Abstract

Introduction: Immunochemical methods have significant importance in biomedical research. The benefit of immunochemical methods is their high sensitivity and accuracy. The aim of the work was to use immunochemical methods in investigation of cancer biomarkers and degenerative diseases. A total of four studies were performed. Two studies were focused on the search for new biomarkers of prostate cancer, the third study was focused on evaluation of FGF23 in patients with hyperparathyroidism, and the fourth study looked at the assessment of hyaluronic acid in synovial fluid of patients with knee gonarthrosis.

Methods and patients: Study 1: Concentrations of Chromogranin A, Endoglin, TIMP-1 and thymidine kinase 1 (TK1) in serum and Endoglin, SPINK-1, Annexin, TIMP-1 in urine were measured in 58 patients with the (mean age 68 years, range 45 – 82 years) with clinically diagnosed prostate cancer and in 30 healthy individuals with the (mean age 64 years, range: 55 – 78 years) without clinically relevant urological history and PSA values in the reference range. Subsequently, serum TK1 levels were measured in 169 patients (mean age 62 years, range 45-82 years) with prostate cancer and in a control group of 39 healthy men (mean age 61 years, range 54-78 years). The TK1 assay was also used to determine the TK210 epitope. Serum TK210 levels were measured in 126 patients (mean age 70 years, range 46-85 years) with prostate cancer and in a control group of 49 healthy men (mean age 63 years, range 54-78 years) with a benign etiology of the disease, including benign prostatic hyperplasia.
Study 2: Serum mindin concentrations were measured in 56 patients (mean age 68 years, range 45-82 years) with prostate cancer and in a control group of 29 healthy men (mean age 64 years, range 55-78 years).
Study 3: Plasma cFGF23 and iFGF23 levels were investigated in patients (31 women aged 24-77 years and 7 men aged 38-75 years) with primary parathyroidism included 38 adult patients with primary hyperparathyroidism due to adenoma. PTH levels were examined just before the incision and after excision of the adenoma. cFGF23, iFGF23, phosphate, eGFR and P1NP were examined intraoperatively and the next day after surgery.
Study 4: Hyaluronic acid was investigated in synovial fluid of of 67 patients with the mean age of 67 years (35 men, mean age 65 years and 32 women, mean age 68 years) with clinically diagnosed osteoarthritis were included in the study. All studied biomarkers were determined by immunochemical methods.

Results: Results are expressed as medians. Serum thymidine kinase 1 concentrations are increased in prostate cancer patients compared to the control group of healthy men (0,196 pmol/L vs. 0,076 pmol/L, P <0,0001, AUC = 0,80). Thymidine kinase concentrations are elevated in patients with severe disease according to the TNM classification and the ISUP criteria.

Serum mindin levels in prostate cancer patients are significantly decreased compared to the control group (0,78 ng/mL vs 2,12 ng/mL, P = 0,0007, AUC = 0.71). Mindin levels are decreased in patiens with severe disease according to the TNM classification.

Plasma cFGF23 and iFGF23 decreased significantly one day after parathyroidectomy, cFGF23 (cFGF23: 89,94 vs. 37,49 RU/mL, P <0,0001, iFGF23: 57,78 vs. <1,5 pg/mL, P<0,0001). Plasma iFGF23 and cFGF23 correlate with phosphates (cFGF23: Spearman r = -0,253, P = 0,0065; iFGF23: Spearman r = -0,245, P = 0,0085), pre-operative iFGF23 and cFGF23 correlate with eGFR (cFGF23: Spearman r = -0,499, P = 0,0014; iFGF23: Spearman r = -0,491, P = 0,0017).

Hyaluronic acid concentrations in patients with knee osteoarthritis who underwent arthroscopy are significantly increased compared to the group of patients with complete knee replacement (2581 mg/L vs. 1763 mg/L, P = 0,01). Concentrations of hyaluronic acid in synovial fluid correlate with increased osmotic pressure (Spearman r = 0.29, P = 0,015), and may therefore be another indicator of disease severity.

Conclusion: Mindin and TK1 are additional markers for the diagnosis of prostate cancer. Plasma FGF23 levels decrease one day after parathyroidectomy. Hyaluronic acid concentrations in synovial fluid are elevated in patiens subjected to arthroscopy and correlate with increased synovial fluid osmolality. Immunochemical methods are appropriated for the diagnosis of cancer and degenerative diseases.

Keywords: ELISA, prostate cancer, pHPT, hyaluronic acid, gonanthrosis, biomarker, thymidinkinase 1, mindin