The Evaluation & Treatment of a Thyroid Nodule

Bryan D. Friedman, D.O.
Triple Board Certified
Ear, Nose & Throat, Facial Plastic & Cosmetic Surgery

Disclosures

I have none!
Goals: For My Primary Care Comrades

Effectively educate patients on the preliminary work-up and differential diagnosis of a thyroid nodule
“Tests/Labs, Imaging, Procedures, Various Physician Involvement”

Comfortably risk stratify
“Steer the Ship”

Offer adjunctive support through the treatment process
“Positive Vibes, Tricks of the Trade”

Diligent post-treatment surveillance and follow up
“Womb to the Tomb”
“Avoid Lerner and Rowe”

Shifting the Paradigm
“What would A.T. Still think about medicine today”

A patient presents to your clinic…… “Doc I have this thing….”

Diligent history and physical examination are performed, confirming a solitary nodule on the right thyroid lobe……
First off …. Kudos
Let’s palpate
Anatomy

- 2 lateral lobes, connected by an isthmus
  - "bit smaller than a key fob"
- "medial" thyroid derived from foramen cecum, base of tongue. Drains lymphatically into delphian, pretracheal nodes
  - "thyroglossal duct cyst"
- "lateral" thyroid derived from Parafollicular C cells. Drains lymphatically into the Internal Jugular Vein
- Recurrent Laryngeal Nerve
  - "Paralyzed cord"
- Superior Laryngeal Nerve
  - "Voice Pitch"
- Superior Thyroid Artery ← External Carotid
- Inferior Thyroid Artery ← Thyrocervical Trunk
- Superior, Middle (unpaired), Inferior Thyroid Vein
Hormones

- Follicles absorb and store iodine to produce TH
  “Iodine Pills” crisis kit
- Triiodothyronine, T3
  More Potent, 10% of thyroid’s production, 1 day half-life, 80% peripherally converted
  Liothyronine
- Thyroxine, T4
  Correlates with TSH level & feedback, 90%, 1 week half-life
  Levothyroxine
- In Conjunction
  Calorigenesis, lower cholesterol, growth and development
  Stored bound to thyroglobulin in colloid
  Protein bound, Thyroid-Binding Globulin, 1% free, unbound
TFT's

another day

Back to Our Patient.....

- 4-7% adults
- 1-20 newly found will harbor cancer
- 24,000 annually diagnosed, as earlier preliminary screening, increasing
- 1,100 deaths per year
- 95% differential colloid, adenoma, cyst, focal thyroiditis, cancer
- Non-Thyroid
  - Lymph node, parathyroid cyst, cystic hygroma, dermoid, teratoma, laryngocele, TGD
But Doc, Do I have Cancer?

- With the assistance of our work-up, i.e. FNA, H & P provide a clinical setting
  
  LESS THAN 20 years old
  
  60+ years old, nodular disease more common than malignancy, yet new onset malignancy
  
  Exposure to ionizing radiation
  
  4 cm firm nodule, concerning, elastography (up and coming)
  
  increased risk of false - FNA
  
  Lymphadenopathy and vocal cord paralysis
  
  Family History, i.e. medullary
  
  - Know your patient
  
  Up to 1955, low dose radiation for adeno-tonsillar hypertrophy, thymic enlargement, acne, tinea of scalp, 20-30 years later nodules can develop
  
  “25 year old mechanic attempting repair on a 1966 Lincoln continental”

Pay Attention........

ALL PATIENTS WITH A THYROID LESION SHOULD HAVE A VOCAL CORD EXAMINATION TO ASSESS VOCAL CORD MOTION

VOICE AND SWALLOWING CAN BE NORMAL IN THE SETTING OF COMPLETE UNILATERAL VOCAL CORD PARALYSIS
Work-Up: Laboratory Evaluation

**TSH Assay**
- screen for euthyroid, hyperthyroid, hypothyroid
- Spinal Arc Reflex
- efficient use of consultation time with ENT

**TPO**
- Hashimoto’s

**Thyroglobulin**
- Normal and some malignant tissue
- Antibody of thyroid antibodies up to 25% of patients
- Not necessarily useful in work up of thyroid nodule
- Thyroglobulin is to Thyroid cancer like PSA is to Prostate Cancer

**Calcitonin and Radionucleotide**
- Rarity of medullary
- 95% will be cold, 10% cold chance of malignancy, scanning no correlation with malignancy

---

Pay
Attention........

Upon suspicion of palpable thyroid disease, ULTRASOUND!
Ultrasound

Does not distinguish between benign and malignant, yet baseline
Can identify the number, size and shape of nodal or thyroidal pathology
Screen for metastasis, in patients with radiation exposure
Efficient for use during ENT consultation

Normal Thyroid Ultrasound
Benign Nodule

Malignant Nodule

hypoechoic, solid nodules larger than 1 to 1.5 cm with macrocalcifications
Cystic Nodule

Ultrasound guided FNA is diagnostic procedure of choice for thorough evaluation of thyroid nodule.

A good FNA referral team can reduce surgical candidates by 50% and increased the yield of carcinoma in surgical specimens 15%.

Old School
- Malignant
- Suspicious/indeterminate
- Benign
- Non-diagnostic

New School
- Bethesda

Obtain prior to consultation.....judgement call
- “Patient’s cling to what they want to hear”
Bethesda System

Non-diagnostic (unsatisfactory) → repeat FNA, if not used previously Ultrasound assisted guidance
Benign → clinical follow-up
Atypia of undetermined significance → repeat FNA
Follicular Neoplasm → Surgical Lobectomy
Suspicious for malignancy → Some type of -ectomy
Malignancy → definitely some type of -ectomy

Benign Lesions

Follow up with serial examinations and ultrasounds
Suppressive therapies
Rarely, Surgery......
  Microfollicular, Hurthle Cell
  Cysts
  20% of nodules
  Cyst and benign are not synonymous
  Papillary Cystic Carcinoma to be ruled out
  Repeat cysts should be surgically treated
Algorithm

1) Nodule, 1-1.5 cm, palpable, H and P, TSH, Ultrasound
2) Low TSH, I-123, Tc 99, Uniform or “hot” evaluate and treat hyperthyroidism
3) Normal or High TSH, proceed with ultrasound
4) No nodule, TSH high, treat hypothyroidism, TSH normal → PRN
5) Ultrasound shows posterior nodule, 1-1.5 cm, greater than 50% cystic → FNA
6) FNA Results
   1) Non-diagnostic: repeat U/S 3months
   2) Benign: 6-18 month interval surveillance, U/S, if growth FNA
   3) Malignant: -ectomy
   4) Cystic, less than 4cm, good, recurs or greater than 4cm → -ectomy

I’ve got Cancer?!?!?

Is that the good hodgkins or the bad hodgkins?

If God assigned everyone a type of cancer.................
Memorial Sloan-Kettering

“There are more articles written about thyroid cancer, than people that die from thyroid cancer.”

-Ashok Shaha, M.D.

4 TYPES TO COMMIT TO MEMORY

- Papillary
  - “Good draft number...stateside”

- Follicular
  - “Going to need surgery, at least partial thyroidectomy imminent”

- Medullary
  - “Med school, triad, buzz words, test questions, pimping rounds”
  - Calcitonin

- Anaplastic
  - “Get all of your affairs in order”
Well Differentiated Thyroid Cancer (WDTC)
Papillary Carcinoma

- Orphan Annie Eye
- “Good Cancer”
  - Diffuse Sclerosing, Tall Cell Variants, less favorable histological variant
  - Multifocal potential
  - Each nodule may represent a true multifocality as opposed to intraglandular lymphatic spread
  - Lymphotropic
  - Nodal metastasis can be cystic
  - 30% of patients may have cervical disease, up to 60% pediatric
  - Surprisingly, despite microscopic disease prevalence, low rate of distant metastasis, 3% <10% clinical recurrence in the neck <5% contralateral lobe
  - Cervical lymph node Metastasis has no significant prognostic indicator

Orphan Annie Eye Nucleoli

Confession......
Any takers?

**WDTC: Follicular Carcinoma**

- Histologically, follicular properties/differentiation lacking those of Papillary Carcinoma
- Significant overlap with benign follicular adenoma
- Pericapsular vascular invasion is most reliable indication of malignancy
- Degree strongly prognostic correlate
- Widely vs. Minimally invasive
- Neck disease less likely than papillary, yet distant metastasis at presentation increased, 15%
- Unifocal
- FTC, iodine deficiency leads to elevated TSH
- Hurthle Cell: more aggressive variant
  - Hematogenous, less RAI responsive
WDTC: Follicular Adenoma vs. Carcinoma

Pay Attention......

- Pericapsular vascular invasion is the most reliable indication of malignancy
So Doc, Am I going to die?

- **WDTC**
  - 2 groups: large low risk group, 1-2% death rate, small high risk group, 40-50%
  - Age: females <50, males <40 prognosis improved
  - Invasiveness/extrathyroidal extension
  - Metastasis
  - Gender: males less favorable than females
    - Carter Theory
  - Size: >4-5cm Bad, <1.5 cm Good

Mnemonics

- **Papillary**
  - AGES: Age, Gender, Extent, Size

- **Follicular**
  - AMES: Age, Metastasis, Extent and Size
Ok...... Doc, So Now What?

- +FNA
- Some sort of -ectomy, extent of...
- Thorough pre-op neck ultrasound for contralateral disease, cervical node involvement, CT-Scan
- 1-1.5 cm nodule....threshold for total
- High Risk group: total thyroidectomy = improved thyroidectomy
- Low Risk Group: Lobectomy +/- Isthmusectomy vs. Total Thyroidectomy

Guidelines

- Recommendations:
  - Total thyroid greater than 1 cm
  - Suspicious bilateral nodules → total thyroidectomy
  - Small, low risk, isolated, intrathyroidal papillary without cervical nodal disease → Lobectomy
  - Central Neck Should be evaluated/dissected with advanced staged papillary disease
  - Biopsy + nodal disease, neck dissection should be performed, as opposed to “cherry picking”
    - Neck dissection will decrease subsequent nodal recurrence and the need for complicated re-operations, unclear impact on survival
Invasive Disease

- Preoperative vocal cord evaluation, noting paralyzed cord, or adherent cancer, nerve to be sacrificed
- Extracapsular disease involving surrounding strap muscles → resect involved muscle
- Preserve vital structures whenever possible
  - Near total excision with post-operative adjunctive care nearly equilibrates with more radical resection

Medullary Carcinoma of Thyroid

- 5-10% of all thyroid cancers
- Parafollicular C Cells, lateral aspect of thyroid lobes
- Calcitonin: increased with C-Cell hyperplasia and medullary carcinoma
- RET oncogene
- Tumor marker in establishing a diagnosis in asymptomatic relatives in hereditary cases and post operative recurrences
- Surgery is your option
- Total thyroid and central neck dissection, lateral neck dissection of ipsilateral side, consider bilateral neck dissections
- 75% sporadic
- 25% hereditary
MEN IIA, IIB, FMTC

- Autosomal dominant
- IIA: 3rd decade, Pheochromocytoma, hyperparathyroidism
- IIB: 1st or 2nd decade, Pheochromocytoma, Mucosal Neuromas
- FMTC: Fourth Decade
  - Familial non-multiple endocrine neoplasia medullary carcinoma of thyroid

Lymphoma

- Primary thyroid lymphomas are rare, typically non-Hodgkins type
- Treatment is based on prompt diagnosis and lymphoma subtype
- Radiation and chemotherapy
- Tissue merely required for biopsy
- Thyroid lymphoma increased with Hashimoto’s
Anaplastic

- Longstanding differentiated thyroid cancer dedifferentiates
- BRAF mutation
- Surgical goal: maintain airway, isthmusectomy, debulking
- External Beam Radiation, hyper-fractionated combined with chemotherapy

Rural Doctor’s Practice

- 33 year old woman presents with a 1.25 cm left thyroid lobe, located most lateral aspect of the medial component of the gland
- FNA: reveals well encapsulated, intra-thyroidal, isolated well differentiated Papillary Thyroid Carcinoma
- No neck disease, no voice or swallowing complaints
- PE: FFL: normal functioning of vocal cords
- Neck: Palpable, non-tender 1.25 cm
- Plan: Total Thyroidectomy
The Enemy of Good is Better!

- **RLN paralysis**
  - Incidence increases with total thyroidectomy, revision surgery, previous neck exploration
  - Temporary resolves around 6 months
  - Bilateral damaged cords may not effect voice as much as respiratory distress and stridor

- **SLN paralysis**
  - Cricothyroid muscle affected → loss of pitch
  - Cords will appear lower and bowed
B/L RLN Paramedian Position

B/L SLN Paralysis
The Enemy of Good is Better

- Hypoparathyroidism
- Peri-oral and digital paresthesia, progressive neuromuscular irritability, carpapedal spasms, abdominal cramps, mental status changes, QT prolongations
- Tetanic contractions
- Chvostek’s sign
  - 5% normal population will twitch
- Trousseau Sign
- Carpal spasm through tourniquet induced ischemia
- Temporary, >6 months, in up to 40%
- Permanent, 10%
33 year old undergoes, lobectomy with isthmusectomy

- Post-Op Day 1: unremarkable exam, no hematoma, voice strong, pain controlled
- Plan f/u 7 Days for suture removal
- Post-Op Day 7: Patient no show
- Post Op Day 29: Patient seen in local tavern, requested she follow up for permanent suture removal

In an ideal world……..

- Parathyroid gland, hypocalcemia: OsCal, huge pill!
- B/L Nerve damage: air way, Lerner and Rowe
- Endocrinologist who accepts AHCCS plans to manage post thyroid hormone replacement……?
- Now convince your patient to drive there……
- The art of medicine…..
Post Surgery Doc...Now What?

- Lobectomy...
  - Ultrasound 6 and 12 months, then annually for 3-5 years
  - Possible thyroglobulin levels
- Total
- Monitor for acute hypocalcemia’s, medicate appropriately
- Thyroid Hormone, T4, to suppress TSH to 0.1 to 0.3 mU/L
- Rule of Thumb: I-131 given to high risk papillary and follicular carcinoma
- Ablative doses if less than total thyroidectomy, 30-100 mCi minimum amount of radioactivity necessary for ablation → hypothyroidism
- TSH greater than 30 mU/L → scan the whole body
- Remember to stop thyroid hormone 2-4 weeks prior
- WDTC cells require increased TSH levels to uptake the I-131
- If positive scan → I-131 @ therapeutic doses administered 100-150 mCi

Post Surgery Doc...Now What?

- External Beam Radiation: palliative extensive disease, prolong quality of life
- Thyroglobulin: produced by healthy and cancer cells, yet can be used as marker for WDTC
- Aids with metastasis evaluation, consideration in conjunction with whole body scans
- Thyroglobulin is low, <2ng/ml on T4 suppression, or unmeasurable after thyroid ablation and whole body scan is negative...coast is clear
A Helping Hand..... Along the way

After the acute management . . .
Pay Attention........

- TFT’s 5-6 weeks to level off T4 exogenous dosing due to half life of medication
- Titration of the correct thyroid dosing takes time
- Vocal cord paresis can take up to six months to one year to recover or be compensated for
- Cervical Ultrasound @ 6, 12 months
- Annually for 3-5 years
- Elevated thyroglobulin, >10 ng/m, negative I-131 scan, consider PET/CT scanning
Down the Road......

Common Complaints & Management

- The neck has been eradicated of thyroid disease, however treatment does not come without drawbacks
- Xerostomia
- Radioactive iodine impairs saliva function
- Hence sialagogues
- Permanent vocal cord paralysis, SLN or RLN
- Church choir, can no longer hit the high notes
- The fear of recurrence
- Impairment in swallowing
Shifting the Paradigm....

Show of Hands ...........

While each of us march to the beat of our own drum.....It is the Kreb's cycle that binds us....... 
- Personal sacrifice
- Financial sacrifice
- Patients before your own family
- Hippocratic Oath
I’ll eat soup with Minestrone just to be alone.....
The McDonald’s-ization of medicine?

Pop Quiz

- What do Caesar's Casino Properties and Aetna have in common?
C.E.O.

If you can believe it.....you can achieve it
I can do all things through the women who strengthen me

AAAHC Certified baby!

A medical practice and its staff should be viewed like pieces on a chess board
Even a pawn.....
A.T. Still did it....
My Grandfather did it.....
We can do it........
Where would corporate health care enterprises be without us?

The Shangri-La.....
My Proposal To You.............

1 CPT.....