



Comparative Study of Homocysteine and Vitamin B12 in Patients on Hemodialysis Younger or Older Than 65 Years

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Abstract

Anemia is a satellite symptom of advanced Chronic Kidney Diseases (CKD) and it is a quite multifactorial manifestation. Lower erythro-stimulating factors, uremic intoxication of the bone marrow and of the blood cells, iron deficit, reduced nutrition and affected protein absorption etc., are the factors causing renal anemia. Vitamin B12 and folic acid, as protein structures, are deficient in a number of patients with CKD and, are associated with anemia and neurological disorders. Vitamin B12 has a central role in homocysteine metabolism, and low vitamin B12 levels have been associated with higher homocysteine in patients with advanced chronic kidney disease. This study investigated homocysteine levels in elderly HD patients (older than 65 years), comparing them with younger than 65 years adults, and what is its relation to vitamin B12 status in hemodialysis patients. The results suggest that homocysteine levels are not different in elderly patients, but vitamin B12 and folic acid are lower in this population, probably because of increasing of gut atrophy in advanced age.

Keywords: Homocysteine (HmC); Vitamin B12; Folic acid (Fol.Ac.); Chronic Kidney Disease (CKD); Anemia; Hemodialysis (HD)

Introduction

Higher level of homocysteine is a consistent event in patients with advanced chronic kidney disease on conservative or dialysis treatment and hyper-homocysteinemia is recognized as an independent risk factor for increased cardiovascular morbidity and mortality [1-3]. Severe Chronic Kidney Disease has a damaging effect on hematopoiesis there is an imbalance between hematopoiesis and increased destruction. The major defect appears to be related to bone marrow failure. It may be circulating toxins like increased Parathyroid Hormone (PTH) that play a major role and depress the marrow directly. Lack of erythropoietin, iron deficiency anemia and shortened red cell lifespan are the other important factors, contributing to anemia in CRF [1,2,4]. Another possibility is nutritional deficiency, malabsorption of proteins in guts or deranged metabolism of vitamins in uremic patients [5-7]. Many patients with CKD show smear and megaloblastosis on examination of the bone marrow. This find suggests that Vitamin B12 and folic acid deficiency might be additional factors contributing to inadequate hematopoiesis in uremia Vitamin B12 deficiency is associated with anemia and neurological disorders [1,8,9]. Through its central role in homocysteine metabolism, low B12 levels have been associated with higher serum homocysteine [9-11]. However, in CKD homocysteine levels increase as Glomerular Filtration Rate (GFR) declines, not always dependently on B12 levels. To investigate if homocysteine levels are different in elderly HD patients than in younger, and what is its relation to vitamin B12 status in hemodialysis patients, the study compared 2 groups of patients with similar duration of HD: 1st group - 25 patients older than 65 years and 2nd group - 25 patients younger than 65 years.

Material and Methods

An informed consent was obtained from each participating patient. All patients were tested for serum levels of total Homocysteine (HmC) (Abbot IMX FP-assay), folate (Fol.Ac.), Vit. B12 (Bayer ACS: 180 assay), serum Albumin (Alb), Hemoglobin (Hb) and Creatinine (Cr) in the start of one dialysis procedure. The patients were not supplemented by hydro-soluble vitamins during the last 6 months before the study.

Results

The levels of HmC were significantly higher than normal in both groups, but not much different:

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In the 1st group - 39.6 ± 11.2 vs. 37.3 ± 12.1 mmol/l in the 2nd group (p N.S.). Folic acid, Vit. B12 and Alb showed mild lower levels in elderly patients, as follows: Fol.Ac.: 3.4 ± 3.1 vs. 4.2 ± 3.6 nmol/l ($P < 0.05$); B12: 203 ± 114 vs. 281 ± 122 pmol/l ($P < 0.02$); Alb 35.9 ± 4.2 vs. 39.6 ± 5.6 g/l ($P < 0.05$). There are mild positive correlation between vitamin B12 and Alb. in both groups ($P < 0.05$) and no significant correlation between HmC and Vit. B12 or Fol.Ac.

Discussion

Vitamin B12 levels are a function of dietary intake and deficiencies result from reduced intake or decreased absorption in the ileum [11-13]. Defects in gut and proximal tubular transport proteins have been associated with albuminuria and B12 deficiency. Patients with advanced CKD eliminate uremic toxins through the guts, disturbing vitamin B12 gut absorption [4-6]. On the other hand in CKD tubular excretion of homocysteine is decreased and its serum levels become higher. Typically there is an inverse relationship between levels of homocysteine and B12. However, this relationship is altered in patients with CKD. Although B12 supplementation reduces homocysteine levels in patients with CKD, it is less effective than in patients with normal renal function [2,7,11]. Interestingly there are only a few studies comparing homocysteine levels in elderly and younger patients on dialysis and relation of homocysteine and vitamin B12 status in these populations as well. Our study showed that there are no sizable differences of serum levels of homocysteine, hemoglobin and creatinine in the compared groups of younger and older HD patients, but we found mild significant relation of lower folic acid and vitamin B12 in elderly patients, maybe due to the reduced gastrointestinal absorption of these vitamins, because of some atrophic changes. The positive correlation of vitamin B12 and albumins in both groups perhaps is related to the important role of vitamin B12 to synthesis of the proteins in the human body.

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