CORRESPONDENCE

Diagnostic and Prognostic Value of Serum Thymidine Kinase 1 in Cancer Patients

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Once tumorigenic factors induce abnormal cells' growth, they grow indefinitely without physiological regulations [1–3]. Studies found serum thymidine kinase 1 (TK1) level of cancer patients deviates to a certain extent from normal [4, 5]. It is possible that serum TK1 level can be used in cancers' diagnosis and prognosis. Our study aimed to explore related viewpoint via a clinical controlled trial.

Materials and Methods

Clinical Data

We selected 58 cancer patients detected by clinical pathology and images from August 2013 to May 2015. During the same period, 58 health check-up controls were selected, ranging 40–75 years old. We excluded patients with infections, gastric ulcers, jaundice, or in menstrual period. Informed consent was obtained from all patients. Age matched were selected ($P > 0.05$).

Methods

We draw each subject, under a fasting state, 3 mL venous blood, in the morning. After the serum was separated by centrifugation, it was stored at $-20\text{ }^{\circ}\text{C}$. Western blot chemiluminescence was used to measure the serum TK1 concentration.

Outcome Measures

TK1 levels of all subjects were quantified. The measurements of cancer patients were grouped by cancer types. Additionally, patients' TK1 levels were also measured before and after chemotherapy. Measurements were compared between patients with and without recurrence or metastasis.

Statistical Analysis

SPSS 11.0 statistical software was used to establish a database. Measurement data were presented as mean $\pm$ standard deviation ($\bar{x} \pm \text{SD}$). Inter-group comparisons were performed using t test. Measurement data were tested using χ^2 , with $P < 0.05$ being statistically significant.

Results

Comparing Patients' TK1 Levels with that of Healthy Subjects

The serum TK1 levels in patients with all cancer types were significantly higher than that of the control group ($P < 0.05$). See Table 1.

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Table 1 Comparison of serum TK1 levels between two groups

Test subjects	Serum TK1 (pmol/L)
Control (n = 58)	0.63 ± 0.21
Patients (n = 58)	2.63 ± 0.89
Lung	2.15 ± 0.74
Esophageal	2.09 ± 0.65
Gastric	3.73 ± 1.39
Colorectal	2.79 ± 0.83
Hepatic	1.47 ± 0.47
Pancreatic	1.28 ± 0.34

Table 2 Comparison of cancer patients' serum TK1 levels before and after treatment

Time of measurement	n	Serum TK1 (pmol/L)
Before treatment	58	2.63 ± 0.89
After treatment	58	1.92 ± 0.32 ^a

^a Compared with before treatment $P < 0.05$

Comparison of Cancer Patients' Serum TK1 Levels Before and After Treatment

The measurements of serum TK1 levels in 58 cancer patients before and after treatment showed that serum TK1 levels decreased significantly after treatment ($P < 0.05$). See Table 2.

Cancer Patients' Serum TK1 Levels with Recurrence or Metastasis

Serum TK1 levels in patients with lymph node metastasis or post treatment recurrence were significantly higher than those in patients without either ($P < 0.05$). See Table 3.

Discussion

Recently, incidence and mortality rates of cancers are rising [6, 7]. Since characteristic of cancer is unlimited cell growth [8, 9], cellular proliferation markers could be applied in cancers' diagnosis. TK1 is one of enzymes in thymidine synthesis and can be used to assess the degree of cell proliferation. Under normal processes of cellular decay, TK1 is broken down before cell classification and its level is less than 1 pmol/L. When cancer cells proliferate, most in S and G phases, intracellular TK1 is released in large amounts, leading to its significant increase in serum [10].

Table 3 Cancer patients' serum TK1 levels with recurrence or metastasis

Group	n	Serum TK1 (pmol/L)
Lymph node metastasis		
Yes	22	3.68 ± 1.45 ^a
No	36	1.82 ± 0.62 ^b
Recurrence after treatment		
Yes	19	4.28 ± 1.33 ^a
No	39	2.04 ± 0.35 ^b

^a Compared with ^b $P < 0.05$

In the study, we found that serum TK1 levels were significantly sensitive following cellular cancer lesions. Serum TK1 level is significantly higher in cancer patients and lower after treatment. Serum TK1 level is significantly higher in cancer patients with lymph node metastasis and post-treatment recurrence.

Although, serum TK1 level is not specific to a particular cancer and maybe therefore loose specificity, it is a valuable marker on a diagnosis and a prognosis perspective in a general cancer.

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Author Contribution All authors contributed to the final manuscript. YTL coordinated the effort and integrated the sections and comments.

Compliance with Ethical Standards

Conflict of interest The authors declare no competing interests.

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