

Supplementary Table S1: Germline and somatic mutations of 54 premenopausal women with breast cancer as determined by NGS in relation to each patient's distinct clinicopathological characteristics.

Patient ID Number	Germline Pathogenic mutations	Germline VUS mutations	Somatic pathogenic mutations	Somatic VUS mutations	Age (at Initial Diagnosis)	Stage	Breast Location	T	N	M	Histological Type	ER (at Initial Diagnosis)	PR (at Initial Diagnosis)	HER2 (at Initial Diagnosis)	KI67 (at Initial Diagnosis)	Grade	Molecular Subtype
2	(-)	(-)	(-)	(-)	28	IIIA	LEFT	2	2	0	IDC	POSITIVE	POSITIVE	POSITIVE	≥20%	3	LUMINAL B (HER2 POSITIVE)
3	(-)	(-)	TP53 (c.424_433del, p. Pro142Cysfs*25)	(-)	36	IA	RIGHT	1	0	0	IDC	POSITIVE	POSITIVE	POSITIVE	<20%	2	LUMINAL B (HER2 POSITIVE)
4	(-)	(-)	N/A	N/A	32	IIA	LEFT	2	0	0	IDC	POSITIVE	POSITIVE	NEGATIVE	<20%	3	LUMINAL A
5	(-)	(-)	PIK3CA (c.3140A>G, p. His1047Arg)	BRCA1 (c.3743C>T, p.a1248v)	38	IIB	RIGHT	2	1	0	IDC	POSITIVE	POSITIVE	NEGATIVE	≥20%	3	LUMINAL B (HER2 NEGATIVE)
			PIK3CA (c.1090G>A, p. Gly364Arg)	TP53 (c.622G>A, p.d208n)													
6	(-)	(-)	(-)	(-)	40	IIIC	LEFT	3	3	0	ILC	NEGATIVE	NEGATIVE	POSITIVE	<20%	3	HER2 ENRICHED
7	(-)	(-)	TP53 (c.743G>A, p. Arg248Gln)	KMT2C (c.4873G>A, p. Glu1625Lys)	37	IIIA	LEFT	3	2	0	IDC	POSITIVE	POSITIVE	NEGATIVE	≥20%	3	LUMINAL B (HER2 NEGATIVE)
8	TP53 (c824g>a, p. Cys275Tyr)	(-)	TP53 (c.824g>a, p. Cys255Tyr)	ROS1 (c433A>C, p. Thr145Pro)	32	IIIA	LEFT	4	x	0	IDC	NEGATIVE	NEGATIVE	POSITIVE	≥20%	3	HER2 ENRICHED
				RET (c.1684A>T, p. Thr562Ser)													
9	(-)	(-)	TP53 (c.990del, p. Gln331Argfs*14)	MET (c.4090C>T, p. Pro1364Ser)	40	IIIA	RIGHT	3	1	0	IDC	NEGATIVE	POSITIVE	NEGATIVE	≥20%	3	LUMINAL B (HER2 NEGATIVE)
				NF1 (c.563C>A, p. Ala188Glu)													
10	(-)	(-)	N/A	N/A	40	IIIC	RIGHT	x	x	0	IDC	NEGATIVE	NEGATIVE	POSITIVE	≥20%	2	HER2 ENRICHED
11	(-)	(-)	N/A	N/A	37	IIB	RIGHT	2	1	0	IDC	NEGATIVE	NEGATIVE	NEGATIVE	≥20%	3	TNBC

12	(-)	(-)	PTEN (c.99_100ins, p. Ala34fs)	FGFR3 (c.2272G>A, p. Asp758Asn)	40	III A	LEFT	3	1	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	<20%	2	LUMIN AL A
				ROS1 (c.1135C>G, p. Gln379Glu)													
				BRAF (c.1159G>A, p. Gly387Arg)													
				TP53 (c.691del, p. Thr231ProfsTer 16)													
13	BRCA1 (c.5266dup, p. Gln1756Profs*74)	(-)	(-)	(-)	40	IIIC	LEFT	2	3	0	IDC	NEGAT IVE	NEGAT IVE	NEGAT IVE	≥20%	3	TNBC
	MUTYH (c.452A>G, p. Tyr151Cys)																
14	CHECK2 (c.1232G>A, p. Trp411*)	(-)	N/A	N/A	40	III A	RIGHT	N/ A	N/A	N/ A	IDC	POSITI VE	POSITI VE	NEGAT IVE	≥20%	3	LUMIN AL B (HER2 NEGATI VE)
15	(-)	(-)	ATM (c.494T>G, p.Leu165*)	ATM (c.482A>C, p. Gln161Pro)	47	IA	RIGHT	1	0	0	IDC	NEGAT IVE	NEGAT IVE	NEGAT IVE	≥20%	3	TNBC
16	(-)	(-)	AKT1 (c.49G>A, p.Glu17Lys)	PTEN (c.481A>G, p. Arg161Gly)	52	IIB	RIGHT AND LEFT	R:T 2, L: T2	R:N 0, L:N 1	0	ILC	POSITI VE	POSITI VE	NEGAT IVE	<20%	3	LUMIN AL A
				RAD50 (c.443A>G, p. Lys148Arg)													
17	(-)	(-)	N/A	N/A	47	IIA	LEFT	1	1	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	<20%	2	LUMIN AL A
18	(-)	(-)	N/A	N/A	44	III A	LEFT	1	2	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	≥20%	2	LUMIN AL B (HER2 NEGATI VE)
19	(-)	(-)	N/A	N/A	42	IIB	LEFT	3	0	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	<20%	2	LUMIN AL A
20	(-)	(-)	N/A	N/A	45	IA	RIGHT	1	0	0	IDC	NEGAT IVE	NEGAT IVE	NEGAT IVE	≥20%	3	TNBC
21	(-)	(-)	N/A	N/A	44	IA	RIGHT	1	0	0	IDC	POSITI VE	POSITI VE	POSITI VE	≥20%	3	LUMIN AL B

																	(HER2 POSITIV E)
22	(-)	(-)	N/A	N/A	46	IIA	LEFT	2	0	0	IDC	POSITI VE	POSITI VE	POSITI VE	≥20%	3	LUMIN AL B (HER2 POSITIV E)
23	(-)	(-)	N/A	N/A	48	IIIB	LEFT	4	2	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	≥20%	3	LUMIN AL B (HER2 NEGATI VE)
24	(-)	(-)	N/A	N/A	43	IIB	LEFT	2	1	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	<20%	2	LUMIN AL A
25	(-)	(-)	TP53 (c.824G>A, p. Cys275Tyr)	KMT2C (c.7826G>A, p. Arg2609Gln)	45	IA	LEFT	1	0	0	IDC	NEGAT IVE	NEGAT IVE	POSITI VE	≥20%	3	HER2 ENRICH ED
				RB1 (c.1988A>G, p. Asn663Ser)													
				NOTCH1 (c.2453T>C, p. Leu818Pro)													
26	(-)	(-)	N/A	N/A	46	IA	RIGHT	1	0	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	<20%	1	LUMIN AL A
27	(-)	(-)	PIK3CA (c.3140A>G, p. His1047Arg)	ROS1 (c.500G>A, p. Arg167Gln)	52	IV	LEFT	x	x	1	IDC	POSITI VE	POSITI VE	NEGAT IVE	≥20%	3	LUMIN AL B (HER2 NEGATI VE)
			TP53 (c.743G>A, p. Arg248Gln)														
28	(-)	ATM (c.7475T>G, p. Leu2492Arg)	N/A	N/A	33	III A	RIGHT	3	1	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	<20%	3	LUMIN AL A
29	(-)	BRCA1 (c.3649T>C, p. Ser1217Pro)	(-)	(-)	20	IIIC	LEFT	2	3	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	≥20%	3	LUMIN AL B (HER2 NEGATI VE)
30	(-)	BRCA2 (c. 1342C>T, p. Arg448Cys)	N/A	N/A	35	IA	LEFT	1	0	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	≥20%	2	LUMIN AL B (HER2 NEGATI VE)
31	(-)	BRCA2 (c. 9613_9614delinsCT, p. Ala3205Leu)	(-)	BRCA2 (c. 9613_9614delins CT, p. Ala3205Leu)	34	IV	RIGHT	x	x	1	IDC	POSITI VE	POSITI VE	NEGAT IVE	≥20%	2	LUMIN AL B (HER2

		RAD51D (c.412A>C, p. Asn138His)															NEGATI VE)
32	BRCA1 (c.3700_3704del, p. Val1234Glnfs*8) CHECK2 (c.470T>C, p. Ile157Thr)	BRCA2 (c.352C>T, p. Arg118Cys)	N/A	N/A	37	IIB	RIGHT	2	1	0	IDC	POSITI VE	NEGAT IVE	NEGAT IVE	≥20%	3	LUMIN AL B (HER2 NEGATI VE)
33	(-)	BRCA2 (c.9867T>G, p. Phe3289Leu)	TP53 (c.85_86del, p. Asn29GlnfsTer13)	BRCA2 (c.9867T>G, p. Phe3289Leu) ROS1 (c.433A>C, p. Thr145Pro)	46	IIIC	LEFT	1	3	0	IDC	POSITI VE	POSITI VE	POSITI VE	≥20%	3	LUMIN AL B (HER2 POSITIV E)
34	(-)	BRCA2 (c.8386C>T, p. Pro2796Ser)	N/A	N/A	38	IA	RIGHT	1	0	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	≥20%	3	LUMIN AL B (HER2 NEGATI VE)
35	(-)	BRIP1 (c. 2285G>A, p. Arg762His)	N/A	N/A	33	III A	RIGHT	3	2	0	IDC	POSITI VE	POSITI VE	NEGAT IVE	≥20%	3	LUMIN AL B (HER2 NEGATI VE)
36	(-)	CHECK2 (c.480A>G, p. Ile160Met)	(-)	(-)	29	IIIC	LEFT	4	3	0	IDC	POSITI VE	NEGAT IVE	NEGAT IVE	≥20%	2	LUMIN AL B (HER2 NEGATI VE)
37	(-)	CHECK2 (c.190G>A, p. Glu64Lys)	(-)	FGFR1 (c.2192_*del, p. Lys731_Arg732fs*159)	43	IIA	RIGHT	2	0	0	IDC	POSITI VE	NEGAT IVE	POSITI VE	≥20%	3	LUMIN AL B (HER2 POSITIV E)
38	(-)	CHECK2 (c. 1175C>T, p. Ala392Val)	N/A	N/A	37	IV	RIGHT	2	1	1	IDC	POSITI VE	POSITI VE	NEGAT IVE	≥20%	3	LUMIN AL B (HER2 NEGATI VE)
39	(-)	CHECK2 (c.470T>C, p. Ile157Thr)	(-)	(-)	40	IIA	LEFT	2	0	0	IDC	POSITI VE	POSITI VE	POSITI VE	≥20%	2	LUMIN AL B (HER2 POSITIV E)

[illegible]

49	N/A	N/A	PIK3CA (exon2: c.115G>A, p.Glu39Lys) TP53 (c.818G>T, p.Arg273Leu)	(-)	49	IA	Left	1	0	0	IDC	POSITIVE	POSITIVE	POSITIVE	<20%	3	LUMINAL B (HER2 POSITIVE)
50	N/A	N/A	PIK3CA (c.1624G>A, p. Glu542Lys)	RAD50 (c.2604T>G, p. Asn868Lys)	50	IA	RIGHT	1	0	0	IDC	POSITIVE	POSITIVE	NEGATIVE	<20%	1	LUMINAL A
51	N/A	N/A	PIK3CA (exon21: c.3140A>G, p. His1047Arg) ERBB2 (exon19: c.2264T>C, p. Leu755Ser)	RAD50 (c.980G>A, p. Arg327His) TP53 (c.304A>T, p. Thr102Ser) NF1 (c.2573C>G, p. Ser858Cys)	47	IA	LEFT+RIGHT	L:1 a R:1 lc	L:0, R:0	0	IDC	POSITIVE	POSITIVE	NEGATIVE	≥20%	2	LUMINAL B (HER2 NEGATIVE)
52	N/A	N/A	BRCA2 (c.5576_5579del, p. Ile1859LysfsTer3 TTAA)	(-)	50	IIIA	LEFT	1	2	0	IDC	POSITIVE	POSITIVE	NEGATIVE	<20%	2	LUMINAL A
53	(-)	PMS2 (c.1999G>A, p. Glu667Lys)	(-)	(-)	44	IIIA	LEFT	1	2	0	IDC	POSITIVE	POSITIVE	NEGATIVE	≥20%	3	LUMINAL B (HER2 NEGATIVE)
54	(-)	RAD51C (c.80T>C, p. Leu27Pro)	N/A	N/A	48	IA	LEFT	1	0	0	IDC	NEGATIVE	NEGATIVE	NEGATIVE	≥20%	3	TNBC
55	N/A	N/A	PIK3CA (c.1633G>A, p. Glu545Lys), PTEN (c.923delG, p. Arg308LeufsTer9) PTEN (c.923delA, p. Asp310IleufsTer7)	(-)	39	IV	LEFT+RIGHT	L:1, R:3	L:2, R:3	1	IDC	POSITIVE	POSITIVE	NEGATIVE	≥20%	2	LUMINAL B (HER2 NEGATIVE)