Table S1 | Clinicopathologic characteristics of the training and the validation cohort with or without SLN metastasis

Clinicopathologic features	Training cohort (n=444)			Validation cohort (n=180)		
	No SLN metastasis (n=341) (%)	SLN metastasis (n=103) (%)	P value	No SLN metastasis (n=136) (%)	SLN metastasis (n=44) (%)	P value
Age (y)			0.094			0.094
≤35	17 (5.0)	9 (8.7)		6 (4.4)	6 (4.4)	
36-55	208 (61.0)	69 (67.0)		87(64.0)	24 (54.5)	
>55	116 (34.0)	25 (24.3)		43 (31.6)	14 (31.8)	
BMI (kg/m^2)			**0.015**			0.482
<18.5	12 (3.5)	2 (1.9)		1 (0.7)	1 (2.3)	
18.5-24.9	265 (77.7)	68 (66.0)		91 (66.9)	32 (72.7)	
≥25	64 (18.8)	33 (32.0)		44 (32.4)	11 (25.0)	
Menstrual status			0.496			0.391
Pre-	179 (52.5)	58 (56.3)		61 (44.9)	23 (52.3)	
Post-	162 (47.5)	45 (43.7)		75 (55.1)	21 (47.7)	
Lesion position			0.705			0.327
OUQ	198 (58.1)	57 (55.3)		84 (61.8)	25 (56.8)	
OLQ	50 (14.7)	18.4 (4.3)		17 (12.5)	9 (20.5)	
IUQ	66 (19.4)	17 (16.5)		24 (17.6)	5 (11.4)	
ILQ	18 (5.3)	8 (7.8)		8 (5.9)	2 (4.5)	
Center	9 (2.6)	2 (1.9)		3 (2.2)	3 (6.8)	
Overall TNM stage			**0.004**			**<0.001**
0	25 (7.3)	3 (2.9)		1 (0.7)	0 (0.0)	
Ia	197 (57.8)	49 (47.6)		47 (34.6)	2 (4.5)	
Ib	53 (15.5)	15 (14.6)		86 (63.2)	9 (20.5)	
IIa	49 (14.4)	22 (21.4)		1 (0.7)	25 (56.8)	
IIb	15 (4.4)	14 (13.6)		1 (0.7)	5 (11.4)	
III	2 (0.6)	0 (0.0)		0 (0.0)	3 (6.8)	
Clinical T classification			**0.003**			0.464
Tis	53 (15.5)	14 (13.6)		1 (0.7)	0 (0.0)	
T1	224 (65.7)	53 (51.5)		48 (35.3)	11 (25.0)	
T2	64 (18.8)	36 (23.2)		86 (63.2)	32 (72.7)	
T3	0 (0.0)	0 (0.0)		1 (0.7)	1 (2.3)	
Histological type			0.075			0.330
Ductal	279 (81.8)	74 (71.8)		112 (82.4)	32 (72.7)	
Lobular	25 (7.3)	10 (9.7)		8 (5.9)	5 (11.4)	
Others	37 (10.9)	19 (18.4)		16 (11.8)	7 (15.9)	

Histological grade			0.176			0.091
I	77 (22.6)	17 (16.5)		6 (4.4)	5 (11.4)	
II	240 (70.4)	74 (71.8)		120 (88.2)	33 (75.0)	
III	24 (7.0)	12 (11.7)		10 (7.4)	6 (13.6)	
Subtype			0.298			0.362
Luminal A	203 (59.5)	61 (59.2)		69 (50.7)	23 (52.3)	
Luminal B	64 (18.8)	13 (12.6)		14 (10.3)	9 (20.5)	
HER2+ (HR-)	19 (5.6)	10 (9.7)		12 (8.8)	2 (4.5)	
HER2+ (HR+)	17 (5.0)	8 (7.8)		21 (15.4)	6 (13.6)	
TNBC	38 (11.1)	11 (10.7)		20 (14.7)	4 (9.1)	
ER			0.314			0.115
Negative	58 (17.0)	22 (21.4)		34 (25.0)	6 (13.6)	
Positive	283 (83.0)	81 (78.6)		102 (75.0)	38 (86.4)	
PR			0.151			0.109
Negative	88 (25.8)	34 (33.0)		38 (27.9)	7 (15.9)	
Positive	253 (74.2)	69 (67.0)		98 (72.1)	37 (84.1)	
HER2			0.060			0.403
Negative	305 (89.4)	85 (82.5)		103 (75.7)	36 (81.8)	
Positive	36 (10.6)	18 (17.5)		33 (24.3)	8 (18.2)	
KI67			0.079			0.876
<30%	246 (72.1)	65 (63.1)		91 (66.9)	30 (68.2)	
>=30%	95 (27.9)	38 (36.9)		45 (33.1)	14 (31.8)	
US findings						
BI-RADS			0.526			0.578
4A	52 (15.2)	13 (12.6)		18 (13.2)	5 (11.4)	
4B	57 (16.7)	17 (16.5)		23 (16.9)	12 (27.3)	
4C	84 (24.6)	28 (27.2)		42 (30.9)	10 (22.7)	
5	62 (18.2)	25 (24.3)		25 (18.4)	7 (15.9)	
6	86 (25.2)	20 (19.4)		28 (20.6)	10 (22.7)	
Multifocality			0.243			0.217
yes	78 (22.9)	18 (17.5)		15 (11.0)	8 (18.2)	
no	263 (77.1)	85 (82.5)		121 (89.0)	36 (81.8)	
Maximum diameter (cm)			**<0.001**			0.060
<2	268 (78.6)	57 (55.3)		67 (49.3)	14 (31.8)	
2-5	73 (21.4)	30 (29.1)		66 (48.5)	30 (68.2)	
>5	0 (0.0)	16 (15.5)		3 (2.2)	0 (0.0)	
Tumor shape			0.729			0.117
regular	20 (5.9)	7 (6.8)		13 (9.6)	1 (2.3)	
unregular	321 (94.1)	96 (93.2)		123 (90.4)	43 (97.7)	
Margin			0.219			0.912

distinct	32 (9.4)	14 (13.6)		39 (28.7)	13 (29.5)	
Indistinct	309 (90.6)	89 (86.4)		97 (71.3)	31 (70.5)	
Inner echo			0.082			0.841
even	61 (17.9)	11 (10.7)		17 (12.5)	5 (11.4)	
uneven	280 (82.1)	92 (89.3)		119 (87.5)	39 (88.6)	
Calcification			**<0.001**			**<0.001**
present	123 (36.1)	86 (83.5)		16 (11.8)	36 (81.8)	
absent	218 (63.9)	17 (16.5)		120 (88.2)	8 (18.2)	
Color Doppler flow			0.152			0.979
rich	323 (94.7)	101 (98.1)		3 (2.2)	1 (2.3)	
poor	18 (5.3)	2 (1.9)		133 (97.8)	43 (97.7)	
Aspect-ratio			**<0.001**			**<0.001**
≥1	10 (2.9)	24 (23.3)		33 (24.3)	33 (75.0)	
<1	331 (97.1)	79 (76.7)		103 (75.7)	11 (25.0)	

Abbreviations: SLN, sentinel lymph node; OUQ, outer upper quadrant; OLQ, outer lower quadrant; IUQ, inner upper quadrant; ILQ, inner lower quadrant; HR, hormone receptor; TNBC, triple-negative breast cancer; ER, estrogen receptor; PR, progesterone receptor; US, ultrasound.

Bold value indicates statistical significance.

TABLE S2 |The comparison of the three researches

Research	SOUND	NAUTILUS	Nomogram
Study type	Clinical trial (international)	Clinical trial (international)	Retrospective study (2 centers)
Condition /disease	Early-stage BC (<2cm)	Clinical T1, T2 BC (<5cm)	BC (any size)
Intervention/treatment	SLNB vs Observation	BCS + SLNB(-) vs BCS +SLNB	BCS + SLNB +ALND(-/+)
Outcome measures	dDFS, DFS, OS, cumulative incidence of distant recurrences, cumulative incidence of axillary recurrences	iDFS, OS, DMFS, axillary recurrence rate, LRR, AEs, evaluate quality of life	SLN metastasis or not

Abbreviations: BC, breast cancer; SLNB, sentinel lymph node biopsy; dDFS, distant-disease free survival; DFS, disease free survival; OS, overall survival; BCS, breast conserving surgery; iDFS, invasive disease-free survival; DMFS, distant metastasis free survival; LRR, locoregional recurrence rate; AEs, adverse events; ALND, axillary lymph node dissection.