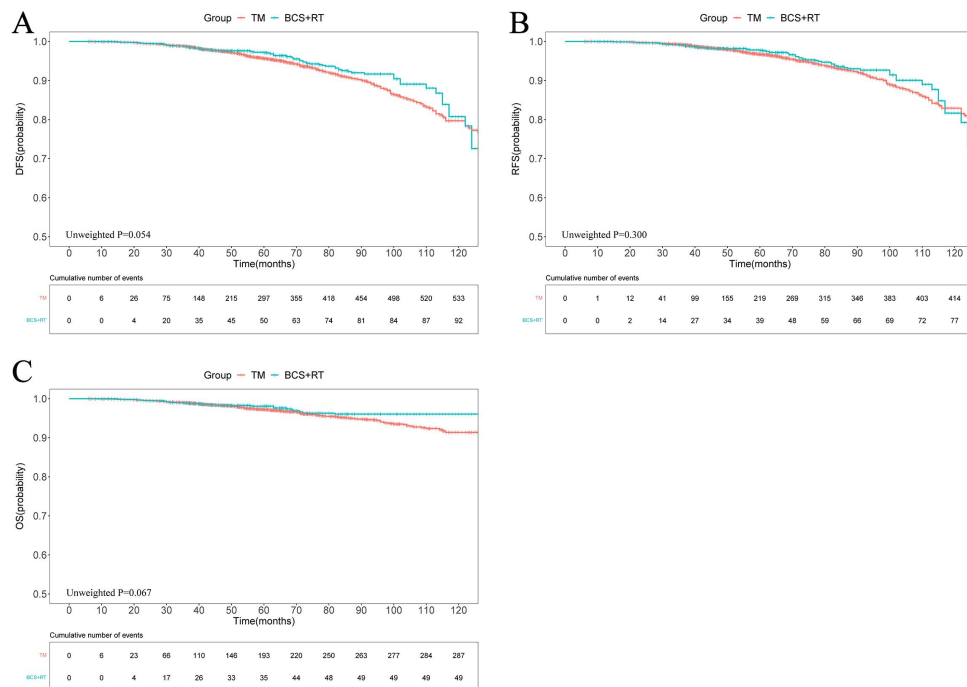


Supplementary Figure 1. Flowchart of our study



Supplementary Figure 2. KM curves of (A) DFS, (B) RFS, and (C) OS in total population who underwent different surgical approaches

Abbreviations: TM, total mastectomy; BCS, breast-conserving surgery; RT, radiation therapy; OS, overall survival; RFS, relapse-free survival; DFS, disease-free survival.

Supplementary Table 1

Clinical and pathological characteristics of patients with obesity in the TM and BCS groups before and after IPTW

Characteristic	N (%)		P value	SMD	PS-weighted P	SMD
	TM (n=885)	BCS (n=240)				
Age, years						
<60	524(59.2)	158(65.8)	0.062	0.137	0.569	0.059
≥60	361(40.8)	82(34.2)				
Menopausal status						
premenopausal	261(29.5)	87(36.2)	0.045	0.144	0.442	0.064
postmenopausal	624(70.5)	153(63.7)				
Tumour grade						
1	477(53.9)	131(54.6)	<0.001	0.390	0.707	0.086
2-3	277(31.3)	99(41.2)				
Unknow	131(14.8)	10(4.2)				
Pathologic T stage						
T1	467(52.8)	161(67.1)	<0.001	0.295	0.867	0.016
T2	418(47.2)	79(32.9)				
Pathologic N stage						
N0	613(69.3)	197(82.1)	<0.001	0.302	0.648	0.044

N1	272(30.7)	43(17.9)				
ER status						
negative	214(24.2)	57(23.8)	0.890	0.010	0.126	0.124
positive	671(75.8)	183(76.2)				
PR status						
negative	293(33.1)	63(26.2)	0.043	0.151	0.623	0.055
positive	592(66.9)	177(73.8)				
HER2 status						
negative	697(78.8)	193(80.4)	0.575	0.041	0.138	0.121
positive	188(21.2)	47(19.6)				
Subtype						
ER-/PR-/HER2-	110(12.4)	40(16.7)	0.053	0.206	0.276	0.155
ER+ or PR+/HER2-	587(66.3)	153(63.7)				
ER- and PR-/HER2+	94(10.6)	15(6.2)				
ER+ or PR+/HER2+	94(10.6)	32(13.3)				
Ki67%						
≤14	234(26.4)	54(22.5)	0.215	0.092	0.908	0.011
>14	651(73.6)	186(77.5)				
Adjuvant hormonal therapy						
No	212(24.0)	56(23.3)	0.841	0.015	0.913	0.013
Yes	673(76.0)	184(76.7)				
Adjuvant chemotherapy						
No	228(25.8)	71(29.6)	0.235	0.085	0.769	0.026
Yes	657(74.2)	169(70.4)				
Adjuvant targeted therapy						
No	754(85.2)	203(84.6)	0.813	0.017	0.233	0.092
Yes	131(14.8)	37(15.4)				

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; IPTW, inverse probability of treatment weighting; SMD, standardized mean difference; PS, propensity score.

Supplementary Table 2

IPTW-adjusted univariate and multivariate analyses of the relationships between DFS rate and clinical factors of patients with obesity

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥60 vs. <60)	2.940	1.450-5.960	0.003	1.000	0.960-1.050	0.891
Menopausal status (postmenopausal vs. premenopausal)	2.560	1.310-5.000	0.006	1.880	0.710-4.970	0.201
Tumour grade (2-3 vs. 1)	1.700	0.880-3.280	0.111	1.620	0.830-3.160	0.161
Tumour grade (Unknow vs.	4.960	2.180-11.290	<0.001	2.470	1.060-5.740	0.036

1)						
Pathologic T stage (T2 vs. T1)	1.500	0.590-3.830	0.399			
Pathologic N stage (N1 vs. N0)	0.770	0.350-1.690	0.512			
ER (positive vs. negative)	1.190	0.620-2.290	0.603			
PR (positive vs. negative)	0.470	0.200-1.120	0.090			
HER2 (positive vs. negative)	0.370	0.180-0.750	0.006	0.350	0.150-0.820	0.015
Ki67% (>14 vs. ≤14)	2.850	1.200-6.770	0.018	2.260	0.990-5.150	0.053
Adjuvant hormonal therapy (yes vs. no)	0.460	0.190-1.130	0.089			
Adjuvant chemotherapy (yes vs. no)	1.580	0.580-4.310	0.374			
Adjuvant targeted therapy (yes vs. no)	0.480	0.200-1.140	0.097			
Surgery (BCS vs. TM)	3.870	2.070-7.240	<0.001	3.390	2.090-5.520	<0.001

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; HR, hazard ratio; 95% CI, 95% confidence interval.

Supplementary Table 3

IPTW-adjusted univariate and multivariate analyses of the relationship between RFS rate and clinical factors of patients with obesity

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥60 vs. <60)	3.090	1.330-7.160	0.009	1.000	0.950-1.050	0.936
Menopausal status (postmenopausal vs. premenopausal)	2.280	1.050-4.920	0.037	1.790	0.550-5.750	0.332
Tumour grade (2-3 vs. 1)	1.590	0.770-3.270	0.212	0.990	0.440-2.240	0.978
Tumour grade (Unknow vs. 1)	6.720	2.730-16.560	<0.001	2.650	1.050-6.660	0.039
Pathologic T stage (T2 vs. T1)	1.250	0.440-3.570	0.674			
Pathologic N stage (N1 vs. N0)	0.770	0.300-1.980	0.582			
ER (positive vs. negative)	1.070	0.500-2.310	0.861			
PR (positive vs. negative)	0.470	0.160-1.330	0.154			
HER2 (positive vs. negative)	0.360	0.160-0.830	0.016	0.270	0.120-0.590	0.001
Ki67% (>14 vs. ≤14)	2.930	1.060-8.100	0.038	1.890	0.810-4.400	0.139
Adjuvant hormonal therapy (yes vs. no)	0.360	0.130-0.970	0.044	0.290	0.180-0.490	<0.001
Adjuvant chemotherapy (yes vs. no)	1.620	0.470-5.570	0.447			
Adjuvant targeted therapy (yes vs. no)	0.430	0.140-1.290	0.131			
Surgery (BCS vs. TM)	5.140	2.500-10.560	<0.001	4.440	2.630-7.520	<0.001

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; IPTW, inverse probability of treatment weighting; HR, hazard ratio; 95% CI, 95% confidence interval.

Supplementary Table 4

IPTW-adjusted univariate and multivariate analyses of the relationship between OS rate and clinical factors of patients with obesity

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥ 60 vs. < 60)	2.060	0.750-5.680	0.162			
Menopausal status (postmenopausal vs. premenopausal)	4.690	1.740-12.630	0.002	4.400	1.730-11.200	0.002
Tumour grade (2-3 vs. 1)	2.190	0.900-5.320	0.084			
Tumour grade (Unknow vs. 1)	2.770	0.520-14.830	0.233			
Pathologic T stage (T2 vs. T1)	3.360	1.590-7.110	0.001	3.090	1.520-6.270	0.002
Pathologic N stage (N1 vs. N0)	1.070	0.390-2.980	0.892			
ER (positive vs. negative)	0.920	0.400-2.070	0.832			
PR (positive vs. negative)	0.650	0.260-1.610	0.351			
HER2 (positive vs. negative)	0.370	0.140-0.980	0.046	0.510	0.210-1.200	0.124
Ki67% (> 14 vs. ≤ 14)	2.180	0.570-8.360	0.258			
Adjuvant hormonal therapy (yes vs. no)	0.910	0.420-1.990	0.815			
Adjuvant chemotherapy (yes vs. no)	2.500	0.930-6.770	0.071			
Adjuvant targeted therapy (yes vs. no)	0.370	0.130-1.050	0.062			
Surgery (BCS vs. TM)	2.830	1.290-6.200	0.010	2.860	1.410-5.790	0.004

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; IPTW, inverse probability of treatment weighting; HR, hazard ratio; 95% CI, 95% confidence interval.

Supplementary Table 5

Clinical and pathological features of patients with obesity in the BCS group, BCS+RT group, and TM group

Characteristic	N (%)			P value	SMD
	TM (n=700)	BCS (n=35)	BCS+RT (n=176)		
Age, years					
<60	399(57.0)	13(37.1)	126(71.6)	<0.001	0.484
≥ 60	301(43.0)	22(62.9)	50(28.4)		
Menopausal status					
premenopausal	199(28.4)	6(17.1)	70(39.8)	0.003	0.344
postmenopausal	501(71.6)	29(82.9)	106(60.2)		
Tumour grade					
1	382(54.6)	18(51.4)	99(56.2)	<0.001	0.305
2-3	204(29.1)	15(42.9)	69(39.2)		
Unknow	114(16.3)	2(5.7)	8(4.5)		
Pathologic T stage					
T1	381(54.4)	25(71.4)	117(66.5)	0.004	0.238
T2	319(45.6)	10(28.6)	59(33.5)		

Pathologic N stage					
N0	564(80.6)	27(77.1)	147(83.5)	0.563	0.107
N1	136(19.4)	8(22.9)	29(16.5)		
ER status					
negative	168(24.0)	9(25.7)	42(23.9)	0.972	0.029
positive	532(76.0)	26(74.3)	134(76.1)		
PR status					
negative	228(32.6)	11(31.4)	45(25.6)	0.200	0.103
positive	472(67.4)	24(68.6)	131(74.4)		
HER2 status					
negative	553(79.0)	27(77.1)	146(83.0)	0.471	0.097
positive	147(21.0)	8(22.9)	30(17.0)		
Subtype					
ER-/PR-/HER2-	84(12.0)	6(17.1)	31(17.6)	0.164	0.207
ER+ or PR+/HER2-	469(67.0)	21(60.0)	115(65.3)		
ER- and PR-/HER2+	74(10.6)	3(8.6)	9(5.1)		
ER + or PR+/HER2+	73(10.4)	5(14.3)	21(11.9)		
Ki67%					
≤14	197(28.1)	6(17.1)	40(22.7)	0.150	0.177
>14	503(71.9)	29(82.9)	136(77.3)		
Adjuvant hormonal therapy					
No	168(24.0)	11(31.4)	41(23.3)	0.580	0.122
Yes	532(76.0)	24(68.6)	135(76.7)		
Adjuvant chemotherapy					
No	216(30.9)	19(54.3)	50(28.4)	0.009	0.362
Yes	484(69.1)	16(45.7)	126(71.6)		
Adjuvant targeted therapy					
No	608(86.9)	31(88.6)	154(87.5)	0.939	0.035
Yes	92(13.1)	4(11.4)	22(12.5)		

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; RT, radiation therapy; SMD, standardized mean difference

Supplementary Table 6

IPTW-adjusted univariate and multivariate analyses of the relationship between RFS rate and clinical factors of patients with obesity in the TM and BCS+RT groups

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥60 vs. <60)	2.550	0.980-6.610	0.054			
Menopausal status (postmenopausal vs. premenopausal)	1.860	0.820-4.220	0.137			
Tumour grade (2-3 vs. 1)	1.850	0.770-4.410	0.166	1.560	0.600-4.070	0.358
Tumour grade (Unknow vs. 1)	5.550	2.180-14.110	<0.001	2.630	1.120-6.190	0.027
Pathologic T stage (T2 vs. T1)	2.640	1.220-5.730	0.014	2.200	0.980-4.930	0.055

Pathologic N stage (N1 vs. N0)	0.690	0.210-2.250	0.540			
ER (positive vs. negative)	0.750	0.320-1.770	0.518			
PR (positive vs. negative)	1.000	0.410-2.450	0.996			
HER2 (positive vs. negative)	0.440	0.190-1.000	0.051			
Ki67% (>14 vs. ≤14)	3.240	1.080-9.710	0.036	2.960	1.010-8.730	0.049
Adjuvant hormonal therapy (yes vs. no)	0.690	0.300-1.610	0.394			
Adjuvant chemotherapy (yes vs. no)	1.030	0.220-4.830	0.967			
Adjuvant targeted therapy (yes vs. no)	0.770	0.210-2.800	0.690			
Surgery (BCS+RT vs. TM)	4.930	2.390-10.180	<0.001	4.380	2.370-8.120	<0.001

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; RT, radiation therapy; IPTW, inverse probability of treatment weighting; HR, hazard ratio; 95% CI, 95% confidence interval.

Supplementary Table 7

IPTW-adjusted univariate and multivariate analyses of the relationship between OS rate and clinical factors of patients with obesity in the TM and BCS+RT groups

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥60 vs. <60)	2.850	0.940-8.630	0.064			
Menopausal status (postmenopausal vs. premenopausal)	10.700	3.200-35.760	<0.001	7.790	2.420-25.080	0.001
Tumour grade (2-3 vs. 1)	4.440	1.470-13.450	0.008	3.360	1.030-10.990	0.045
Tumour grade (Unknow vs. 1)	5.140	1.040-25.490	0.045	2.440	0.710-8.410	0.158
Pathologic T stage (T2 vs. T1)	4.880	1.860-12.820	0.001	2.990	1.130-7.920	0.028
Pathologic N stage (N1 vs. N0)	0.810	0.220-2.980	0.752			
ER (positive vs. negative)	1.060	0.380-2.920	0.911			
PR (positive vs. negative)	0.520	0.150-1.820	0.308			
HER2 (positive vs. negative)	0.280	0.100-0.830	0.021	0.780	0.240-2.530	0.679
Ki67% (>14 vs. ≤14)	3.440	0.740-16.040	0.116			
Adjuvant hormonal therapy (yes vs. no)	0.910	0.340-2.390	0.843			
Adjuvant chemotherapy (yes vs. no)	3.590	1.000-12.900	0.050			
Adjuvant targeted therapy (yes vs. no)	0.210	0.050-0.990	0.049	0.330	0.050-2.030	0.230
Surgery (BCS+RT vs. TM)	4.330	1.790-10.470	0.001	3.590	1.620-7.950	0.002

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; RT, radiation therapy; IPTW, inverse probability of treatment weighting; HR, hazard ratio; 95% CI, 95% confidence interval.

Supplementary Table 8

Clinical and pathological characteristics of the TM and BCS+RT groups in normal BMI patients before and after IPTW

Characteristic	N (%)		P value	SMD	PS-weighted P	SMD
	TM (n=4743)	BCS+RT (n=1260)				
Age, years						

<60	3776 (79.6)	1132 (89.8)	<0.001	0.287	0.605	0.022
≥60	967 (20.4)	128 (10.2)				
Menopausal status						
premenopausal	2481 (52.3)	758 (60.2)	<0.001	0.159	0.734	0.012
postmenopausal	2262 (47.7)	502 (39.8)				
Tumour grade						
1	166 (3.5)	65 (5.2)	<0.001	0.216	0.808	0.023
2-3	3877 (81.7)	1091 (86.6)				
Unknow	700 (14.8)	104 (8.3)				
Pathological T stage						
T1	3001 (63.3)	980 (77.8)	<0.001	0.322	0.873	0.006
T2	1742 (36.7)	280 (22.2)				
Pathological N stage						
N0	3465 (73.1)	987 (78.3)	<0.001	0.123	0.624	0.018
N1	1278 (26.9)	273 (21.7)				
ER status						
negative	1301 (27.4)	312 (24.8)	0.058	0.061	0.846	0.007
positive	3442 (72.6)	948 (75.2)				
PR status						
negative	1703 (35.9)	379 (30.1)	<0.001	0.124	0.636	0.018
positive	3040 (64.1)	881 (69.9)				
HER2 status						
negative	3392 (71.5)	1052 (83.5)	<0.001	0.290	0.982	0.001
positive	1351 (28.5)	208 (16.5)				
Subtype						
ER-/PR-/HER2-	613 (12.9)	218 (17.3)	<0.001	0.302	0.989	0.012
ER+ or PR+/HER2-	2779 (58.6)	834 (66.2)				
ER- and PR-/HER2+	634 (13.4)	84 (6.7)				
ER+ or PR+/HER2+	717 (15.1)	124 (9.8)				
Ki67%						
≤14	1231 (26.0)	341 (27.1)	0.426	0.025	0.891	0.005
>14	3512 (74.0)	919 (72.9)				
Adjuvant hormonal therapy						
No	1065 (22.5)	342 (27.1)	<0.001	0.109	0.952	0.002
Yes	3678 (77.5)	918 (72.9)				
Adjuvant chemotherapy						

No	1361 (28.7)	311 (24.7)	0.005	0.091	0.641	0.016
Yes	3382 (71.3)	949 (75.3)				
Adjuvant targeted therapy						
No	3800 (80.1)	1083 (86.0)	<0.001	0.156	0.503	0.026
Yes	943 (19.9)	177 (14.0)				

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; RT, radiation therapy; SMD, standardized mean difference

Supplementary Table 9

Clinical and pathological characteristics of the TM and BCS+RT groups in patients with overweight before and after IPTW

Characteristic	N (%)		P value	SMD	PS-weighted P	SMD
	TM (n=2957)	BCS+RT (n=687)				
Age, years						
<60	2042 (69.1)	529 (77.0)	<0.001	0.180	0.844	0.010
≥60	915 (30.9)	158 (23.0)				
Menopausal status						
premenopausal	1176 (39.8)	279 (40.6)	0.685	0.017	0.631	0.023
postmenopausal	1781 (60.2)	408 (59.4)				
Tumour grade						
1	78 (2.6)	27 (3.9)	<0.001	0.201	0.971	0.010
2-3	2450 (82.9)	602 (87.6)				
Unknow	429 (14.5)	58 (8.4)				
Pathological T stage						
T1	1668 (56.4)	494 (71.9)	<0.001	0.327	0.458	0.037
T2	1289 (43.6)	193 (28.1)				
Pathological N stage						
N0	2141 (72.4)	534 (77.7)	0.004	0.123	0.822	0.011
N1	816 (27.6)	153 (22.3)				
ER status						
negative	795 (26.9)	155 (22.6)	0.020	0.100	0.882	0.008
positive	2162 (73.1)	532 (77.4)				
PR status						
negative	1031 (34.9)	202 (29.4)	0.006	0.117	0.997	<0.001
positive	1926 (65.1)	485 (70.6)				
HER2 status						
negative	2193 (74.2)	585 (85.2)	<0.001	0.276	0.712	0.021
positive	764 (25.8)	102 (14.8)				
Subtype						

ER-/PR-/HER2-	413 (14.0)	107 (15.6)	<0.001	0.277	0.939	0.032
ER+ or PR+/HER2-	1780 (60.2)	478 (69.6)				
ER- and PR-/HER2+	356 (12.0)	44 (6.4)				
ER+ or PR+/HER2+	408 (13.8)	58 (8.4)				
Ki67%						
≤14	793 (26.8)	191 (27.8)	0.601	0.022	0.926	0.004
>14	2164 (73.2)	496 (72.2)				
Adjuvant hormonal therapy						
No	804 (27.2)	155 (22.6)	0.013	0.107	0.965	0.002
Yes	2153 (72.8)	532 (77.4)				
Adjuvant chemotherapy						
No	696 (23.5)	189 (27.5)	0.029	0.091	0.865	0.008
Yes	2261 (76.5)	498 (72.5)				
Adjuvant targeted therapy						
No	2475 (83.7)	600 (87.3)	0.018	0.103	0.421	0.042
Yes	482 (16.3)	87 (12.7)				

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; RT, radiation therapy; SMD, standardized mean difference

Supplementary Table 10

IPTW-adjusted univariate and multivariate analyses of the relationships between the DFS rate and clinical factors in normal BMI patients

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥60 vs. <60)	2.360	1.46-3.82	<0.001	2.170	1.33-3.55	0.002
Menopausal status (postmenopausal vs. premenopausal)	1.910	1.36-2.68	<0.001	1.390	1.01-1.91	0.046
Tumour grade (2-3 vs. 1)	3.660	1.39-9.60	0.008	1.890	0.69-5.18	0.214
Tumour grade (unknow vs. 1)	5.980	1.82-19.63	0.003	3.880	1.22-12.38	0.022
Pathological T stage (T2 vs. T1)	1.880	1.31-2.71	0.001	1.770	1.17-2.68	0.007
Pathological N stage (N1 vs. N0)	1.540	1.11-2.15	0.011	1.540	1.09-2.17	0.015
ER (positive vs. negative)	0.580	0.41-0.83	0.003	0.520	0.22-1.25	0.142
PR (positive vs. negative)	0.530	0.37-0.76	<0.001	0.620	0.30-1.32	0.215
HER2 (positive vs. negative)	0.980	0.66-1.44	0.906			
Ki67% (>14 vs. ≤14)	2.120	1.52-2.95	<0.001	1.750	1.25-2.44	0.001
Adjuvant hormonal therapy (yes vs. no)	0.670	0.47-0.96	0.028	2.210	0.97-5.02	0.059
Adjuvant chemotherapy (yes vs. no)	1.740	1.19-2.55	0.004	1.360	0.79-2.37	0.267

Adjuvant targeted therapy (yes vs. no)	0.880	0.58-1.34	0.551
Surgery (BCS+RT vs. TM)	1.030	0.71-1.48	0.882

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; HR, hazard ratio; 95% CI, 95% confidence interval.

Supplementary Table 11

IPTW-adjusted univariate and multivariate analyses of the relationships between the DFS rate and clinical factors in patients with overweight

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥ 60 vs. < 60)	1.570	1.04-2.38	0.033	1.420	0.91-2.19	0.120
Menopausal status (postmenopausal vs. premenopausal)	1.690	1.16-2.47	0.006	1.550	1.04-2.31	0.030
Tumour grade (2-3 vs. 1)	-	-	0.051			
Tumour grade (unknown vs. 1)	-	-	0.053			
Pathological T stage (T2 vs. T1)	2.160	1.48-3.15	<0.001	2.030	1.38-2.96	<0.001
Pathological N stage (N1 vs. N0)	1.810	1.24-2.65	0.002	1.750	1.19-2.57	0.005
ER (positive vs. negative)	0.930	0.61-1.41	0.725			
PR (positive vs. negative)	0.730	0.49-1.09	0.122			
HER2 (positive vs. negative)	0.950	0.61-1.49	0.826			
Ki67% (> 14 vs. ≤ 14)	2.120	1.32-3.41	0.002	2.210	1.36-3.60	0.001
Adjuvant hormonal therapy (yes vs. no)	0.910	0.60-1.38	0.651			
Adjuvant chemotherapy (yes vs. no)	1.520	0.96-2.41	0.073			
Adjuvant targeted therapy (yes vs. no)	1.010	0.59-1.73	0.975			
Surgery (BCS+RT vs. TM)	0.730	0.48-1.12	0.148			

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; RT, radiation therapy; SMD, standardized mean difference

Supplementary Table 12

IPTW-adjusted univariate and multivariate analyses of the relationships between the RFS rate and clinical factors in normal BMI patients

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥ 60 vs. < 60)	1.140	0.68-1.92	0.610			
Menopausal status (postmenopausal vs. premenopausal)	1.420	1.01-1.99	0.045	1.440	0.99-2.07	0.053
Tumour grade (2-3 vs. 1)	3.540	1.21-10.35	0.021	1.610	0.54-4.75	0.392
Tumour grade (unknown vs. 1)	3.440	0.96-12.29	0.057	2.020	0.57-7.17	0.278
Pathological T stage (T2 vs. T1)	1.690	1.20-2.38	0.002	1.430	1.02-2.01	0.040
Pathological N stage (N1 vs. N0)	1.870	1.34-2.62	<0.001	1.760	1.25-2.47	0.001
ER (positive vs. negative)	0.480	0.34-0.68	<0.001	0.390	0.16-0.95	0.039
PR (positive vs. negative)	0.630	0.45-0.89	0.009	1.340	0.79-2.28	0.274

HER2 (positive vs. negative)	1.230	0.82-1.84	0.317			
Ki67% (>14 vs. ≤14)	2.540	1.76-3.66	<0.001	2.080	1.40-3.10	<0.001
Adjuvant hormonal therapy (yes vs. no)	0.550	0.39-0.79	0.001	1.240	0.53-2.93	0.619
Adjuvant chemotherapy (yes vs. no)	2.410	1.57-3.69	<0.001	1.400	0.83-2.36	0.205
Adjuvant targeted therapy (yes vs. no)	1.160	0.76-1.78	0.496			
Surgery (BCS+RT vs. TM)	0.980	0.69-1.40	0.919			

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; HR, hazard ratio; 95% CI, 95% confidence interval.

Supplementary Table 13

IPTW-adjusted univariate and multivariate analyses of the relationships between the RFS rate and clinical factors in patients with overweight

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥60 vs. <60)	1.300	0.80-2.13	0.288			
Menopausal status (postmenopausal vs. premenopausal)	1.450	0.96-2.19	0.080			
Tumour grade (2-3 vs. 1)	-	-	0.061			
Tumour grade (unknow vs. 1)	-	-	0.079			
Pathological T stage (T2 vs. T1)	2.440	1.60-3.73	<0.001	2.210	1.39-3.50	0.001
Pathological N stage (N1 vs. N0)	1.560	1.03-2.37	0.036	1.540	0.97-2.45	0.066
ER (positive vs. negative)	0.810	0.51-1.28	0.363			
PR (positive vs. negative)	0.610	0.39-0.94	0.026	0.690	0.41-1.14	0.149
HER2 (positive vs. negative)	0.820	0.51-1.34	0.429			
Ki67% (>14 vs. ≤14)	2.160	1.24-3.76	0.007	1.940	1.00-3.76	0.051
Adjuvant hormonal therapy (yes vs. no)	0.800	0.50-1.27	0.338			
Adjuvant chemotherapy (yes vs. no)	1.890	1.04-3.43	0.038	1.040	0.53-2.04	0.903
Adjuvant targeted therapy (yes vs. no)	0.820	0.47-1.43	0.477			
Surgery (BCS+RT vs. TM)	0.740	0.46-1.19	0.214			

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; RT, radiation therapy; SMD, standardized mean difference

Supplementary Table 14

IPTW-adjusted univariate and multivariate analyses of the relationships between the OS rate and clinical factors in normal BMI patients

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥60 vs. <60)	3.980	2.19-7.21	<0.001	3.430	1.99-5.91	<0.001
Menopausal status (postmenopausal vs. premenopausal)	2.440	1.44-4.14	0.001	1.290	0.78-2.11	0.319
Tumour grade (2-3 vs. 1)	13.210	1.84-94.88	0.010	6.620	0.93-46.95	0.059

Tumour grade (unknow vs. 1)	29.070	3.36-251.59	0.002	18.10 0	2.33-140.7 0	0.006
Pathological T stage (T2 vs. T1)	2.390	1.39-4.11	0.002	2.500	1.46-4.30	0.001
Pathological N stage (N1 vs. N0)	1.090	0.68-1.73	0.721			
ER (positive vs. negative)	0.490	0.28-0.84	0.010	1.030	0.33-3.26	0.961
PR (positive vs. negative)	0.380	0.23-0.63	<0.001	0.470	0.16-1.34	0.157
HER2 (positive vs. negative)	0.870	0.48-1.56	0.632			
Ki67% (>14 vs. ≤14)	1.810	1.11-2.95	0.017	1.420	0.86-2.34	0.169
Adjuvant hormonal therapy (yes vs. no)	0.590	0.34-1.00	0.051			
Adjuvant chemotherapy (yes vs. no)	1.770	1.03-3.04	0.040	1.760	0.88-3.52	0.111
Adjuvant targeted therapy (yes vs. no)	0.520	0.29-0.93	0.027	0.380	0.21-0.69	0.002
Surgery (BCS+RT vs. TM)	1.120	0.65-1.93	0.674			

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; HR, hazard ratio; 95% CI, 95% confidence interval.

Supplementary Table 15

IPTW-adjusted univariate and multivariate analyses of the relationships between the OS rate and clinical factors in patients with overweight

Factor	Univariate analysis			Multivariate analysis		
	HR	95% CI	P value	HR	95% CI	P value
Age, years (≥60 vs. <60)	2.640	1.54-4.52	<0.001	2.220	1.29-3.80	0.004
Menopausal status (postmenopausal vs. premenopausal)	2.460	1.34-4.53	0.004	1.720	0.92-3.22	0.087
Tumour grade (2-3 vs. 1)	-	-	0.061			
Tumour grade (unknow vs. 1)	-	-	0.067			
Pathological T stage (T2 vs. T1)	2.030	1.15-3.57	0.014	1.960	1.13-3.38	0.016
Pathological N stage (N1 vs. N0)	2.100	1.21-3.65	0.008	2.010	1.16-3.47	0.012
ER (positive vs. negative)	0.980	0.56-1.74	0.953			
PR (positive vs. negative)	0.740	0.42-1.30	0.289			
HER2 (positive vs. negative)	0.740	0.38-1.46	0.384			
Ki67% (>14 vs. ≤14)	1.320	0.74-2.35	0.349			
Adjuvant hormonal therapy (yes vs. no)	0.960	0.54-1.68	0.877			
Adjuvant chemotherapy (yes vs. no)	1.330	0.79-2.23	0.280			
Adjuvant targeted therapy (yes vs. no)	0.870	0.38-2.02	0.754			
Surgery (BCS+RT vs. TM)	0.770	0.41-1.44	0.411			

Abbreviations: T, tumour size; N, lymphaden; ER, oestrogen receptor; PR, progesterone receptor; HER2, human epidermal growth factor receptor 2; TM, total mastectomy; BCS, breast-conserving surgery; RT, radiation therapy; SMD, standardized mean difference