pectoris, valvular diseases, previous myocardial infarction, coronary bypass and pulmonary hypertension are especially predisposed for cardiac reactions.

In elderly patients and patients with pre-existing cardiac diseases, reactions with ischemic changes in the ECG and arrhythmia occur more frequently.

In patients with cardiac insufficiency intravascular injection of contrast media can induce pulmonary oedema.

CNS disturbances

Patients with acute cerebral pathology, tumours or a history of epilepsy are predisposed for seizures and merit particular care. Also alcoholics and drug addicts have an increased risk for seizures and neurological reactions.

Encephalopathy has been reported with the use of contrast media, such as iohexol (see section 4.8). Contrast encephalopathy may manifest with symptoms and signs of neurological dysfunction such as headache, visual disturbance, cortical blindness, confusion, seizures, loss of coordination, hemiparesis, aphasia, unconsciousness, coma and cerebral oedema. Symptoms usually occur within minutes to hours after administration of iohexol, and generally resolve within days.

Factors which increase blood-brain barrier permeability will ease the transfer of contrast media to brain tissue and may lead to possible CNS reactions for instance encephalopathy.

Caution is advised in intravascular application to patients with acute cerebral infarction or acute intracranial bleeding as well as in patients with diseases causing disturbance of the blood-brain barrier, and in patients with cerebral oedema, acute demyelination or advanced cerebral atherosclerosis. If contrast encephalopathy is suspected, administration of iohexol should be discontinued and appropriate medical management should be initiated.

Neurological symptoms caused by metastases, degenerative or inflammatory processes can be aggravated by application of contrast media.

Patients with symptomatic cerebrovascular disease, previous stroke or frequent transitory ischemic attacks are at increased risk for contrast medium-induced neurological complications following intra-arterial injection. Intra-arterial injection of contrast media may induce vasospasms with resulting in cerebral ischemic phenomena.

A few patients have experienced a temporary hearing loss or even deafness after myelography, which is believed to be due to a drop in spinal fluid pressure by the lumbar puncture per se.

Renal reactions

Use of iodinated contrast media may cause increase in serum creatinine and acute kidney injury. To prevent these conditions following contrast media administration, special care should be exercised in patients with pre-existing renal impairment and diabetes mellitus as they are at risk.

Other predisposing factors preceding renal failure following application of contrast media, a history of renal disease, age over 60 years, dehydration, advanced arteriosclerosis, decompensated cardiac insufficiency, high doses of contrast media and multiple injections, direct application of contrast media to the renal artery, exposition to further nephrotoxins, severe and chronic hypertension, hyperuricemia, paraproteinemias (myelomatosis and Waldenström's macroglobulinemia plasmacytoma) or dysproteinemias.

Preventive measures:

- Identify patients with a high risk
- Ensure adequate hydration. If necessary by maintaining an i.v. infusion from before the procedure until the contrast medium has been cleared by the kidneys.

- Avoid additional strain on the kidneys in the form of nephrotoxic drugs, oral cholecystographic agents, arterial clamping, renal arterial angioplasty or major surgery, until the contrast medium has been cleared.
- Dose reduction to a minimum.
- Postponing a repeat contrast media examination until renal function returns to pre-examination levels.

Patients on haemodialysis may receive contrast media for radiological procedures. Correlation of the time of contrast media injection with the haemodialysis session is unnecessary.

Diabetic patients receiving metformin:

There is a risk of development of lactic acidosis when iodinated contrast agents are administered to diabetic patients treated with metformin, particularly in those with impaired renal function. To reduce the risk of lactic acidosis, the serum creatinine level should be measured in diabetic patients treated with metformin prior to intravascular administration of iodinated contrast media and the following precautions undertaken in the following circumstances:

(1) Patients with eGFR equal or greater than 60 ml/min/1.73m² (CKD 1 and 2) can continue to take metformin normally.

(2) Patients with eGFR 30 - 59 ml/min/1.73m² (CKD 3)

- Patients receiving intravenous contrast medium with eGRF equal or greater than 45 ml/min /1.73m²) can continue to take metformin normally
- In patients receiving intra-arterial contrast medium, and those receiving intravenous contrast medium with an eGFR between 30 and 44 ml/min/1.73m² metformin should be discontinued 48 hours before contrast medium and should only be restarted 48 hours after contrast medium if renal function has not deteriorated.

(3) In patients with eGFR less than 30 ml/min/1.73m² (CKD 4 and 5) or with an intercurrent illness causing reduced liver function or hypoxia metformin is contraindicated iodinated contrast media should be avoided.

(4) In emergency patients in whom renal function is either impaired or unknown, the physician shall weigh out risk and benefit of an examination with a contrast medium. Metformin should be stopped from the time of contrast medium administration. After the procedure, the patient should be monitored for signs of lactic acidosis.

It is particularly important that the patient is fully hydrated prior to contrast medium administration and for 24 hours afterwards. Renal function (e.g. serum creatinine), serum lactic acid and blood pH should be monitored, as well as the patient with regard to signs of lactic acidosis.

Metformin should be restarted 48 hours after contrast medium if serum creatinine/eGFR is unchanged from the pre-imaging level.

Patients with disturbance of both hepatic and renal function

Particular care is required in patients with severe disturbance of both renal and hepatic function as they may have significantly delayed contrast medium clearance. Patients on haemodialysis may receive contrast media for radiological procedures. Correlation of the time of contrast media injection with the haemodialysis session is unnecessary.

Myasthenia gravis

The administration of iodinated contrast media may aggravate the symptoms of myasthenia gravis.

Pheochromocytoma

In patients with pheochromocytoma undergoing interventional procedures, alpha blockers should be given as prophylaxis to prevent hypertensive crisis.

Disturbed thyroid function

Due to free iodide in the solutions and the additional iodide released by deiodination, iodinated contrast media influence thyroid function. This may induce hyperthyroidism or even thyrotoxic crisis in predisposed patients.

Patients with manifest but not yet diagnosed hyperthyroidism are at risk, patients with latent hyperthyroidism (e.g. nodular goitre) and patients with functional autonomy (often e.g. elderly patients, especially in regions with iodine deficiency) should therefore have their thyroid function assessed before examination if such conditions are suspected.

Before administering an iodinated contrast agent, make sure that the patient is not about to undergo thyroid scan or thyroid function tests or treatment with radioactive iodine, as administration of iodinated contrast agents, regardless of the route, interferes with hormone assays and iodine uptake by the thyroid gland or metastases from thyroid cancer until urinary iodine excretion returns to normal See also section 4.5.

Thyroid function tests indicative of hypothyroidism or transient thyroid suppression have been reported following iodinated contrast media administration to adult and paediatric patients, including infants. Some patients were treated for hypothyroidism. See also section 4.5 on Paediatric population.

Anxiety disorders

A sedative may be administered in the case of marked anxiety.

Sickle cell disease

Contrast media may promote sickling in individuals who are homozygous for sickle cell disease when injected intravenously and intra-arterially.

Further risk factors

Among patients with autoimmune disorders cases of severe vasculitis or Stevens-Johnson-like syndromes have been observed.

Severe vascular and neurological disorders, especially in elderly patients are risk factors for reactions to contrast media.

Extravasation

Extravasation of contrast medium may on rare occasions give rise to local pain, oedema and erythema, which usually recedes without sequelae. However inflammation and even tissue necrosis have been seen. Elevating and cooling the affected site is recommended as routine measures. Surgical decompression may be necessary in cases of compartment syndrome.

Observation-time

Patients must be kept under close observation for 30 minutes following the last injection as the majority of severe reactions occur at this time.

Coagulopathy

Catheter angiography with contrast media carries a risk to induce thromboembolic events.

Serious, rarely fatal, thromboembolic events causing myocardial infarction and stroke have been reported during angiographic procedures with both ionic and non-ionic contrast media. When performing vascular catheterization procedures one should pay meticulous attention to the angiographic technique and flush the catheter frequently (e.g.: with heparinized saline) so as to minimize the risk of procedure-related thrombosis and embolism.

The examination shall be kept as short as possible.

Care should be taken in patients with homocystinuria. (Risk for thromboembolism).

During catheterization it should be considered that besides the contrast medium numerous other factors may also influence the development of thromboembolic events.

These are: duration of the examination, number of injections, type of catheter and syringe material, existing underlying diseases and concomitant medication.

Intrathecal use

Following myelography the patient should rest with the head and thorax elevated by 20° for one hour. Thereafter he/she may ambulate carefully but bending down must be avoided. The head and thorax should be kept elevated for the first 6 hours if remaining in bed. Patients suspected of having a low seizure threshold should be observed during this period. Outpatients should not be completely alone for the first 24 hours.

Cerebral arteriography

In patients with advanced arteriosclerosis, severe hypertension, cardiac decompensation, old age, and previous cerebral thrombosis or embolism and migraine, cardiovascular reactions such as bradycardia and increases or decreases in blood pressure may occur more often.

Arteriography

In relation to procedure used, injury of the artery, vein, aorta and adjacent organs, pleurocentesis, retroperitoneal bleeding, spinal cord injury and symptoms of paraplegia may occur.

Paediatric population:

Hypothyroidism or transient thyroid suppression may be observed after exposure to iodinated contrast media. Special attention should be paid to paediatric patients below 3 years of age because an incident underactive thyroid during early life may be harmful for motor, hearing, and cognitive development and may require transient T4 replacement therapy. The incidence of hypothyroidism in patients younger than 3 years of age exposed to iodinated contrast media has been reported between 1.3% and 15% depending on the age of the subjects and the dose of the iodinated contrast agent and is more commonly observed in neonates and premature infants. Neonates may also be exposed through the mother during pregnancy. Thyroid function should be evaluated in all paediatric patients younger than 3 years of age following exposure to iodinated contrast media. If hypothyroidism is detected, the need for treatment should be considered and thyroid function should be monitored until normalized.

Especially in infants and small children, adequate hydration should be assured before and after contrast medium administration. Nephrotoxic medication should be suspended. The age dependent reduced glomerular filtration rate in infants can also result in delayed excretion of contrast media.

Young infants (age <1 year) and especially neonates are susceptible to electrolyte disturbances and hemodynamic alterations.

Contrast-enhanced mammography (CEM)

Contrast-enhanced mammography results in higher patient exposure to ionizing radiation than standard mammography. Radiation dose depends on breast thickness, the type of mammographic device and the device's system settings. The overall CEM radiation dose remains under the threshold defined by international guidelines for mammography (below 3 mGy).

Important information about the ingredients of Iohexol

This medicine contains less than 1 mmol sodium (23 mg) per ml, that is to say essentially 'sodium-free.

4.5 Interaction with other medicinal products and other forms of interaction

Use of iodinated contrast media may result in a transient impairment of renal function and this may precipitate lactic acidosis in diabetics who are taking metformin (see section 4.4).

Patients treated with interleukin-2 and interferons less than 2 weeks previously have been associated with an increased risk for delayed reactions (erythema, flu-like symptoms and/or skin reactions).

The concomitant use of certain neuroleptics or tricyclic antidepressants may reduce the seizure threshold and thus increase the risk of contrast medium-induced seizures.

Treatment with β -blockers may lower the threshold for hypersensitivity reactions, as well as necessitating higher dose of β -agonists when treating hypersensitivity reactions.

Beta-blockers, vasoactive substances, angiotensin-converting enzyme inhibitors, angiotensin receptor antagonists may reduce the efficacy of the cardiovascular compensation mechanisms of blood pressure changes.

All iodinated contrast media may interfere with tests on thyroid function, thus the iodine binding capacity of the thyroid may be reduced for up to several weeks.

High concentrations of contrast medium in the serum and urine can interfere with laboratory tests for bilirubin, protein or inorganic substances (such as iron, copper, calcium and phosphate). These substances should therefore not be tested on the day of examination.

4.6 Fertility, pregnancy and lactation

Pregnancy

The safety of Iohexol for use in human pregnancy has not been established. An evaluation of experimental animal studies does not indicate direct or indirect harmful effects with respect to reproduction, development of the embryo or foetus, the course of gestation and peri- and postnatal development.

Since whenever possible, radiation exposure should be avoided during pregnancy, the benefits of an X-ray examination, with or without contrast media, should be carefully weighed against the possible risks. Iohexol should not be used in pregnancy unless the benefits outweighs the risks. Iohexol should not be used in pregnancy unless the benefit outweighs the risk and it is considered essential by the physician. Apart from avoidance of exposition

to radiation, the sensitivity of the foetal thyroid for iodine should be taken into account when risk and benefit are evaluated.

In neonates who have been exposed to iodinated contrast media *in utero*, it is recommended to monitor thyroid function (see section 4.4).

Breast-feeding

Contrast media are poorly excreted in human breast milk and minimal amounts are absorbed by the intestine. Breast-feeding may be continued normally when iodinated contrast media are given to the mother. The amount of iohexol in breast milk excreted in 24 hours after injection was 0.5% of the weight-adjusted dosage in a trial. The amount of iohexol ingested by the baby in the first 24 hours after injection corresponds with only 0.2% of the paediatric dosage.

4.7 Effects on ability to drive and use machines

It is advised not to drive or use machines for one hour after the last injection or for 24 hours following intrathecal procedure (see section 4.4). However, individual judgement must be performed if persistent post myelographic symptoms.

Outpatients that leave the hospital after a brief observation period should bear in mind the possible occurrence of dizziness.

4.8 Undesirable effects

The listed frequencies are based on internal clinical documentation and published large scale studies, comprising more than 200,000 patients.

The frequencies of undesirable effects are defined as follows:

Very common ($\geq 1/10$), common ($\geq 1/100$ to $< 1/10$), uncommon ($\geq 1/1,000$ to $< 1/100$), rare ($\geq 1/10,000$ to $< 1/1,000$), very rare ($< 1/10,000$) and not known (cannot be estimated from the available data).

General (applies to all forms of use of iodinated radiological contrast media)

Below are listed possible general side effects in relation with radiological procedures, which include the use of non-iodinated monomeric contrast media. For side effects specific to mode of administration, please refer to these specific sections.

Hypersensitivity reactions may occur irrespective of the dose and mode of administration. And mild symptoms may represent the first signs of a serious anaphylactic reaction/shock. Administration of the contrast medium must be discontinued immediately and, if necessary, specific therapy instituted via the vascular access.

A transient increase in S-creatinine is common after iodinated radiological contrast media, contrast induced nephropathy may occur.

Iodism or 'iodine mumps' is a very rare complication of iodinated contrast media resulting in swelling and tenderness of the salivary glands for up to approximately 10 days after the examination.

Immune system disorders:

Rare: Hypersensitivity (may be life-threatening or fatal) including dyspnoea, rash, erythema, urticaria, pruritus, skin reaction, conjunctivitis, coughing, rhinitis, sneezing, vasculitis, angio oedema, laryngeal oedema,

laryngospasm, bronchospasm or non-cardiogenic pulmonary oedema. They may appear either immediately after the injection and may be indicative of the beginning of a state of shock.

Hypersensitivity related skin reactions may appear up to a few days after the injection.

Very rare: Anaphylactic/anaphylactoid reaction (may be life-threatening or fatal).

Not known: Anaphylactic/anaphylactoid shock (may be life-threatening or fatal).

Nervous system disorders:

Uncommon: Headache

Very rare: Dysgeusia (transient metallic taste), syncope vasovagal.

Cardiac disorders:

Rare: Bradycardia.

Vascular disorders:

Very rare: Hypertension, hypotension.

Gastrointestinal disorders:

Uncommon: Nausea.

Rare: Vomiting, abdominal pain.

Very rare: Diarrhoea.

Not known: Salivary gland enlargement.

General disorders and administration site conditions:

Common: Feeling hot

Uncommon: Hyperhidrosis, cold feeling, vasovagal reactions.

Rare: Pyrexia.

Very rare: Shivering (chills).

Intravascular use (Intra-arterial and Intravenous use)

Please first read the section labelled 'General'. Below, only undesirable events during intravascular use of non-ionic monomer contrast media are described.

The nature of the undesirable effects specifically seen during intraarterial use depends on the site of injection and dose given. Selective arteriographies and other procedures in which the contrast medium reaches a particular organ in high concentrations may be accompanied by complications in that particular organ.

Blood and lymphatic system disorders:

Not known: Thrombocytopenia.

Endocrine disorders:

Not known: Thyrotoxicosis, transient hypothyroidism.

Psychiatric disorders:

Not known: Confusion, agitation, restlessness, anxiety.

Nervous system disorders:

Rare: Dizziness, paresis, paralysis, photophobia, somnolence.

Very rare: Seizures, disturbance in consciousness, cerebrovascular accident, stupor, sensory abnormalities (including hypoaesthesia), paraesthesia, tremor.

Not known: Transient motor dysfunction (including speech disorder, aphasia and dysarthria), transient contrast induced encephalopathy (including transient memory loss, disorientation, coma, retrograde amnesia, hemiparesis, disorientation and brain oedema).

Eye disorders:

Rare: Visual impairment (including diplopia and blurred vision) photophobia.

Not known: Transient cortical blindness.

Ear and labyrinth disorders:

Not known: Transient hearing loss.

Cardiac disorders:

Rare: Arrhythmia (including bradycardia, tachycardia).

Very rare: Myocardial infarction, chest pain.

Not known: Severe cardiac complications (including cardiac arrest, cardio-respiratory arrest), cardiac failure, spasm of the coronary arteries, cyanosis.

Vascular disorders:

Very rare: Flushing.

Not known: Shock, arterial spasm, thrombophlebitis, venous thrombosis.

Respiratory, thoracic and mediastinal disorders:

Common: Transient changes in respiratory rate, respiratory distress

Rare: Cough, respiratory arrest.

Very rare: Dyspnoea.

Not known: Severe respiratory symptoms and signs, pulmonary oedema, acute respiratory distress syndrome, bronchospasm, laryngospasm, apnoea, aspiration, asthmatic attack.

Gastrointestinal disorders:

Rare: Diarrhoea.

Not known: Aggravation of pancreatitis.

Skin and subcutaneous tissue disorders:

Rare: Rash, pruritus, urticaria.

Not known: Angioedema, bullous dermatitis, Stevens-Johnson syndrome, erythema multiformae, toxic epidermal necrolysis, acute generalised exanthematous pustulosis, drug rash with eosinophilia and systemic symptoms, induced psoriasis flare-up, erythema, drug eruption, skin exfoliation.

Musculoskeletal and connective tissue disorders:

Not known: Arthralgia, muscular weakness, musculoskeletal spasm, back pain.

Renal and urinary disorders:

Uncommon: Acute kidney injury.

Not known: Blood creatinine increased.

General disorders and administration site conditions:

Uncommon: Pain and discomfort.

Rare: Asthenic conditions (including malaise, fatigue).

Not known: Administration site reactions, including extravasation.

Injury, poisoning and procedural complications:

Not known: Iodism.

Intrathecal use

Please first read the section 'General'. Below, only undesirable event with frequency during intrathecal use of nonionic monomer contrast media are described.

Undesirable effects following intrathecal use may be delayed and present some hours or even days after the procedure. The frequency is similar to lumbar puncture alone.

Headache, nausea, vomiting or dizziness may largely be attributed to pressure loss in the sub-arachnoid space resulting from leakage at the puncture site. Excessive removal of cerebrospinal fluid should be avoided in order to minimise pressure loss.

Psychiatric disorders:

Not known: Confusion, agitation, anxiety, disorientation.

Nervous system disorders:

Very common: Headache (may be severe and prolonged).

Uncommon: Aseptic meningitis (including chemical meningitis).

Rare: Seizures, dizziness.

Not known: Electroencephalogram abnormal, meningism, status epilepticus, transient contrast-induced encephalopathy (including transient memory loss, coma, stupor, retrograde amnesia, hemiparesis, disorientation), motor dysfunction (including speech disorder, aphasia, dysarthria), paraesthesia, hypoesthesia and sensory disturbance .

Eye disorders:

Not known: Transient cortical blindness, photophobia.

Ear and labyrinth disorders:

Unknown: Transient hearing loss.

Gastrointestinal disorders:

Common: Nausea, vomiting.

Musculoskeletal and connective tissue disorders:

Rare: Neck pain, back pain.

Not known: Muscle spasm.

General disorders and administration site conditions:

Rare: Pain in extremity.

Not known: Administration site conditions.

Use in body cavities

Please first read the section labelled 'General'. Below, only undesirable events with frequency during use of non-ionic monomeric contrast media in body cavities are described.

Endoscopic Retrograde Cholangiopancreatography (ERCP)

Gastrointestinal disorders:

Common: Pancreatitis, blood amylase increased

Oral use

Gastrointestinal disorders:

Very common: Diarrhoea

Common: Nausea, vomiting.

Uncommon: Abdominal pain.

Hysterosalpingography (HSG)

Gastrointestinal disorders:

Very common: Lower abdominal pain.

Arthrography

Musculoskeletal and connective tissue disorders:

Not known: Arthritis.

General disorders and administration site conditions:

Very common: Pain.

Herniography

General disorders and administration site conditions:

Not known: Post procedural pain

Description of selected adverse reactions

Thrombo-embolic complications have been reported in connection with contrast-enhanced angiography of coronary, cerebral, renal and peripheral arteries. The contrast agent may have contributed to the complications (see section 4.4).

Cardiac complications including acute myocardial infarction have been reported during or after contrast-enhanced coronary angiography. Elderly patients or patients with severe coronary artery disease, unstable angina pectoris and left ventricular dysfunction had a higher risk (see section 4.4).

In very rare occasions the contrast medium may cross the blood-brain barrier resulting in uptake of contrast medium in the cerebral cortex and cause contrast encephalopathy after intravascular or intrathecal administration (see section 4.4). The symptoms may include headache, visual disturbance, cortical blindness, seizures, confusion, disorientation, somnolence, loss of consciousness, coma, loss of coordination, hemiparesis, speech disorder, aphasia, amnesia, and brain oedema. Symptoms usually occur within few minutes to 24 hours after the administration. In majority of the case reports the reaction lasted few hours to up to 72 hours.

Anaphylactoid reaction and anaphylactoid shock may lead to profound hypotension and related symptoms and signs like hypoxic encephalopathy, renal and hepatic failure (see section 4.4).

In several cases, extravasation of contrast media has caused local pain and oedema, which usually receded without sequelae. Inflammation, tissue necrosis and compartment syndrome have occurred (see section 4.4).

Paediatric patients

Transient hypothyroidism has been reported in premature infants, neonates and in other children after administration of iodinated contrast media. Premature infants are particularly sensitive to the effect of iodine. Transient hypothyroidism in a premature breast fed infant has been reported. The nursing mother was repeatedly exposed to Iohexol (see section 4.4).

Especially in infants and small children, adequate hydration should be assured before and after contrast medium administration. Nephrotoxic medication should be suspended. The age dependent reduced glomerular filtration rate in infants can also result in delayed excretion of contrast agents.

Reporting suspected side effects

It is important to report suspected side effects after the authorisation of the drug. In this way the relationship between benefits and risks of the drug can be constantly monitored. Healthcare professionals are asked to report any suspected side effects via the Yellow Card Scheme at: www.mhra.gov.uk/yellowcard or search for MHRA Yellow Card in the google play or Apple App Store.

4.9 Overdose

Preclinical data indicate a high safety margin for Iohexol and no fixed upper dose level has been established for routine intravascular use. Symptomatic overdose is unlikely in patients with normal renal function, unless the patient received an excess of 2,000 mg I/kg body weight over a limited period of time. The duration of the

procedure is important for the renal tolerability of high doses of contrast media ($t_{1/2}$ 2 hours). Accidental overdosing is most likely following complex angiographic procedures in children, particularly when multiple injections of contrast medium with a high concentration are given.

In cases of overdose, any resulting water- or electrolyte imbalance must be corrected. Renal function should be monitored for the next 3 days. If needed, haemodialysis may be used for clearance of excessive contrast medium. There is no specific antidote.

Symptoms

The maximum dose of iohexol that can be administered intravascularly is not known. Particularly in patients with decreased renal or cardiac function, consideration should be taken of the occurrence of overdose. On overdose mainly symptoms of circulation disorders of the lungs and heart occur.

Iohexol is only minimally neurotoxic.

Treatment

The treatment is symptomatic.

Haemodialysis may be required for patients with decreased renal function.

The water or electrolyte imbalance must be corrected. Renal function should be monitored for 3 days. If necessary, haemodialysis may be used to clear the excess of contrast medium. There is no specific antidote.

5 PHARMACOLOGICAL PROPERTIES

5.1 Pharmacodynamic properties

Pharmacotherapeutic group: X-ray contrast media, iodinated.

ATC code: V08AB02

For most of the haemodynamic, clinical-chemical and coagulation parameters examined following intravenous injection of iohexol in healthy volunteers, no significant deviation from preinjection values has been found. The few changes observed in the laboratory parameters were minor and considered to be of no clinical importance.

5.2 Pharmacokinetic properties

Close to 100 per cent of the intravenously injected iohexol is excreted unchanged through the kidneys within 24 hours in patients with normal renal function. The maximum urinary concentration of iohexol appears within approximately 1 hour after injection. No metabolites have been detected. The protein binding of iohexol is very low (less than 2%).

5.3 Preclinical safety data

Iohexol has a very low acute intravenous toxicity in mice and rats. Animal studies have shown that iohexol has a very low protein binding, and is well tolerated by the kidneys.

6 PHARMACEUTICAL PARTICULARS

6.1 List of excipients

Sodium calcium edetate
Trometamol
Hydrochloric acid
Sodium hydroxide
Water for injection

6.2 Incompatibilities

In the absence of compatibility studies, Iohexol must not be mixed with other medicinal products. A separate syringe should be used.

6.3 Shelf life

36 months.

6.4 Special precautions for storage

This medicinal product does not require any special temperature storage conditions.

Keep the container in the outer carton in order to protect from light.

6.5 Nature and contents of container

The product is packed in glass vials (50 and 100 ml). Both vials are made of type I glass. The containers are sealed with chlorobutyl rubber stoppers and sealed with a 32 mm cap with an aluminum/plastic flip-off seal (green or brown).

The vials of this product are available in packs of 10.

Not all pack sizes may be marketed.

6.6 Special precautions for disposal

The solution of contrast medium should be drawn into the syringe or infusion bottle connected to the equipment only immediately before the test.

The vials containing the solutions of contrast media are intended for single use only. The rubber stoppers should not be pierced more than once.

Any portions contrast medium solution not used in examination must be discarded.

Any unused medicinal product or waste material should be disposed of in accordance with local requirements.

7 MARKETING AUTHORISATION HOLDER

Zentiva Pharma UK Limited
12 New Fetter Lane
London EC4A 1JP
United Kingdom

8 MARKETING AUTHORISATION NUMBER(S)

PL 17780/0901

9 DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION

10/09/2025

10 DATE OF REVISION OF THE TEXT

10/09/2025