Update on Core Needle Biopsy of Non-palpable Breast Lesions

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Image-Guided CNB of Breast Lesions

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

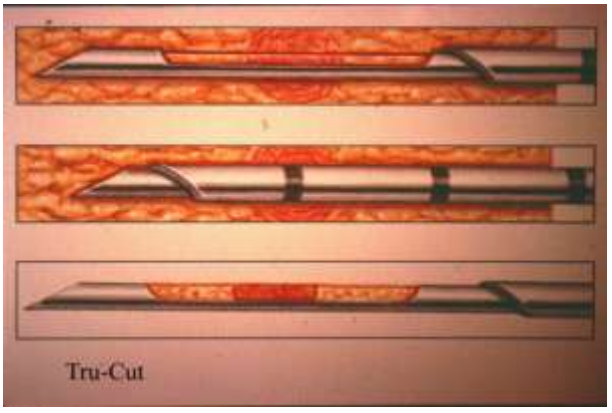
Demonstrates cancers not detected on mammography or sonography

Sensitivity 100%

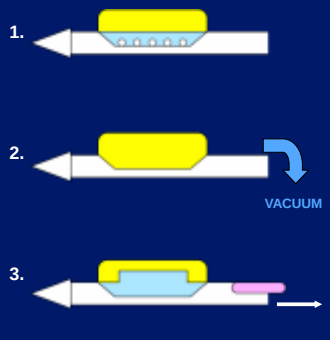
Specificity 37-97%

Needle Biopsy Devices

- Automated (spring loaded gun)
- Directional Vacuum Assisted (DVAB)



Directional Vacuum Assisted Biopsy



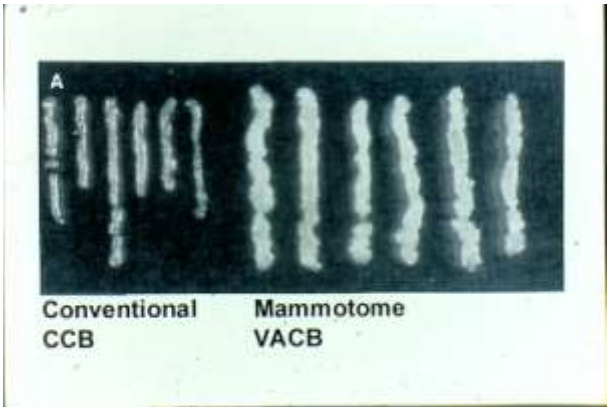
Probe is placed into the breast adjacent to the tissue requiring sampling

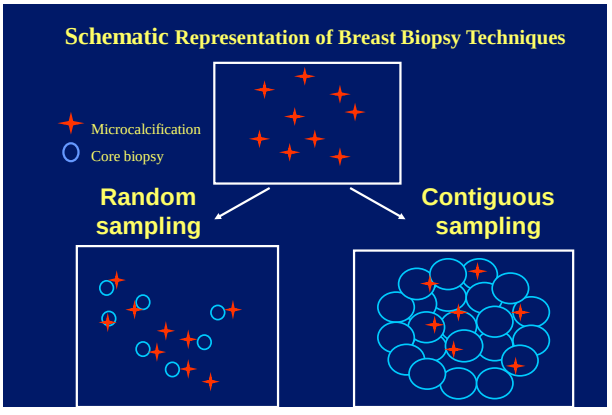
Vacuum suction is applied, tissue is pulled into the cutting apeture

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





Advantages: DVAB vs Automated

Underestimation of ADH

- 41% Automated needle
- 15% DVAB (Mammotome)

Calcs retrieval 99-100%

Reynolds et al. Am J Roentgenol 1998;171:611-3

CNB Size

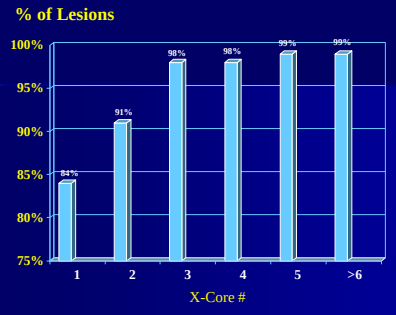
Gauge: 18, 16, 14, 11, 8-g

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

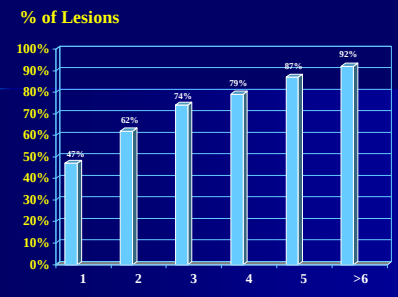
Optimal Numbers of CNB

Solid masses: 4-5 cores

Calcifications: > 10 cores



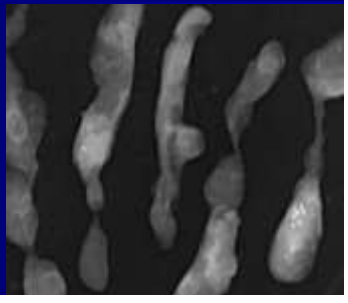
Diagnostic yield from sequential core biopsy specimens for all masses (n=93)



Diagnostic yield from sequential core biopsy specimens for calcifications without mass (n=53)

Specimen Radiography - CNB

- Confirm Calcs
- Calcs must correspond to those on mammography



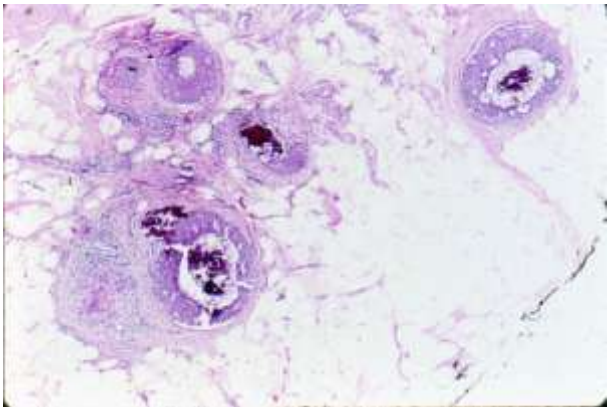
Segregation of Cores with and without Calcs on Specimen Radiographs

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
Easley et al, The Breast Journal 2007;13: 486-489



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 (mucocele vs. muci 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

Total Claims	42 (15.5%)
False Negative	20 (48%)
False Positive	22 (52%)

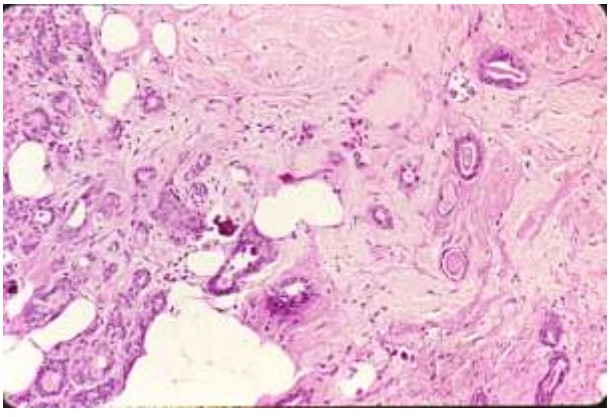
21% of all breast bx claims involved CNB

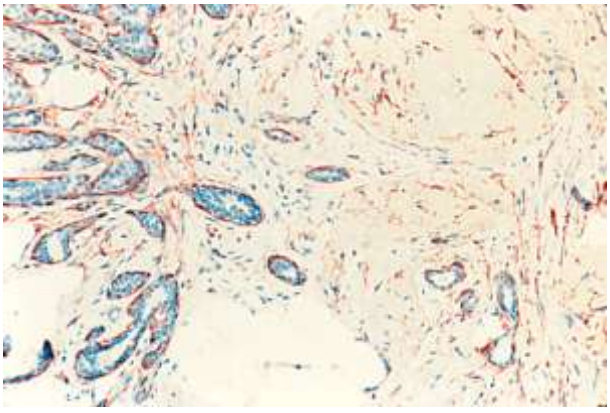
Troxel: Errors in Surgical Pathology, Am J Surg Pathol, 2004;28:1092-1095

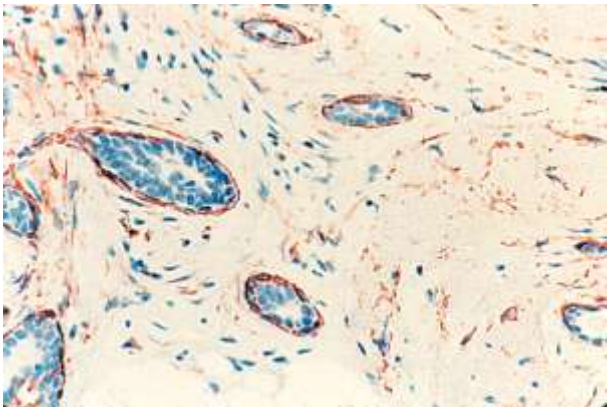
Diagnostic Errors in Stereotactic/ Palpable CNB of Breast

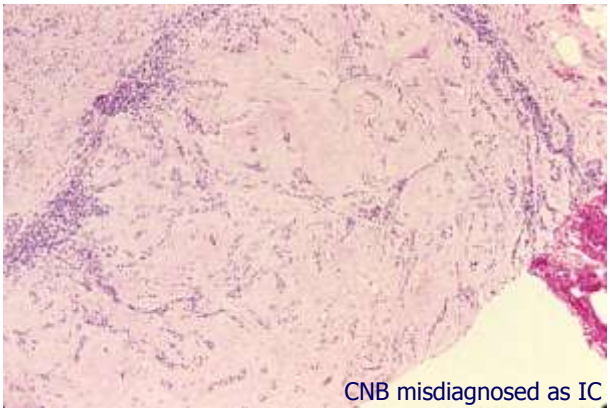
1. Misdiagnosis of DCIS, SA and adenosis as invasive ductal carcinoma.
2. Misdiagnosis of LCIS as low-grade DCIS.
3. Failure to recognize small, easily over-looked foci of invasive lobular carcinoma.

Troxel: Int J Surg Pathol 8(4):335-337, 2000

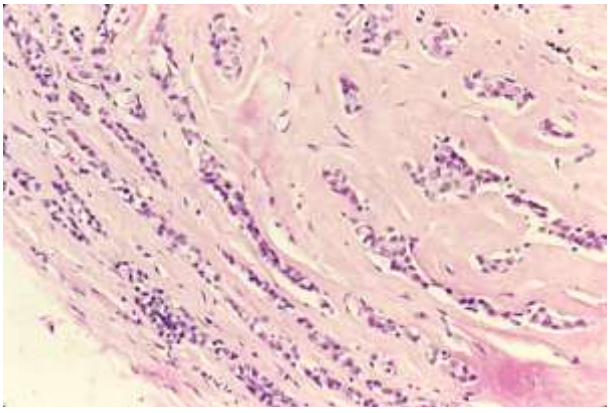




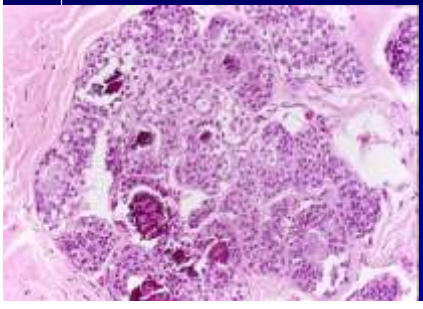




CNB misdiagnosed as IC

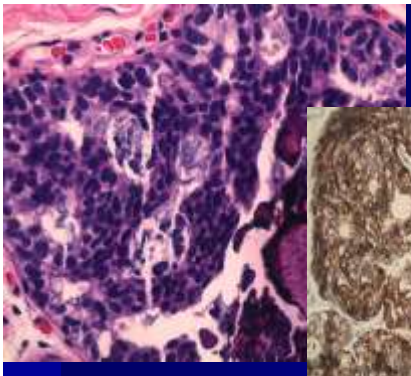


Carcinoma In Situ: lobular or Ductal?



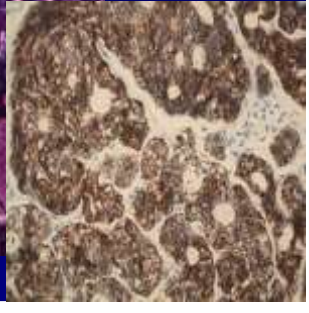
Diagnosis:

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



Deeper cut

E-cadherin



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

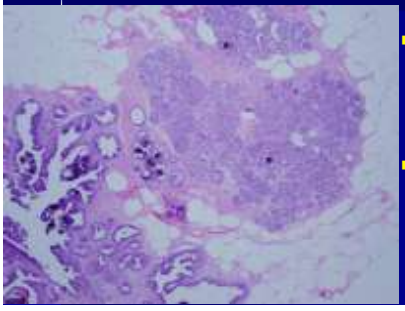
Consensus Meeting on Image Detected Breast Cancer – The American College of Surgeons 2005

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)

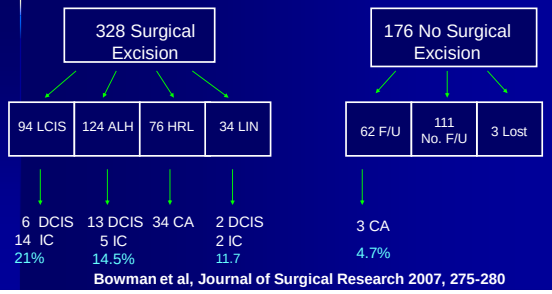
328 Surgical Excision

176 No Surgical Excision

23.2% upgrade. 7 studies included 101 HRL Exc HRL, 16.7% upgrade

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

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



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

Recommendations Regarding Management of LIN Diagnosed at CNB –

Bowman et al, J Surg Res 2007, 275-280

Routine surgical excision		9
Surgical excision for specific circumstances		7
Only for LCIS (not ALH)	1	
LIN with residual Calcs	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)

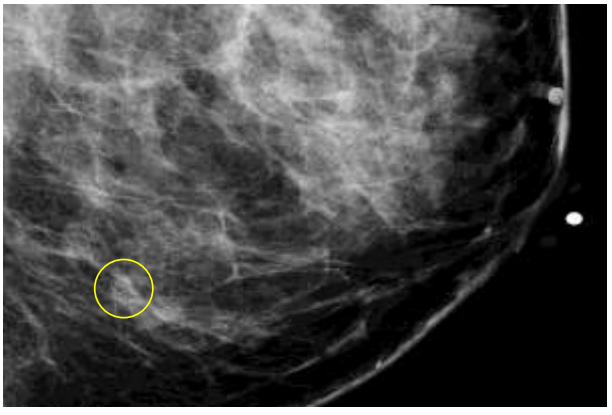
Cangiarella et al:Arch Pathol Lab Med. 2008, 132: 979-983

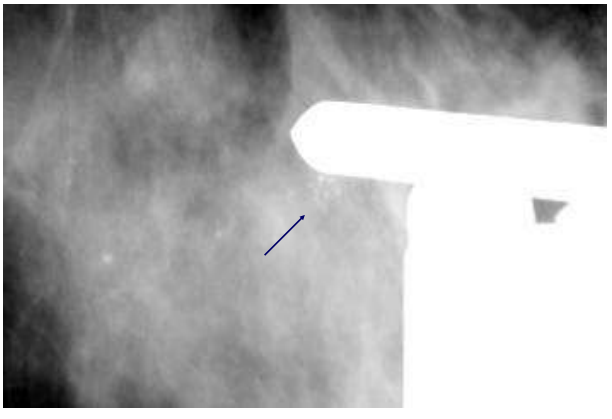
LCIS/ALH on CNB- MDACC

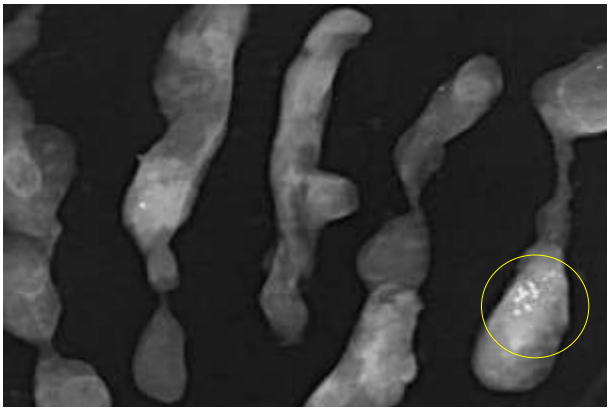
Multidisciplinary approach

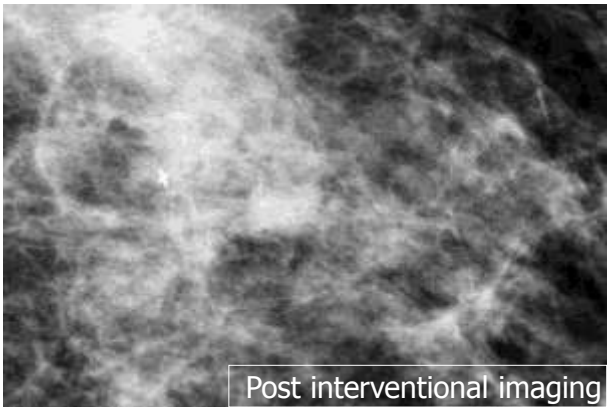
No excision required: if

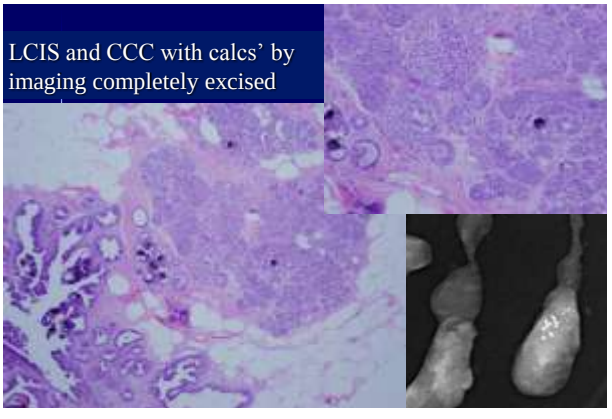
1. Calcs only
2. Completely removed by DVAB
3. Classic LCIS



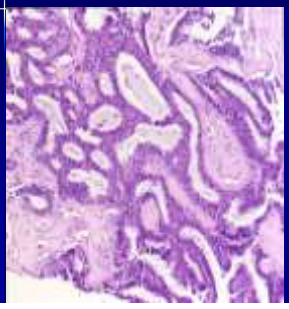




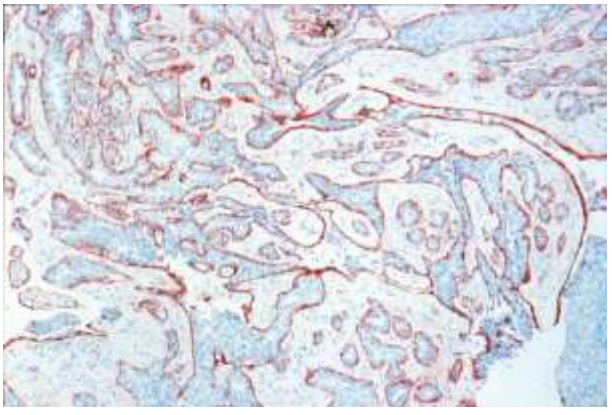

Post interventional imaging

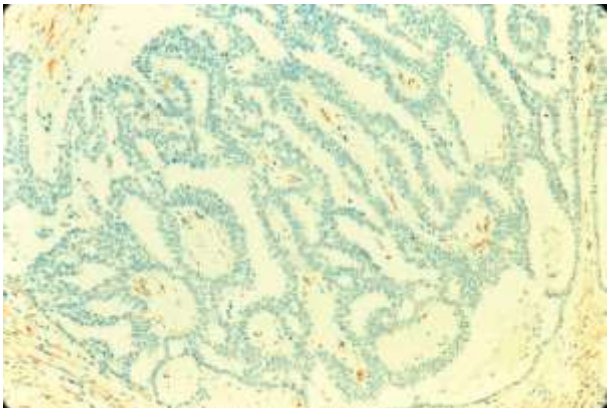

LCIS and CCC with calcs' by imaging completely excised

Papillary lesions on CNB: to Excise or Not to Excise?

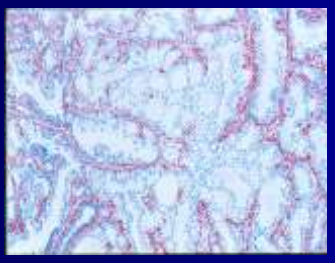


- < 5% of breast biopsies
- Include benign atypical and malignant





Atypia in a Papilloma



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

3 mm area ADH/DCIS in papilloma (Page)

Atypical papilloma on CNB require excision to R/O Ca

Papillary lesions on CNB

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

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

Arora et al. Am J Surg 194, 444-449, 2007

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

Papillary lesions on CNB

Limitations of published series:

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

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

Mode of percutaneous biopsy	N	Malignant	%
Stereotactic	33	4	12
US- core	17	6	35
US- FNA	30	9	30

Valdes E, et al. Annals of Surg Onc. 2006; 13:480-82.

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

Pathologic Diagnosis bx	Ca/cases	%
Papilloma/papillomatosis	6/36	17
Atypical papillomatosis/ papilloma with ADH	2/7	29
"Pure" papillary lesion	9/28	32
Papillary lesion with atypia	2/9	22

Valdes, et al. Annals of Surg Oncol. 2006; 13(4):480-82

Department of surgery and radiology.

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

35 papillomas on CNB

25 excised, 10 mammo 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

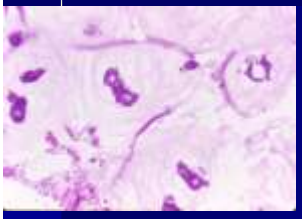
	Type	Size (cm)	Guidance/Needle	# of Cores	Target	Interval (mo)	Surgical Pathology
1	Calcs	1.2	St/ 11 V	29	Excised	1	DCIS 1cm from bx site
2	Mass	1.2	St /14 A	4	Sampled	7	ICPC with DCIS at periphery of pap lesion.
3	Mass	0.8	US/ 14 A	3	Sampled	25	DCIS at periphery of papilloma
4	Mass	0.6	US/ 14 A	4	Sampled	21	DCIS in papilloma
5	Mass	0.8	St/ 11 V	14	Excised	22	IDC, gr 3 and DCIS 1.8cm; admixed with pap.

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

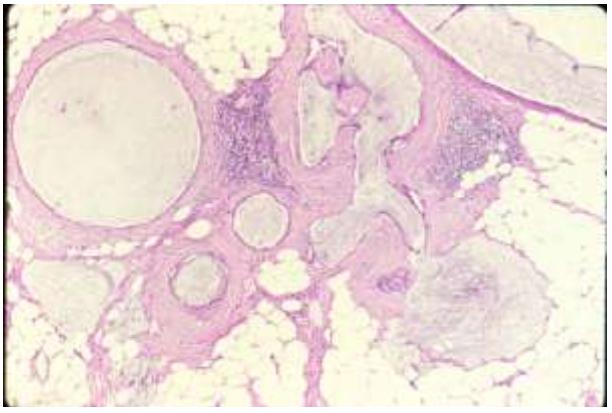


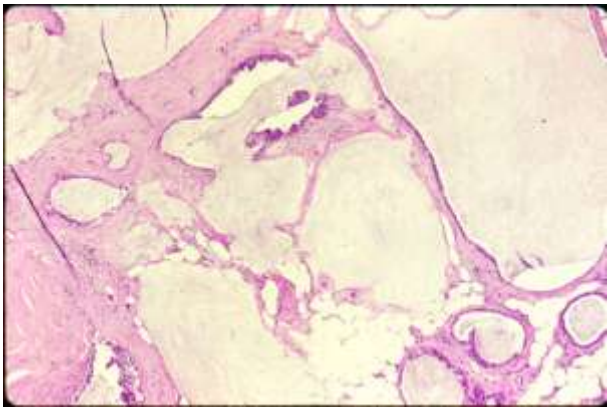
- < 1% of CNB specimens
- Range: Mucocele-like to mucinous carcinoma

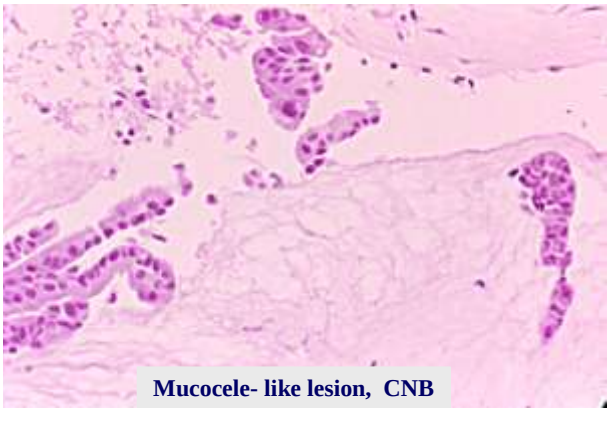
Mucocele-like Lesions

Imaging:

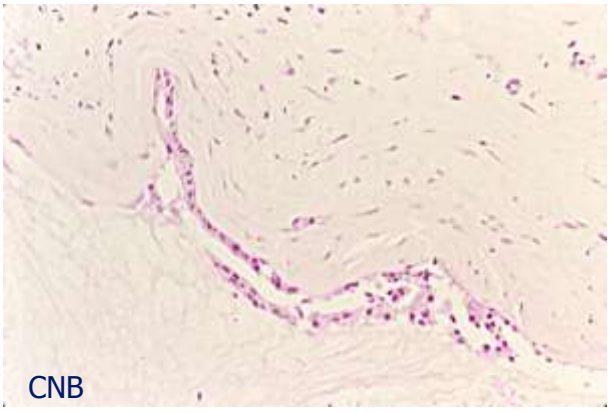
- Indeterminate calcs (majority)
- Well-circumscribed lobulated mass

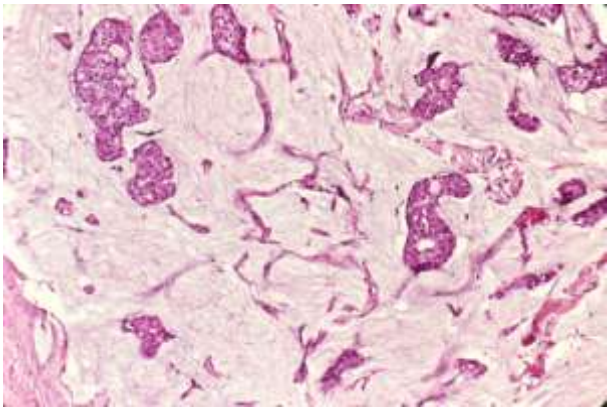


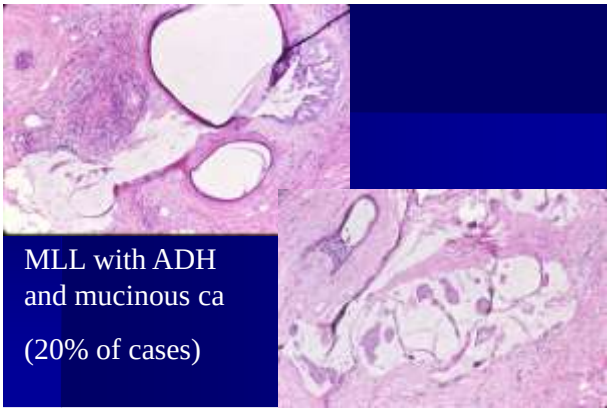




Mucocele- like lesion, CNB


CNB




MLL with ADH
and mucinous ca
(20% of cases)

Mucocele-like Tumors- CNB

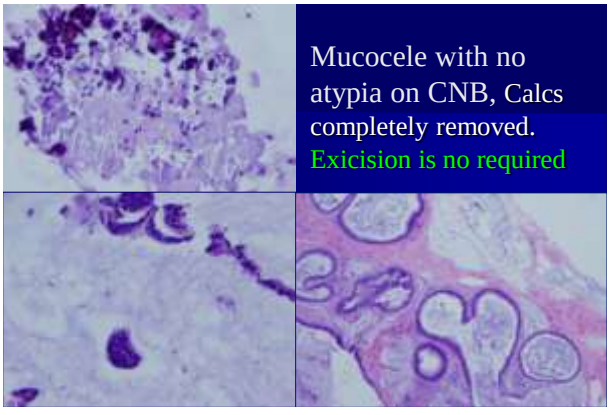
Among 20 cases of MLL with no atypia, no carcinoma was found on excision.

CNB is highly reliable for accurate Dx of mucinous lesions

Wang et al AJCP 2007

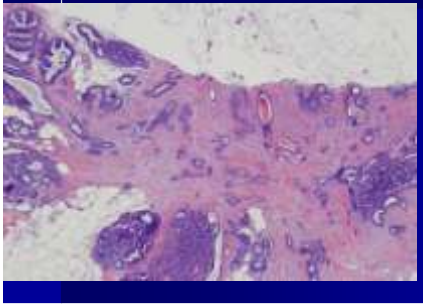
Carder et al Histopath 2004

Renshaw AJCP 2002



Mucocele with no atypia on CNB, Calcs completely removed. Excision 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

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

Radial Scar on CNB

Brenner 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%

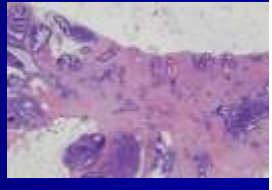
RS no ADH 4%

Radial Scar on CNB

Brenner 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.

Resetkova et al. Breast Cancer Res Treat:2008

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., AJ S P 2001; 25, 1017-1021
Sneige et al., AJCP 2003;119:248-253

ADH in DVAB of Microcalcifications

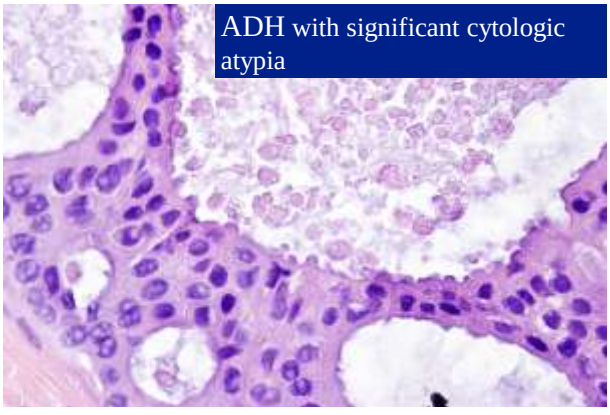
140 patients (86.4% excision)
ADH associated with calcs in the absence of a mass can be categorized into 2 different risk groups.

Nguyen, Albarracin, Whitman, Lopez, Sneige
Ann Surg Oncol: (2011) 18: 752-761

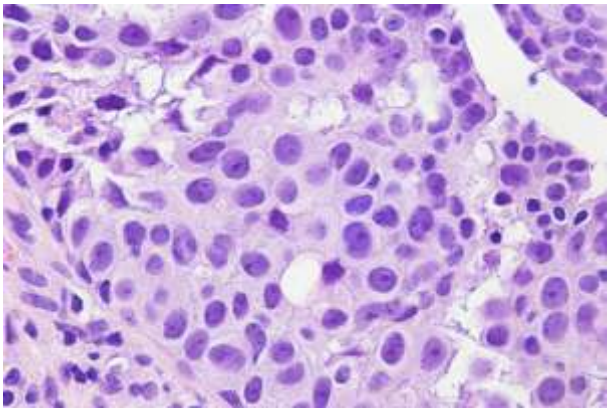
ADH in DVAB of Microcalcifications

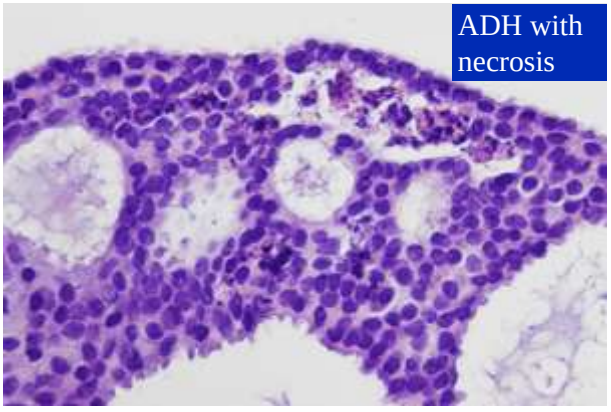
1. ADH associated with significant atypia and/or necrosis are most likely to be associated with carcinoma and should excised

Nguyen, Albarracin, Whitman, Lopez, Sneige
Ann Surg Oncol: (2011) 18: 752-761



ADH with significant cytologic atypia



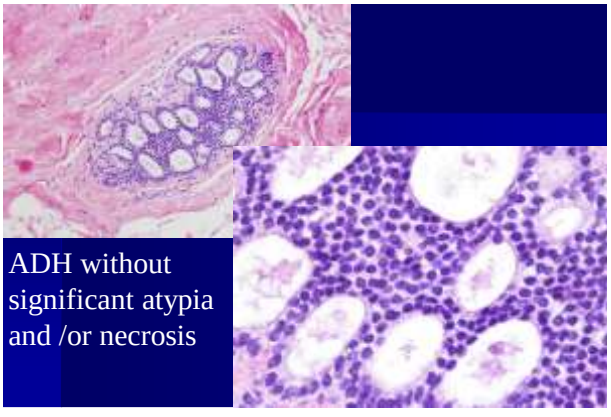


ADH with necrosis

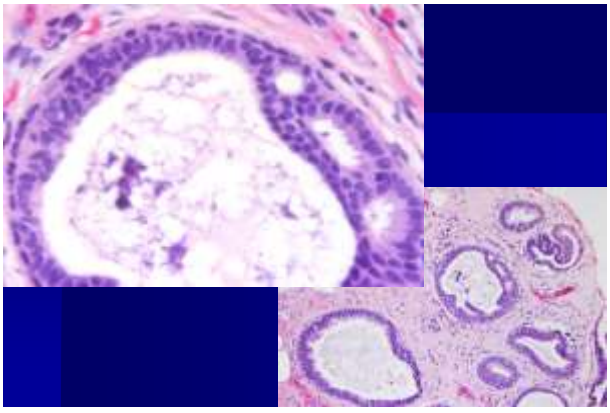
ADH in DVAB of Microcalcifications

2. ADH without these features, regardless of extent of involvement, and with >95% removal of the targeted calcs, 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



ADH without significant atypia and /or necrosis



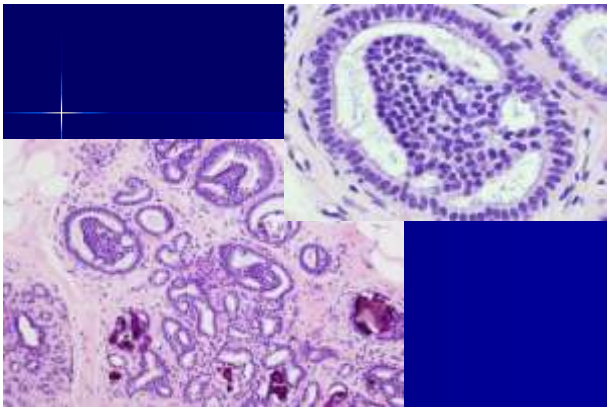


Image-guided CNB of Breast Lesions- Conclusions

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