Usefulness of serum biomarkers: total hCG, free beta hCG subunit and AFP in the diagnosis of tumours

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Objectives

Testing for the free beta subunit of human chorionic gonadotropin (free β-hCG) is an integral part of the diagnosis and management of gestational trophoblastic disease. Combined AFP and hCG testing is an essential adjunct in the evaluation and treatment of nonseminomatous germ cell tumours, and in monitoring the response to therapy. Although the tumour markers AFP and hCG play a large role in the management of GCTs, they are also produced by numerous other malignancies. The objective of this study was to evaluate the probability of elevated levels of these markers in tumours of other etiology.

Methods

Serum concentrations of free β-hCG, total hCG and AFP were measured using a quantitative tests which were based on the principle of solid phase enzyme immunoassay (DS-EIA-GONADOTROPIN-BETA hCG-FREE, DS-EIA-GONADOTROPIN-hCG, DS-EIA-AFP). The serum samples of patients from Central Russia and Volgo-Viatsky Region, Russian Federation were evaluated. Studied groups were comparable with respect to age (from 20 to 84 years old), race and size.

Results

Serum samples from patients with various tumours (prostate cancer, ovarian cancer, breast cancer, gastrointestinal cancer and testicular cancer) and healthy individuals (control group) were investigated. A difference between groups was considered statistically significant if the P value was <0.05. All patients revealed the normal level of free β-hCG (⩾1.9 ng/ml).

Statistically significant difference between control group and samples from patients with testicular cancer was found. As it is represented in Table 1, 45.5% of patients in this group had the level of total hCG more than 10 mIU/ml. The level of serum AFP in patients with testicular cancer was normal. This corresponds to the literature data, according to which a high level of AFP is associated with less frequent and more aggressive germ cell tumors (Fig1., Fig. 2).

We observed that the AFP serum level was statistically significant higher in the group of patients with gastrointestinal cancer. The serum level of total hCG was higher in the group of patients with the breast cancer. However, in these groups the level of tumour markers did not exceed the upper limit of normal levels. In other groups of cancer patients : Prostate cancer and gastrointestinal cancer levels of total hCG and AFP were not statistically different from the control group.

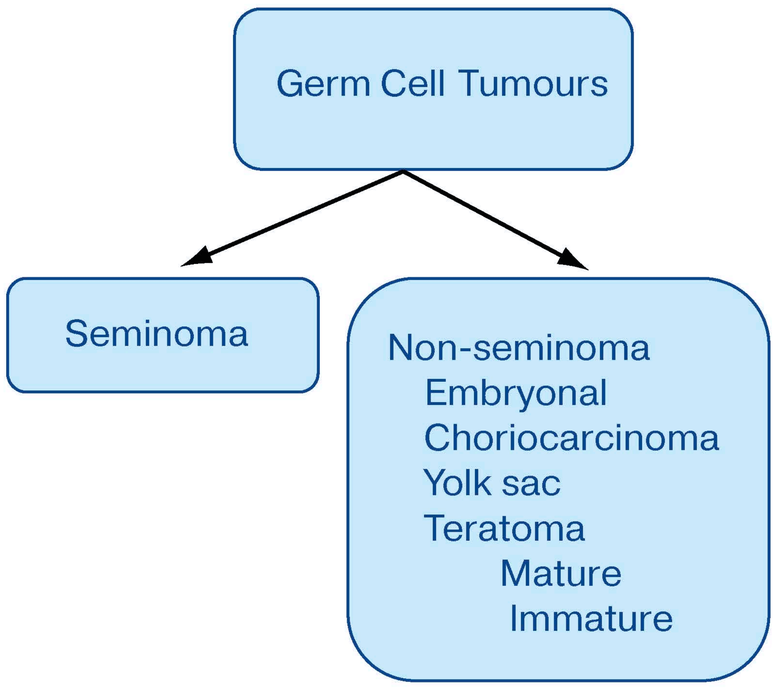

Fig. 1. Testicular cell tumours

AFP -Alfafetoprotein	hCG –Human Chorionic Gonadotropin
During pregnancy: In fetus produced by fetal yolk sac, liver, gastrointestinal tract. Highest levels at 12-14 weeks gestation. At 1 year declines to low adult levels	During pregnancy: Secreted by placenta to maintain corpus luteum.
Never elevated in pure choriocarcinoma or seminoma Can be elevated in: Pure embryonal Teratocarcinoma Yolk sac Combined	***Elevated in all choriocarcinoma, 40- 60% of embryonal, 5-10% of seminomas*** Can be elevated in: Marijuana smokers Liver, pancreas, stomach, lung, breast, kidney, bladder cancer
5-7 day half life	***24-36 hour half life***

Fig. 2. Onco-fetal Substances as Tumour Markers
(M.A. Salam, Principles and Practice of Urology, 2013)

Table 1

Levels of total HCG in serum samples from cancer patients and normal donors

Diagnosis	Number of Samples	Median (mIU/ml)	Number of samples with high level of total hCG (>10mIU/ml)	Coefficient P (Mann–Whitney U test)
Prostate cancer	31	2.4	0	p=0,30
Ovarian cancer	128	2.1	4	p=0,000
Gastrointestinal cancer	78	1.0	0	p=0,52
Breast cancer	32	2.6	0	p=0,06
Testicular cancer	11	29.9	6	p=0,01
Control group	131	1.0	2	–

Table 2

AFP levels in serum samples from cancer patients and normal donors

Diagnosis	Numbe of Samples	Median (IU/ml)	Number, of samples with high level of AFP (>10IU/ml)	Coefficient P (Mann–Whitney U test)
Prostate cancer	31	0.7	1	p=0,17
Ovarian cancer	128	2.9	0	p=0,76
Gastrointestinal cancer	78	2.7	1	p=0,002
Breast cancer	32	1.4	0	p=0,08
Testicular cancer	11	2.7	0	p=0,2
Control group	131	2.2	0	–

Conclusions

According to these data during such diseases as prostate cancer, ovarian cancer and breast cancer the levels of free β-hCG, total hCG and AFP do not significantly rise. The results confirms the utility of these markers for the diagnosis of certain tumours: trophoblastic disease (free -hCG); testicular cancer (AFP, total hCG)