

ORIGINAL ARTICLE

A Clinical Application Study of Nanostructured Substrates for the Detection of Circulating Tumor Cells

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SUMMARY

Background: Circulating tumor cell (CTC) isolation methods based on nanostructured substrates can be used to isolate tumor cells from peripheral blood. This study aimed to validate the clinical application of our method and determine the appropriate diagnostic critical value.

Methods: AFM was used to detect the surface roughness of nanostructured substrates. Cell lines and blood samples were used to verify CTC isolation methods. The ROC curve and AUC were used to evaluate the diagnostic value of CTC numbers.

Results: First, AFM, cell binding yields, and tumor cell detection rate from blood showed that NS has a potential for cell adsorption. Then, the CTC detection method was verified by using cell lines and blood samples. The number of CTCs in patients with cancers or metastases were significantly greater than those of patients without cancers. Then, the ROC curves and AUC showed that this method had a medium diagnostic value.

Conclusions: Isolating CTCs based on nanostructured substrates was appropriate for the clinical diagnosis of tumors, and samples with more than 1.5 CTCs/1 mL blood could be identified as CTC-positive.

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Supplementary Table

Table 1. Staging and diagnostic test of patients.

Types of cancer		Lung	Esophageal	Colorectal	Gastric	Ovarian	Breast
TNM Staging	I + II	43	12	13	15	6	6
	III + IV	30	10	11	10	3	6
	NA	20	7	5	4	1	1
Diagnostic test *	CT	35	20	15	4	5	11
	MRI	44	15	22	6	9	6
	Others **	24	10	18	20	3	5

* - Each patient usually accepted more than one diagnostic test.

** - X-ray, untra-sound, gastroscopy or other methods.