DRN 8103 Thallous chloride (TI201) Injection

Description
Thallous chloride (TI201) injection is a clear, colourless, sterile, isotonic, aqueous solution with a pH of 5.0-7.0. At activity reference time the product has the following composition:

- thallium-201 (as thallous chloride)	37 MBq (1 mCi)
- sterile, isotonic saline solution	q.s.p. 1 ml

It contains no bacteriostatic agent.

It has a specific activity over 18.5 GBq (500 mCi)/mg thallium. It contains at reference time less than 1% of TI200 and less than 0.5% of TI202.

Storage
Refer to outer carton for storage condition.

Stability
1 week after reference date.

Action
Upon intravenous injection the thallous ion in low concentrations follows a pathway analogous to potassium ions. It is rapidly cleared from the blood, accumulating actively in viable myocardial muscle cells to a level higher than in the surrounding tissues, with a maximum in the normal myocardium observed at 10 minutes after injection. Areas of myocardium with impaired circulation, ischaemia and/or infarction and areas where myocardial tissue is replaced by fibrous tissue will show diminished or no accumulation of thallium-201.
Its similarity to potassium implies active accumulation in all viable muscle tissue and in the kidneys. Transient accumulation occurs in organs with a large bloodpool and a high metabolic activity such as the thyroid and notably the liver.

Indications
Scintigraphy with thallium-201 is performed to localize, within the healthy myocardium, areas of diminished or no uptake – both at rest and in conjunction with exercise stress testing – and to evaluate the degree of the impairment. Data thus obtained are used to improve the total of diagnostic information about the quality and condition of the myocardium.

Contraindications
None known.

Precautions
During studies with thallium-201 care should be taken to assure continuous clinical observation. Exercise stress testing should be done only under the supervision of a qualified physician in an appropriately equipped laboratory.

Radiopharmaceuticals should not be administered to patients under 18 years unless the information to be gained outweighs the potential radiation hazard.

Pregnancy

Pregnancy/Fetal Risk

Thallium Tl-201 should not be administered to pregnant women unless it is considered that the benefits to be gained outweigh the potential radiation hazards to the fetus.

Female of Reproductive Potential

Assess the pregnancy status of women of childbearing potential prior to performing imaging procedures with Thallous Chloride Tl 201 Injection. Examinations with radiopharmaceuticals of women of childbearing capability should preferably be done during the first 10 days following the onset of menses.

Breastfeeding

Thallium Tl-201 is distributed into breast milk. To avoid unnecessary irradiation of the infant, temporary discontinuation of nursing is recommended. Prudency dictates that lactating mothers stop nursing their children for a few days after the use of thallium-201.

Interactions with other medicinal products and other forms of interaction

Drugs that increase or decrease myocardial blood flow might correspondingly alter the biodistribution of thallium Tl-201.

Effect on ability to drive and use machines

None known.

Warnings

Radiopharmaceuticals must be used by persons qualified by the appropriate government authorities. These persons have followed a specific training in the use and handling of radionuclides. All unnecessary exposure to radiation, either of personnel or of patients should be avoided.

Adverse reactions

Over the past years, a small number of adverse reactions have been reported. A causal connection with the use of Thallous Chloride (TI201) Injection could not be demonstrated.

Immune system disorders: Hypersensitivity reactions (frequency not known)
General disorders and administration site conditions: Injection site reactions (frequency not known)

Overdose and Treatment

In the event of the administration of a radiation overdose with thallium Tl-201, the absorbed dose to the patient should be reduced where possible by increasing the elimination of the radionuclide from the body by forced diuresis with frequent voiding and stimulation of the gastrointestinal passage.

Dosage and administration
Thallium-201 is intended as a single dose diagnostic agent. Adult dosage: 37-74 MBq (1-2 mCi) by intravenous injection.

Procedure
Scintigraphy is done with a gamma-camera preferably provided with a low-energy, high-resolution collimator, using the 65-82keV radiation. Images at rest are usually obtained in the interval of 10 to 60 minutes after injection. In exercise stress testing the thallium-201 is injected when the patient reaches the predetermined maximum stress level, the exercise is then continued for at least 1 to 2 minutes at a gradually decreased load; imaging should begin not later than 10 minutes after the injection.

Images obtained later than 90 minutes after injection contain considerably less information due to redistribution of the activity. Scintiphotos are taken from at least three directions: anterior view (AP), left anterior oblique view (LAO) and left lateral view (LL). Functioning myocardial tissue is shown as an active area in which defects are found as cold spots. The normal image at rest displays most notably the left ventricular wall. The right ventricle usually does not present itself unless after exercise or in case of right ventricular hypertrophy. The ventricular blood space shows as a central cold area due to the fast blood clearance of thallium-201. In patients with diabetes mellitus the quality of the cardiac scan may be decreased due to diabetic myocardiopathy.

Additional diagnostic information may be obtained by the application of ECG-gating equipment, computer processing and double isotope studies.

Physical characteristics
Thallium-201 is cyclotron-produced radionuclide, obtained by isolation from lead-201. The latter is produced by proton irradiation of an inactive thallium target.

The half-life of thallium-201 is 73.1 hours. It decays by electron capture to mercury-201, followed by the emission of γ-rays of 135 and 167 keV and X-rays of 65-82 keV.
The irradiation procedure also yields lead-200 and lead-202m decaying to thallium-200 ($t_{1/2}$ = 26.1 h) and thallium-202 ($t_{1/2}$ = 288 h). By a proper selection of process parameters these have been reduced to a minimum.

The results of checks of the activity with ionization chambers should be interpreted with care. In general, ionization chambers are not specifically calibrated for thallium-201, or less recent emission data have been used for their calibration. Moreover, the check is complicated by the variable quantities of thallium-200 and -202.

Thallium-201 decay

time before reference time	factor	time after reference time	factor	time after reference time	factor
3.0 days	1.978	0.5 day	0.893	4.0 days	0.403

2.5 days	1.765	1.0 day	0.797	5.0 days	0.321
2.0 days	1.576	1.5 days	0.712	6.0 days	0.256
1.5 days	1.406	2.0 days	0.635	7.0 days	0.204
1.0 day	1.255	2.5 days	0.567	8.0 days	0.162
0.5 day	1.120	3.0 days	0.506	9.0 days	0.129

Radiation dosimetry
The radiation doses of thallium-201 to various organs in man have been calculated according to the MIRD-procedure, using the physical data published in J. Nucl. Med., 18, 1047-1048 (1977). Human distribution data were obtained by autopsy and were correlated with the results of animal distribution studies.

Estimated absorbed dose:

	mGy/MBq	rad/mCi
Bone marrow	0.135	0.50
Gonads	0.124	0.46
Kidneys	0.23	0.85
Liver	0.135	0.50
Skeleton	0.084	0.32
Spleen	0.116	0.43
Thyroid	0.116	0.43
Whole body	0.06	0.22

Whole body effective dose equivalent: 9.6 mSv for 75 HBq.

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Manufactured and released by:
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