To cut or not to cut?
Evaluating surgical criteria for benign and non-diagnostic thyroid nodules

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Learning Objectives

1. Discuss the pertinent history of the onset and progression of a thyroid nodule, personal medical history, and family history to thoroughly assess the risk for malignancy
2. Identify ultrasonography characteristics suggestive of benign and malignant thyroid nodules
3. Recognize clinical and ultrasound criteria for fine needle aspiration
4. Explore the limitations of fine needle aspiration
5. Facilitate the clinician in leading an open dialogue of risks and benefits of surgical intervention versus surveillance of benign and non-diagnostic thyroid nodules

Thyroid Gland

10/7/2016
endocrine

of thyroid nodules

clinical, physical exam findings???

clinician has become the preferred term, since it is a more clinically accurate. Either way your choice.

I made the image larger.
Thyroid Nodules

- Incidental palpation: 4-7% of the population
- Thyroid ultrasound (US) indicates that the incidence is as high as 70%
- American Cancer Society: approximately 62,450 new cases of thyroid cancer (CA) in the United States in 2015
- Occur 3 times more often in women than in men
- Thyroid malignancy is the most rapidly increasing cancer in the US
  - In part due to the increased use of thyroid ultrasonography


Thyroid Ultrasound (US)

- Sound wave technology
  - No radiation
  - Quick, non-invasive
  - The most accurate and sensitive imaging study for the thyroid gland and nodules

- Characterize thyroid nodules
  - Location
  - Size
  - Margins
  - Echogenicity
  - Vascularity
  - Calcifications
  - Shape

Haugen BR, Alexander EK, Bible KC, et al; The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer. 2015 American Thyroid Association Management Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer. Thyroid. 2016 Feb;26(2):1-133.

Case Study: Felicia

- 49-year-old female presents to the endocrine clinic as a new patient with questions regarding multinodular goiter (MNG)
- Advised by ENT to have a left-sided dominant nodule surgically removed while under anesthesia during her upcoming chronic sinusitis surgery
- Felicia would like to avoid any thyroid surgery if possible
okay, couple things
- use a template that does not encroach on upper/lower/right/left margins as it affect your font and spacing. This font is only a 14, ideally at least an 18 or larger
- exact statistics and figures should really be cited in the bottom of slides for quick references.
- Use this image elsewhere if you need font space of made image smaller

SCOTT URQUHART, 9/12/2016

12 font

SCOTT URQUHART, 9/12/2016

location and size repeated. maybe mention it is the most accurate imaging study thyroid, i.e. better than CT and MRI.

SCOTT URQUHART, 9/12/2016

if this is the citation don’t bullet it, and state the source, date, etc.

SCOTT URQUHART, 9/12/2016

Aaron Smith, 9/20/2016
The History of the Thyroid Nodule

**Key History Points**

- Is this a new nodule or the first evaluation of the nodule?
- Any previous imaging, serological, or histological evaluation of the thyroid nodule(s)?
- Have the nodule(s) size or characteristics changed over time?
- Past medical history (PMH) of CA or radiation exposure?
- Family history (FamHx) of thyroid CA or multiple endocrine neoplasia type 2

### Felicia’s Last Thyroid US: 3 Months Prior

- **Right lobe**
  - Multiple colloid nodules with inspissated colloid
  - Largest is 1.5cm

- **Left lobe**
  - 4cm large complex solid and cystic nodule with inspissated colloid in the cystic spaces replacing the entire left thyroid lobe

### Felicia’s History and ROS

- No FamHx or PMH concerning for malignancy
- Two sisters with MNG
- Denies any neck pain, compressive/obstructive symptoms, hypo- or hyperthyroid symptoms
SU12  previous thyroid studies and labs.
SCOTT URQUHART, 9/12/2016

SU13  these inner 3 sub-bullets color is too light and not enough contrast.
SCOTT URQUHART, 9/12/2016

SU16  such as dysphagia or dyspnea, may want to either type them in or make sure they know what these are.
SCOTT URQUHART, 9/12/2016
Felicia’s Records

- 2008: Goiter palpated on exam
- 2008: Thyroid US
  - 2.3 cm complex largely solid mass right middle pole
  - 3.3 cm largely cystic lesion left middle pole
- 2008: Right sided FNA consistent with benign colloid nodule
  - The left sided nodule was not biopsied at that time due to largely cystic component

Felicia’s Records, cont’d

- 2011: Thyroid US
  - 1.6 cm right middle pole nodule is now smaller and contains multiple non-specific echogenic areas
  - 1 cm benign-appearing right middle pole nodule, not seen on previous US
  - 3.7 cm highly vascular heterogenous mass with some colloid components with indeterminate component left lower/middle poles
  - She did not follow up in 2011 and the next evaluation was with the current thyroid US

The Symptomatic vs Asymptomatic Thyroid Nodule

- Dysphagia
- Dyspnea
- Psychological concerns
- Hyperthyroid symptoms associated with toxic nodular goiter
- Determine the need for surgery
- Use caution in making recommendations based on the reported symptoms alone
SU18 acronym?
SCOTT URQUHART, 9/12/2016

AS19 x
Ashlyn Smith, 9/19/2016

SU17 acronym? Right middle pole
SCOTT URQUHART, 9/12/2016

AS20 x
Ashlyn Smith, 9/19/2016

Slide 11

SU19 Right upper pole, many clinicians probably don’t know these descriptions.
SCOTT URQUHART, 9/12/2016

AS21 x
Ashlyn Smith, 9/19/2016

SU20 again here, past evals I review, attendees get frustrated if they don’t know the acronyms.
SCOTT URQUHART, 9/12/2016

AS22 x
Ashlyn Smith, 9/19/2016

Slide 12

SU23 curious how you present this as I think about nodules affecting ADL’s
SCOTT URQUHART, 9/12/2016

AS23 x
Ashlyn Smith, 9/19/2016

SU24 thoughts about CXR if concerned about tracheal deviation.
SCOTT URQUHART, 9/12/2016

AS24 x
Ashlyn Smith, 9/19/2016

AS6 I’m not aware of any guidelines including CXR in surgical consideration
Ashlyn Smith, 9/14/2016

AS25 x
Ashlyn Smith, 9/19/2016
Physical Exam

- What you may find:
  - Goiter
  - Asymmetric gland
  - Nodular goiter
  - One or more thyroid nodules
  - Thyroid gland/nodule tenderness
  - Nothing

Assess for Signs and Symptoms of Hypo- or Hyperthyroidism

**Hypothyroidism**
- Fatigue
- Constipation
- Cold intolerance
- Weight gain
- Muscle cramps
- Integumentary changes: hair loss, dry skin, brittle nails
- Bradycardia
- Hyporeflexia

**Hyperthyroidism**
- Fatigue
- Frequent bowel movement
- Heat intolerance
- Weight loss
- Palpitations
- Anxiety
- Tremor
- Tachycardia and elevated blood pressure
- Hyperreflexia

Hypothalamic-Pituitary-Thyroid Axis
Slide 13

SU25 is this suggesting that physical exam not recommended and will this deter clinician from relying on some degree their PE skills? just thoughts.
SCOTT URQUHART, 9/12/2016

AS27 x
Ashlyn Smith, 9/19/2016

AS7 Pictures of how NOT to do thyroid exam. Personal pet peeve
Ashlyn Smith, 9/14/2016

AS26 x
Ashlyn Smith, 9/19/2016

Slide 14

SU26 May want to expand here and have complete SxS of hypo and hyper since this list is very limited, I know this is a thyroid nodule lecture and not one on thyrotoxic nodule(s)
SCOTT URQUHART, 9/12/2016

Slide 15

SU27 moved up title and made image larger
SCOTT URQUHART, 9/12/2016
Serological Evaluation

- Thyroid stimulating hormone (TSH)
  - Normal: no further evaluation
  - Elevated: evaluate hypothyroidism with free thyroxine (T4) and anti-thyroid peroxidase (TPO) antibodies
  - Suppressed: evaluate with free T4 and assess underlying causes of hyperthyroidism including workup for toxic nodular goiter

Additional Evaluation considerations

- FamHx of medullary thyroid CA or concerning features on US
  - Consider screen for abnormal calcitonin
- Lab evaluation for Felicia: TSH 1.30 uIU/mL (0.30-3.00)

Q: Based on this laboratory findings, what further serological testing is recommended?

A) Free T4  
B) Thyroid uptake and scan  
C) None  
D) Anti-TPO antibodies  
E) Thyroid stimulating immunoglobulin

Slide 16

SU28 yes short and sweet, quick take-away
SCOTT URQUHART, 9/12/2016

SU29 either type of make point that a Free T3 may be necesssary if TSH low and Free T4 normal, in that there are a small percentage of isolated Free T3 thyrotoxicosis.
SCOTT URQUHART, 9/12/2016

Slide 17

SU30 do you know if FH is an acceptable acronym for Family history vs FamHx
SCOTT URQUHART, 9/12/2016

AS28 x
Ashlyn Smith, 9/19/2016

Slide 18

SU31 I'm guessing that they will have ARS, audience response system.
SCOTT URQUHART, 9/12/2016

SU32 references cited on bottom without bullets
SCOTT URQUHART, 9/12/2016

AS14 x
Aaron Smith, 9/20/2016
Imaging a thyroid nodule

• Required to accurately evaluate a thyroid nodule and to give the most appropriate recommendation
• Thyroid US: the most sensitive imaging study for evaluating thyroid nodule characteristics

Additional Imaging Studies

• Regarding Felicia:
  • Thyroid uptake and scan: not indicated as TSH is not suppressed
  • CT scan or MRI: not recommended

Thyroid US Characteristics

<table>
<thead>
<tr>
<th>Concern for Malignancy</th>
<th>Benign Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoechoic</td>
<td>Purely cystic</td>
</tr>
<tr>
<td>Microcalcifications</td>
<td>Colloid</td>
</tr>
<tr>
<td>&gt;1.0cm and solid/hypoechoic</td>
<td>&lt;1.0cm without suspicious characteristics</td>
</tr>
<tr>
<td>Irregular margins</td>
<td></td>
</tr>
<tr>
<td>Tall/wide</td>
<td></td>
</tr>
<tr>
<td>Extracapsular growth</td>
<td></td>
</tr>
<tr>
<td>Associated cervical nodes</td>
<td></td>
</tr>
</tbody>
</table>
Slide 19

SU33  ahh, here it is, I mentioned this in slide 5.
SCOTT URQUHART, 9/12/2016

AS29  x
Ashlyn Smith, 9/19/2016

Slide 20

SU34  toxic nodule or nodules with or without goiter unless this just being referenced to Felicia
SCOTT URQUHART, 9/12/2016

AS30  x
Ashlyn Smith, 9/19/2016

Slide 21

SU35  acronym? lymphadenopathy.
SCOTT URQUHART, 9/12/2016

AS31  x
Ashlyn Smith, 9/19/2016
Reminder: Felicia’s 2011 Thyroid US

- 2011 thyroid US
  - 1.6 cm right middle pole nodule is now smaller and contains multiple non-specific echogenic areas
  - 1 cm benign-appearing right upper pole nodule, not seen on previous US
  - 3.7 cm highly vascular heterogenous mass with some colloid components with indeterminate component
  - She did not follow up in 2011 and the next evaluation was with the current thyroid US

Felicia’s 2015 Thyroid US

- Right lobe
  - Multiple colloid nodules with inspissated colloid
  - Largest is 1.5 cm
- Left lobe
  - 4 cm large complex solid and cystic nodule with inspissated colloid in the cystic spaces replacing the entire left thyroid lobe

Q: Which thyroid US characteristics of Felicia’s nodule in question are concerning for malignancy?

A) Partially solid
B) Partially cystic
C) >1.0 cm
D) Colloid
E) A and B
F) A and C
G) All of the above
Right upper pole, many clinicians probably don't know these
descriptions.

SCOTT URQUHART, 9/12/2016

again here, past evals I review, attendees get frustrated if they don't
know the acronyms.

SCOTT URQUHART, 9/12/2016

would be very helpful to know or have radiology comment on
microcalcifications and increased vascularity, spongiform. This
would appear to be an incomplete. This description in the case
would by most, be considered an incomplete radiological report,
which you could use as a teaching point.

SCOTT URQUHART, 9/13/2016

concerning, greater than >1cm may not necessarily be suggestive.

SCOTT URQUHART, 9/13/2016

Ashlyn Smith, 9/19/2016

Ashlyn Smith, 9/19/2016
Q: What is the next most appropriate step?

A) Observation with thyroid US in 6 months
B) Observation with thyroid US in 12 months
C) Hemithyroidectomy
D) Total thyroidectomy
E) Fine Needle Aspiration (FNA)

Recommendation for FNA

- Indicated based on thyroid US findings of partially solid component and size >1cm
- Unfortunately, Felicia’s FNA is non-diagnostic due to cystic fluid only with scant follicular cells for evaluation

Q: Now what?

A) Observation for 6 months
B) Observation for 12 months
C) Repeat FNA now
D) Refer for thyroidectomy
E) No further work up or surveillance
Slide 26

SU36 this is still in regards to Felicia?? recommend animation for this slide as they see the answer at the same time they see the indication.
SCOTT URQUHART, 9/13/2016

AS35 Ashlyn Smith, 9/19/2016

Slide 27

SU49 why is this red title arrow down so low
SCOTT URQUHART, 9/13/2016

AS36 Ashlyn Smith, 9/19/2016

SU50 raise title up to level like the rest
SCOTT URQUHART, 9/13/2016

AS37 Ashlyn Smith, 9/19/2016
Limitations of FNA

- Most definitively distinguishes between a benign nodule, neoplasm and atypia.
- Non-diagnostic: occurs in 10% to 15% of cases.
  - More likely in nodules with a large cystic component as the fluid does not contain tissue for histological evaluation.
- A benign FNA of a larger nodule is less reassuring.
- Unlikely to aspirate small insidious malignant cells nestled among a larger collection of benign tissue.


After learning of the FNA results, the patient asks, “What should we do about the nodule now?”

Non-diagnostic solid nodules

- Repeat FNA
- Repeatedly non-diagnostic FNAs will need to be considered for surgical removal unless the nodule has “clearly favorable clinical and US features”

SU38 size cut off or size for example.
   SCOTT URQUHART, 9/12/2016

AS40 x
   Ashlyn Smith, 9/19/2016

SU39 earlier point about references, citations, no bullet.
   SCOTT URQUHART, 9/12/2016

AS15 x
   Aaron Smith, 9/20/2016

SU41 changed all font on this slide to 24, sub-bullets were in 20, there is enough space to change to 24.
   SCOTT URQUHART, 9/12/2016

AS38 x
   Ashlyn Smith, 9/19/2016

SU37 also suspicious for, atypia, and follicular neoplasms, all of which are not necessarily CA. just some thoughts to consider.
   SCOTT URQUHART, 9/13/2016

AS39 x
   Ashlyn Smith, 9/19/2016

Slide 30

SU40 same, and there are 2 different pages of references.
   SCOTT URQUHART, 9/12/2016

AS16 x
   Aaron Smith, 9/20/2016

SU42 changed to 24 font
   SCOTT URQUHART, 9/12/2016

AS1 x
   Aaron Smith, 9/20/2016
Non-diagnostic **cystic** nodules

**AACE**
- Benign-appearing characteristics, repeat FNA may be warranted based on clinical picture
- After multiple cystic recurrences, surgery can be considered
- Time commitment, financial burden, emotional cost of repeated evaluation with thyroid US and possible repeat FNAs


Q: Now What?

A) Observation for 6 months
B) Observation for 12 months
C) Repeat FNA now
D) Refer for thyroidectomy
E) No further work up or observation

Repeatedly non-diagnostic nodules

- The risk for malignancy in a nodule with a single non-diagnostic FNA is estimated to be **20%**
- For nodules that underwent repeat FNA, the risk was **0%** for those that were again non-diagnostic

**Conclusion:** “Patients with two sequential non-diagnostic thyroid aspirates have a very low risk of malignancy”

SU43 changed font to 24
SCOTT URQUHART, 9/12/2016

AS2 x
Aaron Smith, 9/20/2016

SU53 this would also depend on size correct?
SCOTT URQUHART, 9/13/2016

AS8 Perhaps I can change to "surgical intervention may be considered."
2016 AACE guidelines are a little vague here.
Ashlyn Smith, 9/14/2016

Slide 32

SU54 her's however is mixed echogenicity, without obvious concerning features, so would it be FNA now?
SCOTT URQUHART, 9/13/2016

AS9 Recommendation based on solid but nodules without concerning characteristics would be US in 6-12 months. I will change this
Ashlyn Smith, 9/14/2016

Slide 33

SU55 is this for solid, cystic, and mixed nodules?
SCOTT URQUHART, 9/13/2016

AS3 x
Aaron Smith, 9/20/2016

AS10 no statistical difference among types
Ashlyn Smith, 9/14/2016

AS4 x
Aaron Smith, 9/20/2016
Biopsy-proven benign thyroid nodules

**Observation**

- Recommended unless certain criteria is present:
  - Local neck compressive/obstructive symptoms that can confidently be attributed to thyroid nodule(s)
  - Patient preference [e.g. due to anxiety or aesthetics]
  - Higher index of suspicion [e.g. history of previous radiation exposure, progressive nodule growth, suspicious characteristics on US, strong family history of thyroid CA]


**Surgical Considerations**

- Traditional surgery risks
- Potential for surgical hypothyroidism with hemithyroidectomy and permanent hypothyroidism with total thyroidectomy
- Hypocalcemia secondary to transient or permanent postoperative hypoparathyroidism
- Transient or permanent vocal hoarseness or changes in vocal quality
- Injury or damage to the recurrent laryngeal nerve

Biopsy-proven benign thyroid nodules

**American Thyroid Association guidelines**

- For Felicia’s thyroid nodule, the clinical suspicion is designated as “very low <3%”
  - “Spongiform or partially cystic nodules without any of the sonographic features described in the low, intermediate, or high suspicion patterns have a low risk of malignancy <3%. If FNA is performed, the nodule should be at least 2 cm. Observation without FNA may also be considered for nodules ≥2 cm”
what is subscript 1?
How about strong family history of thyroid CA esp. MTC.

Nodule growth is not for general growth but growth of greater than or equal to 20% in 2 of the 3 dimensions.

this should include hypocalcemia since intact PTH isn’t checked unless hypocalcemia is present.

secondary to injury or damage, i.e. transient vs. permanent

consistency, although not a biggie, is it <3% or less than or = to 3 % as above?

2 different reference pages, no bullet.

specifically <3% for Felicia
What would be your recommendation for Felicia?

**Observation**
- Benign thyroid US characteristics
  - Colloid nodule
  - Partially cystic
  - No suspicious sonographic features
  - Lack of clinical neck compressive symptoms
- Patient preference
- **ATA**: Felicia’s risk of malignancy for the nodule in question is <3

Is Thyroidectomy Appropriate?
- Consider the burden of repeated imaging studies, potential repeat serological studies and FNA, and the time/cost and anxiety for the patient
- **AACE and ATA**: Repeatedly non-diagnostic FNA will need to be considered for surgical removal unless the nodule has “clearly favorable clinical and US features”

Clinical Recommendation
- After a thorough discussion of surgical and observation risks versus benefits, surgery will ultimately not be indicated at this time for Felicia
<3 % ? previous slides is < or equal to 3%
SCOTT URQUHART, 9/13/2016

Perhaps, "what would be your recommendation for Felicia at this point"? Animate this one or others when asking the audience a question to give them time to think it out.
SCOTT URQUHART, 9/13/2016

I'm a little lost on the intial flow of this slide, but maybe not if I heard it presented.
SCOTT URQUHART, 9/13/2016

This and the previous slide used to be on one page in columns comparing the arguments for surgery vs observation but the slide was really wordy and used small font. I'll have to rethink how I present it if it wasn't clear this way.
Ashlyn Smith, 9/14/2016

is this financial cost? Risks and benefits of surveillance vs. surgery
SCOTT URQUHART, 9/13/2016

this sentence essentially clarifies the above bullet
SCOTT URQUHART, 9/13/2016
References