Update on Core Needle Biopsy of Non-palpable Breast Lesions

Nour Sneige, M.D.
UT MD Anderson Cancer Center
Houston, Tx

Image-Guided CNB of Breast Lesions

An alternative to surgical biopsy

CNB vs Surgical Excision

- Same accuracy (1-2% delayed false neg)
- less invasive, less expensive
- Spares most patients (benign) unnecessary surgery
- Empowers patient to decide on treatment options
**CNB of Breast Lesions**

1. Technical considerations
2. Diagnostic problems
3. Controversies: to excise or not to excise

**Imaging Guidance Systems**

- Ultrasound
- Stereotactic mammography
- Magnetic resonance (MRI)

**Ultrasound Guidance System**

System of choice (lesion imaged with US)

- Less expensive
- More readily available
- No radiation exposure
- Lesions not amenable to stereo (tail of axilla, close to chest wall)
- Less time consuming
Stereotactic Guidance System

- Can be used for wider range of lesions: masses and calcifications
- Breast and lesion are immobilized accurate sampling ± 2 mm

MRI

Demonstrates cancers not detected on mammography or sonography

- Sensitivity 100%
- Specificity 37-97%

Needle Biopsy Devices

- Automated (spring loaded gun)
- Directional Vacuum Assisted (DVAB)
Probe is placed into the breast adjacent to the tissue requiring sampling.

Vacuum suction is applied, tissue is pulled into the cutting aperture.

A rotating mechanism cuts and encloses the tissue that has been pulled into the cutting aperture.

**Directional Vacuum Assisted Biopsy**

1. Probe is placed into the breast adjacent to the tissue requiring sampling.
2. Vacuum suction is applied, tissue is pulled into the cutting aperture.
3. A rotating mechanism cuts and encloses the tissue that has been pulled into the cutting aperture.

**Advantages: DVAB vs Automated**

- Faster (1.4 min. vs. 17 min.)
- Twice the weight (34 vs. 17 mg)
- Tissue shift by bleeding, avoided
- Contiguous sampling
Schematic Representation of Breast Biopsy Techniques

Advantages: DVAB vs Automated

Underestimation of ADH

41% Automated needle
15% DVAB (Mammotome)

Calcs retrieval 99-100%

**CNB Size**

Gauge: 18, 16, 14, 11, 8-g

Calcs: 11-g V more accurate than 14-g V/A

**Optimal Numbers of CNB**

Solid masses: 4-5 cores

Calcifications: > 10 cores

Diagnostic yield from sequential core biopsy specimens for all masses (n=93)
Specimen Radiography - CNB

- Confirm Calcs
- Calcs must correspond to those on mammography

Segregation of Cores with and without Calcs on Specimen Radiographs

Diagnostic yield of malignancy (DVAB):
Cores with calcs: 84%
Cores without calcs: 71%

Same diagnosis: atypical/malignant in 76%
Equally careful attention should be given to cores with no calcs

Margolin et al, Radiology 2004; 233: 251-254
Radiologic-Pathologic Correlation

Pathologist should review specimen radiograph (calcs)

Pathologist should be provided with:
1) Specimen radiograph
2) BI-RADS category
Imaging-Histologic Discordance

0.9 - 6% of cases
Discordance is an indication for surgical excision (24% malignant)

Diagnostic Problems- CNB

- Tubular lesions (tubular CA vs. adenosis)
- Papillary lesions (pap CA vs. papilloma)
- Mucinous lesions (mucosele vs. muc CA)
- Fibroepithelial lesions (FA vs. PT)
- In situ vs invasive
- Ductal vs lobular carcinoma in situ

Diagnostic Problems- CNB

1. Benign or malignant?
2. In situ or invasive?
3. In situ lobular or ductal?
**Breast Biopsy Claims from 1998-2003**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Claims</td>
<td>42</td>
<td>(15.5%)</td>
</tr>
<tr>
<td>False Negative</td>
<td>20</td>
<td>(48%)</td>
</tr>
<tr>
<td>False Positive</td>
<td>22</td>
<td>(52%)</td>
</tr>
</tbody>
</table>

21% of all breast bx claims involved CNB


---

**Diagnostic Errors in Stereotactic/ Palpable CNB of Breast**

1. Misdiagnosis of DCIS, SA and adenosis as invasive ductal carcinoma.
2. Misdiagnosis of LCIS as low-grade DCIS.
3. Failure to recognize small, easily over-looked foci of invasive lobular carcinoma.

Diagnosis:
1. LCIS
2. Ca in situ
3. ADH/DCIS

Carcinoma In Situ: lobular or Ductal?

Deeper cut
Indeterminate Lesions at CNB

- Ancillary studies
- If in doubt, second opinion / defer to surgical excision

Controversies:
To Excise or Not to Excise?

- Lobular Neoplasia
- Papilloma
- Mucocele
- Radial Scar
- Flat epithelial atypia
- ADH

Consensus Meeting on Image Detected Breast Cancer – The American College of Surgeons 2005

Patients with high-risk lesions, including ADH, ALH and LCIS found on percutaneous biopsy may have DCIS or invasive cancer at the same site and should generally undergo surgical excision. This incidence of missing such important findings is markedly reduced with the use of vacuum assisted biopsy and large gauge needles.
Consensus Meeting on Image Detected Breast Cancer – The American College of Surgeons

For some individuals with high-risk histologic findings, in whom careful correlation of imaging and histologic findings is concordant, or breast MRI is normal, follow-up without surgical excision may be reasonable.

Lobular Neoplasia: To Excise or Not to Excise?

- 1% of all breast biopsies
- “Marker” of inc. risk in excisional biopsy

Lobular Neoplasia Diagnosed at CNB Does Not Mandate Surgical Excision

504 Subjects
(19 studies)
328 Surgical 176 No Surgical Excision
23.2% upgrade. 7 studies included 101 HRL Exc
HRL, 16.7% upgrade

Outcomes for All Patients Undergoing Surgical Excision or Observation (504 Subjects)

- 328 Surgical Excision
  - 94 LCIS
  - 124 ALH
  - 76 HRL
  - 34 LIN
  - 62 F/U
  - 111 No. F/U
  - 3 Lost

- 176 No Surgical Excision
  - 6 DCIS
  - 13 DCIS
  - 34 CA
  - 2 DCIS
  - 3 CA

Bowman et al., Journal of Surgical Research 2007, 275-280

Recommendations Regarding Management of LIN Diagnosed at CNB –

- Routine surgical excision: 9
- Surgical excision for specific circumstances: 7
  - Only for LCIS (not ALH): 1
  - LIN with residual Calc: 2
  - LIN with synchronous mass: 1
  - LIN with asso with a high risk lesion: 1
  - Pleomorphic LCIS: 1
  - Cases of diagnostic confusion: 1
  - Clinical follow-up: 1
  - No firm recommendations: 2

LCIS and ALH on CNB
Limitations of published reports

1) Marked variation in the clinical, methodological, and radiological details.
2) Inconsistency regarding inclusion criteria for surgical excision vs observation /selection bias
3) Inclusion of subjects with other high-risk lesions
4) Inclusion of cases with overlapping diagnoses (PLCIS).
5) Small numbers, the retrospective nature, and nearly half were nonconsecutive series.

Bowman et al., Journal of Surgical Research 2007, 275-280
LN in CNB is Associated With a Low Risk of DCIS/IC

- 92 LCIS/ALH on CNB
  - 7 cancers on excision
    3 (3%) in area of bx site (1 DCIS; 2 IDC)*
    2 away from bx site
    2 after negative bx site excision

*One interpretive error (ADH on core)

Renshaw et al. AJCP 2006; 126: 310-313

LN in CNB is Associated With a Low Risk of DCIS/IC

- Rate of DCIS/IC found is well within the reported false-negative rate for NLB (1.2%-9.1%).
- In centers with appropriate f/u info, routine excision of all biopsy sites for LN may not always be necessary.

Renshaw et al. AJCP 2006; 126: 310-313

38 CNB upgrade on excision 3(8%)
- 18 ALH 1 (6%)
- 20 LCIS 2 (10%)

Problems: 8 associated with mass/density
9-11 V or 14 G auto (S or US)

LCIS/ALH on CNB- MDACC

Multidisciplinary approach
No excision required: if
1. Calcs only
2. Completely removed by DVAB
3. Classic LCIS
Post interventional imaging

LCIS and CCC with calcs' by imaging completely excised
Papillary lesions on CNB: to Excise or Not to Excise?

- < 5% of breast biopsies
- Include benign atypical and malignant
Atypia in a Papilloma

Atypical papilloma on CNB require excision to R/O Ca

10% focal, <30% atypia, 30-90% DCIS (Tavassoli)

3 mm area ADH/DCIS in papilloma (Page)

Papillary lesions on CNB

1063 subjects (16 series) with benign or atypical papillary lesions

138 (23%, R 6-39%) upgraded to carcinoma on excision


Reliability of CNB in the diagnosis of papilloma (no atypia)?
Reliability of CNB in the Diagnosis of Papilloma?

Papilloma with no atypia
345 cases (15 series)

8 series: 0% upgrade to cancer
7 series: 2-20% upgrade to cancer

Limitations of published series:
- Small number of patients
- Selection bias for excision
- 2 largest studies used cases diagnosed on FNA

Papillary lesions on CNB


Relationship of Mode of Biopsy of the Papillary Lesion With Malignancy at Surgical Excision

<table>
<thead>
<tr>
<th>Mode of percutaneous biopsy</th>
<th>N</th>
<th>Malignant</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stereotactic</td>
<td>33</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>US- core</td>
<td>17</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>US- FNA</td>
<td>30</td>
<td>9</td>
<td>30</td>
</tr>
</tbody>
</table>

### Relationship of Pathologic Characteristics of Papillary Lesions With Malignancy at Surgical Excision

<table>
<thead>
<tr>
<th>Pathologic Diagnosis</th>
<th>Ca/cases</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papilloma/papillomatosis</td>
<td>6/36</td>
<td>17</td>
</tr>
<tr>
<td>Atypical papillomatosis/papilloma with ADH</td>
<td>2/7</td>
<td>29</td>
</tr>
<tr>
<td>“Pure” papillary lesion</td>
<td>9/28</td>
<td>32</td>
</tr>
<tr>
<td>Papillary lesion with atypia</td>
<td>2/9</td>
<td>22</td>
</tr>
</tbody>
</table>


Department of surgery and radiology.

### Lesions Yielding a Benign, Concordant Diagnosis at Percutaneous Biopsy May Warrant Surgical Excision

- 35 papillomas on CNB
- 25 excised, 10 mammogram F/U > 2 yrs
- Excision: 5 Cancers (14%)

Liberman, et al. 2006 AJR 186:1328-1334

### Lesions Yielding Benign Papilloma at Percutaneous Biopsy and Cancer at Surgery

<table>
<thead>
<tr>
<th>Type</th>
<th>Size (cm)</th>
<th>Guidance/Needle</th>
<th># of Cores</th>
<th>Target</th>
<th>Interval (mo)</th>
<th>Surgical Pathology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.2</td>
<td>St/11 V</td>
<td>29</td>
<td>Excised</td>
<td>1</td>
<td>DCIS 1 cm from bx site</td>
</tr>
<tr>
<td>2</td>
<td>1.2</td>
<td>St/14 A</td>
<td>4</td>
<td>Sampled</td>
<td>7</td>
<td>IDC with DCIS at periphery of pap lesion.</td>
</tr>
<tr>
<td>3</td>
<td>0.8</td>
<td>US/14 A</td>
<td>3</td>
<td>Sampled</td>
<td>25</td>
<td>DCIS at periphery of papilloma</td>
</tr>
<tr>
<td>4</td>
<td>0.6</td>
<td>US/14 A</td>
<td>4</td>
<td>Sampled</td>
<td>21</td>
<td>DCIS in papilloma</td>
</tr>
<tr>
<td>5</td>
<td>0.8</td>
<td>St/11 V</td>
<td>14</td>
<td>Excised</td>
<td>22</td>
<td>IDC, gr 3 and DCIS 1.8 cm admixed with pap.</td>
</tr>
</tbody>
</table>
Lesions Diagnosed As Papilloma on CNB - MDACC

No excision:
- Small (up to 1.5 cm)
- DVAB samples
- Concordant imaging and histologic findings (size)

Mucinous Lesions

- < 1% of CNB specimens
- Range: Mucocele-like to mucinous carcinoma

Mucocele-like Lesions

Imaging:
- Indeterminate calcs (majority)
- Well-circumscribed lobulated mass
Mucocele-like lesion, CNB
MLL with ADH and mucinous ca (20% of cases)
Mucocele-like Tumors- CNB

Among 20 cases of MLL with no atypia, no carcinoma was found on excision.

CNB is highly reliable for accurate Dx of mucinous lesions

Wang et al AJCP 2007
Carder et al Histopath 2004
Renshaw AJCP 2002

Mucocele with no atypia on CNB, Calecs completely removed. Exicision is no required

Radial Scars

Stellate
Radiating central fibroelastic stroma
Nonpro/prolif.epith.
### Results of Surgical Excision of Radial Scars Without Atypia Diagnosed on CNB

<table>
<thead>
<tr>
<th>Authors</th>
<th>Biopsy Technique</th>
<th># cases</th>
<th>DCIS/IC at Excision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dershaw</td>
<td>14 A</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Lee</td>
<td>14 A</td>
<td>4</td>
<td>1 DCIS</td>
</tr>
<tr>
<td>Jackman</td>
<td>14 A</td>
<td>5</td>
<td>2 IDC, 1 DCIS</td>
</tr>
<tr>
<td>Philpotts</td>
<td>14 A; 11 M</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Kirwan</td>
<td>14 A</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>Cawson</td>
<td>14 A</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75</strong></td>
<td><strong>3 (4%)</strong></td>
<td></td>
</tr>
</tbody>
</table>

---

### Radial Scar on CNB

*Bremer et al. AJR 2002; 179: 1179-1184*

- 198 lesions (11 institutions)
  - 157 lesions
  - (102 excised, rest f/u 24 m)

**CA at excision:**
- RS with ADH on CNB 28%
- RS no ADH 4%

---

### Radial Scar on CNB

*Bremer et al. AJR 2002; 179: 1179-1184*

Dx of RS on CNB is likely to be reliable when:

- No associated ADH
- >12 cores obtained
- VAD used
Radial Sclerosing Lesion

- 80 patients (9 or 11 SDVAB)
  - 19 excised, 2 upgraded to atypia
  - 61 mammographic surveillance

Conclusions: more extensive sampling by 9/11-g device followed by meticulous correlation of radiological-pathological and close f/u could obviate surgical excision in the majority of RSL.


ADH at CNB: MDACC Approach

ADH limited to ≤ 2 foci (DVAB) had no worse lesion on excision, provided that most of calcs are removed

Ely et al., AJSP 2001; 25, 1017-1021
Sneige et al., AJCP 2003;119:248-253

ADH in DVAB of Microcalcifications

140 patients (86.4% excision) ADH associated with calcs in the absence of a mass can be categorized into 2 different risk groups.

Nguyen, Albarracin, Whitman, Lopez, Sneige
Ann Surg Oncol: (2011) 18: 752-761
1. ADH associated with significant atypia and/or necrosis are most likely to be associated with carcinoma and should be excised.
ADH in DVAB of Microcalcifications

2. ADH without these features, regardless of extent of involvement, and with >95% removal of the targeted calc, is associated with a minimal risk (<3%) of carcinoma and may undergo mammographic f/u only.

Nguyen, Albarracin, Whitman, Lopez, Sneige
Ann Surg Oncol: (2011) 18: 752-761
Image-guided CNB of Breast Lesions - Conclusions

- Important for the diagnosis
- Awareness of the diagnostic problems associated with CNB
- Best managed using a multidisciplinary approach (clinician, radiologist, pathologist, and surgeon involved)