

# THE THYROID NODULE BIOPSY AND REPORTING

*Getting the right patient to  
surgery*

Thomas A Thomson MD FRCPC.  
Pathologist/Cytopathologist  
BC Cancer Agency, Vancouver Clinic



**BC Cancer Agency**  
CARE & RESEARCH  
An agency of the Provincial Health Services Authority

## Objectives

- ◆ FNA in thyroid nodule diagnosis
- ◆ FNA technique
- ◆ FNA Interpretation and Reports
- ◆ Core biopsy and frozen section

## The palpable thyroid nodule

- ◆ Usually means >1.0 cm.
- ◆ If <8mm, FNA necessary?
- ◆ Common: 5% of population
- ◆ Usually benign: 90-95%.
- ◆ Pre-test probability cancer - low

## Malignant neoplasms

- ◆ Papillary carcinoma : 75-80%
- ◆ Follicular carcinoma: 10-15%
- ◆ Medullary carcinoma: 5%
- ◆ Other: <1%
  - including anaplastic carcinoma,  
lymphoma, metastatic malignancy,  
rare tumor types

## Pre-FNA assessment

- ◆ History: duration, growth rate, radiation exposure, family history
- ◆ Exam: size, fixation, nodes
- ◆ TSH
- ◆ Ultrasound - confirm and assess for high risk features
  - ◆ Complex cyst
  - ◆ Increased vascularity
  - ◆ Micro calcification
  - ◆ Irregular margins

## Who should do FNA?



Any trained and interested physician with sufficient intensity of practise.

**RELAX,  
I've practiced on  
hundreds  
of grapefruits**

## FNA Technique

### Informed Consent

- bleeding
- nerve injury
- tracheal puncture
- needle track seeding of tumor

### Palpation or Ultrasound-guided

Fine needle: #25 or #27 gauge needle

Local anaesthetic is nice!

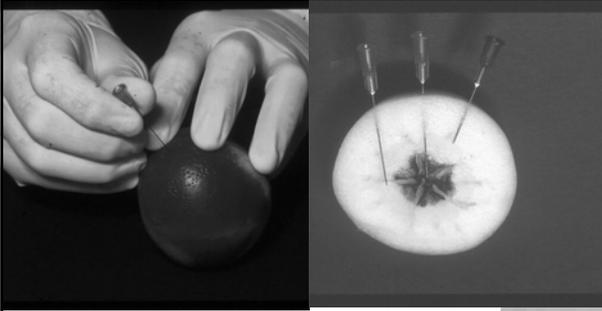


"Come on, don't waste my time. Get out of there."

## FNA Technique

- Needle passes: minimum of 2; 3-6 to adequately sample
- Non-aspiration (capillary method) is best.
- Don't wander the needle! You will come out of the target.
- Be Quick! 10 seconds is enough. Blood in the hub – quit!
- Smears if possible but Liquid based collection is ok
- Post biopsy care: pressure, observation, acetaminophen

## FNA –Simple not Trivial



## FNA technique



Blood, Blood!!

Dx: Unsatisfactory

- Excess suction
- Large bore needle
- Excess time

## Slide preparation

- ◆ Express the material as a drop on the slide.
- ◆ Air dried smear and Alcohol fixed smear (Cytology spray)
- ◆ Rinse the needles into balanced salt solution, RPMI or Cytolyte and send to lab.
- ◆ Cell blocks: usually not necessary or helpful
  - need 1- 2 passes to get adequate material
  - nice for special stains

## FNA: Palpation or Ultrasound?

- ◆ **Palpation:**
  - Convenient, inexpensive, office procedure.
  - Nodule: >1.0cm, confirmed by ultrasound, mostly solid
  - No contraindications or recent previous FNA
- ◆ **Ultrasound:**
  - more complex and costly
  - more accurate and higher satisfactory rate.
- ◆ All nodules should have Ultrasound before FNA
  - 15-20% of "palpable" nodules are <1.0 cm. on US
  - 25-50% of "solitary" nodules are in multinodular gland (most <1.0cm)
  - 2-3% of US detected nodules >1.0 cm are not palpable.

### Ultrasound - indications

- ◆ Non-palpable or difficult location (posterior-inferior)
- ◆ Nodule in background of Hashimoto's thyroiditis
- ◆ Difficult neck exam (thick, short, previous surgery)
- ◆ Complex cystic nodules
- ◆ Unsatisfactory repeat
- ◆ Surveillance: known nodule, follow up for lymph nodes



"Did you see where that one went?"

### Is a repeat FNA helpful?

- ◆ Studies vary: 'not helpful' to >50% diagnostic on second biopsy
- ◆ Most report is helpful for unsatisfactory or non-specific cases (eg cyst, nos)
- ◆ Wait at least 3 months to avoid false positive atypia from reparative change.
- ◆ Repeat with ultrasound



"Do I get that one again?"

### What about core biopsy?

- ◆ Increasingly being offered in some USA centres.
- ◆ Usually #20 gauge needle.
- ◆ Single action spring needle
- ◆ May be useful as a second test in some patients
- ◆ Not helpful in follicular lesions

### FNA vs core biopsy?

Renshaw and Pinnar AJCP 2007; 128: 370-4

- ◆ 377 patients, 6 years
- ◆ Concurrent FNA and one pass Core biopsy

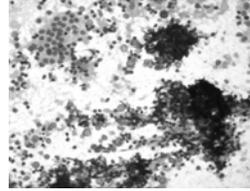
|            | <u>FNA</u> | <u>CB</u> | <u>Combined</u> |
|------------|------------|-----------|-----------------|
| ◆ Adequacy | 70%        | 82%       | 90%             |
| ◆ Non-Dx   | 70 cases   | 25 cases  |                 |

- ◆ NB. FNA atypical in 21 cases of Core bx negative: 14 biopsies revealed 9 malignancies (8 PTC)

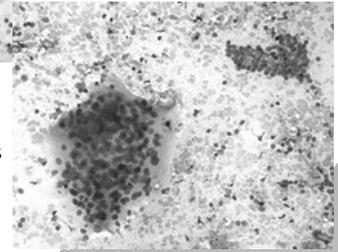
## Interpretation and Reporting

- ◆ **Purpose** : identify who should have surgery
- ◆ Many reporting systems from 2 to 6 categories
- ◆ Papanicolaou Society Guidelines (1997)  
– Canadian Soc. Cytology recommends some changes
- ◆ New guidelines coming - NCI workshop  
(website: <http://thyroidfna.cancer.gov>)

## Benign - Thyroiditis

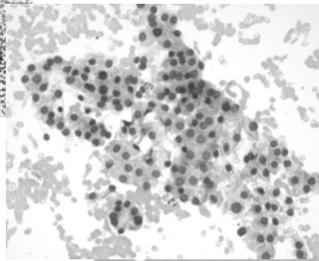
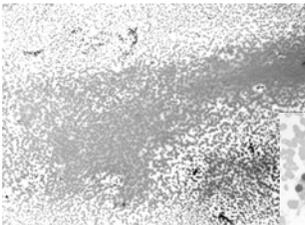


Hashimoto  
Thyroiditis

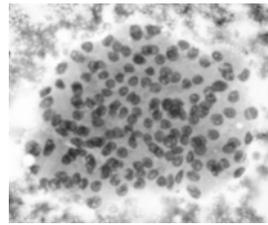


Granulomatous  
Thyroiditis

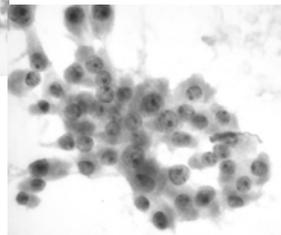
## Follicular Lesion – Favor Goiter



## Follicular Lesions – Favor Neoplasm

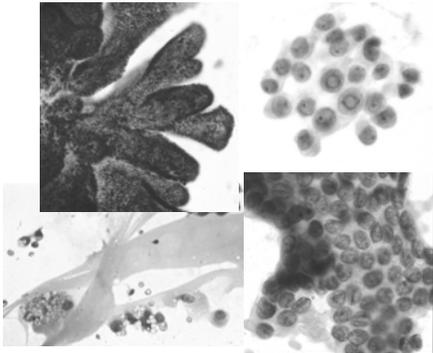


Microfollicular  
pattern

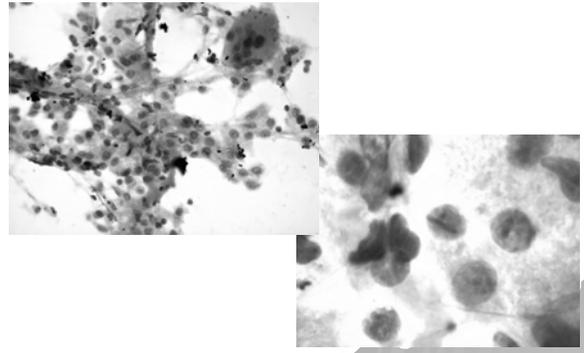


Hurthle Cell  
lesion

## Papillary carcinoma



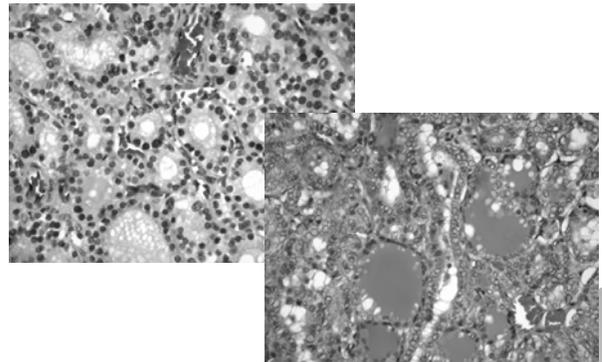
## Suboptimal specimens



## What are the problems?

- ◆ No sample: Missed the target / poor technique
- ◆ Sample quality: few cells, fixation poor, only histiocytes (no follicular cells)
- ◆ Interpretation – inexperience, borderline nuclear changes, reactive change (HT, recent FNA). 2<sup>nd</sup> opinion may be helpful?
- ◆ Diagnostic criteria – overlap of diagnostic criteria for follicular lesions
- ◆ Unhelpful or useless reports – 2<sup>nd</sup> opinion

## Microfollicular lesions



### Insufficient for diagnosis

- ◆ The major cause of diagnostic error is the interpretation of sub optimal samples leading to false-negative and false-positive diagnosis
- ◆ Most pathologists want to see at least 6-10 groups of follicular epithelial cells (10cells/group) on 2 slides.

### Insufficient for diagnosis

- Inadequate aspirates should be <15%.**
- ◆ **Variable amongst practitioners**
  - ◆ **BCCA unsatisfactory rates for physicians sending in samples 15-55%**

### FNA Performance

- ◆ **Reported sensitivities (57-99%) and specificities (55-99%)**
- ◆ **Dutch national survey: false negative rate 30%**
  - ◆ Cancer Cytopathol 2000;90:330-334
- ◆ **BCCA: false negative rate (PTC only) in clinic 4/18 = 22%**  
**referred in 18/54 = 33%**
  - Unpublished data 1995-2003

### 1. Effectiveness of Toyota Process Redesign in reducing Thyroid Gland Fine-Needle Aspiration Errors Raab et al. Am J Clin Pathol 2006;126:585-592

1. Specimen adequacy was standardized
2. Immediate Interpretation encouraged
3. Standard reports established
  - Unsatisfactory
  - Non-specific
  - Benign
  - Atypical
  - Follicular neoplasm
  - Suspicious
  - Malignant

2. Effectiveness of Toyota Process Redesign in reducing Thyroid Gland Fine-Needle Aspiration Errors  
Raab et al. Am J Clin Pathol 2006;126;585-592

Standardized terminology for adequacy

- Pre-standard 5.8% unsatisfactory
- Post-standard 19.8% unsatisfactory

Immediate interpretation

- Yes: 7.8% unsatisfactory
- No: 23.8% unsatisfactory

3. Effectiveness of Toyota Process Redesign in reducing Thyroid Gland Fine-Needle Aspiration Errors  
Raab et al. Am J Clin Pathol 2006;126;585-592

Accuracy characteristics from Standard reports

- Sensitivity: 70.2% to 90.6%
- Specificity: 67.0% to 55.1%
- False Neg rate: 41.8% to 19.1%
  - ◆ (benign only, more unsatisfactory)
- False Pos rate: 22.6 to 26.3%
  - ◆ (follicular neoplasms, suspicious and malignant included in calculation of positive)

**Standardized FNA Report (probable)**

- ◆ **Malignant:** PTC, MC, Aca, NHL, other
- ◆ **Suspicious for** (specify eg. papillary carcinoma)
- ◆ **Follicular patterned lesion:**
  - indeterminate type
  - favour hyperplastic nodule
  - favour Follicular or Hurthle cell neoplasm
- ◆ **Benign:** Colloid cyst, Thyroiditis - Hashimoto or Sub acute (granulomatous) types
- ◆ **Suboptimal** cellularity/preservation but suggestive of ....
- ◆ **Unsatisfactory:** no cells or poor slide preparation

**Standardized FNA Reports – Predictive values**

- ◆ **Malignant** ~ 100%
- ◆ **Suspicious** ~ 65-70%
- ◆ **Follicular patterned lesion:**
  - indeterminate type: ?
  - favour hyperplastic nodule: 15-20% neoplasm
  - favour Follicular or Hurthle cell neoplasm: ~50% neoplasm
- ◆ **Benign:** <1% will be neoplasms
- ◆ **Suboptimal** cellularity/preservation but suggestive of .... ?
- ◆ **Unsatisfactory:** ? Perhaps 5-10% neoplastic

### Management - Unsatisfactory

- ◆ Clinical/Ultrasound follow up
- ◆ Repeat FNA
- ◆ Consider Core Biopsy if available

### Management - Suboptimal

- ◆ Follow and repeat under Ultrasound.
- ◆ Cystic change only
  - Clinical and Ultrasound follow up.
  - Repeat FNA with Ultrasound
  - most are degenerate adenomas or hemorrhagic cysts
  - Cancer risk low; increases with size (>4cm.)
  - If cyst disappears with FNA risk of cancer is very low.
  - If residual lesion after FNA – reaspirate the remnant

### Management - Follicular Lesions

- ◆ 80% are benign (Neoplasm risk ~20%)
- ◆ Assess predictive value of report
- ◆ Follicular carcinoma risk increases with:
  - ◆ Size >4cm (40% vs. 13%)
  - ◆ Male vs. Female (43% vs. 16%)
  - ◆ Solitary vs. Multinodular (25% vs. 6%)
  - ◆ Nuclear atypia (60% vs. 6%)

### Frozen section useful?

#### **Yes!!**

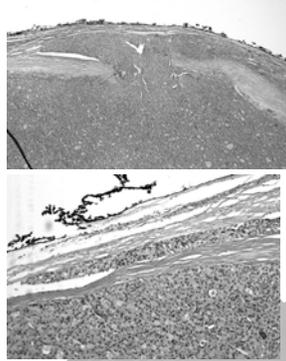
- **Margins**
- **Tissue type: lymph node, parathyroid**
- **Suspicious for papillary carcinoma: 25-40% are diagnostic.**
  - ◆ (Some reports up to 75% but false positive rate increased.)

## Frozen section useful?

### ◆ No!

– If FNA report is follicular pattern lesion then

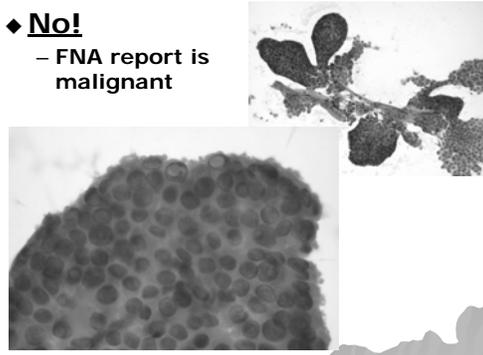
- ◆ FS unlikely to find adenoma vs. carcinoma features
- ◆ Post FNA pseudo-invasion may give false positive diagnosis on FS.



## Is Frozen section useful?

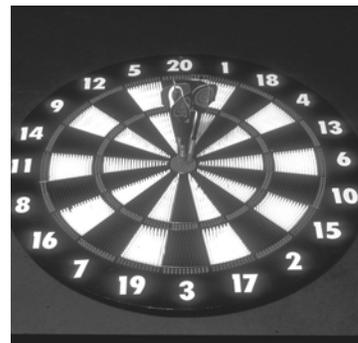
### ◆ No!

– FNA report is malignant



## Summary

- ◆ FNA the best test but far from perfect.
- ◆ FNA technique is simple but not trivial!
- ◆ Better technique gives better samples and more accurate diagnosis.
- ◆ Ultrasound-guided FNA may be indicated.
- ◆ Core biopsy may be useful.
- ◆ Frozen section definite but limited role.
- ◆ New standard reporting pending.



Thanks!!



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