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Journal of Parathyroid Disease

Journal of Parathyroid Disease 2014,2(1),9–11

Brief Communication

Influence of parathyroid hormone on platelet counts and mean platelet volume in hemodialysis

Hamid Nasri*

Abstract

Patients with end-stage kidney failure suffer from various hemostatic disorders. Uremic patients show a bleeding tendency which is mainly due to abnormalities of platelet function. In a study on 36 stable hemodialysis patients, we found a significant inverse correlation of platelet count with mean platelet volume and also a significant inverse correlation of platelet count with proportion of hemodialysis. In diabetic hemodialysis patients, a significant inverse correlation of platelet count with serum intact parathormone was detected. In a study on 36 stable hemodialysis patients, we found a significant inverse correlation of platelet count with mean platelet volume and also a significant inverse correlation of platelet count with proportion of hemodialysis. In diabetic hemodialysis patients, a significant inverse correlation of platelet count with serum intact parathormone was detected. The clinical consequence of these findings needs more attention in hemodialysis patients.

Keywords: Hyperparathyroidism, End-stage renal disease, Hemodialysis

Please cite this paper as: Nasri H. Influence of parathyroid hormone on platelet counts and mean platelet volume in hemodialysis. J Parathyr Dis 2014; 2(1): 9-11.

Introduction

Patients with end-stage kidney failure suffer from various hemostatic disorders (1). Uremic patients show a bleeding tendency which is mainly due to abnormalities of platelet function (1,2). The increased bleeding tendency of chronic kidney disease patients has been mainly related to platelet dysfunction. The most common abnormalities are decreased platelet adhesiveness, decreased platelet factor-3 availability, defective platelet aggregation and prolongation of the bleeding time (1-3). A part of the etiologic mechanisms which have been interacted, include platelet inhibition by plasma metabolites, phenolic acid, urea, guanidinosuccinic acid, abnormal platelet arachidonic acid metabolism, increased vessel wall prostacyclin and increased levels of parathyroid hormone (1-3). Secondary hyperparathyroidism is a common finding in patients with chronic kidney disease and is defined by excessive parathyroid hormone secretion and an imbalance in calcium and phosphorus metabolism (4). Parathormone acts as a uremic toxin and may be responsible for various complications which frequently detected in hemodialysis patients (4-6). In end-stage renal disease, the proportion of platelets is usually normal, however, platelet function is disturbed. In uremia, a reduction in the storage pool of ADP and serotonin is present and the platelet granule content is diminished (1-3,7). Various findings have shown that, parathormone inhibits platelet function in vitro, led to the speculation that parathyroid hormone might play a role in the start of such defects. Platelet volume is a marker and possibly a determinant of platelet function (1-3,7). Mean platelet volume is an assessment of platelet size, reflects changes in either the level of platelet stimulation or the rate of platelet production. Increased mean platelet volume, may reflect increased platelet activation or increased numbers of large, hyperaggregable platelets and is found as an independent coronary risk factor. Hence, mean platelet volume could be an independent risk factor for myocardial infarction in the general population and also coronary heart disease in hemodialysis patients (1-3,7,8). According to the above mentioned findings, investigations regarding the factors affects, the mean platelet volume regulation, especially serum parathormone in hemodialysis is scarce and we therefore aimed to conduct a study to examine the association of

Received: 4 November 2013, Accepted: 12 January 2014, ePublished: 17 February 2014

Department of Internal Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran.
***Corresponding author:** Prof. Hamid Nasri, E-mail: hamidnasri@med.mui.ac.ir

Implication for health policy/practice/research/ medical education

In a study on 36 stable hemodialysis patients, we found a significant inverse correlation of platelet count with mean platelet volume and also a significant inverse correlation of platelet count with proportion of hemodialysis. In diabetic hemodialysis patients, a significant inverse correlation of platelet count with serum intact parathormone was detected. In a study on 36 stable hemodialysis patients, we found a significant inverse correlation of platelet count with mean platelet volume and also a significant inverse correlation of platelet count with proportion of hemodialysis. In diabetic hemodialysis patients, a significant inverse correlation of platelet count with serum intact parathormone was detected. The clinical consequence of these findings needs more attention in hemodialysis patients.

serum parathyroid hormone on mean platelet volume and count in stable hemodialysis patients (1-3,7,8).

Patients and Methods

Patients

This cross-sectional investigation was conducted on patients undergoing routine hemodialysis treatment. Exclusion criteria were using nonsteroidal anti-inflammatory drugs or angiotensin-converting-enzyme inhibitors and also using the other drugs had adverse effects on platelet production or function, also presence of any active or chronic infection.

Laboratory methods

After an overnight fast, blood samples were obtained. For patients, complete blood counts containing platelet count and mean platelet volume (MPV) were measured using Sysmex-KX-21N cell counter (Reference range: 7.5-11.5). Intact serum parathormone (iPTH) was measured by the radioimmunoassay method, using DSL-8000 of USA (normal range of values are 10-65 pg/mL). Levels of serum calcium, phosphorus and alkaline phosphatase were assessed using standard kits. Duration and proportion of dialysis sessions of dialysis treatment were measured through patients' records. The duration of each hemodialysis session was four hours.

Ethical issues

1) The research followed the tenets of the Declaration of Helsinki; 2) informed consent was obtained; 3) the research was approved by the institutional review board.

Statistical analysis

Data are expressed as the mean (SD) and median values. Comparison between the groups was done using Student's *t*-test. Statistical correlations were calculated by partial correlation test. All statistical analyses were performed using SPSS 11.5 (SPSS Inc., Chicago, IL, USA). Statistical significance was determined at a $p \leq 0.05$.

Results

The study contained 36 patients (females; 14, males; 22). The mean patient's age was 46 (16.5) years. The median time of hemodialysis was 17.5 months. The mean platelet counts was 162 (75). The mean MPV of patients was 9 (1) fl. The median level of serum iPTH was 309 pg/ml. In this study, no significant differences of platelet count or MPV between males and females was seen ($p > 0.05$). In patients, a significant inverse association of hemodialysis count and MPV ($r = -0.39$, $p = 0.018$ was seen. In female hemodialysis patients a significant inverse correlation of platelet count with proportion of dialysis ($r = 0.55$, $p = 0.049$) (adjusted for age) was found too. Moreover, In diabetic hemodialysis patients a significant inverse correlation of hemodialysis count with serum iPTH was detected ($r = -0.76$, $p = 0.017$).

Discussion

In this study, we found a significant inverse correlation of platelet count and MPV and also a significant inverse correlation of platelet count with proportion of hemodialysis. In diabetic hemodialysis patients, a significant inverse correlation of platelet count with serum iPTH was detected. MPV is a physiological variable for homeostasis. Large platelets produce more prothrombotic factors and aggregate more easily and are more reactive (1-9). Large platelets also contain more dense granules and release more ß-thromboglobulin and serotonin than do small platelets. Adverse effects of high serum parathormone on RBC production and intensification of anemia in hemodialysis patients was observed in our previous study (2-9). Possible pathogenic association between anemia and parathyroid hormone consists, reduced erythropoiesis due to calcitriol deficiency and direct or indirect impact of PTH on red blood cell production, erythropoietin release, survival and loss (2-8). While, parathormone levels are significantly increases in uremia, it might contribute to the defective platelet function and the bleeding tendency usually occurring in dialysis patients (2-10). Various studies revealed that, platelet activation and aggregation and coagulation process are the earliest and most important event which occur after contact between blood and artificial membranes. It was interpreted that an increase in cytosolic calcium in uremic patients is responsible for platelets dysfunction at least in part induced by parathormone (2-10). Papanas *et al.*, in a study on 416 type II diabetic patients, found that MPV is higher in type II diabetic patients than in none-diabetic individuals and among type II diabetic patients, MPV is higher in those who have microvascular disorders (11).

Conclusion

In this study we found an inverse correlation of serum parathormone with platelet counts which needs to more attention the clinical consequence of this finding in hemodialysis patients.

Conflict of interests

The author declared no competing interests.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the author.

Funding/Support

None.

Author's contribution

HN is the single author of the manuscript.

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