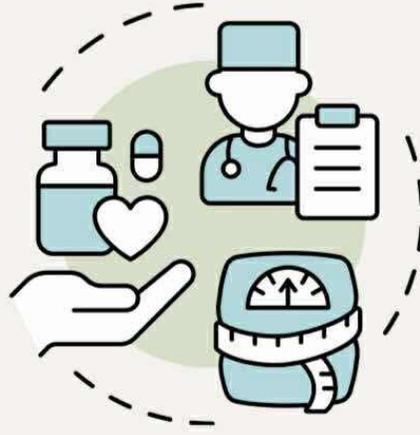


تفريغ كلىنكال



THYROID FUNCTION

المحاضرة: TESTS

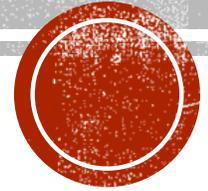
الصيدلاني/ة: ياسمين خليل



لجان الرفعات

آخر تشابتر فاينل 🙏 الحمد لله رب العالمين
سهل ما تعلقوا

OTHER COMMON TESTS



اللهم اغفر لأبيهم وارحمهم وعافه وأعف عنه واجمعه وأهله والمسلمين في الجنة يارب العالمين

بسم الله الرحمن الرحيم

T_3 : 3 ذرات يود (active form) T_4 : 4 ذرات يود (يتحول إلى T_3)

THYROID FUNCTION TESTS

يبدا أفعالها من الدماغ Hypothal

تشرحها على الصورة

Once released from the thyroid gland, thyroid hormone circulates in the bloodstream where free T_4 and T_3 are available to travel across the cell membrane. In the cytoplasm, T_4 is deiodinated into T_3 , the active form of thyroid hormone. T_3 combines with its nuclear receptor on thyroid hormone-responsive genes, leading to production of messenger RNA that, in turn, leads to production of proteins that influence metabolism and development.

Effects include tissue growth, brain maturation, increased heat production, increased oxygen consumption, and an increased number of β -adrenergic receptors.

Clinically, individuals who have excess thyroid hormone (**thyrotoxicosis**) will have symptoms of increased metabolism such as tachycardia and tremor, while individuals with **hypothyroidism** note symptoms of lowered metabolism like edema and constipation

cause the increase of β adrenergic receptor activation
 كانه حاد النقص دائما عندة عندة الخسوس ودرارة
 ضيق ودائما يخسر وزنه ودرارة
 جسمه عاليه وعضب ودهن flight/flight

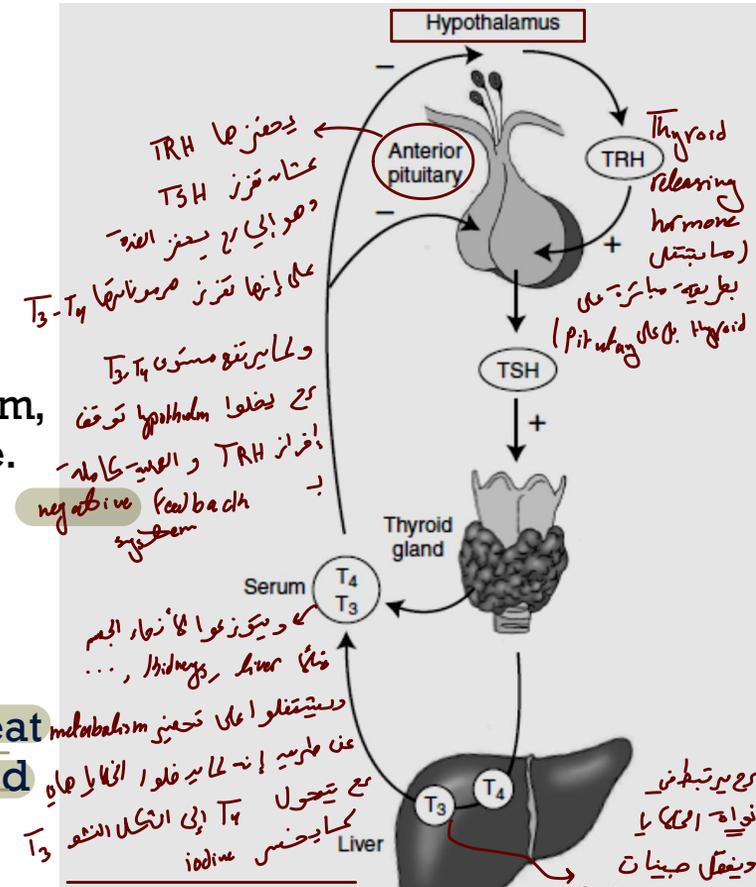


FIGURE 22-3. Hypothalamic-pituitary-thyroid axis. Thyrotropin-releasing hormone (TRH) stimulates the production and release of thyrotropin (TSH). TSH stimulates the thyroid gland to synthesize and secrete thyroid hormone. T_4 that is released by the thyroid gland is mostly converted to T_3 by the liver and kidney. T_3 and T_4 feedback inhibit TSH release directly through action at the pituitary and indirectly by decreasing TRH release from the hypothalamus. (Adapted with permission from Surks MI, Sievert R. Drugs and thyroid function. N Engl J Med 1995;333:1688.)

له علاقة $T_4 + T_3$ عكسية مع TSH
 = negative feedback system

عكس الشفط إلى لا تغزر رصاصي الهرمونات بجلاء - يكونه صقل و *rest/digest* و *metabolism* يكونه عند *bradycardia* ، و زبارة ، تقا و يحس و صرع لأنه مان *metabolism*

THYROID FUNCTION TESTS

اللهم بلغنا رمضان
 واجعلنا فيه من العتقاء

Thyroid function tests:

1. **TSH** marker لتقييم على Thyroid hormone ؛ كونه ليشي سرعة كاي تغل في عية $T_4 + T_3$ و كونه علاقة عكسية مع $T_4 + T_3$ ، و تقدر عيز من فلال مستوى TSH ؛ إذا كانه المنقص
 error في Thyroid نفسها
 مشكلة تو تحوز Thyroid
 Primary or secondary

والمسلمين

- The most useful test for assessing thyroid function is the **TSH**.
- All the assays are capable of diagnosing **primary hypothyroidism** by low thyroid hormone production and elevated levels of TSH.
- **Second-generation TSH immunometric assays**, with detection limits of **0.1 mU/L**, can effectively screen for **hyperthyroidism**, but **third-generation TSH chemiluminometric assays**, with detection limits of **0.01 mU/L**, are less likely to give false-negative results and can more accurately distinguish between **euthyroidism** and **hyperthyroidism**.

• بما انه الصغور في الفة بين primary و euthyroid و ما انه الفة
 في تغزر $T_4 + T_3$ في نتوقع مستواهم قليل في أكبر TSH شو؟ عاي مستواه و
 Primary Hypoer في يكونه المنقص ← قياسي النشاط المناعي ①
 m unit/L للتفسير من كمية الهرمونات بتقييم بالوحدة unit
 ② biological activity
 العظيمة الطبيعية للفة
 قياسي الإشعاعي البيكيميائي أده لأنه الحدتها هو 0.01 mU/L =
 الو منح إلى عية نشاط غير طبيعي
 في نادرًا ما يكونه في فلال في المنقص more sensitive + accurate



TSH

- Second- and third-generation TSH assays are routinely used to monitor and adjust thyroid hormone replacement therapy as well as screen for both hyperthyroidism and hypothyroidism.

دعمت من الحالات التي تستخدم فيها جدول الفحوصات لـ TSH هي عند الناس إلى يكون عندها داء في الغدة ويستأهلها ف يكون اياً فذا علاج بدلي

Hyroxime من مصدر فارسي

تدل $T_4 + T_3$ فاشفي الريبنج تبصهم من فعال جدول الفحصين ونشون إذا البرية منيرة أو لازم فعدها

- The sensitivity of the third-generation TSH assays has led to the ability to detect subclinical disease-or a mild degree of thyroid dysfunction-due to the large reciprocal change in TSH levels seen for even small changes in free T4.

في بداية أمر هذا الغدة ممكن يكون T_4 مرتفع شوي و T_3 طبيعي !! أو مستوى TSH برهفو طبيعي

T_4 نازل شوي! اسم صافي الحالة subclinical disease

- In subclinical hypothyroidism, the TSH is minimally increased while the free T4 stays within the normal range. Likewise, in subclinical hyperthyroidism, the TSH is suppressed while the free T4 is normal.

د نفس العتمة لما يبره TSH هو نازل
أو مرتفع شوي و T_4 مستواه طبيعي



② T3 AND T4

والسودان والمسلمين في كل مكان

① هائي زياره على TSH

- Serum total T4 and T3 levels are usually measured by radioimmunoassay (RIA), chemiluminometric assay, or similar immunometric technique. Because more than 99.9% of thyroid hormone is protein bound, alteration in thyroid hormone-binding proteins, unrelated to thyroid disease, frequently lead to total T4 and T3 levels outside of the normal range.
- Because of this, assays have been developed to measure free T4 and T3, the biologically active forms of thyroid hormone
- Currently available assay kits for measuring free T4 levels are not error proof, though, and can still be affected by some binding protein abnormalities. When this is suspected, measurement of free T4 levels is performed by dialysis.

حتى شرط فال غرو صموى T3 + T4 يحكى - المثال في الغدة نفسها، بل بارتباطهم في البروتينات (يرتبطوا بالبروتينات غير ينتقلوا في الدم للدم)

هدول ابي يعطوني تاني في الجسم من المرتبطين مع بروتينات الدم

بعضها ليس من الاضطرار

لذا امكننا شاكين في الحسرات من الطبيعية لـ T3 + T4 والتعدي ما عندنا عملنا ولا عندنا مشاعل في الغدة، في نقيضه عينات تعلقنا في بيها وفي T3 و T4 لمامهم عن البروتينات في ربح قدر نقيس كقيمتهم بالهنا



داعضن البروتينات المستعملة للتنقيح

على الغدة الدرقية - Thyroid gland

THYROGLOBULIN

فقط يتم إنتاجه من مهاد وراثي محياه في الجسم فالو لقيته في الدم صادي ل على وجود غدة thyroid في الدم. يرمز في ل على ورم سوارعيه او خبيثه غانا نانا الله

- Thyroglobulin is a protein synthesized and secreted exclusively by **thyroid follicular cells**. Its presences in the circulation is proof of the **presence of thyroid tissue**, either benign or malignant so its used as a **tumor marker for thyroid cancer patients**. Patients with well-differentiated thyroid cancer who have been treated successfully with surgery and radioactive iodine ablation should have **undetectable thyroglobulin levels**.
 بعد علاج الورم بترجمه شبيهه طبيعيه -> في الدم (انه تكونه شبعه من موجوده)
- Thyroglobulin is currently measured by **double antibody RIA, enzyme-linked immunoassay (ELISA), immunoradiometric assay (IRMA), and immunochemiluminescent assay (ICMA) methods**.
 (a) (b)
 هي اقسام صناعه يعززها الجسم لمحاربة كحبات (c)
 في الدم (d)
 في وجودها في المضادان
 في الدم و صيغته بي
 انضعت لنتائجها في ذرع على الوارثه
 عن طريقه
- The accuracy of the thyroglobulin assay is primarily dependent on the **specificity of the antibody used and the absence of antithyroglobulin autoantibodies**. Even with modern assays, **antithyroglobulin autoantibodies interfere with measurements and lead to unreliable thyroglobulin results**. **Approximately 25% of patients with well-differentiated thyroid cancer will have antithyroglobulin autoantibodies. This is approximately twice as high as in the general population**.
 كس مرضه شخصاهم بورم صناعه لهوره Thyroglobulin يكونه عارضين اظه من ظهور الاجسام المضاده الا كتيها الصغف الناس في الحددين
 طبيعي -> في الدم (دفعه من)
- If a patient with well-differentiated **thyroid cancer and antithyroglobulin autoantibodies** has been **successfully treated with surgery and radioactive iodine ablation, autoantibodies should disappear over time**
 بعد علاج الورم دوما انه اضعت النتائج لهوره Thyroglobulin في صارع يكونه في سبب يظلي الاجسام المضاده في الدم خارج كصغف



مستقبلات مناعية تؤدي إلى تحفيز الـ receptor تبع لسلاح thyroid أو نهجم وتكسر المستقبل مما

في تؤدي إلى Hyperthyroidism أو Hypo

Graves' Disease:

إنتاج الجسم أرقام زيادة تنشط TSH receptor على

لسلاح thyroid ولكن بهر قليل وتخفض مما

المستقبل يدل تنشطه في تستقبل كأنها TSH

في تبه أوالدة، انما ازعجان كثير T_4, T_3 ← Hyperthyroidism

AUTOIMMUNE ANTIBODIES



← يتكونه من نهم طالعة ليرة كثير

- The most common cause of hyperthyroidism is an autoimmune disorder called
- ① **Graves' disease:** The antibody in this condition is directed at the **TSH receptor** and stimulates the receptor, leading to growth of the thyroid gland and production of excessive amounts of thyroid hormone. This condition can be diagnosed with tests that detect antibodies to the TSH receptor.

← يغير جهايات تكونه قادره تنجح
صاار الحكم الهمائل من $T_4 + T_3$
- Thyroid stimulating antibodies (TSAb) use a bioassay to determine presence of autoimmune hyperthyroidism. Tests for **TSH receptor antibodies** (TSHR-Ab) can detect antibodies directed against the TSH receptor whether they act to stimulate or block the TSH receptor. Both stimulating and blocking antibody assays will be positive in 70-100% of patients with Graves' disease.

هاي الطريقة تعتمد على قياس الـ ارقام المعادة التي تنشط TSH receptor إذ اكلت... stimulated و... inhibited !
diagnosis تتابع لسلاح thyroid وفلا لها في مثال إنتاج $T_4 + T_3$ (فلا مناعي)
- ② **Chronic lymphocytic thyroiditis (Hashimoto's thyroiditis):** is the most common cause of hypothyroidism in the developed world. In this condition, antibodies lead to decreased thyroid hormone production by the thyroid gland. The best test for this condition is the **thyroid peroxidase (TPO) antibody**, which is present in 10-15% of the general population and 80-99% of patients with autoimmune hypothyroidism

marker
 انزيم تتخذه الغدة - ينتج هرموناتها فنخذه كـ
 لعنا لنتها على انتاجها الهرمونات

في هاتين الاجسام عنانه في هائل مناهي
 مع سهاجم هاد الانزيم وتقلل انتاج الغدة
 لهرموناتها .

THYROID TESTS INTERPRETATION

العلاقة عكسية بين T_4 و TSH كاستجابة
 ديس بالمنه كما يكون TSH قليل صاوح رخص الغدة تتبع T_4 كثير في ينزل مستواهم
 Secondary Hypo thyroidism

TABLE 22-1 INTERPRETATION OF THYROID TESTS

	LOW FREE T_4	NORMAL FREE T_4	HIGH FREE T_4
Low TSH	Secondary hypothyroidism Severe nonthyroidal illness	Subclinical hyperthyroidism Nonthyroidal illness	Hyperthyroidism
Normal TSH	Secondary hypothyroidism Severe nonthyroidal illness	Normal	Artifact Pituitary hyperthyroidism Laboratory draw within 6 hours of thyroxine dose
High TSH	Primary hypothyroidism	Subclinical hypothyroidism	Test artifact Pituitary hyperthyroidism Thyroid hormone resistance

المستطلة في الاستجابة من الـ انتاج في receptors
 في يزيه الشغل و انتاج TSH و T_4



OTHER TOOLS FOR THYROID EVALUATION

استخدامه من Thyroid على صيغة مستوية T_4 , T_3 ، فان استخدمها في اى اهمية لتقييم وظائف الغدة

- **Nuclear Medicine Evaluation:** Radioactive iodine ¹³¹ is useful in assessing the metabolic activity of thyroid tissue and assisting in the evaluation and treatment of thyroid cancer. Radioactive iodine can also be useful in the evaluation of thyroid nodules in the presence of a low or undetectable TSH.

دواء ، إذ احاد عليه Benign فالغدة سرخ غدهن ايو دنجلا كبير
Malignant خبيث فامرغ ندر تختمه

- **Thyroid Ultrasound:** used to assess thyroid anatomy and characterization of palpable thyroid abnormalities

بنشوف الغدة ، اذا فيها انتظامان
أورامه هيلك من الشكل

خزينة (الخنز صيا دقة) .

- **Fine-Needle Aspiration (FNA)** biopsy is often the first step and most accurate tool in the evaluation of thyroid nodules, which allows prompt identification and treatment of thyroid malignancies and avoids unnecessary surgery in most individuals with benign thyroid lesions.

خلالها الخنزية تحدد الخصائص شغالة غيره ، ضيئة ، به علية ...



TUMOR MARKERS

های ار bio markers با ما بگویم، إنتاج الورم ذاته او إنه الورم حفز خلايا ثانية أنتجهم و إنتاج مواد ثانية.

- Cancer can be detected and monitored using biologic **tumor markers**, that are produced either directly by the tumor or as an effect of the tumor on healthy tissue.

- They can be used for **Screening, Diagnosis, and to test the effectiveness of the treatment**

روح يكونه من تقني حالات سرطان مثل سرطان البروستاتا، GI، breast

- ① **Carcinoembryonic antigen (CEA)** is the most widely used tumor marker for colorectal cancer and is also frequently elevated in lung, breast, and gastrointestinal tumors. CEA can be used to aid in the diagnosis, prognosis, and therapy monitoring of colorectal cancer but not screening

بسن لا يقبل sensitive

لاني

استخدمه

screening

②

- **Human Chorionic Gonadotropin (hCG)** is elevated in trophoblastic tumors, choriocarcinoma, and germ cell tumors of the ovary and testis.



TUMOR MARKERS

screening + monitoring

- (3) ■ **Prostate Specific Antigen (PSA):** detection of total PSA has been used in screening for and in monitoring of prostate cancer, evidence for the usefulness in detecting free PSA as a fraction of total has been identified. Patients with malignancy have a lower percentage of free PSA *سرطان خبيث 21 تكونه نسبة جاد marker قليلة*
- (4) ■ **α-Fetoprotein (AFP):** is an abundant serum protein normally synthesized by the fetal liver that is reexpressed in certain types of tumors. AFP is often elevated in patients with hepatocellular carcinoma (HCC) and germ cell tumors *ينتج من كبد حديثي الولادة - بين لو مار سرطانة صلبة تنجم عن تشخيص نسيتهم كما يجب*
- (5) ■ **Cancer Antigen 125 (CA-125):** It may be useful for detecting ovarian tumors at an early stage and for monitoring treatments without surgical restaging.



Tumor Markers – Comparison Table

Tumor Marker	Source / Nature	Associated Cancers	Clinical Uses	Important Notes
CEA (Carcinoembryonic Antigen)	Glycoprotein normally expressed in fetal tissue	Colorectal cancer, lung, breast, gastrointestinal tumors	Diagnosis, prognosis, monitoring therapy	Not useful for screening
hCG (Human Chorionic Gonadotropin)	Hormone	Trophoblastic tumors, choriocarcinoma, germ cell tumors of ovary and testis	Diagnosis and monitoring	Normally elevated in pregnancy
PSA (Prostate Specific Antigen)	Serine protease produced by prostate epithelial cells	Prostate cancer	Screening, diagnosis, monitoring	Malignancy shows lower percentage of free PSA
AFP (Alpha-Fetoprotein)	Serum protein synthesized by fetal liver	Hepatocellular carcinoma (HCC), germ cell tumors	Diagnosis and monitoring	Re-expressed in certain tumors
CA-125 (Cancer Antigen 125)	Glycoprotein	Ovarian cancer	Early detection and monitoring treatment	Useful without surgical restaging

اللّٰهُ يَرْفَعِي عَنْكُمْ اَدْرَسُوا هَادِ الْجَدُولَ بِهِ مَا تَخَلَّصُوا *biomarkers* اِلَيْهِ فَوْقَهُ

عَمَّا تَعْرِضُونَ اِذَا فَنِيَ اَوْ ضَلَّ اَوْ كَا

سَاوَاتِرَ اَنْتُمْ هَادِ السَّبَبِ 🤔

TABLE 31-4 ENDOCRINE TUMOR MARKERS

TUMOR MARKER	TUMOR TYPE	METHOD	SPECIMEN	CLINICAL UTILITY
Homovanillic acid (HVA)	Neuroblastoma, pheochromocytoma, paraganglionoma	HPLC	24-hr urine	Diagnosis of neuroblastoma ^a
Vanillylmandelic acid (VMA)	Pheochromocytoma, paraganglionoma, neuroblastoma	HPLC	24-hr urine	Diagnosis of neuroblastoma ^a
Metanephrines (fractionated) ^b	Pheochromocytoma, paraganglionoma, neuroblastoma	HPLC	24-hr urine or plasma	Screening and diagnosis of pheochromocytoma ^c
Catecholamines (fractionated) ^{b,d}	Pheochromocytoma, paraganglionoma, neuroblastoma	HPLC, LC-MS/MS	24-hr urine	Screening and diagnosis of pheochromocytoma, paraganglionoma, neuroblastoma ^c
Hydroxyindoleacetic acid (5-HIAA)	Carcinoid tumors	HPLC	24-hr urine	Diagnosis of carcinoid tumors ^e
Serotonin	Carcinoid tumors	HPLC	Serum	Diagnosis of carcinoid tumors ^e
Calcitonin	MTC and neuroendocrine tumors	IA	Serum	Screening, ^f response to therapy, and monitoring recurrence of MTC
Parathyroid hormone (PTH)	Pituitary adenoma	IA	Serum	Diagnosis and postsurgical monitoring of 1' hyperparathyroidism
Growth hormone (GH)	Pituitary adenoma, ectopic GH-secreting tumorsurgical	IA	Serum	Diagnosis and post monitoring of acromegaly
Prolactin (PRL)	Pituitary adenoma	IA	Serum	Diagnosis and postsurgical monitoring of prolactinoma
Adrenocorticotrophic hormone (ACTH)	Pituitary adenoma, ectopic ACTH-producing tumor	IA	Serum	Diagnosis of ectopic ACTH-producing tumor
Cortisol	Adrenal tumors	IA	Serum or urine	Diagnosis of Cushing's syndrome, adrenal adenoma
Antidiuretic hormone (ADH)	Posterior pituitary tumors	IA	Serum	Diagnosis of SIADH
Chromogranin A	Pheochromocytoma, neuroblastoma, carcinoid tumors, small cell lung cancers	ELISA, RIA	Serum	Aid in diagnosis of carcinoid tumors, pheochromocytomas, and neuroblastomas
C-peptide	Insulin-secreting tumors	ELISA, IA	Serum	Diagnosis of insulinoma

