Breast Biopsy: Beyond the Basics

Part 1: Getting the Tissue

John M. Lewin M.D., FACR, FSBI
Learning Objectives

• At the end of this lecture the participant should be able to:

1. Use techniques to minimize pain and bleeding during a biopsy
2. Optimize imaging of a hard-to-see lesion on a stereotactic device
3. Accurately target and sample a lesion
4. Give the appropriate recommendation for management based on the pathologic result
Pain Control – Local Anesthesia

• Controversies
  – To buffer or not to buffer
  – Lidocaine, bupivacaine or both
  – Epinephrine or not
  – Does warming the agent help?
  – Does cooling the skin help?
To Buffer or Not To Buffer – Theory:

- Lidocaine HCl is acidic (required for stability)
  - 1% lidocaine: pH = 6.1
  - 1% lidocaine w/ epi: pH = 4.2
  - Injecting acid causes pain

- Lidocaine HCl is primarily in ionized form in solution
  - Buffering with NaHCO3 creates more non-ionized molecules – needed for entry into neurons

Does Buffering Help?

• Many published studies – dental, hand, ER, peds...
  – None in the breast, but some in superficial tissue, e.g.
    • Upper lip for plastic surgery; n= 44
      – 26 favored buffered ; 15 favored unbuffered ; 3 no pref
        » p > .05
      – Buffered effect lasted longer
    • Scrotum for vasectomy; n= 85 (1 side w; 1 side w/o)
      – Buffered less painful for infiltration (1.7 vs 3.2)
      – And for procedure (2.2 vs 3.7)
        » p << .01
  – Results mixed overall...
Cochrane Review

• 23 studies – infiltration pain only
  – 10 parallel
  – 13 crossover
  – (8 had mod to high risk of bias due to allocation concealment)

• Results:
  – Infiltration pain less for buffered by 1 -2 pain units (1-10)
  – Bigger effect of buffering when lidocaine contained epi

  – So... I recommend using buffering your lidocaine
Caveat: If you go to the review today...

Adjusting the pH of lidocaine solution for reducing pain on injection

Published: 20 May 2015

Authors: Cepeda M, Tzortzopoulou A, Thackrey M, Hudcova J, Arora Gandhi P, Schumann R

Primary Review Group: Anaesthesia, Critical and Intensive Care

This review has been withdrawn.

The reason for withdrawal and previous versions are archived and accessible within the withdrawn record in the Cochrane Library.
How much bicarb?

• Typically comes as 8.4% NaHCO$_3$
  – But check – some comes as 4.2% (e.g. Neut®)

• Dose as follows (for 8.4%):
  – For 5 ml: 0.5 ml bicarb to 4.5ml 1% lidocaine
  – For 10 ml: 1 ml bicarb to 9 ml 1% lidocaine
Bupivacaine or not

• Lidocaine is the mainstay of local anesthetics
  – Rapid onset (~2min) ; long enough duration (~45min)
  – Safe

• Bupivacaine can be used in addition
  – Slower onset but longer acting (2-4 h)
  – Cardiotoxic – can be fatal if goes IV
    • Most cases come from epidural injection
    • Intralipid can be used for recovery
Bupivacaine – Lit Review

• Many studies but no consensus
  – Mixture of Lidocaine and Bupivacaine not shown to be better than lido alone
  – Bupivacaine does last longer
  – Adding epi increases duration of lidocaine anesthesia

• In my experience, use Bupivacaine as a second anesthetic if ...
  – The patient complains of pain during the administration of the (buffered) lidocaine
Local Anesthesia Controversies: Summary

- To buffer or not to buffer -- **buffer** (evidence based)
- Lidocaine, bupivacaine
  - use **bup** if lido not working (my experience)
- Epinephrine or not
  - use if need to increase duration (e.g. stereo vs U/S)
- Does warming the agent help? – **yes**¹
- Does cooling the skin help? - **unclear**

Also, use a small (30g) needle in the skin
Minimizing Bleeding

• Anticoagulants/Antiplatelets – discontinue or not?
  – Weigh risk of breast hematoma vs risk of stroke or MI
  – I do not discontinue meds; literature supports this


• Other keys
  – Hold direct pressure for 10 min without peeking
  – ? Space-filling markers; ?epinephrine in the lidocaine
Targeting

• Accuracy, high to low: Ultrasound / Stereo / MRI
  – Ultrasound:
    • Real-time imaging; target visible under ultrasound
  – Stereo:
    • Intermittent imaging; target can move; breast compressed
    • Faint calcifications can be hard to visualize
    • Non calc cases can be hard to visualize; plus no confirmation
  – MRI:
    • Intermittent imaging; breast not very compressed
    • Target may be hard to see; worse with time, blood; no confirmation
Basic Ultrasound Biopsy Technique
(outside the scope of this course: “Beyond the Basics”)
Ultrasound Targeting Tip 1:

- If needle is hard to see, angle the beam
Ultrasound Targeting Tip 2:

- After you fire, take an image perpendicular to the needle to prove you are in the lesion.
Stereo Targeting

• Trickier than ultrasound biopsy
• More common than MRI biopsy
• A fast prone stereo biopsy will reduce patient discomfort since often the table is the biggest source of discomfort

• Two types of systems: Prone & Upright
Prone Biopsy Systems

• Introduced in the early 1990s
• Markedly reduced the risk of a vaso-vagal reaction during the procedure
• Current systems use a CCD array for the detector
  – Inferior image quality compared to FFDM detectors
  – Limited field-of-view
• Positioning for posterior lesions can be challenging
Prone Stereotactic Biopsy

- Jackman, et al, 2003, reported technical success in 98% of cases. For the other 2%, failure was due to:
  - Inability to visualize the target (56%)
  - Target too far posterior (29%)
  - Patient factors (15%)


- Type of biopsy where tips and tricks are most useful
Issues

• Positioning
• Imaging
• Targeting

• Note: tips and tricks in this lecture all apply to prone biopsy – some also apply to upright
  – Full-field imaging solves some of these issues
Locating the Target
(and getting it within the 5 cm window)

• Problem: A small target in a large breast can be hard to locate.
• Why?
  – Instead of 24 x 30 cm field-of-view you have only a 5 cm field-of-view
• Tips
  – Start with a full-field view in the projection of your biopsy approach (e.g., LM)
  – If really stuck, mark skin, place BBs and take an upright full-field view
  – Make sure imaging is optimal; you are posterior enough (see above)
  – Change positioner (i.e., position yourself)
Tips on Positioning

• The obvious:
  – Pick the shortest approach
  – Sometimes the shortest approach may be from below
  – An oblique view may be the best approach for some lesions

• Less obvious:
  – How to get far posterior, far superior, far lateral lesions
Arm through the hole positioning

• Used for
  – Far Lateral
  – Far posterior if in lateral aspect of breast
  – Sometimes far superior

• Tips
  – Use arm sling if you have one
  – If not can use step stool
  – Use oblique positioning to get arm out of the image
Arm Through Hole
Imaging

• Problem: Sometimes it is hard to see calcifications on the stereo table, even though they were visible on the mammogram

• Why?
  – Differences in detector performance
  – Differences in compression
  – Differences in image processing
# Detector Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Mammography Unit</th>
<th>Stereotactic Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detector Type</td>
<td>Solid state with or without scinitillator (CsI) (amorphous selenium or amorphous silicon)</td>
<td>CCD (charge coupled device) with scintillator (CsI)</td>
</tr>
<tr>
<td>Spatial Resolution</td>
<td>70 - 100 microns</td>
<td>100 microns (50 in high-res mode)</td>
</tr>
<tr>
<td>Contrast Resolution</td>
<td>High</td>
<td>Pretty high</td>
</tr>
<tr>
<td>Dynamic Range</td>
<td>Wide (very hard to saturate detector)</td>
<td>Narrow (easy to saturate)</td>
</tr>
<tr>
<td>Electronic Noise</td>
<td>Low</td>
<td>Moderate (transistor noise)</td>
</tr>
<tr>
<td>Quantum Noise (statistical noise)</td>
<td>Low if exposed properly</td>
<td>Limited by dynamic range</td>
</tr>
<tr>
<td>Size</td>
<td>Large</td>
<td>5 cm x 5cm (nominally)</td>
</tr>
</tbody>
</table>
What is important?

• Spatial resolution?
  – No. Not much difference. Actually favors stereo in high res (i.e., 1024) mode.
  – Important calcifications are 100 microns or larger (most malignant calcs are 200 microns)
    • But of course it is usually the benign ones that cause the hardest biopsies (i.e. sclerosing adenosis)

• Contrast to Noise Ratio?
  – Yes. We have trouble with small calcifications because they don’t have much contrast (esp. when they are in dense tissue)
### How to Increase Contrast to Noise Ratio:

#### 1) Increase Contrast

<table>
<thead>
<tr>
<th>Contrast Inhibitor</th>
<th>How to Fix</th>
<th>Why</th>
<th>Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Contrast</td>
<td>Lower the kVp (you can set a manual technique)</td>
<td>Softer beam increases subject contrast</td>
<td>Longer exposure can increase motion blur</td>
</tr>
<tr>
<td>Tissue scatter</td>
<td>Tighten compression</td>
<td>Thinner breast causes less internal scatter</td>
<td>Patient discomfort</td>
</tr>
<tr>
<td>Tissue scatter</td>
<td>Use sterile adhesive covering to flatten surface</td>
<td>As above. Plus, curved surface increases scatter</td>
<td>Hassle (but worth it sometimes)</td>
</tr>
<tr>
<td>Detector type / age</td>
<td>Upgrade detector</td>
<td>Newer detectors work better (duh)</td>
<td>$$$$$$</td>
</tr>
</tbody>
</table>
### How to Increase Contrast to Noise Ratio:

#### 2) Decrease Noise

<table>
<thead>
<tr>
<th>Noise Enhancer</th>
<th>How to Fix</th>
<th>Why</th>
<th>Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantum (statistical) Noise</td>
<td>Increase your technique by increasing mAs and/or kVp</td>
<td>More photons will decrease quantum noise</td>
<td>Longer exposure can increase motion blur. Higher kVp decreases subject contrast. (Usually worth it. Consider having patient hold her breath)</td>
</tr>
<tr>
<td></td>
<td>NOTE: this is the single best trick I have for seeing calcs better!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantum Noise</td>
<td>Stick with 512 mode</td>
<td>512 mode averages the pixels, decreasing noise</td>
<td>Lower spatial resolution (not usually the problem)</td>
</tr>
</tbody>
</table>
So...Don’t be afraid to set a manual technique

Look at technique that was just shot ...

Then decrease the kVp (esp if 30 or more) and increase the mAs.
Example

Too Little Technique

More Technique
Targeting

• Problem: Calcifications have often moved between the stereo image and the pre- and post-fire images

• Why?
  – Gravity
  – Patient motion
  – Anesthetic introduction
  – Needle introduction
# Targeting Solutions

<table>
<thead>
<tr>
<th>Cause of Motion</th>
<th>Solution</th>
<th>Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravity/ Patient Motion</td>
<td>Tight compression; minimize time between stereo pair and targeting; Make patient comfortable and calm; Retake stereo after all else is ready</td>
<td>Patient comfort; Desire to minimize exposures / time of procedure</td>
</tr>
<tr>
<td>Anesthetic introduction</td>
<td>Do not use more than necessary (3-5 ml vs 10 ml); Key is accuracy, not volume</td>
<td>Need enough to anesthetize patient</td>
</tr>
<tr>
<td>Needle Introduction</td>
<td>Fire rather than push needle in. Understand post-fire images to minimize retargeting</td>
<td>Post fire images can be confusing...</td>
</tr>
</tbody>
</table>
Targeting Basics (outline)

• Needle Basics
  – Pullback and throw

• Understanding the post-fire stereo pair
  – When to retarget
  – When to adjust
  – When to just biopsy
Needle Geometry Basics

How to calculate pullback:

\[
\text{Throw} - \text{Pullback} = \frac{1}{2} \text{Notch} + \text{Dead Space}
\]

\[
\text{Pullback} = \text{Throw} - \left( \frac{1}{2} \text{Notch} + \text{Dead Space} \right)
\]

Example:

Throw = 2 cm; Notch = 2 cm; Dead Space = 8 mm

Pullback (mm) = 20 - \left( \frac{1}{2} \times 20 + 8 \right) = 2 \text{ mm}
Tips on interpreting the post-fire images...

• You need to look at both images to understand how the target relates to the notch
  – Some cases are obvious, but others not so much...
“Post-Fire” Stereotactic Images
Straightforward Case #1

Calcifications lined up with notch. Good to go.
“Post-Fire” Stereotactic Images
Straightforward Case #2

Clearly these are too far posterior. Need to retarget.
Clearly these are too deep. Need to push in.
Less Straightforward: Real life case

Biopsy; adjust and biopsy or retarget?
“Post-Fire” Stereotactic Images
Less Straightforward Case #1

Calcifications are up and to the left in both images – biopsy at 10:00
Calcifications are up and to the right in both images – biopsy at 2:00
Calcifications are down and to the right in both images – biopsy at 4:00
Calcifications are at 10:00 – but may be too deep. Push in (and retake stereo) then biopsy at 10:00
Real life case revisited

Biopsy; adjust and biopsy or retarget?
Next: What to do about a negative stroke margin?

• Problem:
  – Thin breast and lesion cannot be positioned so that there is adequate tissue between the back edge of the breast and the support plate
  – Worsened with increasing needle dead space
  – Worsened if cannot do all approaches
    • i.e., cannot go From Below
What to do about a negative stroke margin (cont.)?

• Tips
  – Push in (fire outside the breast) and see how far you can get before touching the back skin (patient will tell you)
  – Once needle is in, loosen compression a little
  – Place something behind the breast to allow back skin to tent, e.g.
    • 2nd fenestrated compression paddle (Fischer)
    • MammoPad
  – If you think you are going to go through the back of the breast, prep it ahead of time
What to do about a negative stroke margin?

• Tips (cont.)
  – Use a needle with less dead space
  – Note: This is not necessarily the same as a “short notch” needle
    – “most” short notch (petite) needles have the same dead space as the regular needle
      • Exception: One vendor’s “Blunt Nose Short Notch” needle has a 4 mm dead space.

• Short Notch: 12mm vs 20mm
• One vendor has “½ sampling notch” option
So when do you use a short notch (petite) needle?

• Use petite for a thin breast where you cannot get the tissue to cover the entire notch
  – (Notch coverage is needed for adequate suction)

• Can also try...
  – Loosening compression after needle is in place
  – Thicken breast by using tape to squeeze the breast side to side
  – Pull skin back with forceps
  – Pick an approach where the breast is thicker (usu. ML)
One more thing...

- If calcifications keep moving out of the way of the needle, they may be in a partially calcified fibroadenoma. Target even farther below (anterior) or switch to above (posterior).
Technical Improvements to Prone Stereo Units

• Visualization
  – Full field detectors using the same technology used in digital mammo units

• Posterior Access
  – Angled needle for cartesian coordinate systems

• Patient Factors
  – More comfortable table designs
  – Efficiency improvements
Upright Stereo Biopsy Systems

• Old –
  – Limited field of view CCD array add-on attachment
  – Some only accommodated lateral arm approach

• New –
  – Use FFDM detector built into mammo system
    • High image quality
    • Full field of view / same positioning
  – Newest systems (with or without tomo) speed up process, greatly reducing vaso-vagal risk
  – Most new systems being sold are upright (according to vendor)
MRI Biopsy Tips

• Compression should be firm enough to enable needle insertion but not so firm as to impede contrast uptake
  – I use a scalpel to make a skin nick (I don’t for stereo when using a cutting needle)

• Move quickly to preserve enhancement of the target until at least the needle placement image
  – Requires advanced planning and teamwork

• If possible use lavage and suction to evacuate blood from the biopsy site so that residual target can be seen

• Pay attention to improvements in coils and devices
MRI Biopsy Success

• MR-guided biopsy has the lowest success rate of the 3 modalities
• Have a low threshold to rebiopsy or excise lesions if pathology is discordant
• Rebiopsy or follow-up in short interval if concordant but you are uncertain the lesion was adequately sampled
Failure to Enhance

• Some lesions that enhanced on the diagnostic study do not enhance at the time of biopsy
  – Enhancement may be dependent on hormone levels
  – Compression decreases enhancement

• Most lesions that fail to enhance at biopsy are benign, but not all

• Follow-up is recommended; f/u interval should depend on initial suspicion and lesion characteristics (e.g., 3m, 6m or 12m follow-up may be appropriate)
Summary – Part I

• Pay attention to details during numbing and hemostasis
• Ultrasound guided biopsy is the most reliable due to real-time visualization of the target and needle
• Prone stereotactic biopsy is highly successful. Techniques exist to maximize success in the problematic areas:
  – Imaging
  – Patient positioning
  – Targeting
• MRI biopsy has the worst success rate, even in the hands of experts, and is complicated by a lack of a confirmatory specimen image. The threshold to re-biopsy should be lower than for the other modalities.
Breast Biopsy: Beyond the Basics

The Importance of Rad/Path Correlation and Borderline Lesions

Dr Chris I Flowers MD FSBI
Talking Points

• Importance of the Radiology/Pathology relationship
• Lesion/tumor heterogeneity
• Why Rad/Path correlation is even more important in Borderline lesions
Problem Overview

• Approx. 1 million needle biopsies in the USA per year
• HHS estimates 10,000 had a delay in diagnosis of their breast cancer due to a failure to resolve imaging pathology discordance after their biopsy*

*The ASPE Technical Expert Panel on Improving Cancer Policy Research through Information Technology. The Importance of Radiology and Pathology Communication in the Diagnosis and Staging of Cancer: Mammography as a Case Study. November 2010
The Importance of Relationships

• Insuring that the lesion biopsied is the one being looked at by the pathologist

• Microcalcification
  – Means different things to different specialties

• Heterogeneity within the tissue sample
Pathology Issues

• Slightly easier with the advent of Digital Pathology
  – Whole slide scanning
  – E.g. Aperio™

• Can view whole slides for an overview giving easier correlation with imaging
Pathology Issues

• Radiology views either
  – Squashed breasts in one plane (Mammography)
  – Pancake breasts spread on the chest wall (US)
  – Hanging breasts (MRI) especially important for relationship to pectoralis in invasive disease
Pathology Issues

• Core biopsies
  – Needs to determine if sampling error
  – Small volume, may be distorted due to processing shrinkage

• Surgical specimens
  – These may have sat in a formalin pot overnight, and relationships to in-vivo anatomy may be difficult to determine
Pathology Issues

• Inter-observer variability
  – Especially with benign and borderline lesions
  – May relate to the amount of tissue received from the biopsy
  – Often they are counting either number of ducts containing cells or the number of mitoses per field
  – CAD for digital pathology may improve this situation
Pathologist Variability

• Like radiology, most pathologists are generalists not specialists
• Can be difficult to differentiate between cellular benign and malignant lesions
Variability
Variability in Reporting

Figure 2

Case 4: All 10 pathologists diagnosed this lesion as a phyllodes tumor, with 7 diagnosing it as borderline, 2 as malignant, and 1 as benign (hematoxylin and eosin; 4× and 20×).
Modern Pathology (2006) 19, 195–207. doi:10.1038/modpathol.3800496; published online 9 December 2005

Interobserver agreement and reproducibility in classification of invasive breast carcinoma: an NCI breast cancer family registry study

Teri A Longacre¹, Marguerite Ennis², Louise A Quenneville³, Anita L Bane⁴, Ira J Bleiweiss⁶, Beverley A Carter⁷, Edison Catelano⁸, Michael R Hendrickson¹, Hanina Hibshoosh⁹, Lester J Layfield¹⁰, Lorenzo Memeo⁹, Hong Wu¹¹ and Frances P O'Malley⁴,⁵
Inter-observer variability in breast biopsy

<table>
<thead>
<tr>
<th>diagnostic category</th>
<th>Kappa values</th>
<th>interpretation count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invasive cancer</td>
<td>96% (95% CI, 94%-97%)</td>
<td>663</td>
</tr>
<tr>
<td>DCIS cases</td>
<td>84% (95% CI, 82%-86%)</td>
<td>2097</td>
</tr>
<tr>
<td>Atypia cases</td>
<td>48% (95% CI, 44%-52%)</td>
<td>2070</td>
</tr>
<tr>
<td>Benign cases without atypia</td>
<td>87% (95% CI, 85%-89%)</td>
<td>2070</td>
</tr>
</tbody>
</table>

Preoperative biopsy interpretation during 2011-14, compared to expert consensus
Lesion Heterogeneity

It matters which area you biopsy. Otherwise you may get ‘sampling error’
How a specimen is cut may affect the final diagnosis

• Especially when a tumor is surrounded by DCIS

• Surgical biopsy of a borderline lesion
  – Gives rise to the concept of upgrade of disease
  – ‘surgical upgrade’
  – Borderline lesions have potential to be upgraded for surgery.
    • Needle size has some impact
<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Underestimation rate (%) by needle size (gauge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liberman</td>
<td>1998</td>
<td>10</td>
</tr>
<tr>
<td>Philpotts</td>
<td>1999</td>
<td>26.7</td>
</tr>
<tr>
<td>Darling</td>
<td>2000</td>
<td>44</td>
</tr>
<tr>
<td>Philpotts</td>
<td>2000</td>
<td>23</td>
</tr>
<tr>
<td>Berg</td>
<td>2001</td>
<td>7</td>
</tr>
<tr>
<td>Jackman</td>
<td>2001</td>
<td>48.1</td>
</tr>
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<td>Hoornije</td>
<td>2003</td>
<td>40</td>
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<td>Philpotts</td>
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<td>1</td>
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<tr>
<td>Lomoschitz</td>
<td>2004</td>
<td>50</td>
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<tr>
<td>Lourenco</td>
<td>2007</td>
<td>28.3</td>
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<tr>
<td>Liberman</td>
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<tr>
<td>Sigalzafrani</td>
<td>2008</td>
<td>16</td>
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<td>Schueller</td>
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<td>39</td>
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<tr>
<td>Hoang</td>
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<td>28</td>
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<tr>
<td>Youk</td>
<td>2009</td>
<td>62</td>
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<tr>
<td>Eby</td>
<td>2009</td>
<td>20.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21.6</td>
</tr>
</tbody>
</table>
### Table 3. Underestimation of ductal carcinoma in situ (DCIS) by needle size

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Underestimation rate (%) by needle size (gauge)</th>
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</thead>
<tbody>
<tr>
<td>Liberman(^{19})</td>
<td>1998</td>
<td>5</td>
</tr>
<tr>
<td>Won(^{35})</td>
<td>1999</td>
<td>35</td>
</tr>
<tr>
<td>Darling(^{21})</td>
<td>2000</td>
<td>21, 17</td>
</tr>
<tr>
<td>Lee(^{36})</td>
<td>2000</td>
<td>44, 18</td>
</tr>
<tr>
<td>Philpotts(^{22})</td>
<td>2001</td>
<td>18</td>
</tr>
<tr>
<td>Brem(^{37})</td>
<td>2001</td>
<td>4, 10</td>
</tr>
<tr>
<td>Jackman(^{24})</td>
<td>2001</td>
<td>11, 11</td>
</tr>
<tr>
<td>Hoornije(^{25})</td>
<td>2003</td>
<td>15, 11</td>
</tr>
<tr>
<td>Lomoschitz(^{27})</td>
<td>2004</td>
<td>15, 17</td>
</tr>
<tr>
<td>Lourenco(^{28})</td>
<td>2007</td>
<td>28.7, 22.7</td>
</tr>
<tr>
<td>Liberman(^{29})</td>
<td>2007</td>
<td>13</td>
</tr>
<tr>
<td>Schueller(^{31})</td>
<td>2008</td>
<td>36</td>
</tr>
</tbody>
</table>
Lesions with risk of malignant upgrade when core biopsy followed by surgical excision

- Atypical Ductal Hyperplasia (ADH)
- Lobular Neoplasia (Lobular CIS and atypical lobular neoplasia)
- Columnar Cell Lesions (Flat Epithelial Atypia FEA)
- Papillary Lesions
- Radial Scar (Complex Sclerosing Lesion CSL)
- Fibroepithelial Lesion with cellular stroma
- Mucocele-like Lesion
- Spindle Cell Lesion
Reported Factors in the Literature
Influencing the chance of diagnosis after Surgical Biopsy

- Institution
- Year of publication
- Completeness of pathology (technical factors)
- Subspecialty second opinion
- CNB targeting accuracy
- Persistence of target lesion post procedure
- Quantity of CNB sampling technique
Reported Factors in the Literature 2
Influencing the chance of diagnosis after Surgical Biopsy

- Palpable lesion vs screen detected
- Size of lesion
- Pre-procedure BI-RADS score
- Presence of indeterminate calcification within or surrounding a mass
- Number of Foci of ADH
- Background Patient Cancer Risk
- Type of Lesion (Higher if ADH is the sole lesion or lesion plus atypia)
Distribution of Disease

- Can affect your interpretation
- (especially DCIS)
Outcomes by Type of Disease

Tot T et al, Human Pathology (2011) 42, 1761–1769
Diagnosis + Extent of Disease

- Important objective of Rad/Path Review
- Decide on whether findings are CONCORDANT
- If DISCORDANT results decide
  - Whether to repeat the biopsy
    - Possibly with a different modality
  - Whether to ask for surgical biopsy at this stage
Open Borders – There is no Wall!

• What is a borderline lesion?
• What are the diagnostic criteria?
• When does a borderline lesion represent a malignancy?
• GOLD STANDARD is surgical pathology?
Spectrum of Disease

Borderline lesions comprise a mix of:
- Ductal Hyperplasia
- Atypical Ductal Hyperplasia
- Flat Epithelial Atypia
- Lobular Hyperplasia
- Atypical Lobular Hyperplasia
- Lobular CIS

Plus many other types
Borderline Lesions

• Recommended reading
  – Benign breast lesions that mimic cancer: Determining radiologic-pathologic concordance. Appl Radiol Sept 2015;24-32
  – Borderline breast core needle histology: predictive values for malignancy in lesions of uncertain malignant potential (B3). Br J Cancer. 2007 Apr 23; 96(8): 1253–1257
Concordance

• The need for Rad/Path concordance
  – Decreased risk of missing a clinically important cancer
  – Increases chances of success of primary surgical intervention
Lesions prompting Surgical Biopsy

• Lesion with Atypia (ADH)

• Anything other than a straight forward papilloma
  – Flat epithelial atypia
  – ’Papillary Lesion’

• LCIS is controversial and depends on amount of tissue sampled
Identical lesions: Location, Size, Shape
Look for same contours of lesion

Image courtesy Dr T Tot, Falun, Sweden
Concordance Criteria

• All lesions detected by imaging MUST have a histologically verified correlate

• Remember that histology is higher resolution than imaging, and lesions may be found which are radiologically occult
Causes of Discordance

- Compressed breast (mammos)
- Hanging Breasts (US)
- Distortion during histology fixation
- Inadequate sampling
- Inadequate histology technique
- Failure in Rad/Path correlation
The American Society of Breast Surgeons

• Position statement on concordance assessment of image guided breast biopsies and management of Borderline or High-Risk lesions
Microcalcifications

- Key differences between Radiology and Pathology
  - Histology can see more microcalcifications
  - Digital technology beats analog in mammograms for calcifications
  - Some ‘calcifications’ can wash out of a specimen
    - E.g. Milk of Calcium
    - Can especially be a problem on stereotactic core biopsy when the calcifications have been removed on the post biopsy film, but no calcium seen in the specimen x-rays
Calcifications

• Like spotting a star cluster amongst a background
• Specimen x-rays of the blocks can help the pathologist find the calcifications
DCIS is even more problematic

- Non-calcified parts of DCIS may surround the calcified structures.
- The real extent of DCIS may be much larger than the area of mammographically seen microcalcifications.
- Removing only the calcified structures is often insufficient.
Conclusions

• Rad/Path concordance of the utmost importance
• Especially important in borderline lesions
  – Decisions may need to be made with surgical team to determine optimal biopsy technique
• Difficulties in obtaining concordance due to tumor heterogeneity
• Importance of getting to know and working directly with your breast pathologist