Thyroid FNA
And
Cytopathology

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FNA thyroid

- Wide range of accuracy - causes
- Overview of tools and sampling
- Preparation techniques
- Impact of US guidance
- Impact of training in sampling technique
- (Diagnostic categories - Refs.)

Thyroid FNA accuracy

- Sensitivity 65-98%
- Specificity 72-100%
- Non-dx 2-21% (>40% by others)

“Expertise in sampling and interpretation”


Variability in FNA sampling via palpation

- Non dx 1.9% (0%*) ---- 41%
- Susp/Follicular Lesion 4.3% ---- 27%
- Combined 6.4% (4.6%*) ---- 68%

* Based on repeat sampling in sub-set of cases.
**UCSF unpublished data**, 1387 cases

- Benign 75%
- Malignant 7.1%
- Susp/follicular 14.4%
- Non-dx 3.5%

Palpable masses, no US, Cytopathologists

**Variability in FNA Sampling via ultrasound**

- Non dx 0.7% ---- 53%
- Susp/Follicular Lesion 4.5% ---- 23%
- Combined 6.4% ---- 53%

**Errors in Thyroid FNA**

- N 364
- False neg. 25% (includes unsat.)
- False pos. 10% (includes atypical)
- Almost all the errors were caused by over or under interpretation of poor specimens


**TOOLS**
**Needles**

- Thin/Fine needles (22-25 gauge)
- Syringe, Slip-tip vs. Luer lock

**Needle Tips**

**Open syringe; no suction**

**Sampling with suction**
Sampling

First needle pass offers best chance for good sample

Placement of Needle

Adjustment of Needle
Minimize time to target

Pass / Excursion

Excursions (~5-25)
Needle Tip Bevel

- Regular Bevel
  - MICROLANCE Point
  - for all intramuscular injection
  - for all subcutaneous injection

Number of Excursions

- Usually 10-20
- If bloody do at least 5
**Blood**

Blood immediately – do 5 excursions
If blood appears at 10 excursions – stop.
Cellblocks and cell surface marker studies are less sensitive to blood contamination than smears.

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**Sampling Without Suction**

**Advantage** - Less Blood
**Disadvantages** - Sometimes dry tap
generally less volume of material

*Do not block hub of needle*

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**Suction**

- 1-2 ml sufficient
- Release suction before pulling out

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**Staining for Adequacy**

- Literature mixed on impact on accuracy
- Important tool in teaching sampling technique
- Helps to limit number of samples
- Most likely not a big factor for diagnostic material when operator is *highly* proficient

Ljung, personal opinion
based on 30 y experience
Examples of good and bad samples

CA Good Specimen

FNA Cancer Scant Material

Good Reactive Lymphocytes
Lymphocytes
Poor specimen, crush

Number of Passes

- Result of Quick stain
- Size of target
- Amount of bleeding
- Need for special studies
  - Cell block
  - Cultures
  - Flow cytometry (lymphoma)

FNAB – Specimen Preparation

Direct Smears
Liquid based thin layer
Cell block

Liquid Based Cytology Preparations

Designed for Pap-Smears

Goals
- Readable by computer
- Minimal cell overlap
- Clean background

Result
- Fewer cells overall
- Clusters minimized
- Background material minimized
- Most stromal fragments lost
- Not suitable for adequacy check
- Not suitable for Romanowsky type stains

Bottom Line – loss of critical information for FNA
Ultrasound Guided FNAB

Thoracic FNA
Definitive dx of Cancer

<table>
<thead>
<tr>
<th>Thin Prep</th>
<th>Smears</th>
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<tbody>
<tr>
<td>35% (40%)</td>
<td>78% (60%)</td>
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</tbody>
</table>

Yassa L et al Cancer 2007;111:508-516
Siddiqui MA et al Cancer 2008;114:17-33
Ljung B Cancer 2008;114:144-148

Impact of use of US-guidance on non-diagnostic rates of FNA thyroid samples

<table>
<thead>
<tr>
<th>Palp. FNA</th>
<th>US-FNA</th>
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<tbody>
<tr>
<td>46.8%</td>
<td>15.6%</td>
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<tr>
<td>Many clinicians</td>
<td>One radiologist</td>
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<tr>
<td></td>
<td>Mehrotra et. al</td>
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<tr>
<td></td>
<td>Cytopath 2006 Aug:17(4)</td>
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<tr>
<td>8.7%</td>
<td>3.5%</td>
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<tr>
<td>Endocrine group</td>
<td>Endocrine group + radiologist</td>
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<tr>
<td></td>
<td>Danese, et. al</td>
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<td></td>
<td>Thyroid Vol 8, No 1 1998</td>
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<td>32%</td>
<td>21%</td>
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<td>Same, single operator, prospective study, difference only in small masses (&lt;15mm)</td>
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Cesur, et al Thyroid Vol 16 No 6 2006 p. 555
Impact of use of US-guidance on palpable thyroid masses

- Modest improvement when operators were the same (only small lesions <1.5 cm impacted in one of two studies)

- Training/experience of operators appears to have more impact on sample quality than use of US sampling palpable masses

Factors improving FNA accuracy

- Hands-on one-to-one training in sampling technique
- Immediate evaluation of direct smears
- Frequent use of the technique (>100/y)
- Hands-on training in manipulating needle under US visualization

Components/stages of training

- Cognitive – learn concept
- Associative – practice with feedback–eliminate errors
- Autonomous – able to perform with little or no cognitive input

Levels of training, FNA sampling

- See one, do one, teach one ~ 50% dx
- 10 cases in training ~ 60% dx
- 50 cases in training ~ 85% dx
- 100 cases in training ~ 90% dx
- 200 cases in training ~ 95% dx

Rogers et al Annals of surgery Vol 233 No2 159-166
“A mediocre idea well implemented is better than a brilliant idea poorly implemented”

CONCLUSION
FNA dx can be excellent
TRAINING IS ESSENTIAL