(a) US can find the lesions;
(b) Only solid or nearly solid (<20% cystic) lesions included;
(c) The lesion size within the limits of 5 to 50mm;
(d) No less than 3 mm tissue surrounding the lesions;
(e) Patients must receive surgery or biopsy in a week after ultrasound supersonic inspection.

499 patients were enrolled in the study

Excluded

(a) No pathology(n=15);
(b) Lack of clinical information (n=6);
(c) Unsatisfactory elastic images (n=7);
(d) Received neoadjuvant chemotherapy(n=3);
(e) Elasticity data has missing values (n=234)

234 patients

| 140 patients from center1 | 35 patients from center2 | 29 patients from center3 | 30 patients from center4 |

External Validation cohort1

External Validation cohort2

External Validation cohort3

116 Patients between Jun. 1, 2016 and Oct. 30,2019

24 Patients between Nov. 1, 2020 and Feb.8, 2021

Development cohort

Internal Validation cohort

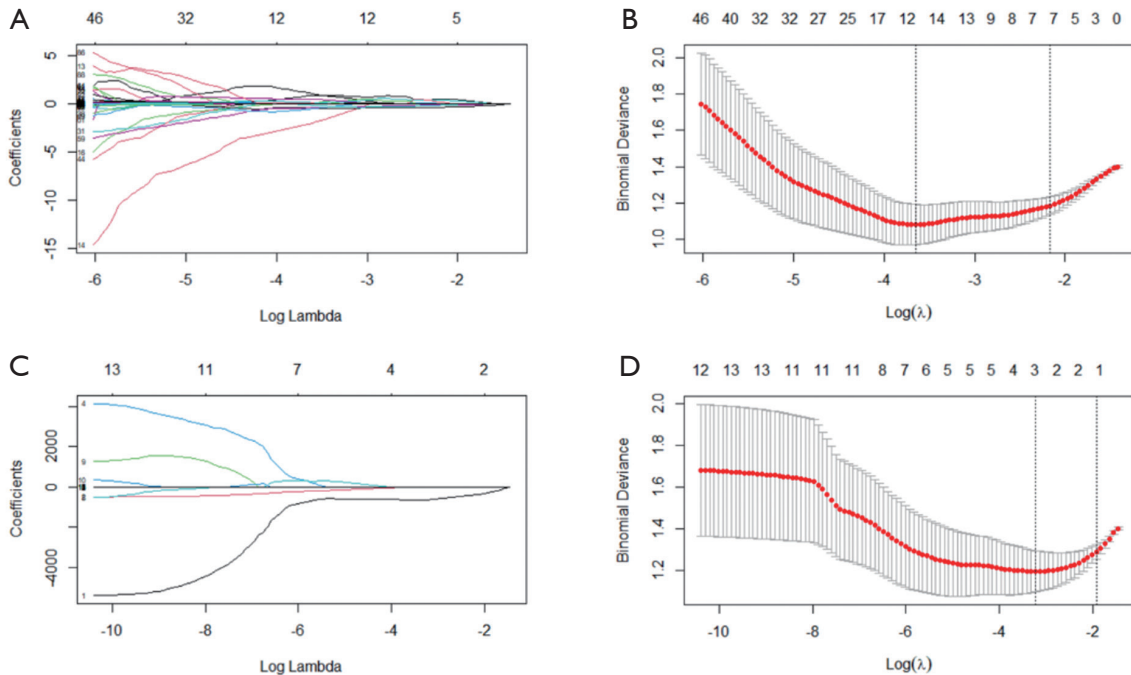**Figure S1** Flowchart of patient selection. US, ultrasound.

Figure S2 LASSO binary logistic regression results of shear wave elastography (A) and strain elastography (C) characteristics. The optimal penalization coefficient, λ, of shear wave elastography (B) and strain elastography (D) characteristics was selected by repeated procession of the 10-fold cross validation. LASSO, least absolute shrinkage and selection operator.

Table S1 Diagnostic performance of multivariable diagnosis in the development cohort

Variable	Odds ratio (95% CI)	Wald	P value
Shape =1	3.393 (0.846–15.452)	1.68	0.093
Margin =1	8.742 (2.561–33.294)	3.36	0.001
Posterior features =2	1.828 (0.445–7.289)	0.86	0.389
Vascularity =2	3.705 (1.041–14.333)	1.99	0.047
Shell mean/A mean(1.5)E	6.194 (0.888–57.836)	1.71	0.087
B/A'1.5	1.357 (0.901–2.113)	1.44	0.151