Diagnostic approach to and treatment of thyroid nodules

Presentor: Sabra Rostamkhani

Professor: Dr. Davari

Introduction:

- Thyroid nodules are **discovered** by the patient, during routine physical examination, or incidentally noted during a radiologic procedure, such as carotid US, neck or chest CT, MRI or PET scanning.
- **Importance**: the need to exclude thyroid cancer
- Groups with **higher prevalence of cancer** include children, adults less than 30 y/o, history of head and neck irradiation, family history of thyroid cancer.

Evaluation

- The initial evaluation in all patients with a thyroid nodule includes:

✓History and physical examination

✓Measurement of serum TSH

✓Ultrasound to confirm the presence of nodularity, assess sonographic features and assess for the presence of additional nodule and lymphadenopathy.

History and physical examination:

- Have a low accuracy for predicting cancer.
- Features of the history that suggest malignancy: rapid growth of a neck mass, childhood head and neck irradiation, family history of thyroid cancer, thyroid cancer syndromes such as MEN2, FAP, or Cowden syndrome.
- PH/E: a fixed hard mass, obstructive symptoms, cervical lymphadenopathy, or vocal cord paralysis all suggest the possibility of cancer.

Serum TSH:

- Thyroid function should be assessed in all patients with thyroid nodules.
- Serum TSH is an independent risk factor for predicting malignancy in a thyroid nodule.
- Studies have shown that when cancer was diagnosed, a higher TSH was associated with a more advanced stage of cancer

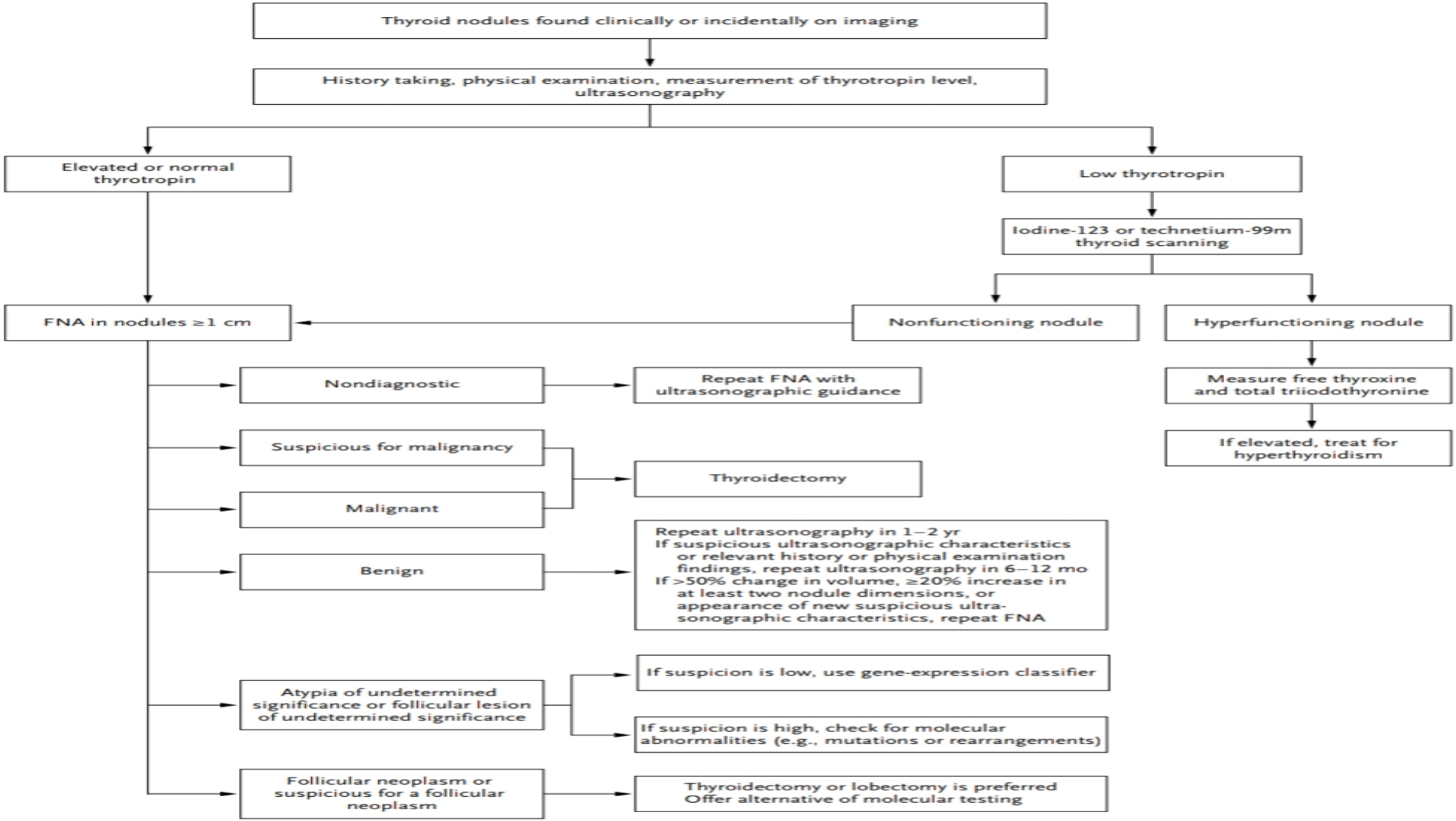
thyroid ultrasonogrphy:

- thyroid ultrasound should be performed in all thyroid nodules, either palpable or incidentally found on other imaging studies.

✓provides more informaton than PH/E, about the size and anatomy of the thyroid gland and adjacent structures in the neck.

✓Ultrasound can identify posteriorly located nodules or predominantly cystic nodules.

✓ultrasound findings can be used to select nodules for FNA biopsy.


Thyroid nodules found clinically or incidentally on imaging
History taking, physical examination, measurement of thyrotropin level, ultrasonography
Elevated or normal thyrotropin
Low thyrotropin
Iodine-123 or technetium-99m thyroid scanning
Nonfunctioning nodule
Hyperfunctioning nodule
FNA in nodules ≥1 cm
Measure free thyroxine and total triiodothyronine
If elevated, treat for hyperthyroidism
Nondiagnostic
Repeat FNA with ultrasonographic guidance
Suspicious for malignancy
Malignant
Thyroidectomy
Benign
Repeat ultrasonography in 1–2 yr
If suspicious ultrasonographic characteristics or relevant history or physical examination findings, repeat ultrasonography in 6–12 mo
If >50% change in volume, ≥20% increase in at least two nodule dimensions, or appearance of new suspicious ultrasonographic characteristics, repeat FNA
Atypia of undetermined significance or follicular lesion of undetermined significance
If suspicion is low, use gene-expression classifier
If suspicion is high, check for molecular abnormalities (e.g., mutations or rearrangements)
Follicular neoplasm or suspicious for a follicular neoplasm
Thyroidectomy or lobectomy is preferred
Offer alternative of molecular testing

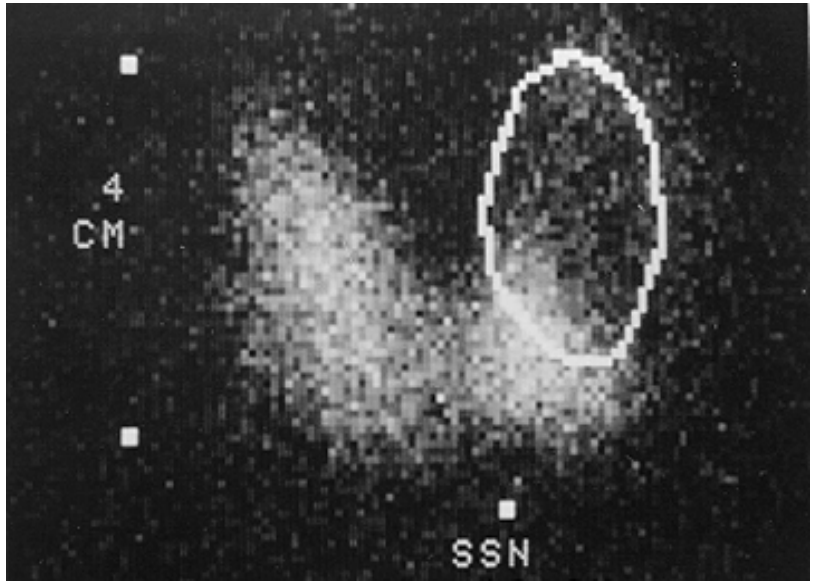
low TSH:

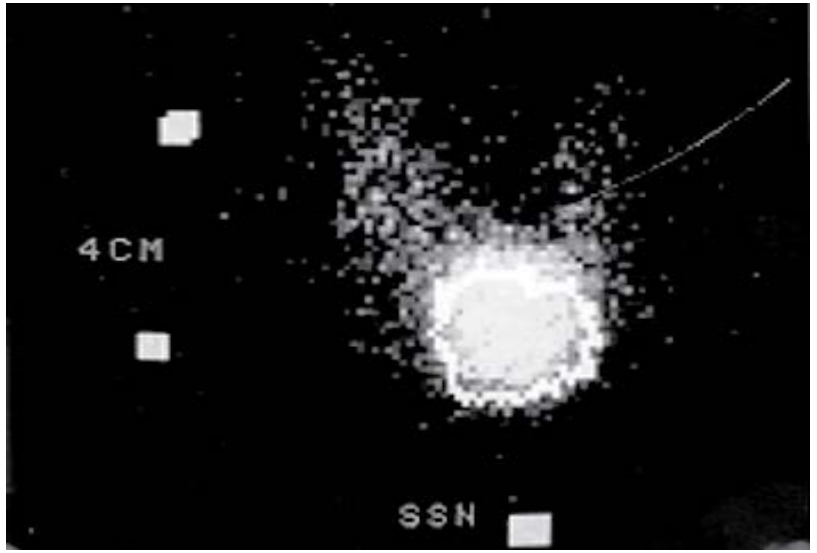
- The possibility that the nodule is hyperfunctioning is increased and thyroid scintigraphy should be performed next.
- Patients with TSH below the normal range also require an evaluation for hyperthyroidism.

Thyroid scintigraphy:

- Thyroid scintigraphy is used to determine the functional status of a nodule.
- thyroid scintigraphy may be useful in patients with multiple thyroid nodules to select those that are hypofunctional and therefore may require FNA.
- Although thyroid scintigraphy can be used to select nodules for FNA, it cannot be used to select patients for surgical resection.
- Radionuclide scanning is contraindicated during pregnancy. If a women is breastfeeding, breastfeeding should be held if a radionuclide scan is obtained.

- ✓ **Nonfunctioning** nodules appear cold (uptake less than surrounding thyroid tissue), and they may require further evaluation by FNA.
- ✓ **Autonomous** nodules may appear hot (uptake is greater than surrounding thyroid tissue) if they are hyperfunctioning. Autonomous nodules that do not make sufficient thyroid hormone to suppress serum TSH concentrations will appear indeterminate on thyroid scintigraphy. Since hyperfunctioning nodules rarely are cancer, a nodule that is hyperfunctioning on radioiodine imaging does not require FNA.





TSH norma or high:

- If the serum TSH is normal or elevated and the nodule meets sonographic criteria for sampling , the next step in the evaluation of a thyroid nodule is a palpation or ultrasound-guided FNA biopsy.
- Nodules that do not meet sonographic criteria for FNA should be monitored.

Sonographic criteria for FNA:

- FNA should be performed in any nodule **(regardless of size)** with the following suspicious sonographic features:

✓ Subcapsular locations adjacent to the recurrent laryngeal nerve or trachea

✓ Extrathyroidal extension

✓ Extrusion through rim calcifications

✓ Associated with sonographically abnormal cervical lymph nodes

Sonographic criteria for FNA:

- FNA should be performed in **nodules ≥1 cm** (as determined by largest dimension) if they are solid and hypoechoic with one or more of these suspicious sonographic features:

✓Irregular margins

✓ Microcalcifications

✓ Taller than wide shape

✓Rim calcifications with extrusion of soft tissue

- FNA can be considered in selected patients with nodules <1 cm if there is a strong FHof thyroid cancer, known syndromes associated with thyroid cancer, young age, a history of therapeutic childhood head and neck or whole body radiation, or preference for FNA over observation. However, most patients with suspicious subcentimeter nodules can be observed.
- Spongiform nodules, defined as an aggregation of multiple microcystic components in more than 50 percent of the nodule volume, may not require FNA regardless of size

Monitoring of nodules that do not meet FNA criteria:

- Nodules that do not meet sonographic criteria for FNA should be monitored. The **frequency of evaluation** depends upon the sonographic features of the nodules:

✓ 6 to 12 months for subcentimeter nodules with suspicious characteristics

✓12 to 24 months for nodules with low to intermediate suspicion on ultrasound

✓ 2 to 3 years for very-low-risk nodules.

- Nodules that enlarge significantly should be assessed for FNA, and subcentimeter nodules that grow to ≥1 to 2.5 cm require a biopsy depending upon their size and ultrasound characteristics.

Management:

- There are six major categories of results that are obtained from fine-needle aspiration (FNA), each of which indicates different subsequent management.

Nondiagnostic (Bethesda I):

- Cytologically inadequate: the absence of malignant cells should not be interpreted as a negative biopsy. so, we repeat the FNA in approximately **four to six weeks**, using ultrasound guidance.
- If repeated aspirations are nondiagnostic, US-guided **core-needle biopsy** should be considered.
- **Surgical excision**, especially for larger, solid nodules with sonographically suspicious features , or **observation**, especially for smaller, partially cystic nodules, are reasonable options for repeatedly nondiagnostic biopsies.
- If growth of the nodule (>20 percent in two dimensions on ultrasound) is detected during observation, **diagnostic surgery** is also reasonable.

Benign nodules (Bethesda II):

- Patients with benign nodules are usually followed without surgery with periodic ultrasound monitoring , initially at 12 to 24 months, then at increasing intervals over time.
- However, reassessment (repeating FNA) is warranted when there is any of the following:

✓Substantial growth (more than a 50 percent change in volume or 20 percent increase in nodule diameter with a minimum increase in two or more dimensions of at least 2 mm)

✓ Appearance of suspicious ultrasound features

✓New symptoms are attributed to a nodule

Indeterminate cytology (Bethesda III and IV):

- When cytologic results show follicular lesion/atypia of undetermined significance (FLUS/AUS) or follicular neoplasm, the results are often called indeterminate.
- the approach varies with institutional practices and availability of molecular testing.

Indeterminate cytology (Bethesda III and IV):

- one option is to repeat the FNA after 6-12 weeks. if the result shows AUS/FLUS again, molecular testing is performed.

✓benign pattern = observation, with diagnostic lobectomy as an alternative depending on the nodule's clinical characteristics.

✓suspicious pattern= diagnostic lobectomy or total thyroidectomy.

- if molecular testing is unavailable and repeat FNA shows AUS/FLUS, surgical resection is suggested.

Suspicious for malignancy (Bethesda V):

- includes lesions with some features suggestive of, but not definitive for, papillary thyroid cancer, or other malignancies.
- Such patients should be referred for surgery. Molecular markers should not be used for this category; however, the results of mutational analysis may be helpful when the choice between lobectomy and total thyroidectomy is uncertain.

Malignant (Bethesda VI)

- The malignant category includes papillary cancer, medullary thyroid cancer (MTC), thyroid lymphoma, anaplastic cancer, and cancer metastatic to the thyroid. Patients with cytology diagnostic of malignancy should be referred for surgery.

Thanks for your attention