^{131}I sodium iodide

Theracap®
As capsule or solution for injection

1. Indications

^{131}I-sodium iodide is approved for:

- Treatment of primary hyperthyroidism due to Graves' disease, toxic multinodular goitre or autonomous nodules.
- Treatment of papillary and follicular thyroid carcinoma including metastatic disease.

In the management of thyroid carcinoma, sodium iodide is used to identify thyroid remnant and metastases (after ablation).

2. Preparation

Approved product, see summary of product characteristics (SmPC).

3. Quality control

Approved product, see summary of product characteristics (SmPC) and the European Pharmacopeia.

4. Interactions

Active substance	Withdrawal period prior to administration of ^{131}I
Amiodarone	4 weeks
Antithyroid agents: carbimazol, propylthiouracil, thiamazole,)	1 week
Benzodiazepines	4 weeks
Lithium	4 weeks
Perchlorate	1 week
Cough syrups, vitamins	2 weeks
Miscellaneous agents: Salicylates, steroids, sodium nitroprusside, anticoagulants, penicillines, antiparasitics, sulfonamides, tolbutamide, thiopental	1 week
Phenylbutazone	1-2 weeks
(Iodinated) contrast agents	1-2 months, up to 1 year
Iodine-containing preparations for topical use	1-9 months
Iodine-containing supplements for example kelp tablets	1-2 weeks

5. Adverse reactions

The safety profile of sodium iodide ^{131}I differs widely according to the doses administered. Frequent occurring adverse reactions are: hypothyroidism, transient hyperthyroidism, salivary and lacrimal gland disorders, and local radiation effects. In cancer treatment additionally gastrointestinal adverse reactions and bone marrow suppression may frequently occur. See also the chapters in the medical section.

Thyroid and parathyroid gland disorders

Dose dependent hypothyroidism may occur as a late consequence of radioiodine treatment of hyperthyroidism. This may manifest itself weeks or years after treatment, requiring suitable timed measurement of thyroid function and appropriate thyroid replacement. Hypothyroidism is generally not seen until 6-12 weeks after sodium iodide ^{131}I administration.

The destruction of thyroid follicles caused by the radiation exposure of sodium iodide (^{131}I) may lead to exacerbation of an already existing hyperthyroidism after 2-10 days or even to thyrotoxic crisis. Occasionally, an immune hyperthyroidism may develop after initial normalisation (latency period 2-10 months). With high dose radioiodine treatment, the patient may experience transient inflammatory thyroiditis and tracheitis 1-3 days after administration, with a possibility of severe tracheal constriction, especially where there is existing tracheal stenosis.

Cases of transient hypoparathyroidism have been observed after ^{131}I.

Eye disorders

Endocrine ophthalmopathy may progress or new ophthalmopathy may occur after radioiodine therapy of hyperthyroidism or Graves` disease.

Gastrointestinal disorders

High levels of radioactivity may also lead to gastrointestinal disturbance, usually within the first hours or days after administration.

Salivary and lacrimal gland disorders

Sialoadenitis may occur, with swelling and pain in the salivary glands, partial loss of taste and dry mouth. Sialoadenitis is usually reversible spontaneously or with anti inflammatory treatment but cases have occasionally been described of dose-dependent persistent ageusia and dry mouth. Malfunction of the salivary and/or lacrimal glands with resulting sicca syndrome may also appear with a delay of several months and up to two years after radioiodine therapy. Although sicca syndrome is a transient effect in most cases, the symptom may persist for years in some patients.

Bone marrow depression

As a late consequence, reversible bone marrow depression may develop, presenting with isolated thrombocytopenia or erythrocytopenia. Bone marrow depression is more likely to occur after one single administration of more than 5000 MBq, or after repeat administration in intervals below 6 months.

Local irradiation effects
Vocal cord dysfunction and paralysis have been reported after administration of sodium iodide ^{131}I, however, in some cases this might also have been caused by thyroid surgery and it cannot be decided whether the dysfunction of the vocal cords was caused by radiation or by surgical treatment.
High tissue uptake of radioiodine can be associated with local pain, discomfort and oedema e.g. in case of radioiodine treatment of the remnant thyroid gland, a diffuse and severe soft tissue pain may occur in the head and neck region.
In the treatment of metastasising thyroid carcinomas with CNS involvement, the possibility of local cerebral oedema and/or an increasing existing cerebral oedema must also be born in mind.

Secondary malignancies
After higher activities, typically those used in the treatment of thyroid malignancies, an increased incidence of leukaemia has been observed.
There is also evidence for an increased incidence of secondary solid cancers at high activities.

6. Biodistribution & pharmacokinetics
Absorption
After oral administration sodium iodide ^{131}I is absorbed rapidly from the upper gastrointestinal tract (90% in 60 min). The absorption is influenced by gastric emptying. It is increased by hyperthyroidism and decreased by hypothyroidism.
In studies on the dissolution of sodium iodide ^{131}I capsules it was shown that the dissolution took place within 5-12 min and that the radioactivity was homogeneously spread over the gastric mucosa.
Studies on the serum activities levels showed that after a fast increase, persisting 10-20 min, the equilibrium was reached after approximately 40 min.

Distribution and Organ uptake
The pharmacokinetics follows that of unlabelled iodide. After entering the blood stream it is distributed in the extra thyroidal compartment. From here it is predominantly taken up by the thyroid that extracts approximately 20% of the iodide in one pass or excreted renally. The uptake of iodide in the thyroid reaches a maximum after 24-48 h, 50% of the maximum peak is reached after 5 h. The uptake is influenced by several factors: the age of the patient, the volume of the thyroid, renal clearance, the level of circulating iodide and by other medicinal products.
The iodide clearance by the thyroid is usually 5-50 ml/min. In case of iodine shortage it is however increased to up to 100 ml/min and during hyperthyroidism to up to 1000 ml/min. In case of iodine overload it can be decreased to 2-5 ml/min. Iodide accumulates also in the kidneys. Small amounts of iodide ^{131}I are taken up by salivary glands and gastric mucosa.

Half-Life
The effective half-life of radioiodine in plasma is in the order of 12 h whereas that for radioiodine taken up by the thyroid gland is about 6 days. Thus after administration of sodium iodide ^{131}I approximately 40% of the activity has an effective half-life of 0,4 days and the remaining 60% 8 days.

Elimination
Urinary excretion is 37-75%, faecal excretion is about 10% with almost negligible excretion in sweat.

7. Stability
14 days from the activity reference time and date as stated on the label. Store below 25°C, do not freeze.

8. Literature

- SmPC Theracap ^{131}, capsules 37-5550 MB/st, GE Healthcare; 2014.
- SmPC Sodium Iodide (131I) capsules, Mallinckrodt; 2014.