Mechanisms of Development and Clinical Significance of Anemia in Patients with Type 1 and Type 2 Diabetes Mellitus

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ABSTRACT

Diabetes mellitus (DM) is a common disease that affects about 5% of the European population. The prevalence of this disease is increasing every year. It is expected that in the next few years the number of such patients in Europe will exceed 32 million people. A characteristic complication of both type 1 and type 2 diabetes is nephropathy. In industrialized countries, diabetic nephropathy has now become the leading cause of end-stage chronic kidney disease (CKD). As the number of patients with DM increases, we can expect a proportional increase in the role of diabetic nephropathy in the structure of patients with terminal renal insufficiency.

Keywords: Diabetes mellitus, microangiopathy, endocrine disease, anemia, chronic kidney disease, severity of nephropathy.

Relevance. Approximately half of patients with CKD suffer from anemia. Accordingly, DM is one of the main causes of renal anemia. In diabetic nephropathy, anemia develops earlier and more often and is more severe than in patients with kidney diseases of a different nature. For example, according to the epidemiological study NHANES III (National Health and Nutrition Examination Survey) conducted in the USA, the incidence of anemia in patients with CKD stages III–IV and DM was 2 times higher than in patients with comparable renal impairment, not suffering from DM.

Anemia has an undesirable effect on the quality of life of patients, causes a decrease in performance and exercise tolerance, deterioration of sexual and cognitive functions and is accompanied by various symptoms (shortness of breath, dizziness, poor appetite, etc.). Moreover, anemia in patients with DM allows predicting an increased risk of adverse outcomes (regardless of the severity of nephropathy) and, apparently, by itself contributes to the progression of micro- and macroangiopathy. However, doctors usually do not attach much importance to anemia in such patients.

A leading role in the pathogenesis of renal anemia is played by a deficiency of erythropoietin produced by the kidneys. In this regard, it has been suggested that its earlier use in patients with diabetic nephropathy may lead to an improved prognosis in this condition.

The purpose of the study. To determine the prevalence of anemia in people with type 2 diabetes.

Materials and methods of research. 80 patients with type 2 diabetes aged over 40 years were included. There were 43 men and 37 women among the surveyed. The average age of women and men was 58±14 and 62±12 years, respectively. The average duration of diabetes is 11.42±2.2 years. The control group

consisted of 38 patients (mean age – 58.6±2.3 years) without a history of DM.

The results of the study. The study examined 80 patients with type 2 diabetes, whose disease duration was more than 5 years, of which 26 (56.5%) were men and 20 (43.5%) were women. Among patients whose disease duration is less than 5 years, 15 (44.1%) men and 19 (55.8%) women. The level of HbA1c in men was 7.1% (4.8–15.0), in women – 6.6% (4.9–11.1), in the general group – 6.9% (4.8–15.0). In 36 (28.8%) patients, DM was counted with anemia. The levels of Hb, HbA1c and urinary albumin excretion, as well as the measurement of the albumin/creatinine ratio in urine, were examined individually for each sex

The ratio of albumin/creatinine in urine in men is 9.0 (0.8–>1000) mg/g and in women - 9.9 (1.0–>1000) mg/g, in the general group – 9.6 (0.8–>1000) mg/g. Creatinine clearance in men – 112 ±42 ml/min and in women – 86±33 ml/min, in the general group – 103±41 ml/min. 87% of patients (86% of men and 84% of women) had normal serum creatinine (<110 mmol/L). 75% of patients (74% of men and 77% of women) had a normal albumin/creatinine ratio (<24 mg/g). The average Hb level was 14.2±1.3 g/dl in men and 13.6±1.5 g/dl in women. 19 (23.7%) patients were diagnosed with anemia according to WHO criteria, including 11 men and 8 women with an average Hb level of 12.3 g/dl (from 10.9 to 12.9) and 11.5 g/dl (from 10.9 to 12.9). dl (from 9.2 to 11.9) in men and women responsibly. The average volume of erythrocytes (ESR) for 10 anemic men was 90.1±5.4, with only one patient with ECM<78. The average MCV value for a 5-year-old male was 84.5±7.8, in 3 out of 8 patients MCV<78. Therefore, the majority (85%) of patients had normocytic anemia. Using WHO criteria for determining anemia, in 74% of anemic patients, serum creatinine was <110 mmol/L and 72% of anemic patients had an estimated creatinine clearance >60 ml/min. Of those with normal serum creatinine (<110 mmol/L), 7% of men and 14% of women had anemia compared to 24% of men and 38% of women with elevated creatinine (>110 mmol/L).

According to the results of this epidemiological study, the prevalence of anemia among people with type 2 diabetes is 23.7%. Despite the fact that in the presence of anemia, creatinine clearance was the highest correlation, approximately 75% of patients with anemia had serum creatinine levels (<110 mmol/L) and creatinine clearance (>60 ml/min) were normal. Measurements of the prevalence of anemia in the publications of foreign authors vary depending on the studied population and the diagnostic methods used [15]. This study shows that in the age group of about 60 years with preserved kidney function (glomerular filtration rate – 60 ml/min per 1.73 m2), the prevalence of anemia is 23.7%, which coincides with the data of studies by foreign authors [15]. The severity of anemia in individuals with DM was associated with a number of factors, including glomerular filtration rate, urinary albumin excretion and the level of glycated hemoglobin HbA1c [4]. In addition, the prevalence of anemia in patients with DM is 2-3 times higher than in patients with comparable renal impairment in the general population [4, 15].

The results of this study coincide with the conclusions of foreign authors. However, in this study, the associations with age, serum creatinine and estimated creatinine clearance were more pronounced in men. The absence of further associations may be due to the relatively small sample size. Another important finding was the association between the duration of diabetes and the prevalence of anemia. Individuals with a duration of diabetes for more than 5 years had a 1.7 times higher risk of anemia than those with a duration of diabetes for less than 5 years. These observations suggest that the detection of anemia should occur during routine examination of persons with diabetes and contribute to timely treatment in order to minimize the risk of microvascular complications such as nephropathy and retinopathy.

Conclusion. Currently, information is accumulating on the slowing down of the progression of chronic complications of diabetes mellitus (nephropathy, neuropathy, retinopathy) and cardiovascular pathology under the influence of antianemic therapy with the use of RCHEPO drugs. At the same time, the question of the correlation between the effects of normalization of hemoglobin levels and the direct cardio-, nephro- and neuroprotective effects of EPO remains unclear. Based on further study of the mechanisms of anemia development in patients with diabetes mellitus and the pathogenetic role of EPO in these processes, clear indications for the initiation of therapy with rfEPO drugs, optimal treatment regimens, target hemoglobin levels for various groups of patients should be determined.

Recommendations

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