LIOTHYRONINE (Triiodothyronine)

Newborn use only

2018

Alert	**NOT** a choice for maintenance thyroid replacement due to its short duration of action. Liothyronine is to be used only after consultation with and approval from a paediatric endocrinologist. Intravenous liothyronine is available in Australia only via the Special Access Scheme.
Indication	1. Hypothyroidism (high TSH and low T_4/T_3, or low T_4/T_3 alone if hypopituitarism) in whom oral levothyroxine is contraindicated for a prolonged period e.g. following bowel surgery. 2. Sick euthyroidism (low T_4/T_3 with no significant elevation of TSH), particularly after cardiac surgery – consider treatment if free T_3 concentration is <1.5 picomol/L or if free T_3 is <3.5 picomol/L and inotropic support or haemodynamic instability is present [1].
Action	The principal pharmacological effect of exogenous thyroid hormones is to increase the metabolic rate of body tissues. The biological action of liothyronine (L-T_3) is qualitatively similar to that of levothyroxine (T_4) but the effect develops in a few hours and disappears within 24–48 hours of stopping treatment.
Drug Type	Liothyronine is a synthetic form of triiodothyronine (T_3), a thyroid hormone.
Trade Name	IV: Thyrotardin (Medsurge, UK) or Triostat-R (Mercury Pharma, UK) can be obtained via the Special Access Scheme.
Presentation	**IV** Thyrotardin 100 microgram vial. Triostat-R 20 microgram vial. Contains dextran 110 and sodium hydroxide as excipients.
Dosage/Interval	**IV continuous infusion** 0.05 microgram/kg/hour (range 0.05–0.15 microgram/kg/hour [titrated to free T_3 of 4.5 to 7.8 picomol/L in neonates and 5.2–8.0 picomol/L in 31–60 days old and 4.1–7.9 picomol/L in 61 days–12 months]) [1]. May be given centrally or peripherally, for up to 72 hours – or until free T_3 is normal. **IV slow bolus injection** 0.4 microgram/kg over 20 minutes. Subsequent doses 0.2 microgram/kg over 20 minutes every 3 to 12 hours (titrated to free T_3 level – normal is 4.5 to 7.8 picomol/L in neonates [1] and 2.3 to 9.2 picomol/L in 1 month to 7 years of age [2]). **Discontinuing intravenous T_3 treatment** • In infants with sick euthyroid syndrome in whom T_3 treatment has been started as an adjunct to inotropic support, intravenous T_3 therapy can be weaned over 24 hours or simply stopped once inotropic support is no longer required. • Intravenous T_3 can typically be ceased when FT_3 levels reach the normal range. • If hypothyroidism is expected to be an on-going problem, the infant should be started on oral levothyroxine (T_4) treatment as soon as possible. Levothyroxine should commence before T_3 is discontinued. Intravenous T_3 can only be stopped when T_4 concentrations are within the normal range (10–20 picomol/L). This may take a few days.
Route	IV
Maximum Daily Dose	
Preparation/Dilution	**IV Bolus:** Add 2mL of water for injection to 20 microgram vial to make 10microgram/mL solution. Shake gently to dissolve. Further dilute 2mL of reconstituted solution (20 micrograms) with 18mL of sodium chloride 0.9% giving a concentration of 1 microgram/mL.* **IV Infusion:** Add 4mL of water for injection to 20 microgram vial to make 5microgram/mL solution. Shake gently to dissolve. Further dilute 1 mL of reconstituted solution (5 micrograms) to make up to 50 mL of sodium chloride 0.9% giving a concentration of 0.1 microgram/mL. *Note that this product is irritant to veins (alkaline).
Administration	IV slow bolus injection over 20 minutes.

	IV continuous infusion: Use a light-resistant, low absorbing, non-PVC extension set. Liothyronine (T_3) is only stable for 24 hours, the giving set and drug need to be changed every 24 hours.
Monitoring	Reverse T_3 (as well as TSH, T_3 and T_4) is to be measured on all patients before starting therapy. In infants in whom a T_3 infusion is required, the aim is to titrate the infusion rate to achieve a normal plasma concentration of free T_3 (titrated to free T_3 of 4.5 to 7.8 picomol/L in neonates, 5.2–8.0 picomol/L in 31–60 days old and 4.1–7.9 picomol/L in 61 days–12 months). During therapy, free T_3 should be measured and reviewed regularly. Continuous cardiac monitoring for IV infusion to watch for tachycardia and arrhythmias as signs of possible overdose.
Contraindications	Hypersensitivity to liothyronine sodium. Patients with untreated hyperthyroidism.
Precautions	Patients with cardiovascular disorders. Patients with untreated adrenal cortical insufficiency.
Drug Interactions	Anticoagulants: Liothyronine sodium therapy may potentiate the action of anticoagulants by increasing the catabolism of vitamin K-dependent clotting factors. Anticonvulsants: Initiation or discontinuation of anticonvulsant therapy may alter liothyronine dose requirements. Phenytoin concentrations may be increased by liothyronine. Anticonvulsants such as carbamazepine and phenytoin enhance the metabolism of thyroid hormones and may displace them from plasma proteins. Cardiac glycosides: Thyroid hormones may potentiate digitalis toxicity. The increased metabolic rate following liothyronine therapy may increase digitalis requirements. Cholestyramine: Reduces gastrointestinal absorption of liothyronine by binding liothyronine within the gut lumen. Catecholamines: Liothyronine increases receptor sensitivity to catecholamines, thus potentially increasing the risk of cardiac arrhythmias. Ketamine: May cause hypertension and tachycardia when administered to patients receiving thyroid replacement therapy. Insulin or oral hypoglycaemics: Requirements of insulin or oral hypoglycaemics may increase in patients receiving therapy with liothyronine. Amiodarone and iodinated contrast media can, due to its high iodine content, cause both hyperthyroidism and hypothyroidism. Dose adjustment of liothyronine may be necessary. Enzyme-inducing drugs, barbiturates, rifampicin, carbamazepine and other drugs with hepatic enzyme properties, can increase the hepatic clearance of liothyronine.
Adverse Reactions	Tachycardia, tachyarrhythmia, hypertension. Overtreatment may cause hyperactivity, bone-age advancement and craniosynostosis. Excessive dosage may also cause diarrhoea, ischaemic cardiac pain, sweating, muscle cramps and muscle weakness. Late-onset circulatory collapse has been reported in preterm infants treated with thyroid hormones particularly in the context of cortisol insufficiency.
Compatibility	In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products.
Incompatibility	In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products.
Stability	IV: Thyrotardin – Shelf life at 2–8°C is 4 years. The reconstituted solution should be used immediately. IV: Triostat-R – Use immediately after reconstitution.
Storage	**IV** Thyrotardin is to be stored in a refrigerator between 2 and 8°C. Protect from light. The reconstituted solution must be protected from direct sunlight. Triostat-R: Do not store above 25°C. Protect from light.
Special Comments	

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Evidence summary	Refer to full version.
References	Refer to full version.

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