ULTRASOUND-GUIDED FNA BIOPSY

AACE/ACE Principles of Endocrine Neck Sonography
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No Disclosures
Goals of FNA

- Obtain an Adequate Specimen
- Sample the Area of Concern
- Provide Good Material for the Cytopathologist
- Minimize Patient Discomfort
- Make the Right Diagnosis!
Value of Ultrasound Prior to FNA

- Record the size and volume of the nodule
- Record nodule’s ultrasound characteristics
- Selection of needle size and length
- Selection of most suspicious nodules in MNG
- Detect other areas of suspicion
  - Lymph nodes, parathyroid adenoma, etc
- Determine if UG FNA is needed
Preparation

- Explanation of the procedure
- Proper patient position
- Room set-up
- Anti-septic – alcohol, betadine
- Anesthesia
  - None, Ice, Ethyl Chloride, Lidocaine
- Anxiety – pre-medication seldom needed
Preparation of the neck – Betadyne and alcohol
Pain with FNA

- FNA of thyroid nodules less painful than that of cervical lymph nodes
- Most tolerate the transient pain without the use of local anesthesia
- Using 25g needle/aspiration in 218 patients, FNA pain correlated with:
  - age <25 years, female sex, # nodules biopsied and anxiety

Lo WC et al.  Head Neck, 2013 June
Leboulleux S et al. Thyroid 2013 Sep
Techniques to Minimize Discomfort

- Discuss procedure with patient
- Use smallest needle possible
  - 27 gauge for most FNAB
  - 22 for draining cysts
- Avoid sternocleidomastoid muscle
- Enter quickly through skin and then slowly advance
- Fine oscillation and rotation
- Local anesthesia is seldom required
Anticoagulation

- Bleeding complications are rare after thyroid nodule FNA
- Patients on aspirin, heparin, clopidogrel or coumadin undergoing neck FNA showed no increased bleeding risk
- If patient on anticoagulant, consider 10 minute observation for hematoma formation
- Color doppler to avoid/detect small vessels

FNA vs. Core Needle Biopsy

- Rare reports of hemorrhage and tumor needle tracking with large CNB
- CNB requires anesthesia and increases local discomfort
- CNB does not consistently add significant accuracy or clarification for follicular neoplasms
- CNB may complement FNA in cases of FNA insufficient samples

NCI Thyroid FNA State of the Science Conference. Diagn Cytopathol 2008 Jun
Setting up for FNA
Monitor Clearly In View
Needles

25g  27g  23g  25g  26g  25g  22g
Needles

- 27 gauge needles for most nodules
- 22 gauge for drainage of cyst fluid if needed
- Most nodules can be accessed with 1.25-1.5” needles; 2.5” spinal needles are seldom needed
- Stylet needle if going through thyroid to target
  - Exophytic nodules, lymph nodes, etc
- Echogenic needles not needed
- Needle guides can be used, but generally unnecessary
Fragment of macrofollicle obtained through 27 gauge needle
Fig. 8. Fine needle sampling without aspiration of a thyroid tumor.
Capillary Action - Zajdelka

- Relies on forward motion of the needle as well as surface tension induced capillary action within the needle core (stronger with higher gauge)
- “Spinning” the free needle may improve yield
- May be done with needle only or needle attached to syringe w/o plunger
Aspiration (FNA) vs. Capillary Action (FNC)

- In a palpation-biopsy study using 2 passes with each technique into 260 nodules, there was no difference in adequacy or accuracy.

- In an US-biopsy study, 88 nodules underwent FNA and 92 underwent FNC, again no difference between the techniques. Concluded that FNC may offer more technical ease.


**Suction**

- Larger volume of sample
- More blood
- Begin sampling once in target

- Avascular nodules
- Lymph nodes
- Parathyroids
- Complex cysts
- Drain cysts

**Suction-less**

- Smaller volume of sample
- Less blood
- Simpler

- Vascular nodules
- Superficial nodules
- Most nodules
Aspiration

- Pistol grip on syringe with tubing
  - Good for cyst drainage

- TAO Aspirator
  - Pre-set suction amount
  - Residual vacuum may bring material into syringe
  - Out of production
Ultrasound Visualization for Fine Needle Aspiration Biopsy
Ultrasound-guided FNA Biopsy

- Variety of Aspiration Techniques
  - Parallel versus Perpendicular imaging
  - Syringe holder or not
  - Suction versus suctionless
- Have monitor clearly visible
- Echogenic needles not necessary
- Maximize cellular yield and minimize blood
  - Dwell time: Keep under 6-10 seconds
- Quality Slide preparation
Methods of Approach

parallel

perpendicular
Parallel Approach
Perpendicular Approach
Improving needle visualization

- Needle and transducer MUST line up
- Position yourself so you can see the relationship
  - Look down the needle and transducer head
- Needle bevel up
- Make fine adjustments
  - Rotation and lateral movement
- Beam steering
- Echogenic needles rarely needed
- Practice, practice, practice.
Dwell-Time

- First pass most likely to be best as hemorrhage begins to occur
- 2-5 seconds of back-forth motion
- Blood in hub: too long of a dwell time
- Position needle in the peripheral 2-5 mm of nodules undergoing cystic degeneration
Number of Passes

- **IF Rapid On-Site Evaluation (ROSE) available**
  - 2-3 passes from different regions then assess
  - Additional passes if inadequate
    - Adequate: >6 groups of >=10 follicular cells
  - Additional passes for special studies

- **Without ROSE**
  - 2-8 passes from different sites (average 3-4 passes)
  - Either all in liquid transport OR slides with rinse into transport media
Special Situations

- Hypervascular nodules
- Peripherally calcified nodules
- Predominately cystic nodules
- Deep biopsy
Hypervascular Nodules

- Capillary action
- Reduce dwell time
- 1-2 Rapid thrusts after gentle positioning needle just outside the nodule
- Subsequent FNAs at different sites of nodule
Interrupted Eggshell FNA Approach

Kim DW. Clinical Imaging 2012, E-pub
Predominantly Cystic Nodules

- Target Solid Component
- Direct needle into solid component without traversing the cystic part if possible
- Drain cyst fluid then FNA solid component
  - Try w/one puncture (exchange syringe)
Biopsy with Curvilinear Probe
Insufficient US-FNA Samples

- If a common problem (>10% of your samples):
  - Use ROSE to determine adequacy
  - Take an FNA/slide-making course
  - Alter technique(s)
  - Consider LBC

- Approach to Insufficient FNA
  - Repeat FNA if not benign US phenotype
  - Surgery if overt malignant US findings
  - Discuss w/ pathologist and observe select cases
  - Consider CNB if expert-repeat FNA still insufficient

Slide Preparation

- **Goals**
  - Monolayer Dispersion of cells
  - Avoid distortion or crush artifact
- Slides versus liquid based preparation
- Fixation and staining
  - Pap versus Wright Stain
  - Pathologist preference
Smear Technique
Book Method

- Let capillary action spread the sample out over the slides.
Pull Apart Like Opening a Book

Two Mirror Image Slides
1 → Alcohol Fix for Pap Stain
1 → Diff-Quik for On-Site Eval
Extracting sample from the needle and syringe

- Spray – Sample in needle
- Pop – (Excessive) sample in syringe
- Tap – Sample in syringe neck
- Flick – Sample in needle hub
- Rinse – For liquid based prep and for additional studies
  - TG, calcitonin, PTH, flow cytometry, genetics
SNAP TECHNIQUE

Tube & Slide Parallel

Pull Up

Release
After the FNA

- Consider observation for 30 minutes post-procedure if needle >23 g, especially if CNB
- If on anticoagulant, observe for 10 minutes to confirm no hematoma formation
- If hematoma: ice and pressure; observe until stabilization confirmed
- Local pain/bruising: ice pack, acetaminophen
- Counsel patient of how results will be relayed
Biopsy Techniques - Summary

- Goal is acquisition of quality diagnostic material and presentation for cytology
- Achieve competency in several techniques to best fit the clinical need
- Avoid excessive dwell time and excessive blood on slides
- Good technique results in a quick and near painless procedure
- Prepare high quality slides