Dysthyroïdie

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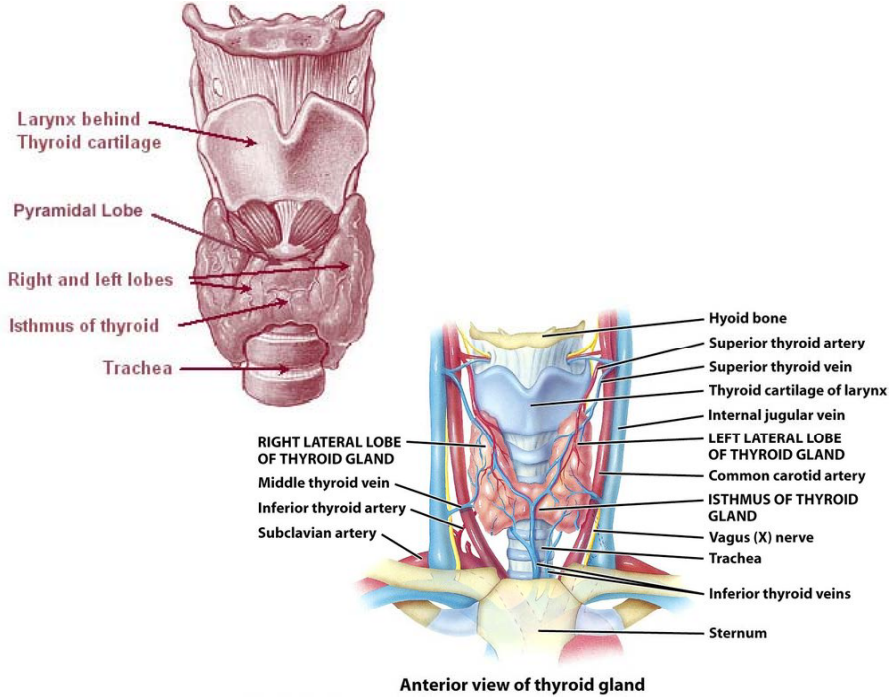
HUG



Anterior view of thyroid gland




Histologie

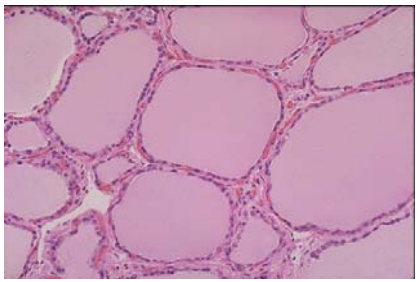


Figure 45.1 : Follicule thyroïdien (coupe histologique)

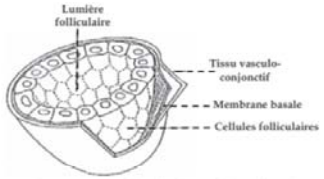
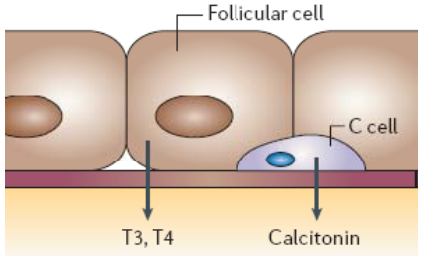


Figure 45.2 : Follicule thyroïdien (dessin)




Réseau capillaire autour des follicules thyroïdiens . Motta P. Anatomie microscopique. Edition française, PICCIN 1988

L'iode, substrat des hormones thyroïdiennes

Apports recommandés:
Adulte 150 mcg/j.
Femme enceinte 200 mcg/j.

Box 1 | Sources of iodine exposure and potential excess

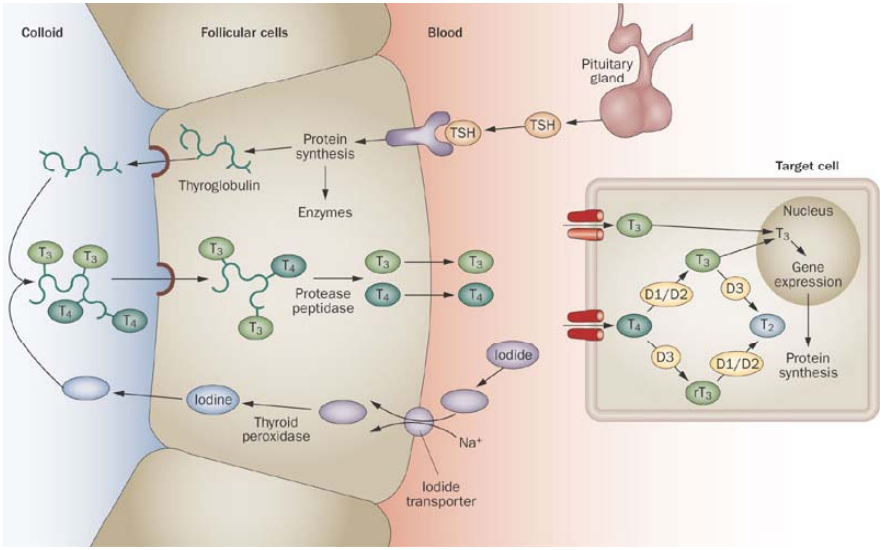
Diet

- Kelp (per g): 16–8,165 μg[36]
- Bread (per slice): 2.2–587.4 μg[80]
- Milk (per 8 oz): 88–168 μg[80]
- Fish fillet (per g, dry weight): 0.73 μg[81]
- Iodized salt: Variable

Other sources

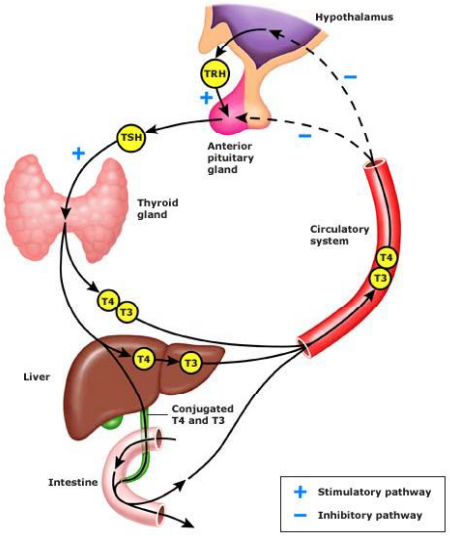
- Vitamins (prenatal, labelled content per daily serving): 75–200 μg[46]
- Amiodarone (per 200 mg): 75,000 μg
- Iodinated contrast (free iodine content, per CT scan): 13,500 μg
- Topical iodine (povidone iodine): variable, usually 1–5%
- Expectorants, mouthwashes, vaginal douches: variable
- Saturated solution of potassium iodide (per drop): 50,000 μg

Synthesis of thyroid hormones

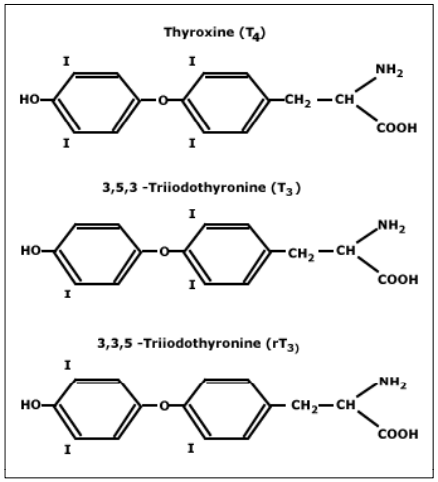


Cohen-Lehman, J. *et al.* (2009) *Nat. Rev. Endocrinol.*

Physiologie



Hormones thyroïdiennes



Sécrétion thyroïdienne:

- 90% de T4
- 10% de T3 (hormone active)

Conversion périphérique de T4 en T3 (déiodinases)

Demi-vie:

- T4: 1 semaine
- T3: 1.5 jour

T4/T3 totale = T4/T3 libre + T4/T3 liée.

Liaison: (TBG, Transthyrétine, Albumine)

Fraction libre de T3 = 0.4%

Fraction libre de T4 = 0.04%

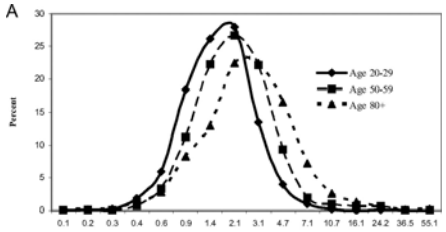
Thyréostimuline/ TSH

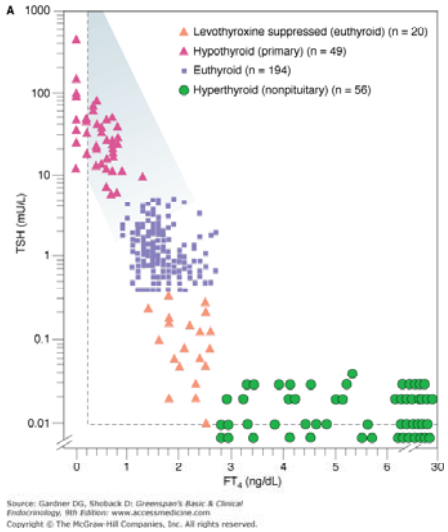
Demi-vie 1h

Dépistage, et suivi

Variation en fonction de:

- L'âge
- L'ethnie





Le phénomène Wolff-Chaikoff

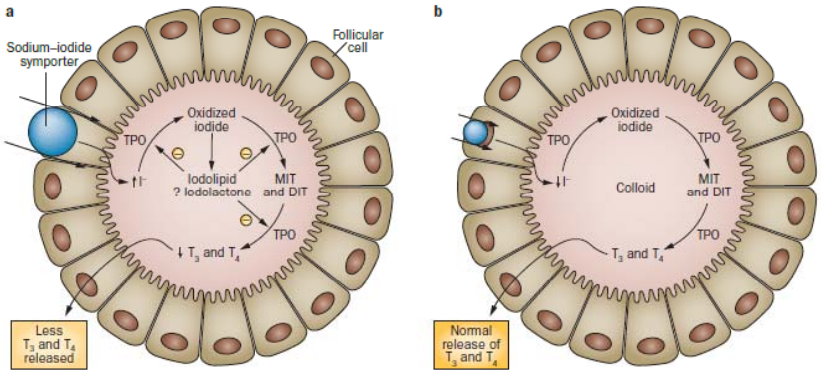


Figure 1 | The Wolff–Chaikoff effect. **a** | The proposed mechanism for the acute Wolff–Chaikoff effect. During initial iodine exposure, [illegible] transient inhibition of TPO and a decrease in the synthesis of thyroid hormone. **b** | The mechanism by which adaptation to the acute Wolff–Chaikoff effect occurs. [illegible], which enables the synthesis of thyroid hormone to resume. Abbreviations: DIT, diiodotyrosine; I^-, iodide; MIT, monoiodotyrosine; TPO, thyroid peroxidase. Permission obtained from Massachusetts Medical Society © Pramyothin, P. *et al. N. Engl. J. Med.* **365**, 2123–2127 (2011).

Effets des hormones thyroïdiennes

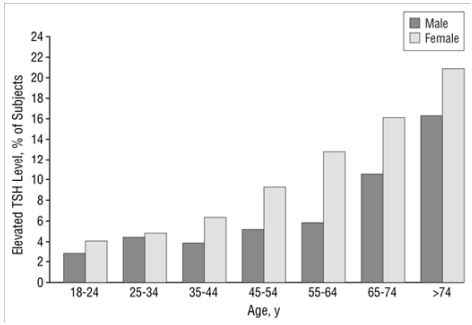
TABLE 1. Effects of Thyroid Hormone on the Body

Body System	Effect of Thyroid Hormones
Metabolism	Increases cellular metabolism
	Stimulates effective carbohydrate utilization
Cardiovascular	Increased cardiac output secondary to increased metabolic rate
Respiratory	Respiration rate and depth increase secondary to an increased rate of metabolism—tissue oxygen consumption increased
Gastrointestinal	Increases production and secretion of digestive enzymes and gastric motility
Muscular	Muscular development and strength
Nervous system	Regulates sleep-wake cycles, normal cerebration
Endocrine	Increases the release of other hormones and increases the tissues' need for hormones to match the new metabolic rate

Schmaltz C.Adv Neonatal Care. 2012

L'hypothyroïdie

Hypothyroïdie prévalence



Colorado thyroid disease prevalence study , arch intern Med. 2000 Feb 28;160(4):526-34.

Table 4
Prevalence of Hypothyroidism

Study	Subclinical	Overt	TSH	Comment
NHANES III	4.3%	0.3%	4.5	
Colorado Thyroid Disease Prevalence	8.5%	0.4%	5.0	Not on thyroid hormone
Framingham			10.0	Over age 60 years: 5.9% women; 2.3% men; 39% of whom had subnormal T_4
British Whickham			10.0	9.3% women; 1.2% men

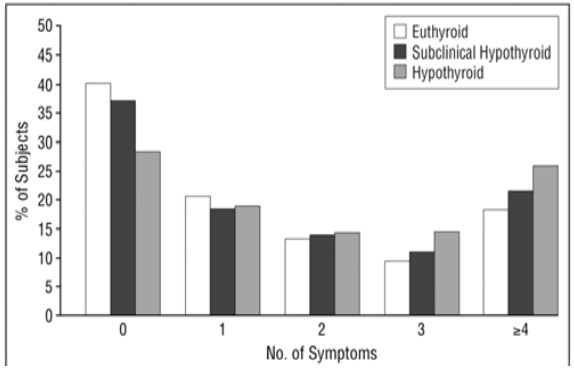
Sources: Hollowell *et al.*, 2002 (11); Canaris *et al.*, 2000 (12); Sawin *et al.*, 1985 (13); Vanderpump *et al.*, 1995 (14); Vanderpump and Tunbridge, 2002 (15).
Abbreviations: NHANES = National Health and Nutrition Examination Survey.

Clinique

Frilosité
Peau sèche Cheveux/ongles cassants
Bradycardie
Fatigue, ralentissement psychomoteur, dépression
Prise de poids
Constipation
Œdèmes
⬇ réflexes
Troubles cycle

Percentage of Euthyroid, Subclinical and Hypothyroid Patients Reporting Symptoms

60% euthyroid have ≥ 1 symptom
15% ≥ 4 symptoms



R5. Clinical scoring systems should not be used to diagnose hypothyroidism. Grade A, BEL 1

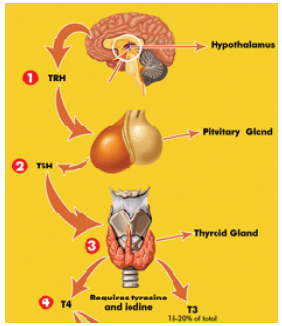
Canaris et al.

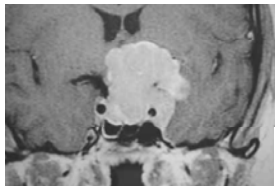
Prévalence des AC

	TRAb	AC anti TPO	AC anti Tg
Population générale	0%	5-20%	8-27%
Basedow	80-95%	50-70%	50-80%
Hashimoto	10-20%	80-90%	90-100%
Thyroïdite silencieuse	0%	25%	60%
AF + pour Hashimoto	0%	30-50%	30-50%
Diabète de type 1	0%	30-40%	30-40%

Hypothyroïdie

	Hypothyroïdie subclinique	Hypothyroïdie franche	Hypothyroïdie centrale
TSH	↑	↑	Normale à ↓
T4l	« Normale »	↓	↓
Fréquence	5-10%		Rare





Hypothyroïdie centrale

- TSH peut-être « normale » (mais inadaptée vu⬇T4)

➔ si suspicion hypoT centrale: demander T4 libre !

Etiologies

Hypothyroïdie primaire (> 95%)	**Thyroïdite chronique auto-immune (Hashimoto)** **Thyroïdite (silencieuse, post partum, De Quervain)** **Iatrogène:** **Après thyroïdectomie, radio-iode, irradiation cervicale.** **Médicamenteux: amiodarone , lithium, antithyroïdiens, …)** **Surcharge iodées (produit de contraste)** **Maladie infiltratives (Riedel, sarcoidiose, amyloidose…)**
Hypothyroïdie secondaire (<5%)	Macroadénome hypophysaire, craniopharyngiome, méningiome, tumeur sellaire) Après chirurgie ou radiothérapie hypophysaire Hypophysite Sarcoïdose, histiocytose, hémochromatose Syndrome de Sheehan Infection (TBC, toxoplasmose)

Bilan d'une hypothyroïdie

- Que faire:
  - Répéter TSH?
  - T4l et T3?
  - Anticorps anti- TPO , anti Tg, TRAb?
  - Thyroglobuline?
  - Imagerie?
  - Autres?

Bilan d'une hypothyroïdie: contrôler la TSH
Les dysthyroïdies transitoires:

subaiguë de De Quervain

- probable cause virale (rechercher virose à l'anamnèse)
- thyroïde douloureuse !
- Tt: ββ, AINS +/- glucocorticoïdes

du post-partum

- auto-immune
- fréquente, mais silencieuse
- dans les 6 mois post-partum

silencieuse

- idem à post-partum
- Tt: symptomatique (ββ)

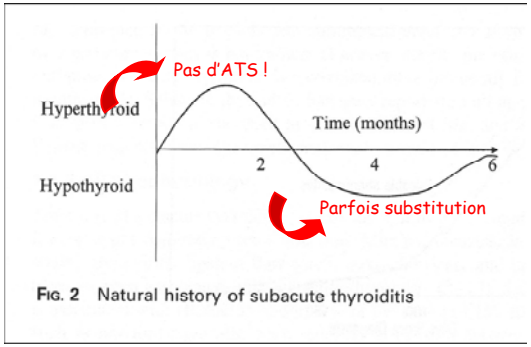


FIG. 2 Natural history of subacute thyroiditis

- **médics:** amiodarone, lithium, interféron-alpha

Dosage des anti-TPO?

- Doser au maximum 1 fois !
- Très bonne sensibilité pour la maladie de Hashimoto, spécificité plus faible
- Utile pour confirmer l'origine auto-immune (?)
- Autre utilité = hypothyroïdie subclinique

  - si AC-TPO ⬆, le risque d'évolution vers une hypothyroïdie franche est augmenté.

Anti TPO → Négatifs : risque de 2% / an

Anti TPO → Positifs: risque de 5% / an

Bilan d'une hypothyroïdie

- Que faire:
  - Répéter TSH? Plutôt oui
  - T4l et T3? T4 l si TSH anormale ou atteinte centrale
  - Anticorps anti- TPO , anti Tg, TRAb? max 1x AC antiTPO
  - Thyroglobuline? Non, utile pour le suivi des cancer.
  - Imagerie? US si palpation anormale
  - Autres? Non

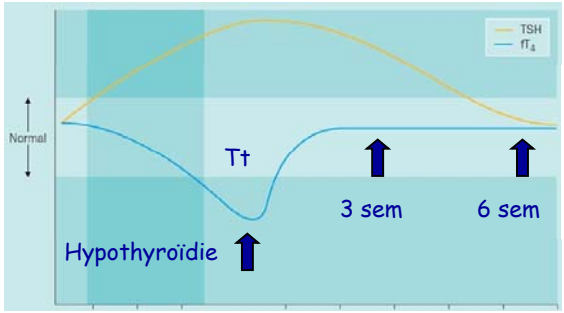
Hypothyroïdie le traitement

- Hypothyroïdie franche ou hypothyroïdie subclinique avec valeur de TSH > 10mUI/l
  - lévothyroxine 1.2-1.8 µg/kg/j 20-30 min à jeun, à distance du calcium et fer
  - patient âgé ou coronarien ➔ débuter à 25-50 µg/j et augmenter toutes les 2-4 semaines de 25 µg –
  - femme enceinte: ⬆ besoin en lévothyroxine de 25-50%
- Hypothyroïdie subclinique avec TSH 6-10mUI/l avec symptômes/ goitre: essai de ttt si symptômes, CAVE personne âgée
- Hypothyroïdie subclinique asymptomatique: suivi de la TSH 1-2x/an
  - Exception: traité toute hypothyroïdie chez la femme avec un désir de grossesse avec cible TSH < 2,5mUI/l
- Nb: pas de réel bénéfice à associer T4 + T3 (Novothyral®)

Fig. 2 A patient before and after successful treatment of primary hypothyroidism.

Suivi patients substitués

- TSH 1x/an
- Attendre > 6 semaines avant de contrôler la TSH
-Cible :
  - Normaliser la TSH 0,4-3mUI/l chez le jeune, entre 2 et 5 mUI/l chez le patient âgé, en tenant compte des symptômes
  -Hypothyroïdie centrale , T4l dans le tiers sup de la norme.



An 88-year-old man is evaluated during a routine physical examination. He reports occasional tiredness but has no other symptoms, such as nervousness, weight gain or loss, joint discomfort, constipation, palpitations, or dyspnea. The patient has a history of hypertension. Medications are daily lisinopril and daily low-dose aspirin.

Physical examination shows an alert and oriented older man. Blood pressure is 140/85 mm Hg; all other vital signs are normal. Cardiac examination shows a grade 1/6 crescendo-decrescendo systolic murmur, and pulmonary examination findings are normal. The thyroid gland is not palpable; no cervical lymphadenopathy is noted. Results of examination of the extremities, including pulses, are normal.

Laboratory studies:	
Complete blood count	Normal
Comprehensive metabolic profile	Normal
Thyroid function tests (repeated and confirmed)	
Thyroid-stimulating hormone	6.8 µU/mL (6.8 mU/L)
Thyroxine (T_4), free	1.1 ng/dL (14 pmol/L)
Thyroid peroxidase antibody titer	Normal

A: levothyroxine
B: liothyronine
C: radioactive iodine test
D: observation

D

A 28-year-old woman is evaluated for fatigue, weight gain and occasional constipation. The patient has a history of craniopharyngioma, which was resected; she was subsequently given radiation therapy. She has hypopituitarism and diabetes insipidus after tumor resection and radiation. Her medications include hydrocortisone, levothyroxine, oral contraceptives, and desmopressin. She does not have dizziness, nausea, vomiting, polyuria, or polydipsia. She has regular menstrual cycles.
The physical examination is unremarkable.

Laboratory Studies

Complete blood count	Normal
Electrolyte panel	Normal
TSH	0.1 mU/L
Free T_4	6.4 pmol/L

Which of the following changes should be made to the patient therapy?

A Hydrocortisone dose should be lowered

B Oral contraceptives should be discontinued

C Desmopressin should be discontinued

D Thyroid hormone dose should be increased

D

A 27-year-old woman who was just found to be pregnant requests advice about thyroid hormone therapy during her pregnancy. She has hypothyroidism following radioiodine ablation for Graves' disease 4 years ago. She feels well and has no symptoms of thyroid hormone excess or deficiency. Her only medication is levothyroxine 100 µg/d.
On physical examination: the blood pressure is 105/60 mm Hg, pulse rate 68/min, and BMI 21. The thyroid gland is small, firm, and nontender.

The serum thyroid-stimulating hormone is 1.5 µU/mL (1.5 mU/L).

Which of the following is the most appropriate approach to her thyroid hormone therapy during pregnancy?

MKSAP 16
Item 13

A Her levothyroxine dose is correct and will not need to be changed

B Her levothyroxine dose will likely need to be decreased by 20% to 30%

C Her levothyroxine dose will likely need to be increased by 30% to 50%

D Liothyronine (LT_3) should be add to levothyroxine therapy

E She should be switched to a natural thyroid preparation

C

A 59-year-old woman is evaluated for a 2-week history of diffuse arthralgias, malaise, anorexia, and left-sided neck pain and swelling. The pain radiates upwards towards the left ear. She has no fever, chills, palpitations, or nervousness.

On physical examination, the temperature is 37.3 °C (99.2 °F), and the pulse rate is 92/min. Thyroid examination shows warmth, tenderness, and moderate enlargement of the left lobe of the gland, without fluctuance. Laboratory testing shows a leukocyte count of 12,300/µL (12.3 × 10^9/L), with 82% segmented cells and 3% bands; erythrocyte sedimentation rate is 113 mm/h. Serum free T_4 is 3.0 ng/dL (38.6 pmol/L), and TSH is 0.04 µU/mL (0.04 mU/L). CT scan of the neck shows no evidence of abscess.

Which of the following is the most appropriate therapy at this time?

A Propylthiouracil 100 mg three times daily

B Radioiodine ablation therapy

C Thyroidectomy

D Systemic antibiotic therapy

E Prednisone 40 mg once daily

E

Les hyperthyroïdies

Etiologies les plus fréquentes

- Maladie de Basedow (= Graves' disease) 70%
- Autonomie fonctionnelle 20%
  - unifocale: adénome toxique
  - multifocale/disséminée: goitre nodulaire toxique ou autonome

Etiologies moins fréquentes

- Thyroïdites
  - thyroïdite subaiguë granulomateuse de Quervain
  - thyroïdite d'Hashimoto (phase initiale)
  - thyroïdite subaiguë lymphocytaire (post-partum, silencieuse)
  - post actinique
- Substance contenant de l'iode
  - médicaments (par ex. Amiodarone)
  - produits de contraste contenant de l'iode
  - produits désinfectants contenant de l'iode

Etiologies rares

- Adénome de l'hypophyse sécrétant du TSH
- Résistance hypophysaire aux hormones thyroïdiennes
- Hyperthyroïdie factice
- Transmise par l'hCG durant une grossesse

Hyperthyroïdie: causes

Augmentation de la synthèse hormonale

-Maladie de Basedow

-Causes rares :
dépendante de l'hCG, dépendante de la TSH
Goitre toxique familial non auto-immun

Nodule toxique

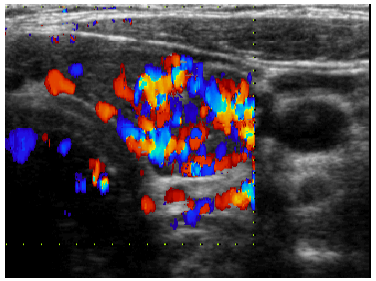
Goitre multinodulaire toxique

Hyperthyroïdie induite par l'iode

Destruction vésiculaire
Thyroïdite sub-aigue
Thyroïdite silencieuse
Thyroïdite Interféron ou amiodarone

Hyperthyroïdie: autres examens ?

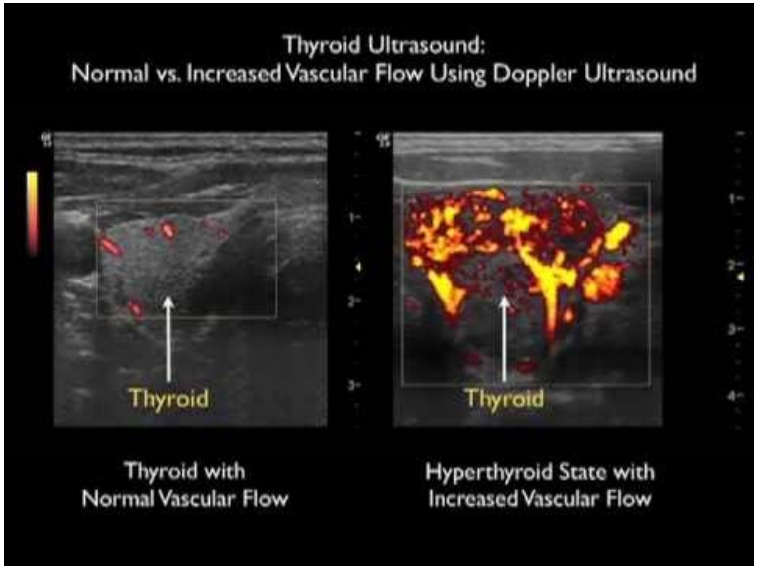
- Ultrason:



Hypervascularisation ++ ➔ Basedow

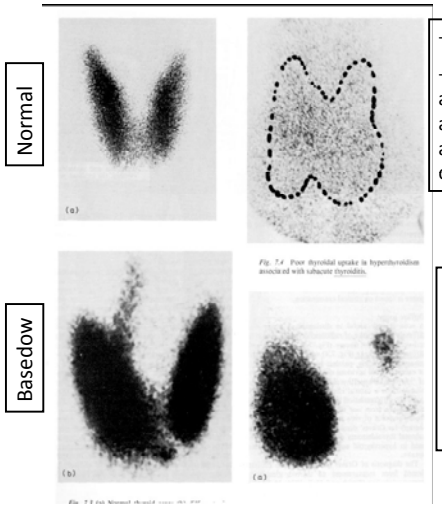
Nodule ➔ Fonctionnel ou pas ?

L'US est surtout utile dans les thyroïdes nodulaires, mais aide peu pour préciser l'étiologie de l'hyperthyroïdie



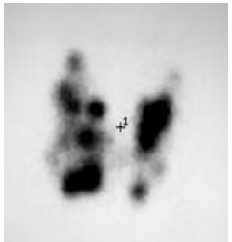
Hyperthyroïdie: autres examens ?

Scintigraphie (^{99}Tc, ^{123}I)

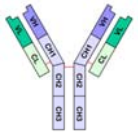


- Thyroïdites
- Surcharge iodée: attendre 2-3 mois après CT, 9-12 mois après l'arrêt d'amiodarone!

Adénome toxique



GMN ➔ US utile!



Maladie de Basedow

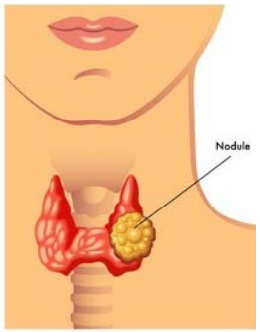
AC anti-rTSH (TRAb)

- Femmes/Hommes: 5/1
- Age moyen: 20-40 ans
- Association avec autres maladies auto-immunes
- Répercussion clinique importante, ophtalmopathie
- 40-50% de rémission après 12-18 mois d'ATS
- Alternatifs : Chirurgie – radio-iode

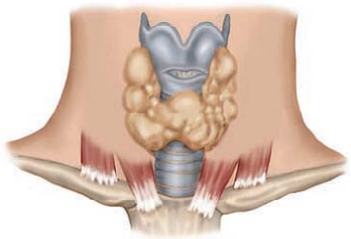
Ophtalmopathie dans la maladie de Basedow

Fig 2 Computed tomography images of orbits of A: normal eye; B: thyroid eye disease with exophthalmos and moderate enlargement of the medial and lateral recti muscles (arrows), the exophthalmos being due to fatty tissue expansion; C: thyroid eye disease with exophthalmos and severe enlargement of the recti muscles, particularly the medial recti (arrows)

Hyperthyroïdies fonctionnelles:

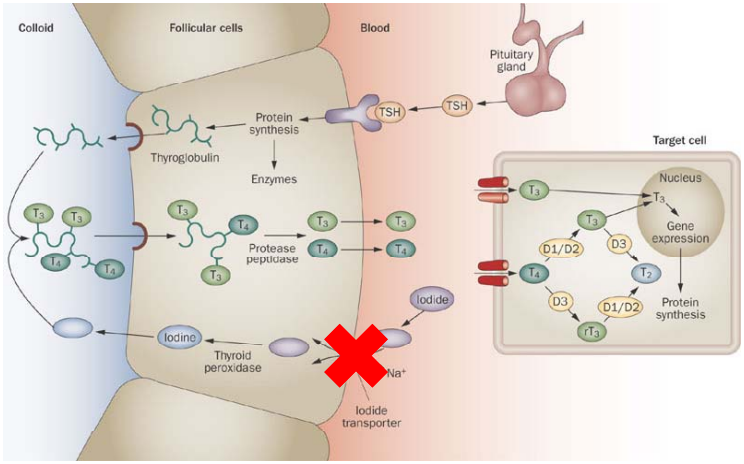


- Adénome toxique
- Goitre multinodulaire autonome
- !! Apport iode ➔ - scanner
  - amiodarone



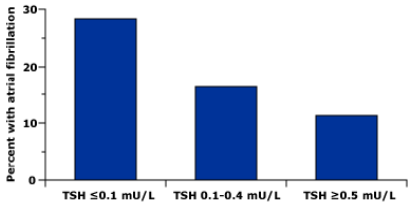
Si charge iodée:

- Ajouter KClO4 = perchlorate de potassium: 2x500 mg/j
- perchlorate de sodium 300mg 3x/j une jour avant et 7 à 14 jours après la charge iodée



Hyperthyroïdie: complications

1. *Risque de FA:*



2. *Risque d'ostéoporose:* surtout chez femmes ménopausées

Hyperthyroïdie: traitements

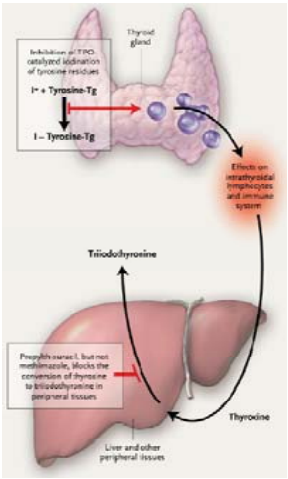
1. *Inhibiteurs synthèse hormonale:*
   - carbimazole (Néo-Mercazole®): débuter à 20-30 mg/j
   - PTU (Propycil®): débuter à 200-300 mg/j

° Rapidement efficaces

° Après introduction:
   - contrôle T4l après 2-3 semaines
   - nb: TSH reste bloquée plus longtemps

° Rare risque (<0.5%) d'agranulocytose

➔ faire une FSC en urgence en cas de fièvre, angine, …



Hyperthyroïdie: traitements

2. Chirurgie:

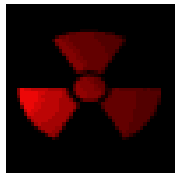
° Thyroïdectomie totale:

- Basedow récidivant ou persistant > 1-2 ans
- GMN autonome

° Lobectomie:

- Adénome toxique

3. Iode radio-actif (^{131}I):



- Basedow récidivant ou persistant > 1-2 ans
(si pas d'ophtalmopathie sévère = CI)
- GMN autonome
- Adénome toxique

nb: hospitalisation en chambre fermée 1 semaine !

A 24-year-old woman is evaluated for a 1-week history of neck discomfort that radiates to the jaw, palpitations, a fast heart rate, anxiety, and fever. The patient reports having a sore throat 4 weeks ago that resolved after a few days. She has no other symptoms and no personal history of thyroid or endocrine disorders. Her only medication is an oral contraceptive.

Physical examination shows an anxious-appearing woman. Temperature is 37.5 °C (99.5 °F), blood pressure is 140/60 mm Hg, pulse rate is 110/min, and respiration rate is 16/min; BMI is 23. Cardiopulmonary examination reveals tachycardia, but other findings are normal. The thyroid gland is slightly enlarged and tender with no nodules. No thyroid bruit is heard, and no cervical lymphadenopathy is palpated. No eye findings or pretibial myxedema is noted. The patient has a fine bilateral hand tremor.

Laboratory studies:	
Erythrocyte sedimentation rate	45 mm/h
Thyroid-stimulating hormone	<0.01 µU/mL (0.01 mU/L)
Thyroxine (T_4), free	4.1 ng/dL (53 pmol/L)
Triiodothyronine (T_3)	300 ng/dL (4.6 nmol/L)

A Doppler thyroid ultrasound shows an enlarged thyroid gland with heterogeneous echotexture without cervical lymphadenopathy; no significant vascular flow is evident.

A: Bilateral fine needle aspiration
B: Methimazole
C: Serum Tg measurement
D: 24h radio-iodine uptake test

A 28-year-old woman is reevaluated for worsening eye symptoms. The patient has a 6-month history of Graves disease. Methimazole was initiated but then discontinued when the patient became neutropenic (absolute neutrophil count, 500/µL [0.5 × 10^9/L]). Although treatment with methimazole abated her symptoms of thyrotoxicosis and normalized results of her thyroid function tests, her eye symptoms have progressed to severe discomfort (burning and itching) in both eyes and diplopia when she looks upward and laterally.

On physical examination, temperature is 37.2 °C (99.0 °F), blood pressure is 130/70 mm Hg, pulse rate is 90/min, and respiration rate is 16/min; BMI is 23. Examination of the thyroid gland shows an enlarged smooth gland without nodules. Examination of the eyes shows significant bilateral chemosis and erythema. Bilateral moderate proptosis and right lid and globe lag are noted. Visual acuity is normal.

Laboratory studies:	
Thyroid-stimulating hormone	<0.01 µU/mL (0.01 mU/L)
Thyroxine (T_4), free	2.4 ng/dL (31 pmol/L)
Triiodothyronine (T_3)	230 ng/dL (3.5 nmol/L)
Thyroid-stimulating immunoglobins	340% (normal, <110%)

An MRI of the orbits shows bilateral proptosis and increased size of the extraocular muscles, especially the right inferior rectus muscle. Increased retro-orbital fat is seen, and the optic nerves appear normal

MKSAP 16
Item 8

Which of the following is the most appropriate treatment for this patient's hyperthyroidism?

A: Oral iodine solution
B: PTU
C: radioactive iodine thérapie
D: Thyroidectomie.

D

A 27-year-old woman is evaluated for palpitations and heat intolerance that develop 3 months after a successful pregnancy. She is breastfeeding. The patient's older sister has Graves' disease, but the patient herself has no history of thyroid disease.

On physical examination, the blood pressure is 128/70 mm Hg, and the pulse rate is 104/min. Eye examination reveals stare and lid lag, but no proptosis. The thyroid gland is moderately enlarged and nontender. She has moist palms and brisk deep tendon reflexes. Serum free T_4 is 2.7 ng/dL (34.2 pmol/L), free T_3 46.22 ng/dL (7.1 pmol/L), and thyroid-stimulating hormone (TSH) is undetectable.

Which one of the following is the most appropriate next step in this patient's management?

A Serum anti-thyroid peroxidase antibodies

B Serum thyroglobulin level

C Serum TSH-r immunoglobulins (TRAB)

D An empiric trial of antithyroid drugs

E Radioiodine (I-131) uptake and thyroid scan

C

A 55-year-old man is evaluated for anxiety, heat intolerance, and weight loss (2.3 kg [5 lb]) over the past 6 weeks. The patient also reports decreased visual acuity. He has no neck discomfort. He takes no medication.

Physical examination reveals a nervous man. Blood pressure is 150/70 mm Hg, pulse rate is 110/min and regular, and respiration rate is 16/min; BMI is 27. Other than tachycardia, the cardiopulmonary examination is unremarkable. Eye examination findings are normal. The thyroid gland is enlarged, smooth, and without bruits or nodules. The skin is warm. A bilateral hand tremor is noted. No pretibial myxedema is seen.

Laboratory studies:

Thyroid-stimulating hormone	1.5 µU/mL (0.5 mU/L)
Thyroxine (T_4), free	2.4 ng/dL (31 pmol/L)
Triiodothyronine (T_3)	220 ng/dL (3.4 nmol/L)
Thyroid-stimulating hormone receptor and thyroid peroxidase antibodies	Negative

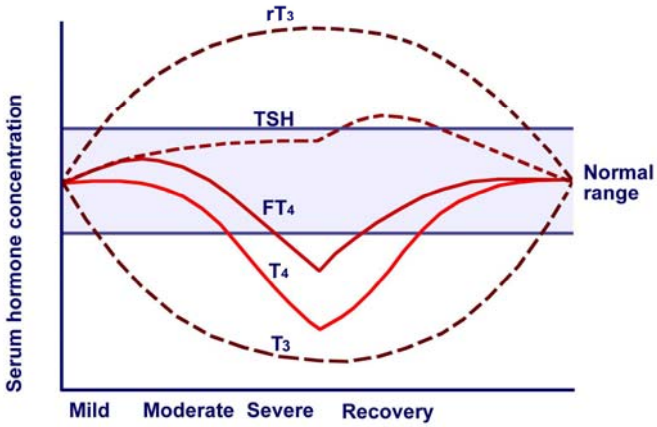
Radioactive iodine (^{123}I) uptake by the thyroid gland at 24 hours is 55% (normal, 10%-30%). A thyroid scan shows homogenous distribution.

Which of the following is the most appropriate next step in management?

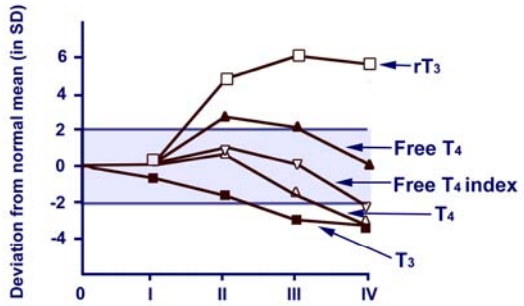
- A Methimazole
- B Pituitary MRI
- C Propylthiouracil
- D Radioactive iodine therapy
- E Thyroidectomy

B

Euthyroid Sick Syndrome



Euthyroid Sick Syndrome

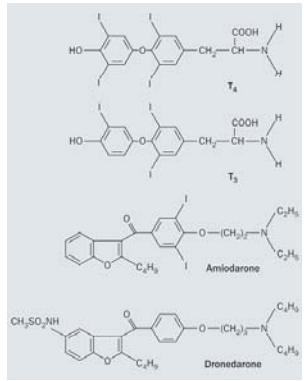


Number of patients	249	120	95	40
Mortality	0.8%	8%	22%	30%
Hospital days	12	15	19	29

Severity of illness mild → moderate → severe

Pas de traitement, contrôle TSH à distance

Amiodarone



Caractéristiques:

Très riche en iode 37.5% de son poids

Demi-vie de 50 jours (élimination de la surcharge iodée très longue)

Très grand volume de distribution (graisses)

⬇ conversion de T4 en T3

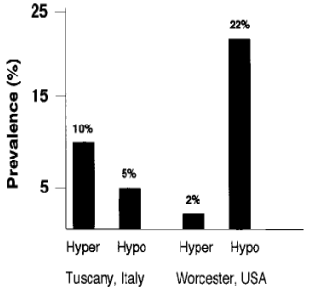
➔ TSH normale, T4 normale haute, T3 normale basse

Risque combiné d'hyperT ou d'hypoT ➔ 15-20%

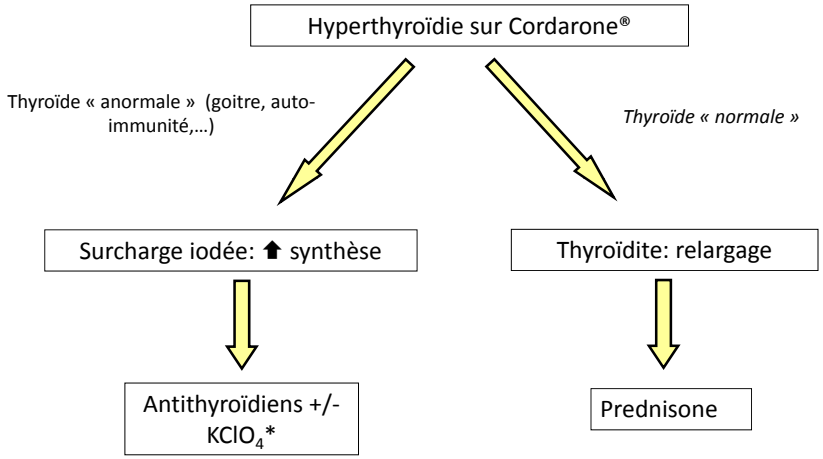
(nb: même après arrêt !)

En CH ➔ ~ 10% d'hyperT

~ 10% d'hypoT



Amiodarone



* KClO4 = perchlorate de potassium: 2x500 mg/j max 6 semaines

A 65-year-old man with refractory atrial fibrillation begins therapy with amiodarone. Baseline thyroid hormone levels are normal. One month later, the patient is asymptomatic but has the following laboratory findings: total T_4, 13.4 µg/dL (172.46 nmol/L); free T_4, 2.7 ng/dL (34.2 pmol/L); free T_3, 11.72 ng/dL (1.8 nmol/L); TSH, 3.9 µU/mL (3.9 mU/L).

Which of the following is the most likely explanation for these findings?

A Amiodarone-induced thyroiditis

B Iodine-induced hyperthyroidism

C Expected changes in euthyroid patients taking amiodarone

D Spurious laboratory results caused by amiodarone

E Euthyroid sick syndrome

C