**Supplementary Methods**

*Statistical process of grouping and modeling*

First, one of our authors numbered all the patients and controls. Then, another author, who did not have access to the patients’ identifying information, randomly selected patients based on their assigned numbers. Next, we used the random\_shuffle () function from the C + + standard template library to randomly select the patients. As such, we consistently obtained different arrangements of the results. A third person in our group selected one of the permutations and divided it equally into two sets for the analysis. One set was used for the training set, and the other was used for the test set. As such, the whole process of grouping was double-blinded and random. We used the data in the training set to build a model with a good ROC curve, after which we input the data from the test set into the model to obtain a new ROC curve. We compared both ROC curves to determine if the model was verified and reproducible.

We used the binary logistic regression (Enter) method to process the data and considered all the variables in the formula to obtain their individual significance levels. Then, we used binary logistic regression (Forward: conditional) to process this analysis again. The program eliminated CEA in the model building process, and in the training set of SCC, the Sig. of CEA was 0.608. The other three markers, IDH1, CA125, and Cyfra21-1, all had Sig. values of < 0.0001. The ROC of the 4-marker-model (Enter) curve was 0.915 and showed no significant difference (P = 0.710) from the 3-marker-model (Forward), for which ROC curve was 0.914. In the training set of NSCLC, the Sig. of CEA was 0.392, but the other three markers, IDH1, CA125, and Cyfra21-1, still had Sig. values of < 0.0001. The ROC of the 4-marker-model (Enter) curve was 0.896 and showed no significant difference (*P* = 0.865) from the 3-marker-model (Forward), for which the ROC curve was 0.896. As such, in our diagnostic models, we ultimately chose IDH1, CA125, and Cyfra21-1, but not CEA.