

Asymptomatic Thyroid Nodules

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Asymptomatic Thyroid Nodules

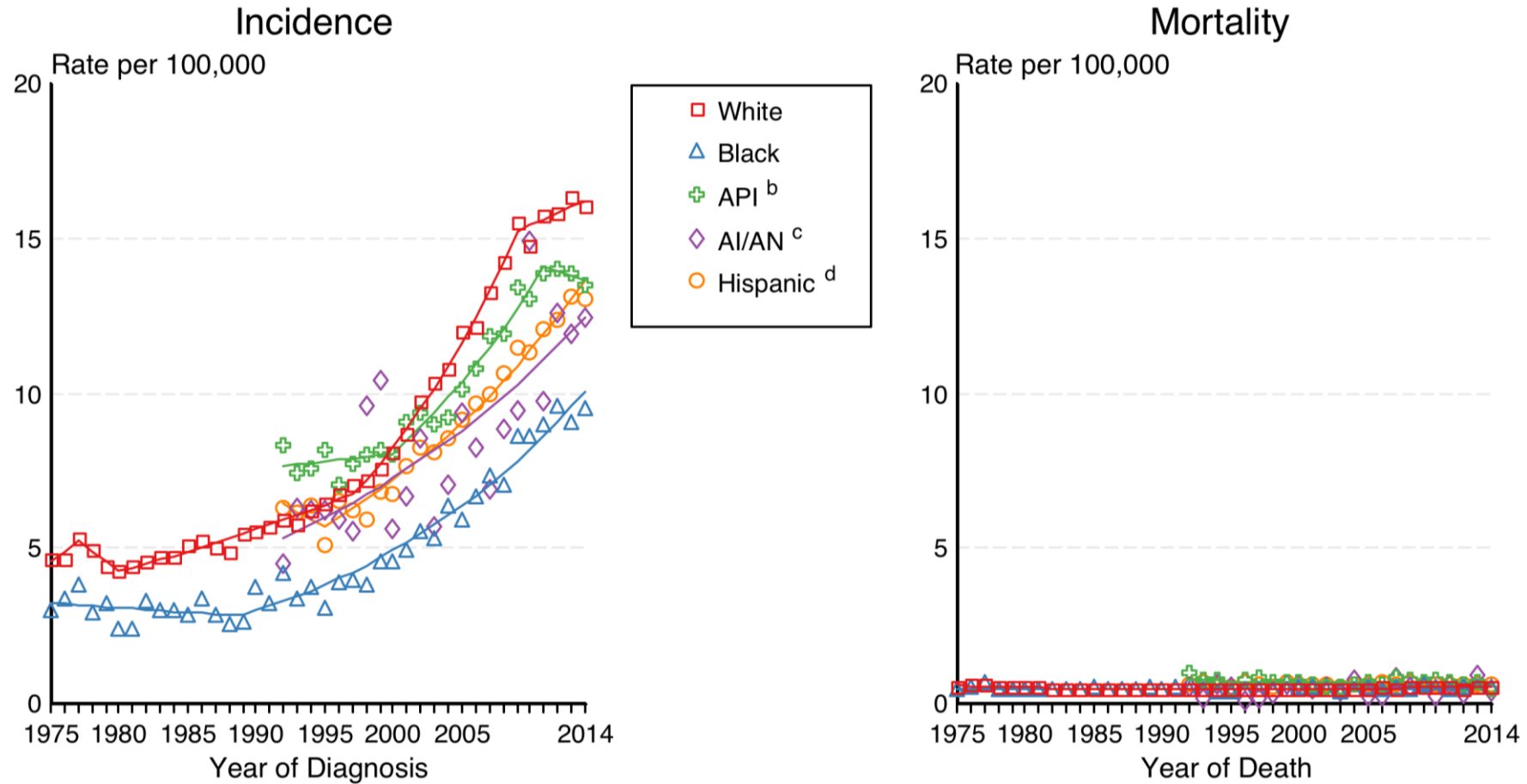


Asymptomatic Thyroid Nodules

SEER Incidence and US Death Rates^a Cancer of the Thyroid, Both Sexes

Joinpoint Analyses for Whites and Blacks from 1975-2014

and for Asian/Pacific Islanders, American Indians/Alaska Natives and Hispanics from 1992-2014



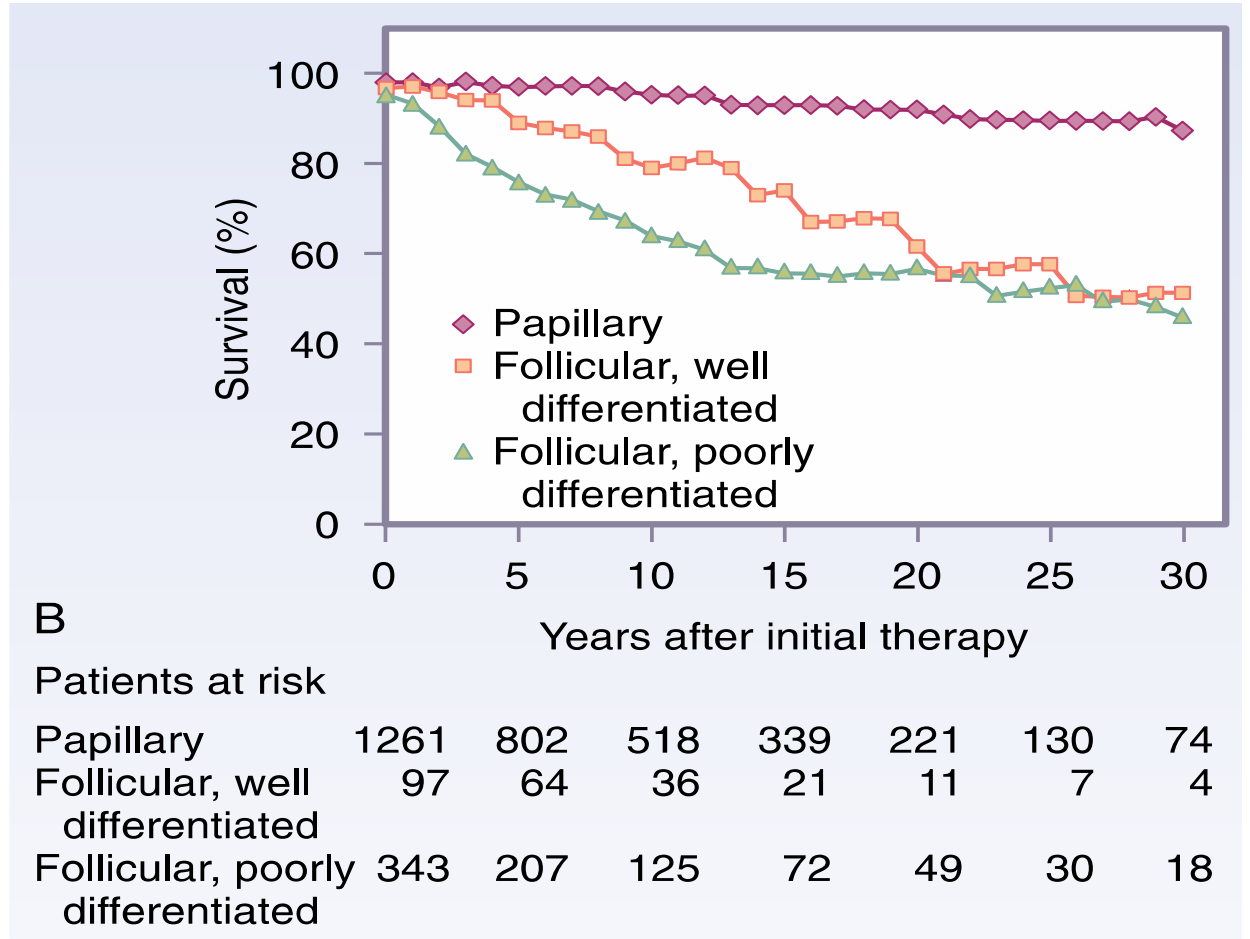
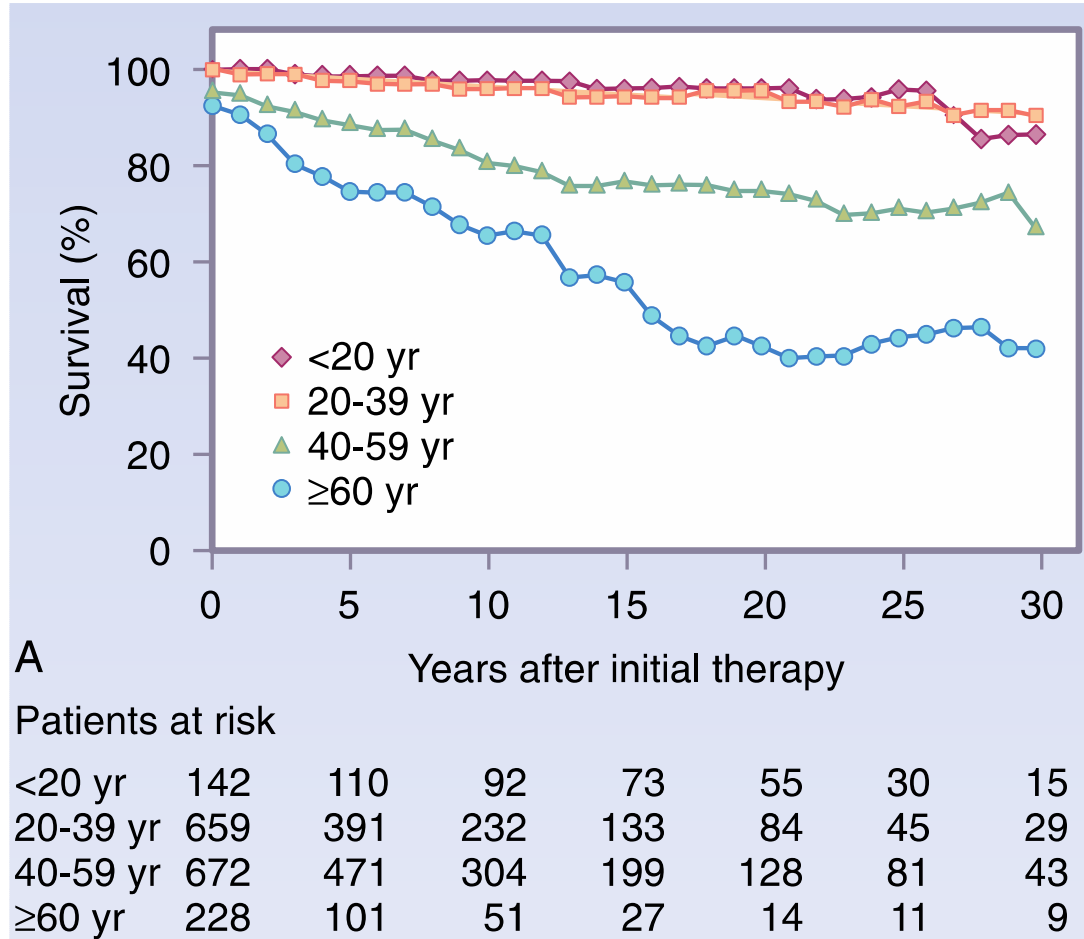
Scope

- Incidence of Thyroid Cancer Rising due to Detection
- 2015 ATA Guidelines
- Bethesda and TIRADS
- Molecular Testing
- Surgical Interventions

Incidence

- Increased Detection:
 - Palpable Nodules:
 - 5% in women, 1% in men
 - » iodine-sufficient parts of world
 - Sonographic Nodules:
 - 19-68% of randomly selected individuals
 - Thyroid Cancers <1cm:
 - 25% of new thyroid cancers 1988-1989
 - 39% of new thyroid cancers 2008-2009
 - Thyroid cancer in autopsy specimens approx 11%
- Tripled from 1975 to 2009:
 - 4.9 to 14.3 per 100,000¹
 - 37,200 new cases of thyroid cancer in 2009
 - 63,000 new cases of thyroid cancer 2014

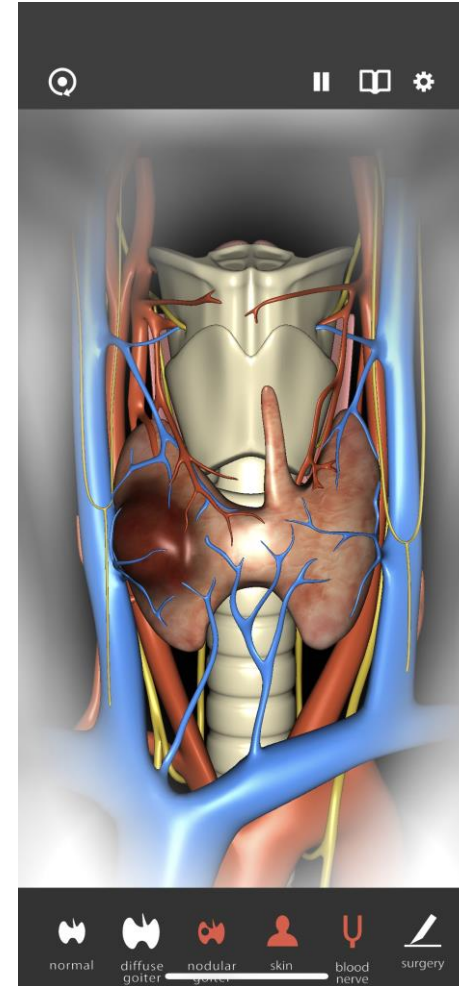
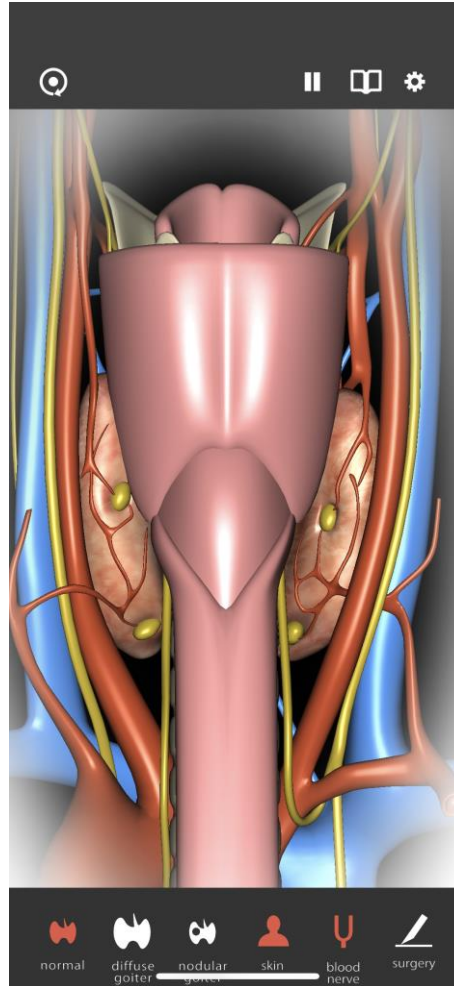
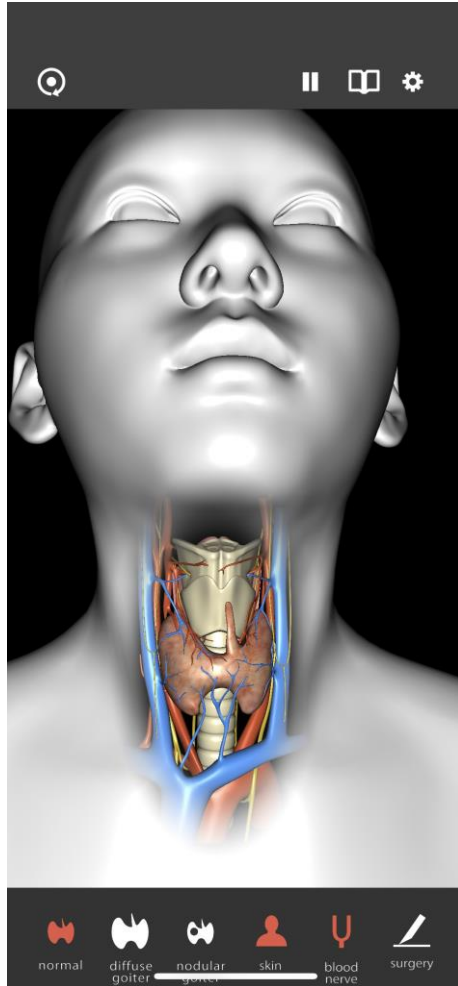
Thyroid Cancer Outcomes



Schlumberger ML. NEJM 1998

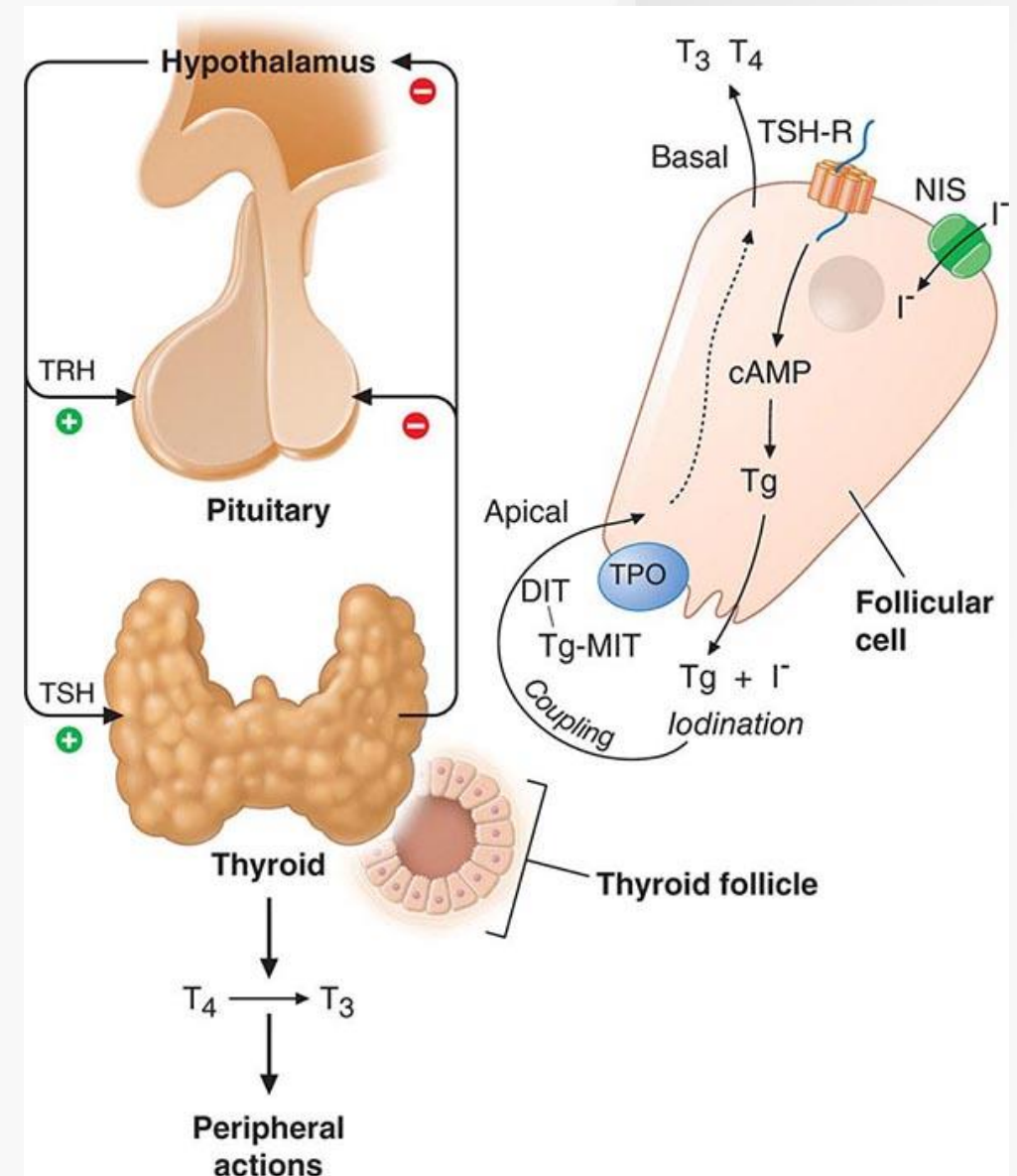
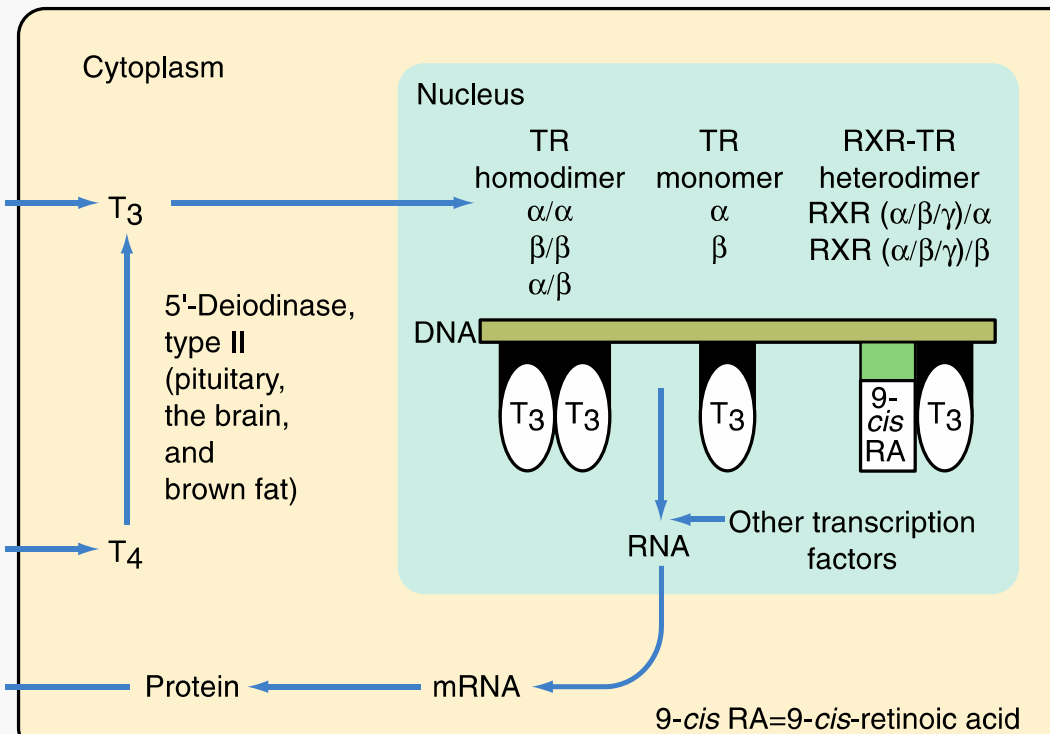


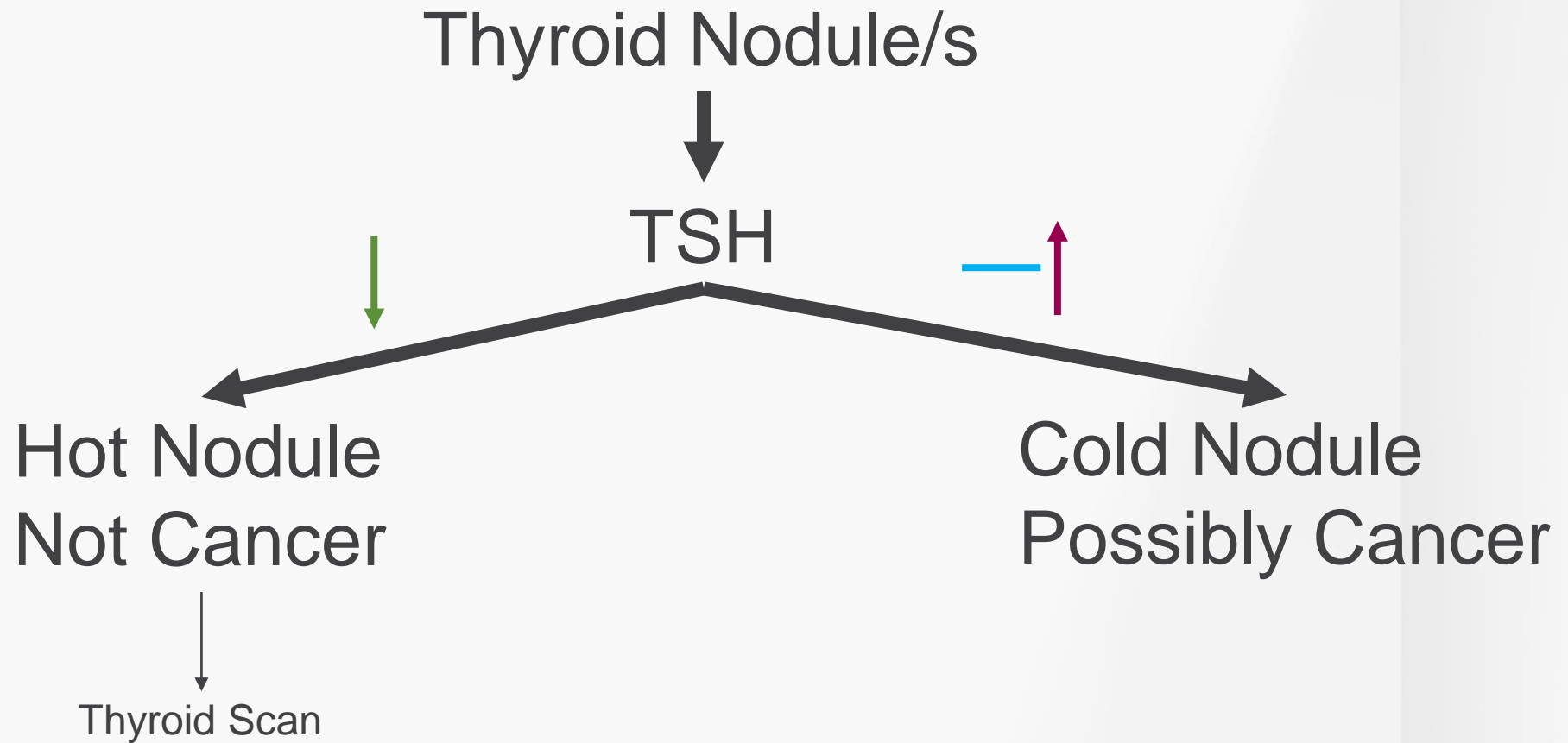
Thyroid Navigator App



Work Up of Thyroid Nodules

- Determine if Hot or Cold
 - TSH level





THYROID

Volume 26, Number 1, 2016

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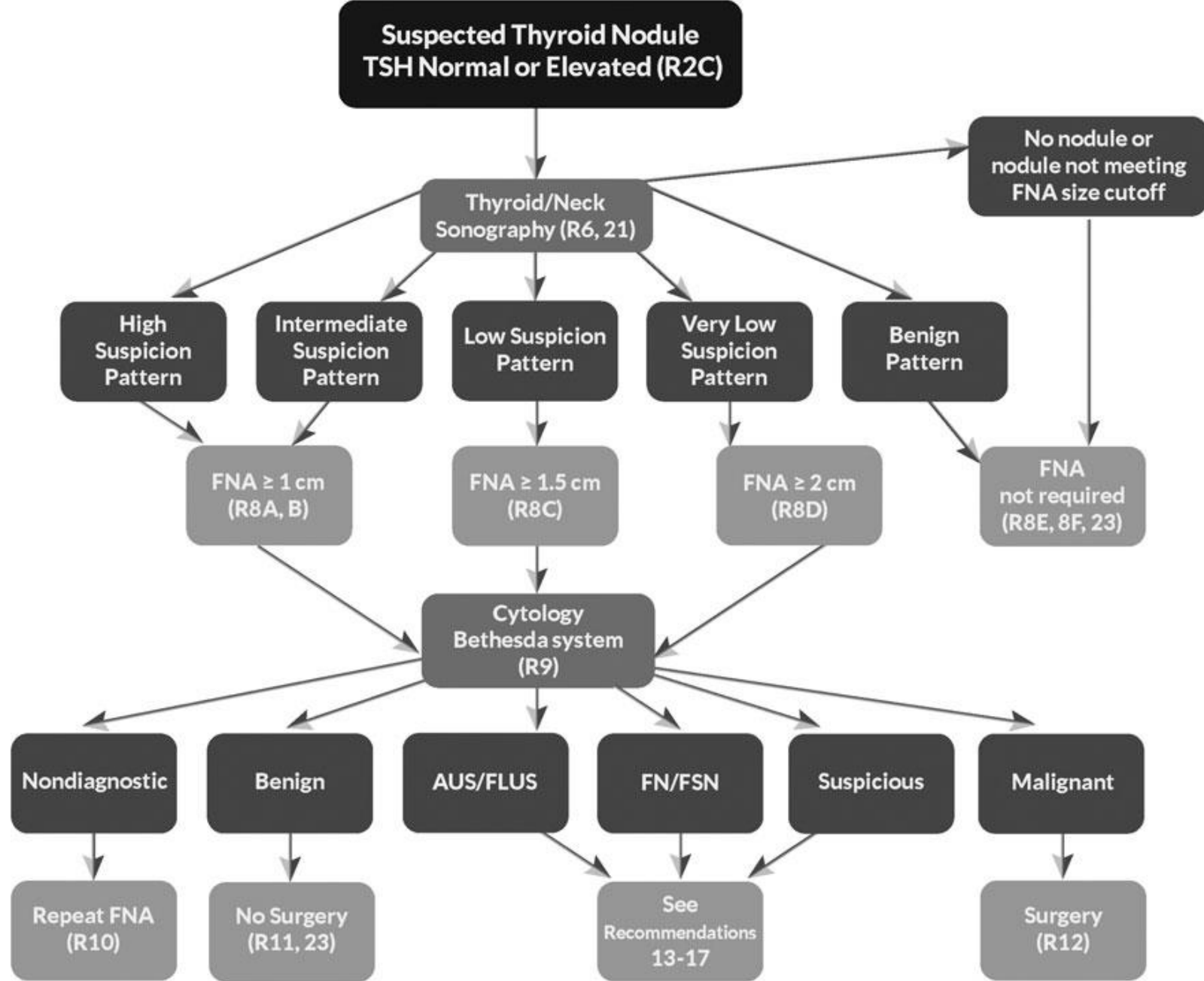
DOI: 10.1089/thy.2015.0020

SPECIAL ARTICLE

2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer

The American Thyroid Association Guidelines Task Force
on Thyroid Nodules and Differentiated Thyroid Cancer

Bryan R. Haugen,^{1,*} Erik K. Alexander,² Keith C. Bible,³ Gerard M. Doherty,⁴ Susan J. Mandel,⁵
Yuri E. Nikiforov,⁶ Furio Pacini,⁷ Gregory W. Randolph,⁸ Anna M. Sawka,⁹ Martin Schlumberger,¹⁰
Kathryn G. Schuff,¹¹ Steven I. Sherman,¹² Julie Ann Sosa,¹³ David L. Steward,¹⁴
R. Michael Tuttle,¹⁵ and Leonard Wartofsky¹⁶

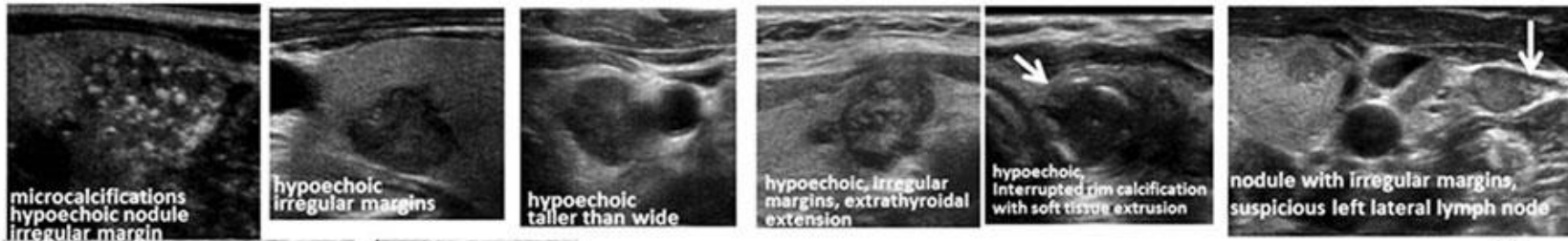


TIRADS

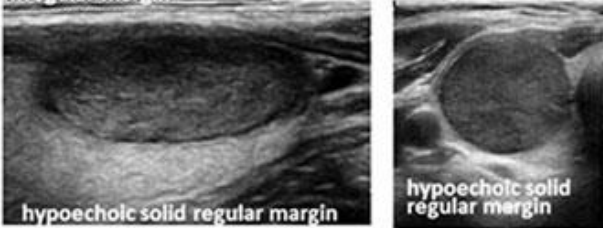
| TIRADS criteria | Nodule description |
|-----------------------|--|
| Composition | Cystic (0) Spongiform (0) Mixed cystic and solid (1) Solid (2) |
| Echogenicity | Anechoic (0) Hyperechoic or isoechoic (1) Hypoechoic (2) Very hypoechoic (3) |
| Shape | Wider-than-tall (0) Taller-than-wide (3) |
| Margin | Smooth (0) Ill-defined (0) Lobulated or irregular (2) Extra-thyroidal extension (3) |
| Echogenic foci | None or large comet-tail artifacts (0) Macrocalcifications (1) Peripheral (rim) calcification (2) Punctate echogenic foci (3) |

| TIRADS classification (points) | Description | Management |
|--------------------------------|-----------------------|--|
| TIRADS 1 (0) | Benign | No FNA |
| TIRADS 2 (2) | Not suspicious | No FNA |
| TIRADS 3 (3) | Mildly suspicious | FNA if ≥ 2.5 cm; active surveillance if ≥ 1.5 cm |
| TIRADS 4 (4–6) | Moderately suspicious | FNA if ≥ 1.5 cm; active surveillance if ≥ 1 cm |
| TIRADS 5 (≥ 7) | Highly suspicious | FNA if ≥ 1.0 cm; active surveillance if ≥ 0.5 cm |

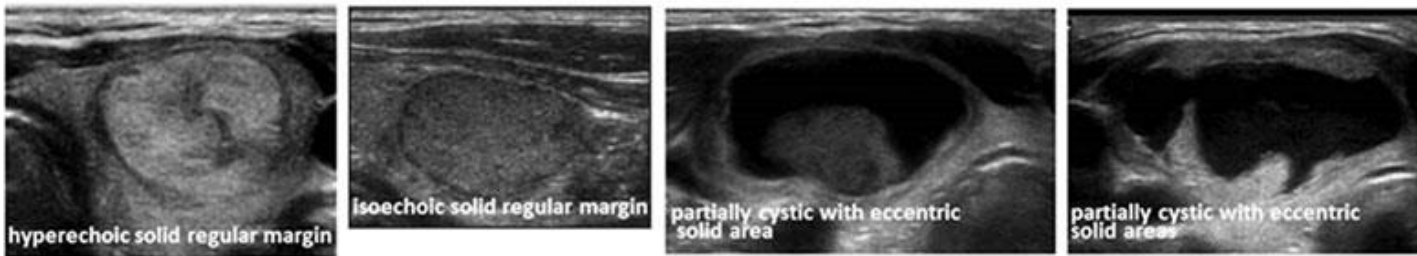
High
Suspicion
>70-90%



Intermediate
Suspicion
10-20%



Low
Suspicion
5-10%



Very low
Suspicion
<3%



Benign
<1%

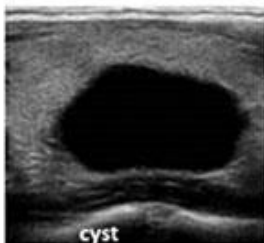


TABLE 6. SONOGRAPHIC PATTERNS, ESTIMATED RISK OF MALIGNANCY, AND FINE-NEEDLE ASPIRATION GUIDANCE FOR THYROID NODULES

| <i>Sonographic pattern</i> | <i>US features</i> | <i>Estimated risk of malignancy, %</i> | <i>FNA size cutoff (largest dimension)</i> |
|----------------------------|---|--|--|
| High suspicion | Solid hypoechoic nodule or solid hypoechoic component of a partially cystic nodule with one or more of the following features: irregular margins (infiltrative, microlobulated), microcalcifications, taller than wide shape, rim calcifications with small extrusive soft tissue component, evidence of ETE | >70–90 ^a | Recommend FNA at ≥ 1 cm |
| Intermediate suspicion | Hypoechoic solid nodule with smooth margins without microcalcifications, ETE, or taller than wide shape | 10–20 | Recommend FNA at ≥ 1 cm |
| Low suspicion | Isoechoic or hyperechoic solid nodule, or partially cystic nodule with eccentric solid areas, without microcalcification, irregular margin or ETE, or taller than wide shape. | 5–10 | Recommend FNA at ≥ 1.5 cm |
| Very low suspicion | Spongiform or partially cystic nodules without any of the sonographic features described in low, intermediate, or high suspicion patterns | <3 | Consider FNA at ≥ 2 cm Observation without FNA is also a reasonable option |
| Benign | Purely cystic nodules (no solid component) | <1 | No biopsy ^b |

TABLE 8. THE BETHESDA SYSTEM FOR REPORTING THYROID CYTOPATHOLOGY: DIAGNOSTIC CATEGORIES AND RISK OF MALIGNANCY^a

| <i>Diagnostic category</i> | <i>Estimated/predicted risk of malignancy by the Bethesda system, %^a</i> | <i>Actual risk of malignancy in nodules surgically excised, % median (range)^b</i> |
|---|---|--|
| Nondiagnostic or unsatisfactory | 1–4 | 20 (9–32) |
| Benign | 0–3 | 2.5 (1–10) |
| Atypia of undetermined significance or follicular lesion of undetermined significance | 5–15 | 14 (6–48) |
| Follicular neoplasm or suspicious for a follicular neoplasm | 15–30 | 25 (14–34) |
| Suspicious for malignancy | 60–75 | 70 (53–97) |
| Malignant | 97–99 | 99 (94–100) |


FNA is main stay

Endocrine (2019) 65:365–370

<https://doi.org/10.1007/s12020-019-01973-2>

ORIGINAL ARTICLE

Thyroid core needle biopsy: patients' pain and satisfaction compared to fine needle aspiration

Hyo Jin Kim¹ · Yeo Koon Kim ² · Jae Hoon Moon³ · June Young Choi⁴ · Sang Il Choi²

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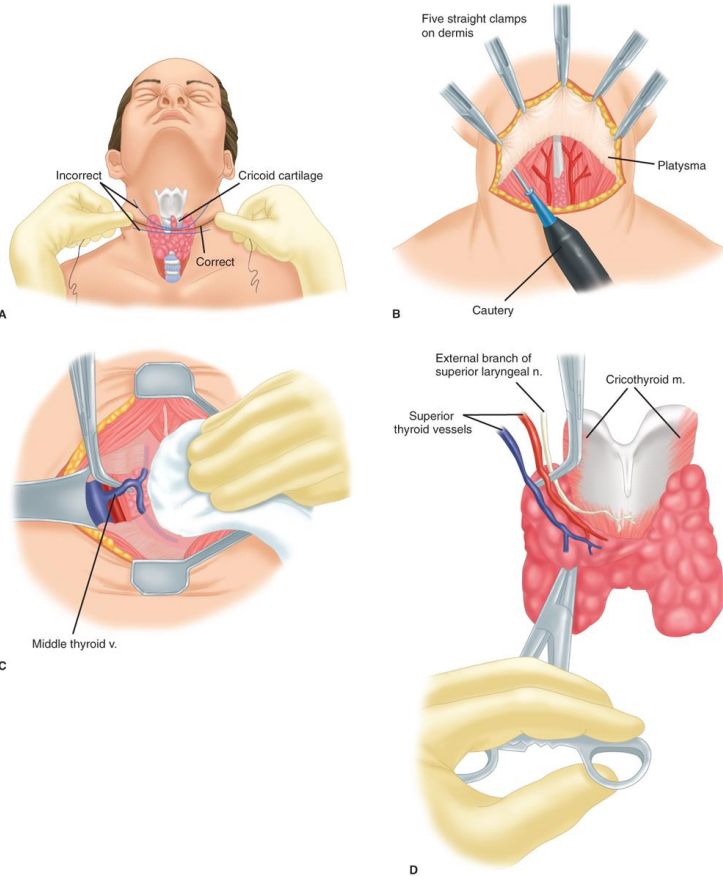
Medical therapy of benign thyroid nodules

None

Malignant Management

- Improve OS and DSS. Reduce persistent/recurrent disease. Accurate staging. Minimize morbidity.
- Facilitate adjuvant therapy
- Malignancy > 4cm = total thyroidectomy +/- selective lymph node dissection
- Malignancy >1cm and <4cm without extrathyroidal extension or LN+ disease = either lobectomy or total thyroidectomy
- Malignancy >1cm and <4cm with contralateral benign nodules = variable
- Malignancy <1cm without extrathyroidal extension or LN+ = lobectomy or active surveillance

How I do it.



Source: F.C. Brunicaudi, D.K. Andersen, T.R. Billiar, D.L. Dunn, L.S. Kao, J.G. Hunter, J.B. Matthews, R.E. Pollock: Schwartz's Principles of Surgery, 11e Copyright © McGraw-Hill Education. All rights reserved.



DEBAKEY BIPOLAR INSULATED FORCEPS



- Incision in a skin crease, SCM to SCM
- Rarely transect the strap muscles.
- Best with a second assist to retract muscles

Post Operative Complications

| Complication | % |
|--|----------|
| Vocal cord paralysis | |
| Transient | 2.5 |
| Permanent | 0.3 |
| Prolonged postoperative hypocalcemia (>7 days) | 3.7, 0.6 |
| Post operative bleeding | < 1 |

If parathyroid resected or in jeopardy, I autotransplant in left SCM marked with hemoclip

I send all patients home same day if PACU PTH is > 9.

Pts sent home on Calcium Carbonate (500mg QID) and Calcitriol (.25ug BID)

Redo Surgery or Dysphonia = Fiberoptic Laryngoscopy

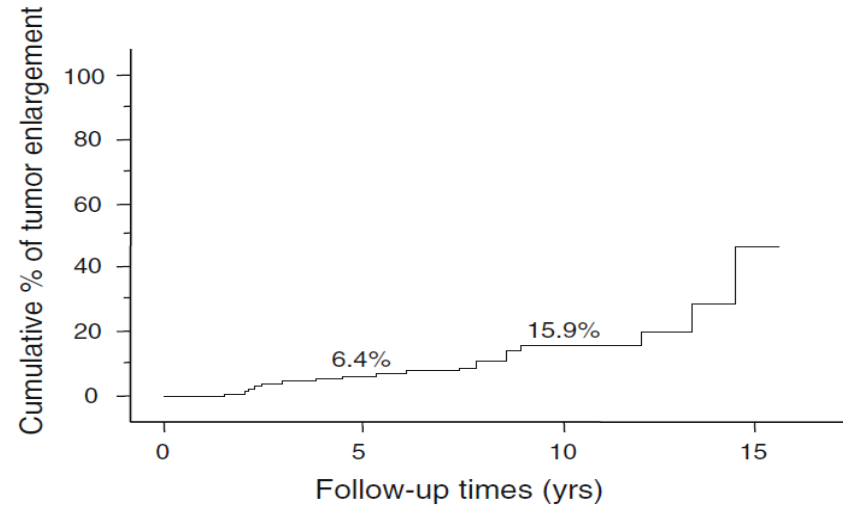
Drains and Thyroidectomy

- Data doesn't support routine use
- No significant difference in
 - Re-op rates
 - Respiratory distress
 - Wound infections
 - Post op fluid collections
 - Longer LOS

Samraj K. Cochrane Data Syst Rev. 2007

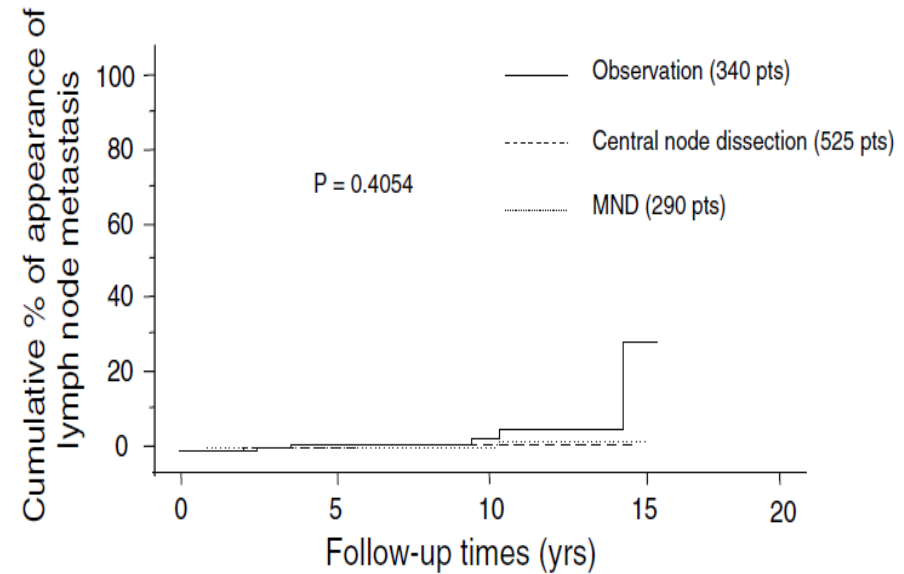
Malignant Management

- Disease Specific Mortality <1%
- Papillary TC <1cm
- Dx by US FNA
- 340 observed, 1,055 surgery
- Mean f/u 74 months



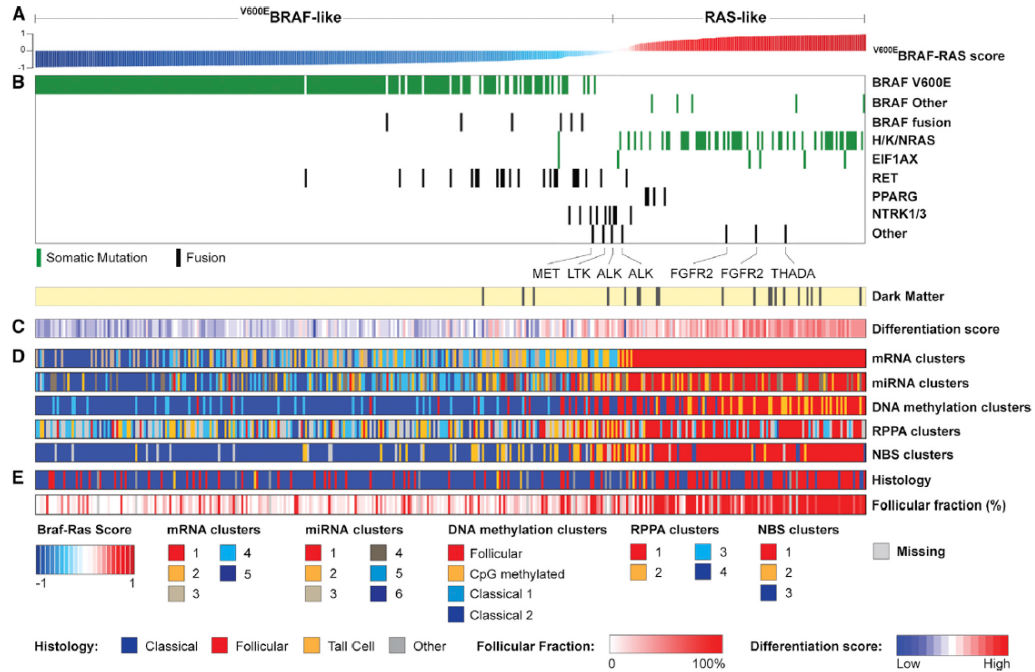
Patients at risk

| Follow-up times (yrs) | Patients at risk |
|-----------------------|------------------|
| 0 | 340 |
| 5 | 291 |
| 10 | 187 |
| 15 | 90 |
| 20 | 39 |
| 25 | 12 |
| 30 | 2 |

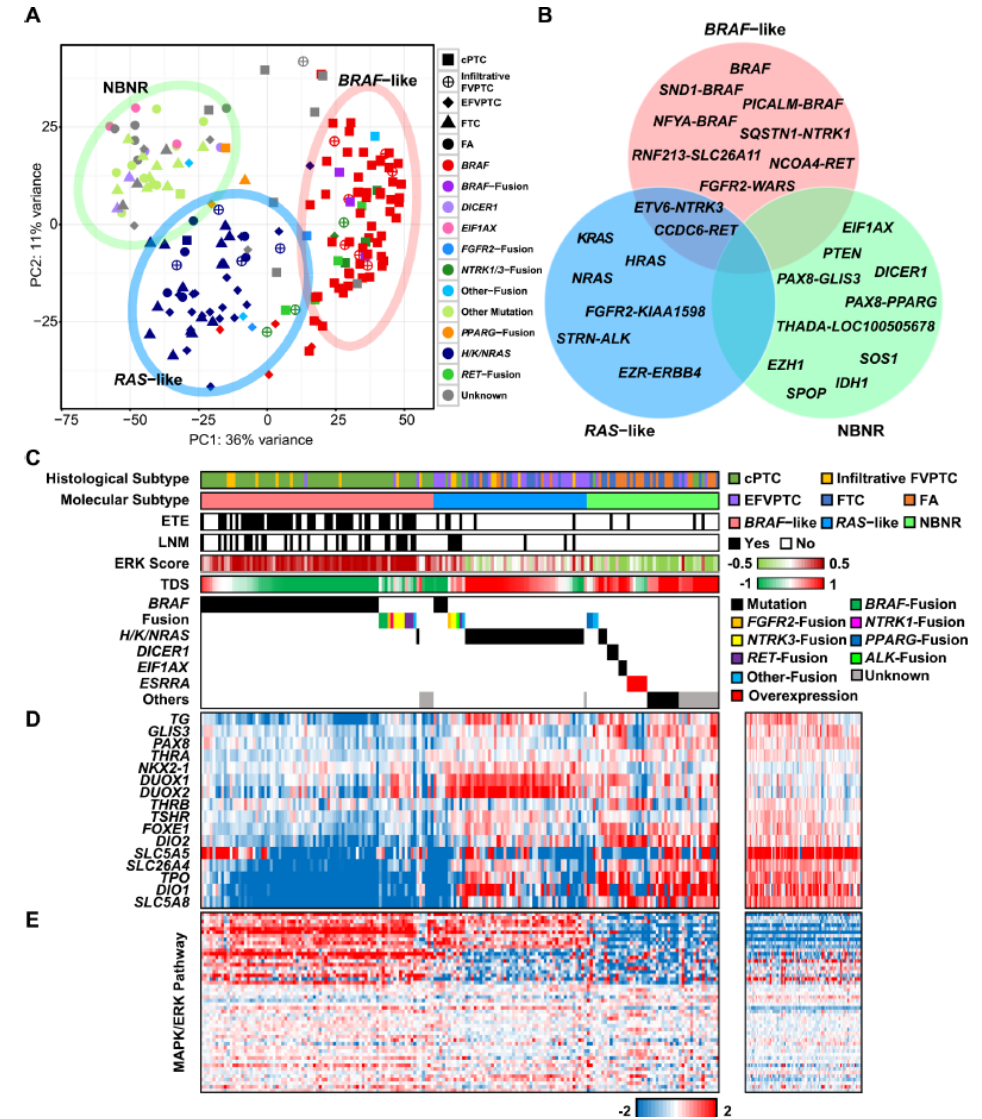


Ito Y. W Jor Surgery 2010

Molecular Testing



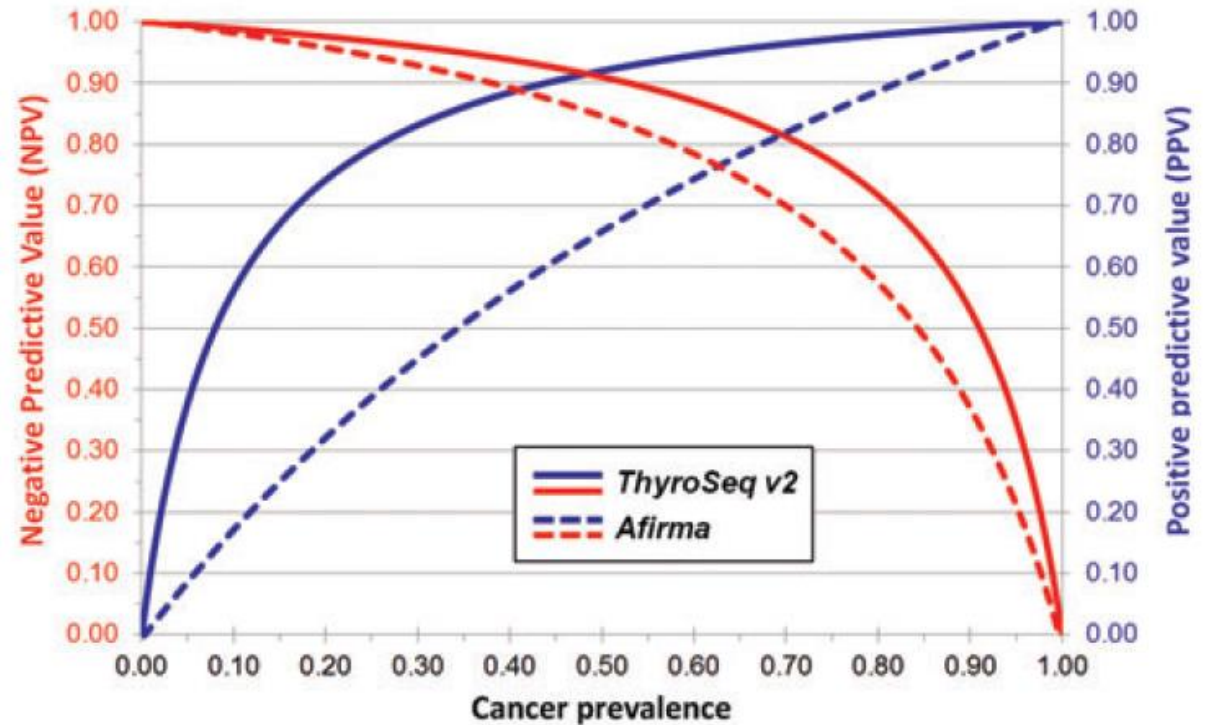
Cancer Genome Atlas Research Network, Cell. 2014



Yoo SK, et. al. PLOS 2016

ThyroSeq

- ThyroSeq 2.1 - “rule in” and “rule out” test
 - PPV 91%, NPV 92%
 - 14 genes
 - 42 gene fusions
 - 8 genes assessed for cell composition of FNA sample
 - follicular cells vs parathyroid cells vs parafollicular cells (C-cells)



Nikiforov YE Thyroid 2015

AUS/FLUS: Bethesda III

Nikiforov et al., 2015

ThyroSeq v2

- PPV 77%
- NPV 97%

Alexander et al., 2012

Afirma

- PPV 38%
- NPV 95%

FN/SFN: Bethesda IV

Nikiforov et al., 2014

ThyroSeq v2

- PPV 83%
- NPV 96%

Alexander et al., 2012

Afirma

- PPV 37%
- NPV 94%

Accuracy of FNA for Large Nodules

TABLE 3: Diagnostic indices of fine-needle aspiration cytology (FNAC) in the five thyroid nodule size categories.

| Group | A (≤ 0.5 cm) | B (>0.5 – 1 cm) | C (>1 – 2 cm) | D (>2 – 4 cm) | E (>4 cm) | <i>p</i> value |
|---------------------|--------------------|----------------------|--------------------|--------------------|--------------|----------------|
| Sensitivity | 96.8 | 94.9 | 98.7 | 86.7 | 50 | 0.006 |
| Specificity | 100 | 93.9 | 100 | 100 | 100 | 0.575 |
| PPV | 100 | 98.8 | 100 | 100 | 100 | 0.745 |
| NPV | 76.9 | 77.5 | 97 | 92 | 85.7 | 0.076 |
| Diagnostic accuracy | 96.8 | 94.8 | 99 | 94.7 | 87.5 | — |

PPV: positive predictive value; NPV: negative predictive value.

False Negatives and TIRADS for >3cm Benign Nodules

Table 3. Diagnostic performance according the TIRADS category of all cases and surgery cases.

| TIRADS category | All cases (n = 632) | | | | | | Surgery cases (n = 164) | | | | | |
|-----------------|----------------------------------|----|-----|-----------|------------------|-----------------|---------------------------|----|-----|-----------|------------------|------------------|
| | Nodules recommended for surgery* | TP | FP | FN | SEN (% ,95%CI) | PPV (% ,95%CI) | Nodules underwent surgery | TP | FP | FN | SEN (% ,95%CI) | PPV (% ,95%CI) |
| 3,4a,4b,4c | 632 (100) | 23 | 609 | 0 (0) | 100 (85.2–100) | 3.6 (2.3–5.4) | 164 (100) | 22 | 142 | 0 (0) | 100 (84.6–100) | 13.4 (8.6–19.6) |
| 4a,4b,4c | 313 (49.5) | 20 | 293 | 3 (13.0) | 87.0 (66.4–97.2) | 6.4 (5.4–7.5) | 86 (52.4) | 19 | 67 | 3 (13.6) | 86.4 (65.1–97.1) | 22.1 (18.2–26.5) |
| 4b,4c | 97 (15.3) | 10 | 87 | 13 (56.5) | 43.5 (23.2–65.5) | 10.3 (6.5–16.0) | 33 (20.1) | 9 | 24 | 13 (59.1) | 40.9 (20.7–63.7) | 27.3 (16.8–41.1) |
| 4c | 17 (2.7) | 2 | 15 | 21 (91.3) | 8.7 (1.1–28.0) | 11.8 (3.2–35.5) | 2 (1.2) | 1 | 1 | 21 (95.4) | 4.6 (0.1–22.8) | 50 (6.1–93.9) |

Numbers in parentheses are percentages and 95% confidence interval

TP: true-positive, FP: false-positive, FN: false-negative, SEN: sensitivity, PPV: positive predictive value

*Number of surgeries that would have been performed had the TIRADS category been applied to the overall sample of nodules as cytology-image discordance

FDG Avid Nodules?

THYROID
Volume 22, Number 9, 2012
© Mary Ann Liebert, Inc.
DOI: 10.1089/thy.2012.0005

THYROID RADIOLOGY AND NUCLEAR MEDICINE

Risk of Malignancy in Thyroid Incidentalomas Detected by ^{18}F -Fluorodeoxyglucose Positron Emission Tomography: A Systematic Review

Kerstin Kathrine Soelberg, Steen Joop Bonnema, Thomas Heiberg Brix, and Laszlo Hegedüs

- $\cong 35\%$ of ^{18}F FDG-PET positive nodules are cancerous.
- $>1\text{cm}$ FNA indicated.

Conclusions

- DTC has great outcomes if treated well
- TSH and US are key 1st steps
- TIRADS and Bethesda Criteria frame management
- Genetics in atypical nodules should be considered
- Minimalist approach to surgery is standard with significant evidence for equivalent outcomes compared to more surgery
- FDG Avidity is a risk factor for cancer
- Surgical intervention for large nodules appropriate due to decreased accuracy of FNA

Montefiore

DOING MORESM