

Predictive factor of underestimation of ultrasound-guided core needle biopsy(CNB)

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Background

- Percutaneous core needle biopsy(CNB) considered as the standard tool for histological diagnosis in breast disease
- Inherent sampling error of CNB- failure to sample the core- leading to histologic **underestimation**
- In times of making **surgical decision**
 - One-stage axillary evaluation?
 - Adequate surgical margin?
- Assessing the risk of underestimation of ultrasound guided CNB diagnosed Atypical ductal hyperplasia(ADH) and Ductal carcinoma in situ(DCIS) is crucial

Aims of the Study

- To investigate **the preoperative factors** in association with **underestimation** of CNB diagnosed ADH and DCIS
- To **validate** the **previously suggested scoring system** predicting the risk of underestimation of CNB diagnosed ADH lesion <Ko, Han et al. Breast Can Res Treat. 2007>
- To evaluate the risk of **LN positivity** in lesions with CNB diagnosed DCIS

Materials and method

- Data acquisition
 - Retrospective review of EMR
- Inclusion criteria
 - Between Jan.2007-Feb.2011 - ADH
 - Between Jan.2000 -Feb.2011 - DCIS
 - CNB diagnosed ADH or DCIS with subsequent surgery
 - Outside biopsy or excisional biopsy of the lesion were excluded
- Total **85** patients with ADH
- Total **506** patients with DCIS

I. Atypical ductal hyperplasia(ADH)



I. ADH_Demographics

Characteristics	N=85(%)	Characteristics	N=85(%)
Mean age	48.61±10.34	Mean size(mm)	15.31±10.60
Range	24-70	Range	3-67
Age		Sonographic size	
≤50	49 (57.6%)	≤15mm	48 (56.5%)
>50	36 (42.4%)	>15mm	36 (42.4%)
Palpable		CNB method	
No	53 (62.4%)	14g automated	58 (68.2%)
Yes	32 (37.6%)	8,11g vacuum assisted	27 (31.8%)
Microcalcification		Extent of ADH	
No	54 (63.5%)	Focal(≤2 ducts)	72 (84.7%)
Yes	31 (36.5%)	Extensive	13 (15.3%)
BI-RADS		Mean Score	7.29±3.36
C3	1 (1.2%)	Range	0-14.5
C4a	44 (51.8%)	Score group	
C4b	21 (24.7%)	≤3.5	9 (22.4%)
C4c	19 (22.4%)	5.5-7.5	27 (31.8%)
Underestimation	31 (36.5%)	≥9	38 (44.7%)

I. ADH_Univariate analysis

Characteristics	Non-underestimation N=54(%)	Underestimation N=31(%)	p-value
Mean age	48.28±10.43	49.19±10.32	0.697
Range	26-70	24-66	
Age			0.078
≤50	35 (64.8%)	14 (45.2%)	
>50	19 (35.2%)	17 (54.8%)	
Mean tumor size(mm)	12.00±6.87	20.81±1.32	<0.001
Range	4-27	3-67	
Sonographic size			<0.001
≤15mm	38 (71.7%)	10 (32.3%)	
>15mm	15 (28.3%)	21 (67.7%)	
CNB method			0.941
14g automated	37 (68.5%)	21 (67.7%)	
8,11g vacuum assisted	17 (31.5%)	10 (32.3%)	
Palpable			<0.001
No	43 (79.6%)	10 (32.3%)	
Yes	11 (20.4%)	21 (67.7%)	
Underestimation	54 (63.5%)	31 (36.5%)	

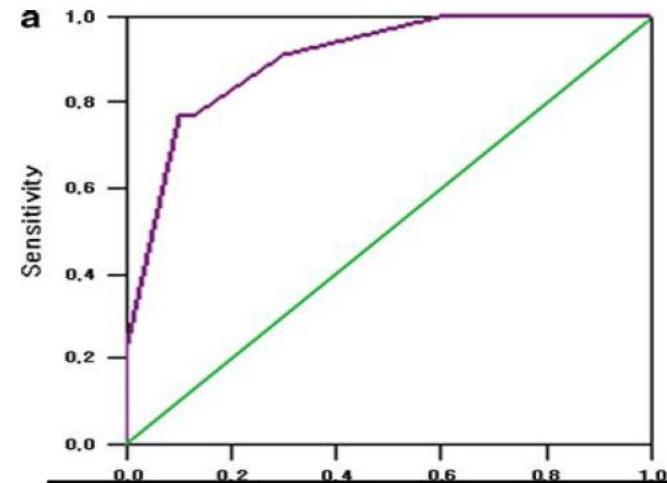
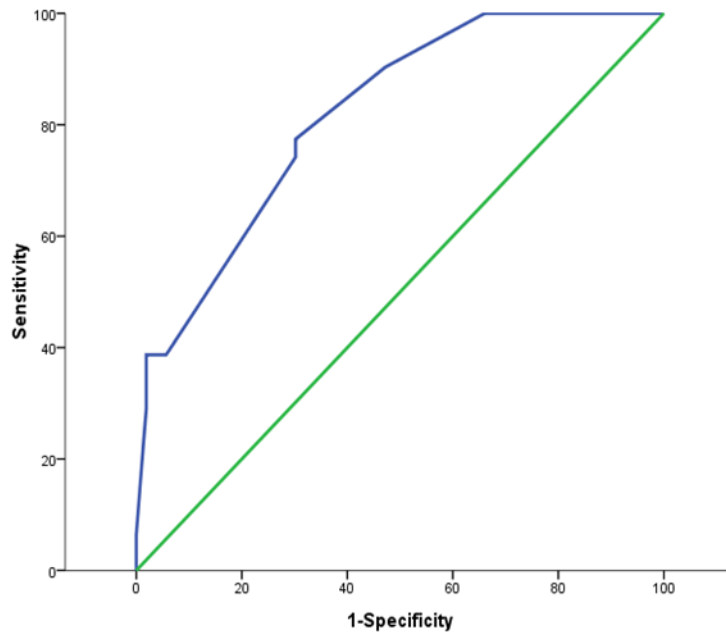
ADH_Univariate analysis

	Non-underestimation N=54(%)	Underestimation N=31(%)	p-value
Microcalcification			0.028
No	39 (72.2%)	15 (48.4%)	
Yes	15 (27.8%)	16 (51.6%)	
BI-RADS			0.302
C3	1 (1.9%)	0 (0%)	
C4a	31 (57.4%)	13 (41.9%)	
C4b	13 (24.1%)	8 (25.8%)	
C4c	9 (16.7%)	10 (32.3%)	
Extent of ADH			0.871
Focal(≤2 ducts)	46 (85.2%)	26 (83.9%)	
Extensive	5 (14.8%)	5 (16.1%)	
Mean Score	6.03±2.85	9.48±3.09	<0.001
Range	0-12.5	5.5-14.5	
Score group			<0.001
≤3.5	18 (34%)	0 (0%)	
5.5-7.5	19 (35.8%)	9 (29%)	
≥9	16 (30.2%)	22 (71%)	

I. ADH_Multivariate analysis

Characteristics	B coefficient	p value	Odds ratio	95%CI	
				Lower	Upper
Extensive	0.583	0.443	1.731	.405	7.931
Palpable	2.884	<0.001	17.881	3.807	83.986
Microcalcification	1.780	0.015	5.927	1.413	24.869
Age>50	1.400	0.037	4.054	1.087	15.128
Size>15mm	0.951	0.115	2.589	.794	8.442

ADH_ <Ko, Han et al. Breast Can Res Treat. 2007>



		95% CI	
AUC	p value	Lower	Upper
.818	<0.001	.729	.907

	Non-underestimation N=54(%)	Underestimation N=31(%)	p-value
Mean Score	6.03±2.85	9.48±3.09	<0.001
Range	0-12.5	5.5-14.5	
Score group			<0.001
≤3.5	18 (34%)	0 (0%)	
5.5-7.5	19 (35.8%)	9 (29%)	
≥9	16 (30.2%)	22 (71%)	

II. Ductal carcinoma in situ(DCIS)



II. DCIS_Demographics

Characteristics	N=506(%)	Characteristics	N=506(%)
Mean age	49.72±10.05	Mean size(mm)	22.79±16.71
Range	24-82	Range	2-100
Age		Sonographic size	
≤50	306 (60.5%)	≤20mm	232 (45.8%)
>50	200 (39.5%)	>20mm	198 (39.1%)
Palpable		CNB method	
No	282 (55.7%)	14g automated	297 (58.7%)
Yes	211 (41.7%)	8,11g vacuum assisted	209 (41.3%)
Image group		Shooting times per lesion	
Mass in mmg	224 (44.3%)	Mean±SD	9.76±6.47
Non-mass in mmg	189 (37.4%)	Range	3-48
Sonography only	90 (17.8%)	Grade	
BI-RADS		Low	234 (46.2%)
C3	2 (0.4%)	High	237 (46.8%)
C4a	137 (27.1%)	Unknown	35 (6.9%)
C4b	142 (28.1%)	Comedo necrosis	
C4c	70 (13.8%)	Non-comedo	214 (42.3%)
C5	113 (22.3%)	Comedo	262 (51.8%)
Underestimation	216 (42.7%)	Unknown	27 (5.3%)

II. DCIS_Univariate Analysis

Characteristics	Non-underestimation N=290(%)	Underestimation N=216(%)	p-value
Mean age	49.82±9.834	49.58±10.36	0.697
Range	24-79	30-82	
Age			0.629
≤50	178 (58.2%)	128 (41.8%)	
>50	112 (56.0%)	88 (29.6%)	
Mean tumor size(mm)	18.87±14.35	27.70±18.12	<0.001
Range	4-90	2-100	
Sonographic size			<0.001
≤20mm	158 (68.1%)	74 (31.9%)	
>20mm	80 (40.4%)	118 (59.6%)	
CNB method			<0.001
14g automated	145 (48.8%)	152 (51.2%)	
8,11g vacuum assisted	145 (69.4%)	64 (60.6%)	
Palpable			<0.001
No	188 (42.4%)	133 (57.6%)	
Yes	98 (70.4%)	120 (56.9%)	
Underestimation			
	290 (57.3%)	216 (42.7%)	

DCIS_Univariate Analysis

	Non-underestimation N=290(%)	Underestimation N=216(%)	p-value
Shooting times(per lesion)			
Mean times	10.35±6.64	8.99±6.17	0.028
Range	3-48	3-47	
BI-RADS			
C3	2 (100%)	0 (0%)	<0.001
C4a	90 (65.7%)	47 (34.3%)	
C4b	93 (65.5%)	49 (34.5%)	
C4c	39 (55.7%)	31 (44.3%)	
C5	37 (33.3%)	74 (66.7%)	
Image group			
Mass in mmg	102 (45.5%)	122 (54.5%)	<0.001
Non-mass in mmg	125 (66.1%)	64 (33.96%)	
MMG free sono only	62 (68.9%)	28 (31.1%)	
Grade			
Low	152 (65.0%)	82 (35.0%)	<0.001
High	119 (58.4%)	118 (49.8%)	

II. DCIS_Multivariate Analysis

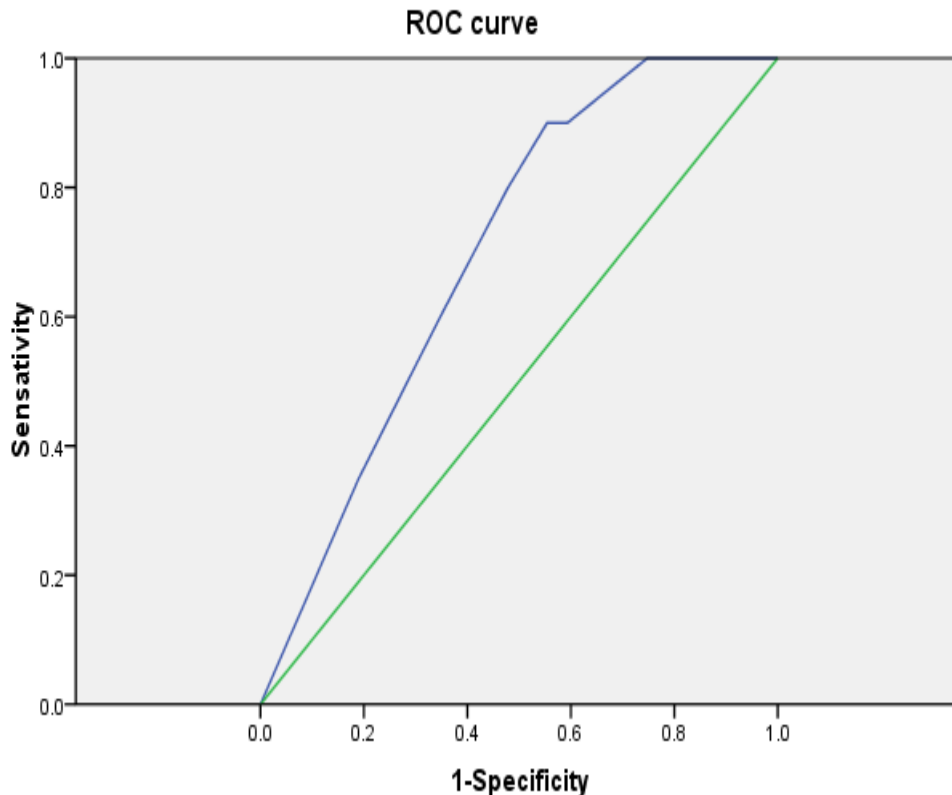
Characteristics	B coefficient	p value	Odds ratio	95%CI	
				Lower	Upper
Size	0.023	0.002	1.023	1.206	2.9646
Palpable	0.634	0.005	1.885	1.009	1.038
CNB method	0.523	0.026	1.687	1.063	2.677
Grade	0.536	0.015	1.709	0.373	0.941

II. DCIS_LN positivity

Characteristics	B coefficient	p value	Odds ratio	95%CI	
				Lower	Upper
Palpable	<u>.555</u>	.268	1.742	.653	4.647
Grade	<u>1.097</u>	.059	2.994	.958	9.358
Size_20mm	<u>1.229</u>	.038	3.419	1.073	10.896

- 407 (80.4%, 407/506) patients undergone axillary evaluation
- 20 (4.91%, 20/407) with positiv LN, all invasive carcinoma
- Scoring system
- $S = (0.56) * \text{palpability}(0;\text{non-palpable}, 1;\text{palpable})$
+ $(1.10) * \text{Grade}(0;\text{low}, 1;\text{high})$
+ $(1.23) * \text{size}(0;20\text{mm or below}, 1; \text{above } 20\text{mm})$

DCIS_LN positivity



Characteristics	LN positivity		Total
	No (N=387)	Yes (N=20)	
Score group	95.1%	4.9%	
≤0.56	77 100%	0 0%	76
1.1-1.66	7 94.7%	4 5.3%	98
1.79-2.33	89 90.8%	9 9.2%	65

AUC	SD	p value	95%CI	
			Lower	Upper
.746	.041	.000	.666	.827

III. Discussion



III. Discussion_ADH

1. Palpable, microcalcification, older age Lesion being the predictive factor
 - Lesions being more cancerous from the start
2. Previous data of **mammotome** biopsy having less underestimation in ADH

Our data of ADH without significant difference, probably due to the selection bias

 - Lesions chosen for mammotome biopsy having more microcalcification ($p < 0.001$)

III. Discussion_DCIS

- Our data demonstrated independent risk factor of underestimation in CNB diagnosed DCIS
 - Size, palpability, grade, CNB method
- DCIS, theoretically a non-invasive carcinoma unable to metastasize to axillary LNs
- Evidence of No-need of axillary evaluation in DCIS?
- Scoring system of LN positivity, AUC 0.746 100% negative predictive value in 0.56 or under
 - Further validation needed
 - Careful application to clinical use

IV. Conclusion

1. Palpable, microcalcification, older age ADH should be excised with caution of underestimation especially when Score higher than 3.5
2. Bigger size, high grade, palpable lesion, when 14g method used, underestimation risk is higher in CNB diagnosed DCIS
3. Axillary evaluation in CNB diagnosed DCIS shouldn't be overlooked when $\text{Score} \geq 1.10$, meaning either size $\geq 20\text{mm}$ or high grade

Thank you

