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The Mean Platelet Volume in children with Pyelonephritis

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Introduction: The mean platelet volume (MPV) is a determinant of inflammation. The aim of the present study was to investigate the MPV levels in children with pyelonephritis and to evaluate the possible relationship between MPV and febrile UTI.

Materials and Methods: In this prospective observational study, 82 patients with Pyelonephritis (group A) and 82 patients with viral gastroenteritis (group B) were enrolled from 20 Jun 2013 through 15 Jan 2014. The patients were divided into two groups according to the presence of pyelonephritis and viral gastroenteritis. The pyelonephritis group (A) included 82 patients and the acute gastroenteritis group (B) included 82 patients. Complete blood count (CBC) parameters were measured at admission. Routine biochemical tests were performed. Groups were compared according to different parameters.

Results: A total of 164 patients were included from inpatients of Amir-Kabir Hospital. The mean platelet volume was lower in group (A) and it was associated with acute pyelonephritis (P =0 .003). The MPV (6.03 ± 0.26 fl vs. 9.06 ± 0.73 fl) was significantly lower in group (A), the platelet count (219.88-± 52.31vs. 184.09 ± 52.21) was significantly higher in group (A), and the WBC count (13.01± 3.43 vs. 8.30 ± 1.13) was significantly higher in group (A).

Conclusions: MPV levels were significantly lower in children with pyelonephritis compared with controls. MPV can be used as a negative acute phase reactant in children with febrile UTI.

Keywords: Child; Pyelonephritis; Mean Platelet Volume; Urinary tract infection.

Running Title: Mean Platelet Volume in Pyelonephritis

Introduction

Urinary tract infections (UTIs) occur in 1-3% of girls and 1% of boys. The diagnosis of UTI requires a culture of the urine. Urine samples for urinalysis should be examined promptly or refrigerated until cultured [1-3]. Urine obtained

by the midstream, clean-catch technique (for older children and adolescents) is considered significant with bacterial growth of a single organism of more than 100,000 colony-forming units (CFU)/mL, and has a 95% positive correlation with a positive culture by suprapubic aspiration. Perineal bags for urine collection are prone to contamination and are not recommended for urine collection for culture [4, 5]. Urinary dipstick tests that combine both the leukocyte esterase and nitrite have a sensitivity of 88% and a specificity of 93% for detecting a UTI [6,7,8]. The presence of even scant bacteria has a correlation of 82% with a positive culture by suprapubic aspiration [9,10]. The mean platelet volume (MPV) is a parameter evaluated during the routine blood count and to which clinicians do not usually pay much attention. Recently, MPV has been used as a simple inflammatory indicator in some disease. [11,12,13]. It has been suggested that the role of this marker is largely influenced by the intensity of inflammation. This study aimed to investigate the MPV in patients with pyelonephritis

Materials and Methods

In this prospective observational study, 82 patients with pyelonephritis (group A) and 82 patients with viral gastroenteritis (group B) were enrolled randomly from 20 Jun 2013 through 15 Jan 2014. The inclusion criteria for group A were clinical signs and symptoms of pyelonephritis, such as abdominal pain, fever, flank pain, dysuria, etc.; a positive urine culture as > 10^5 colony forming units per milliliter of a single pathogen in a midstream clean-void urine sample or 10^4 colony forming units per milliliter of a single pathogen in a urinary catheterization sample. The inclusion criterion for group B was being healthy with uncomplicated viral gastroenteritis with a normal stool exam. Electrolyte, renal function tests, ESR, and CRP were requested. UTI was confirmed using urinalysis and positive urine culture. Renal ultrasound and radioactive nuclide 99mTc-DMSA scanning were performed based on the indications. The patients with any abnormality as scaring on DMSA, renal anomalies, renal enlargement on ultrasonography etc. were excluded from the study. Stool exam and stool culture were requested to rule out a possible bacterial or parasitic infection. In both groups, the patients with any concomitant comorbidity such as renal disease, renal anomaly, confirmed vesicoureteral reflux, history of hematologic disease, diabetes mellitus etc. were excluded from the study. Based on the inclusion and exclusion criteria, 12 patients were excluded from group A and 15 patients were excluded from group B. Complete blood count was performed for all patients using a commercially available analyzer (Sysmex XT 2000i, Roche Diagnostics GmnH, Mannheim, Germany). The hemoglobin level, white blood cell count (WBC), platelet count, and MPV values were recorded for each patient. The reference range for MPV was between 7.0 and 11 FL [7]. Data analysis was performed with SPSS version 20 (IBM Corp., NY, US). The mean, standard deviation, standard error, and frequency were used for descriptive analysis and t-test was used for data analysis. The research followed the tenets of the Declaration of Helsinki. Informed consent was obtained and the Ethics Committee of Arak University of Medical Sciences approved this study. (Grant number# 899)

Results

In this prospective observational study, 164 patients aged 19.2±12 months were enrolled. In group (A), 51 patients and in group (B), 38 patients were male. All patients were in the normal range for weight, height, and blood pressure. There was no significant difference in demographic characteristics between the two groups (PV>0.05). The patients in both group A had mild to moderate dehydration. The patients in group A were febrile (38-40 ºC) while only 10 cases (12%) in group B had a fever (38-38.5 ºC).
The complete blood cell count (CBC) was done for all patients and the mean platelet volume (MPV) was significantly lower in group A (PV=0.003). The mean platelet count (MPC) was also significantly higher in group A (PV=0.006) (Table 1).

Discussion

In this study, MPV was lower in the patients with UTI than patients with gastroenteritis. The mechanism through which MPV decreases during acute pyelonephritis has not been evaluated yet. In a study by Parsa Yousefichaijan et al, MPC was higher in patients with reflux nephropathy than non-reflux nephropathy patients and MPV was lower in patients with reflux nephropathy than patients without reflux nephropathy [1].

Table 1. Laboratory tests in group A (pyelonephritis) and group B (viral gastroenteritis)

Group	A(82 patients)	B(82 patients)	p-value
Age (year)	18.8±12	19.6± 10	0.12
White Blood Cell (number)	13.01 ± 3.43	8.30 ± 1.13	0.001
MPV (fl)	± 0.26	9.06 ± 0.73	0.003
MPC (number)	219.88 ± 52.31	184.09 ± 52.21	0.006
Hemoglobin (gr/dl)	11.5±1.3	12.3±2.4	0.3
ESR (mm/hr)	41±2.1	39±3.2	0.6

Tekin M evaluated the role of MPV in acute pyelonephritis (APN) and reported that MPV was a fast and reliable measurement with a considerable predictive value for the diagnosis of APN and renal scars whose predictive capacity was better than CRP, ESR, and WBC [11]. F. Catal et al found that the platelet count and MPV were useful markers of the routine measurements in children with upper UTI. The platelet count during upper urinary tract infection was higher in patients with gram-positive infections when compared with gram-negative infections and the patients with upper urinary tract infection had a significantly higher MPV [12]. MPV is higher when there is destruction of platelets. This may be seen in inflammatory diseases. Han JS et al showed that 28-day all-cause mortality was significantly higher in patients with MPV≥10.2 fL compared with those with MPV<10.2 fL (P<.001). Therefore, the mean platelet volume at the time of continuous renal replacement therapy initiation may be an inexpensive and useful predictor for 28-day all-cause mortality in patients with AKI requiring continuous renal replacement therapy [13]. MPV levels were significantly lower in children with rotavirus gastroenteritis when compared with controls. There was an inverse relationship between MPV levels and the thrombocyte count, which could be caused by the consumption of large platelets in severe inflammatory conditions, defective thrombopoiesis, or swelling of circulating platelets in an environment rich in activating agents [14,15]. Zareifar S demonstrated a higher platelet counts and lower MPVs in patients with active disease when compared with recovered patients. These parameters were well correlated with the known disease activity markers. They concluded that platelet parameters could be considered reliable markers for the assessment of the disease activity and response to treatment [16]. According to previous studies, MPV decreases in some diseases, such as reflux nephropathy, Crohn's disease, pulmonary tuberculosis, chronic spontaneous urticaria, etc. [1, 17-20].

Conclusions

This study showed an apparent correlation between MPV and febrile UTI. A multicenter study with a larger sample size is required to investigate the correlation between MPV and pyelonephritis.

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Conflict of Interest

Authors have no conflict of interest to declare.

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