

Supplementary material

Tab. S1. Characteristics and comparison of TNBC and FA, in TG and SG

Variable	Total group, TG (n = 92)				SG, size ≤20 mm (n = 57)			
	TNBC (n = 41, 44.6%)	FA (n = 51, 55.4%)	MD (95% CI)	p	TNBC (n = 16, 28.1%)	FA (n = 41, 71.9%)	MD (95% CI)	p
Age, years	55.22 ± 11.76	45.57 ± 15.45	9.65 (3.85; 15.46)	0.001¹	55.75 ± 9.53	47.44 ± 14.60	8.31 (0.39; 16.23)	0.040¹
Size, mm	26.00 (16.00; 43.00)	14.00 (11.50; 18.00)	12.00 (5.00;18.00)	<0.001²	13.44 ± 3.63	13.10 ± 3.69	0.34 (−1.83; 2.51)	0.755 ¹
Size								
≤20 mm	16 (39.0)	41 (80.4)	–	<0.001	0 (0.0)	0 (0.0)	–	–
>20 mm	25 (61.0)	10 (19.6)			16 (100.0)	41 (100.0)		
Shape								
Oval/round	2 (4.9)	35 (68.6)	–	<0.001	1 (6.2)	31 (75.6)	–	<0.001
Irregular	39 (95.1)	16 (31.4)			15 (93.8)	10 (24.4)		
Orientation								
Parallel	39 (95.1)	51 (100.0)	–	0.196	15 (93.8)	41 (100.0)	–	0.281 ³
Non-parallel	2 (4.9)	0 (0.0)			1 (6.2)	0 (0.0)		
Margins								
Circumscribed	0 (0.0)	30 (58.8)	–	<0.001	0 (0.0)	25 (61.0)	–	<0.001
Non-circumscribed	41 (100.0)	21 (41.2)			16 (100.0)	16 (39.0)		
Non-circumscribed margins by type*								
Angular/spicular	19 (46.3)	1 (5.6)	–	0.006	6 (37.5)	1 (7.1)	–	0.172 ³
Macro/microlobular	5 (12.2)	6 (33.3)			2 (12.5)	2 (14.3)		
Indistinct	17 (41.5)	11 (61.1)			8 (50.0)	11 (78.6)		
Echogenicity								
Hypoechoic	22 (53.7)	16 (31.4)	–	0.052	15 (93.8)	15 (36.6)	–	<0.001
Other than hypoechoic	19 (46.3)	35 (68.6)			1 (6.2)	26 (63.4)		
Posterior features								
Yes	34 (82.9)	34 (66.7)	–	0.127	10 (62.5)	27 (65.9)	–	>0.999
No	7 (17.1)	17 (33.3)			6 (37.5)	14 (34.1)		
Skin								
Normal	32 (78.0)	51 (100.0)	–	<0.001³	16 (100.0)	41 (100.0)	–	–
>2 mm	9 (22.0)	0 (0.0)			0 (0.0)	0 (0.0)		
Hyperechogenic halo								
Yes	28 (68.3)	8 (15.7)	–	<0.001	9 (56.2)	7 (17.1)	–	0.007³
No	13 (31.7)	43 (84.3)			7 (43.8)	34 (82.9)		
Vascularity in CD								
Yes	38 (92.7)	32 (62.7)	–	0.002	14 (87.5)	23 (56.1)	–	0.054
No	3 (7.3)	19 (37.3)			2 (12.5)	18 (43.9)		
AngioPlus** compared to CD								
Even	20 (64.5)	41 (87.2)	–	0.036	8 (72.7)	33 (89.2)	–	0.327 ³
AngioPlus dominance	11 (35.5)	6 (12.8)			3 (27.3)	4 (10.8)		
Elastography								
Soft <80 kPa	9 (22.0)	45 (88.2)	–	<0.001	5 (31.2)	38 (92.7)	–	<0.001³
Intermediate T3, 80–160 kPa	11 (26.8)	6 (11.8)			6 (37.5)	3 (7.3)		
Hard >160 kPa	21 (51.2)	0 (0.0)			5 (31.2)	0 (0.0)		

Tab. S1. (continued) Characteristics and comparison of TNBC and FA, in TG and SG

Variable	Total group, TG (n = 92)				SG, size ≤20 mm (n = 57)			
	TNBC (n = 41, 44.6%)	FA (n = 51, 55.4%)	MD (95% CI)	p	TNBC (n = 16, 28.1%)	FA (n = 41, 71.9%)	MD (95% CI)	p
Calcification								
Yes	10 (25.6)	13 (25.5)	–	>0.999	2 (12.5)	11 (26.8)	–	0.313 ³
No	29 (74.4)	38 (74.5)			14 (87.5)	30 (73.2)		
Numerical parameters were described with mean ± standard deviation or median (interquartile range), depending on normality. MD – mean/median difference (TNBC vs FA); CI – confidence interval. Groups compared with t-Student test ¹ , Mann-Whitney U test ² , Pearson Chi-square test or Fisher's exact test ³ , as appropriate.								
* Proportions vs all observations with irregular margins.								
** Proportions vs all observations with available data on AngioPlus (TNBC: n = 31, FA: n = 47).								

Tab. S2. ROC analysis for predicting TNBC type of tumor (vs FA) in TG (p < 0.05)

Variable	Cut off**	AUC (95% CI)	Sensitivity	Specificity	Accuracy	PPV	NPV	p
Elastography other than soft (>80 kPa)	–	0.831 (0.753; 0.910)	0.78	0.88	0.84	0.84	0.83	<0.001
Irregular shape	–	0.819 (0.746; 0.891)	0.95	0.69	0.80	0.71	0.95	<0.001
Non-circumscribed margins	–	0.794 (0.726; 0.862)	1.00	0.59	0.77	0.66	1.00	<0.001
Halo present	–	0.763 (0.675; 0.851)	0.68	0.84	0.77	0.78	0.77	<0.001
Elastography hard (>160 kPa)	–	0.756 (0.679; 0.834)	0.51	1.00	0.78	1.00	0.72	<0.001
Size, mm	21.5	0.747 (0.641; 0.853)	0.59	0.84	0.73	0.75	0.72	<0.001
Angular/spicular margins	–	0.722 (0.642; 0.802)	0.46	0.98	0.75	0.95	0.69	<0.001
Age, years	46.5	0.706 (0.598; 0.814)	0.78	0.61	0.68	0.62	0.77	0.001
Vascularity in CD present	–	0.650 (0.571; 0.728)	0.93	0.37	0.62	0.54	0.86	<0.001
AngioPlus dominance	–	0.614 (0.515; 0.712)	0.35	0.87	0.67	0.65	0.67	0.018
Hypoechogenicity	–	0.611 (0.511; 0.712)	0.54	0.69	0.62	0.58	0.65	0.031
Skin >2 mm	–	0.610 (0.546; 0.674)	0.22	1.00	0.65	1.00	0.61	<0.001
Non-circumscribed margins other than indistinct *	–	0.599 (0.504; 0.695)	0.41	0.78	0.62	0.61	0.62	0.039
AUC – area under curve; CI – confidence interval; PPV – positive predictive value; NPV – negative predictive value.								
* Non-circumscribed margins other than indistinct encompass: irregular, angular/spicular, and micro/macrolobular margins.								
** Cut-off given for numerical variables only.								

Tab. S3. ROC analysis for predicting TNBC type of tumor (vs FA) in the TG – most effective combinations

Combination	AUC (95% CI)	Sensitivity	Specificity	Accuracy	PPV	NPV	p
Combinations of 2 features							
Non-circumscribed margins and irregular shape	0.858 (0.790; 0.926)	0.95	0.76	0.85	0.76	0.95	<0.001
Elastography other than soft (>80 kPa) and irregular shape	0.836 (0.760; 0.912)	0.73	0.94	0.85	0.91	0.81	<0.001
Non-circumscribed margins and vascularity in CD present	0.826 (0.752; 0.900)	0.93	0.73	0.82	0.73	0.92	<0.001
Non-circumscribed margins and posterior features	0.807 (0.725; 0.888)	0.83	0.78	0.80	0.76	0.85	<0.001
Vascularity in CD present and halo present	0.770 (0.684; 0.856)	0.66	0.88	0.78	0.82	0.76	<0.001

Tab. S3. (continued) ROC analysis for predicting TNBC type of tumor (vs FA) in the TG – most effective combinations

Combination	AUC (95% CI)	Sensitivity	Specificity	Accuracy	PPV	NPV	p
Vascularity in CD present and posterior features	0.716 (0.625; 0.807)	0.80	0.63	0.71	0.63	0.80	<0.001
Combinations of 3 features							
Non-circumscribed margins and vascularity in CD present and posterior features	0.844 (0.768; 0.920)	0.80	0.88	0.85	0.85	0.85	<0.001
Non-circumscribed margins and irregular shape and vascularity in CD present	0.841 (0.766; 0.916)	0.88	0.80	0.84	0.78	0.89	<0.001
Elastography other than soft (>80 kPa) and irregular shape and non-circumscribed margins	0.836 (0.760; 0.912)	0.73	0.94	0.85	0.91	0.81	<0.001
Non-circumscribed margins and irregular shape and posterior features	0.834 (0.756; 0.912)	0.80	0.86	0.84	0.82	0.85	<0.001

AUC – area under curve; CI – confidence interval; PPV – positive predictive value; NPV – negative predictive value

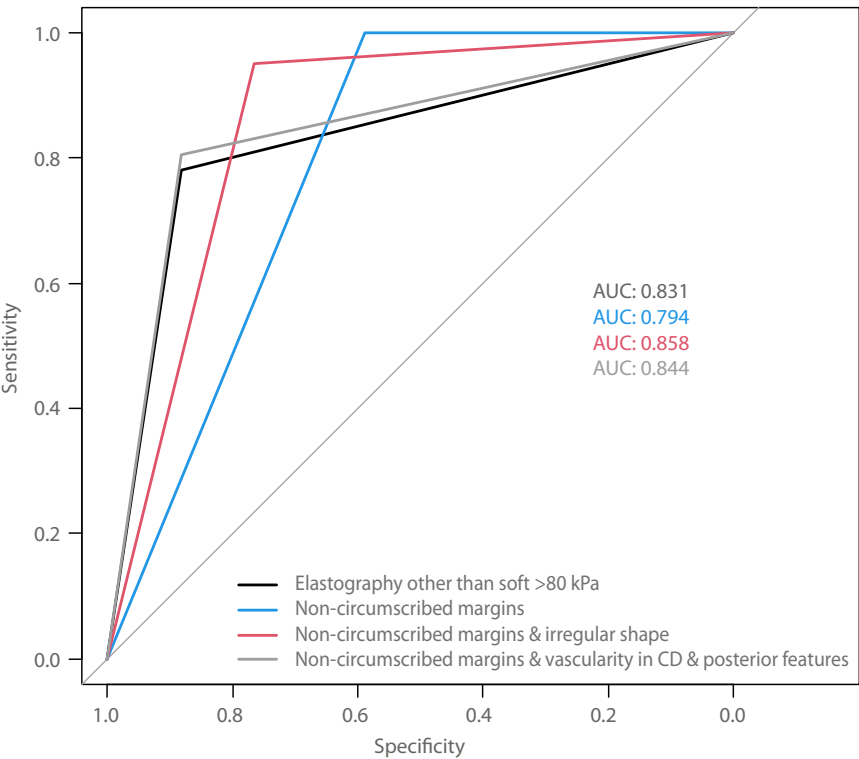


Fig. S1. ROC curves for predicting TNBC (vs FA) using selected features and combinations of features, in total group

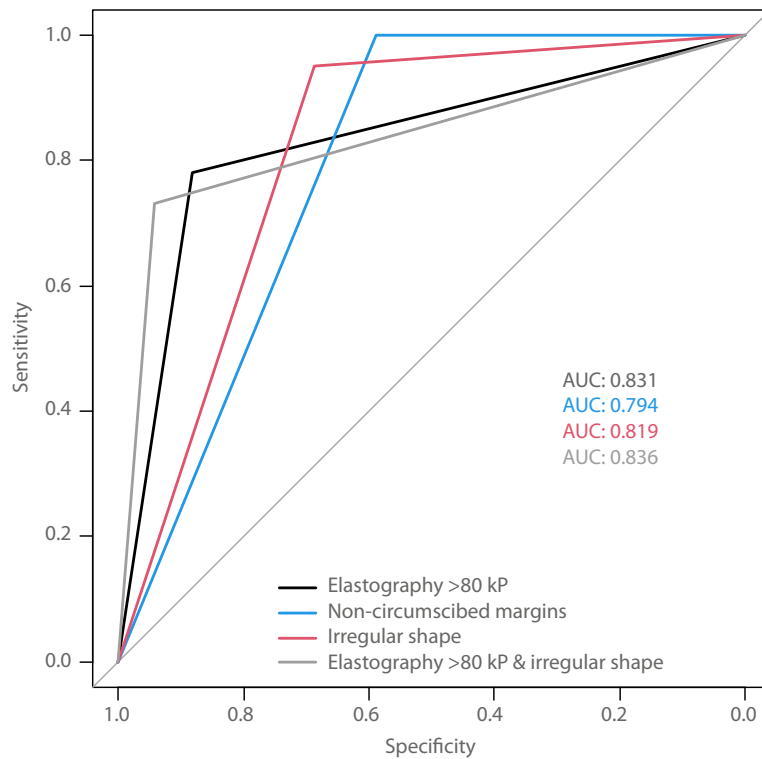


Fig. S2. ROC curves for predicting TNBC (vs FA) using selected features and combinations, in total group

Tab. S4. ROC analysis for predicting TNBC (vs FA) in group with size ≤ 20 mm (significant outcomes, $p < 0.05$)

Variable	Cut off*	AUC (95% CI)	Sensitivity	Specificity	Accuracy	PPV	NPV	<i>p</i>
Irregular shape	—	0.847 (0.756; 0.937)	0.94	0.76	0.81	0.60	0.97	<0.001
Elastography other than soft (>80 kPa)	—	0.807 (0.683; 0.931)	0.69	0.93	0.86	0.79	0.88	<0.001
Non-circumscribed margins	—	0.805 (0.729; 0.880)	1.00	0.61	0.72	0.50	1.00	<0.001
Hypoechogenicity	—	0.786 (0.689; 0.882)	0.94	0.63	0.72	0.50	0.96	<0.001
Age, years	50.5	0.708 (0.573; 0.843)	0.69	0.76	0.74	0.52	0.86	0.039
Hyperechogenic halo present	—	0.696 (0.557; 0.834)	0.56	0.83	0.75	0.56	0.83	0.004
Angular/spicular margins	—	0.675 (0.550; 0.800)	0.38	0.98	0.81	0.86	0.80	0.001
Vascularity in CD present	—	0.657 (0.543; 0.771)	0.88	0.44	0.56	0.38	0.90	0.018
Elastography hard (>160 kPa)	—	0.656 (0.539; 0.774)	0.31	1.00	0.81	1.00	0.79	<0.001
Elastography intermediate (T3, 80–160 kPa)	—	0.651 (0.522; 0.780)	0.38	0.93	0.77	0.67	0.79	0.008

AUC – area under curve; CI – confidence interval; PPV – positive predictive value; NPV – negative predictive value
* Cut-off given for numerical variables only.

Tab. S5. ROC analysis for predicting TNBC (vs FA) in group with size ≤ 20 mm – most effective combinations

Combination	AUC (95% CI)	Sensitivity	Specificity	Accuracy	PPV	NPV	p
Combinations of two features							
Irregular shape and hypoechogenicity	0.944 (0.875; 1.000)	0.94	0.95	0.95	0.88	0.98	<0.001
Non-circumscribed margins and hypoechogenicity	0.908 (0.828; 0.987)	0.94	0.88	0.89	0.75	0.97	<0.001
Non-circumscribed margins and irregular shape	0.871 (0.784; 0.958)	0.94	0.80	0.84	0.65	0.97	<0.001
Non-circumscribed margins and vascularity in CD present	0.828 (0.722; 0.933)	0.88	0.78	0.81	0.61	0.94	<0.001
Elastography other than soft (>80 kPa) and hypoechogenicity	0.812 (0.690; 0.935)	0.62	1.00	0.89	1.00	0.87	<0.001
Vascularity in CD present and hypoechogenicity	0.809 (0.692; 0.925)	0.81	0.80	0.81	0.62	0.92	<0.001
Vascularity in CD present and hyperechogenic halo present	0.720 (0.585; 0.856)	0.56	0.88	0.79	0.64	0.84	0.001
Combinations of three features							
Non-circumscribed margins and irregular shape and hypoechogenicity	0.944 (0.875; 1.000)	0.94	0.95	0.95	0.88	0.98	<0.001
Irregular shape and hypoechogenicity and vascularity in CD present	0.882 (0.778; 0.986)	0.81	0.95	0.91	0.87	0.93	<0.001
Non-circumscribed margins and vascularity in CD present and hypoechogenicity	0.870 (0.763; 0.976)	0.81	0.93	0.89	0.81	0.93	<0.001
Non-circumscribed margins and irregular shape and vascularity in CD present	0.833 (0.720; 0.946)	0.81	0.85	0.84	0.68	0.92	<0.001
Elastography other than soft (>80 kPa) and hypoechogenicity and non-circumscribed margins	0.812 (0.690; 0.935)	0.62	1.00	0.89	1.00	0.87	<0.001
Elastography other than soft (>80 kPa) and hypoechogenicity and irregular shape	0.812 (0.690; 0.935)	0.62	1.00	0.89	1.00	0.87	<0.001
AUC – area under curve; CI – confidence interval; PPV – positive predictive value; NPV – negative predictive value							

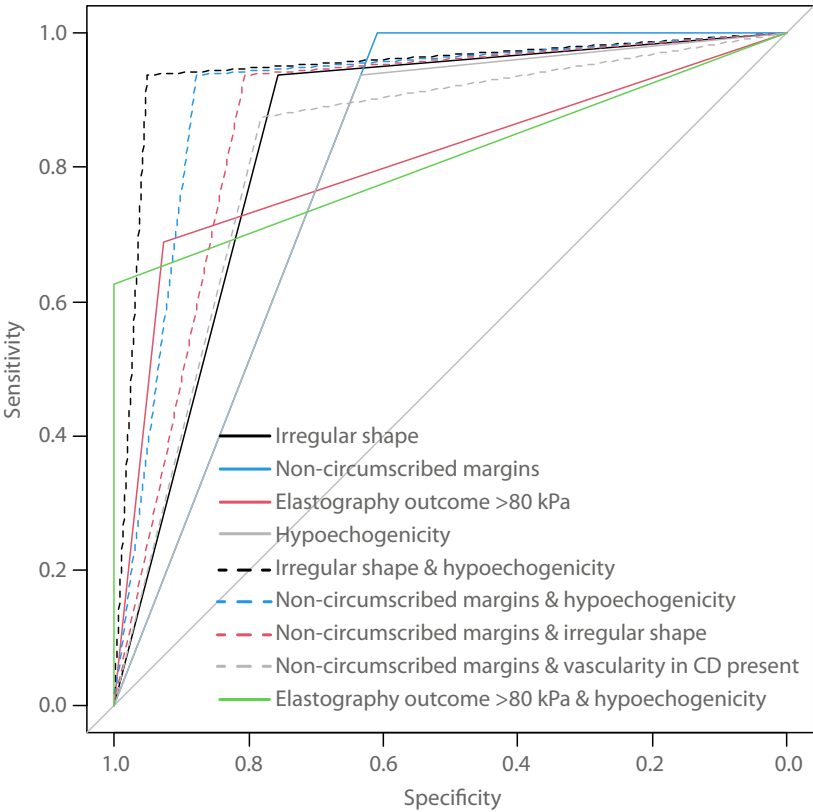


Fig. S3. ROC curves for predicting TNBC (vs FA) using selected features and combinations, in group with size ≤ 20 mm