academicJournals

Vol. 5(5), pp. 62-66, August, 2013
DOI 10.5897/JCMR2013.0239
ISSN 2141-2235 © 2013 Academic Journals
http://www.academicjournals.org/JCMR

Journal of Clinical Medicine and Research

Full Length Research Paper

A useful biomarker in talar osteochondral disease activity: Mean platelet volume (MPV)

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Accepted 22th July, 2013

In order to test the role of platelet activation in the talar osteochondral disease, the mean platelet volume (MPV) in patients undergoing treatment of talar osteochondral disease was evaluated. White blood cell count and highly sensitive C-reactive protein were evaluated in 50 patients with osteochondral defect of talus. Disease activity was assessed according to American Orthopedic Foot and Ankle Society scoring. Additionally, visual analog scale for the pain assessment was used for the study. Biochemical parameters, rehabilitation parameters, and MPV levels were compared with each other at the admission and 3 weeks after surgery. MPV was significantly lower in patients with osteochondral lesions of talus after treatment as compared to admission levels. MPV and C-reactive protein levels decreased together. American orthopedic foot ankle score of the patients were increased after surgery. Visual analog scale decreased suggestive levels. It was proposed that MPV provides a useful marker in activity of inflammatory osteochondral disease. The aim of this study is to define the effect of platelet activation in talar osteochondral disease.

Key words: Talus, osteochondral lesion, platelet volume (MPV), biomarker.

INTRODUCTION

Osteochondral lesions of the talus are common, especially in athletes. It ranges from those confined to the hyaline cartilage covering the articular surface to those involving the subchondral bone (Berndt and Harty, 1959; Canale and Belding, 1980). The lesion may not be apparent on the surface of the cartilage or it may be confined to the subchondral bone without cartilage involvement. It has been shown that the frequency of osteochondral lesions increase following repetitive ankle sprains (Mintz et al., 2003; Brown et al., 2004). Although the etiology is not well understood, both traumatic and atraumatic causes are thought to be effective of pathophysiology. Several studies have shown an anamnestic coincidence of distortion and/or supination trauma prior to the onset of osteocondral disease at the talus. Biomechanical experiments demonstrated that these areas are those with the highest load under varus/valgus and pronation/supination stress. Trauma is held responsible for the more frequent medial, cup-shaped lesion and the less frequent lateral, wafer-shaped lesion (Brown et al., 2004; Lee et al., 2011; Theodoropoulos et al., 2012). Other possible etiological factors such as genetic, metabolic or infectious causes are discussed but are not yet substantiated by scientific and experimental evidence. It has been shown in many different studies, that pluripotent stem cell response activates the thrombocytes which have a key role in tissue recovert and inflammatory response (Sun et al., 2010; Kon et al., 2010). The high sensitive C-reactive protein (hs-CRP) is currently the best applicant assay to identify and monitor the inflammatory response. hs-CRP also increases with infectious and non-infectious inflammatory response. The present study aims to investigate the correlation of mean platelet volume (MPV), hs-CRP and clinical activity indexes, namely American Orthopedic Foot and Ankle Society Scale

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Table 1. The demographic and biochemical properties

Parameter	n= 50 (Mean±SD)
Age (years)	36.7 (18±67)
Gender, female (%)	22 (44)
White blood cell count (103/mm)	7.50 ± 2.13
Hemoglobin (g/dL)	13.0 ± 2.0
Platelet count (x1,000/mm^3)	266.06 ± 91.42
Neutrophil (×10^9/L)	4.48 ± 1.89

Table 2. Comparison of clinical parameters at the admission and after 3 weeks control.

Parameter	The first admission (Mean±SD)	3 weeks control (Mean±SD)	p
MPV (fl)	9.47±1.06	9.07±0.99	<0.001
Hs-CRP (mg/dl)	2.98±1.62	2.54±1.25	<0.001
WBC (×10^9/L))	7.50±2.13	10.10±5.85	<0.001
Neutrophil (×10^9/L)	4.48±1.89	6.41±2.53	<0.001
PLT (×10^9/L)	266.0±91.4	270.1±86.0	<0.001
VAS	7.79±0.76	3.00±1.36	<0.001
AFAS	46.0±9.84	81.4±11.77	<0.001

(AOFAS) and Visual Analog Scale (VAS) in fifty patients were operated, because of the talar osteocondral disease.

METHODOLOGY

Study population

The study was performed with 50 patients diagnosed with talar osteochondral lesion. The patients were chosen among the patients admitted to the Ortopedics Surgery Clinics of Erciyes University Hospital between 2008 and 2011. This study complied with the Declaration of Helsinki, and was approved by the Ethics Committee and the Institutional Review Board of Erciyes University Medical School and informed consent was obtained from each patient.

Clinical assessment

Demographic data, AOFAS and VAS scores of the subjects were obtained from hospital records.

Laboratory values

The following data were recorded from the computerized hospital database: hs-CRP, hemoglobin levels, white blood cell count, platelet count and MPV. For the subjects, hs-CRP and complete blood count (CBC) parameters were recorded at admission and after surgery. Tripotassium EDTA based anticoagulated blood samples were collected in the morning after 20 min rest and were stored at 4°C. These samples were assessed by Sysmex K-1000 auto analyzer© with 30 min of sampling. High sensitive CRP was measured by using BN2 model nephlomete© (Dade–Behring). The expected levels of hs-CRP ranged from 0 to 3 mg/L in our laboratory.

Statistical analysis

Statistical analysis was performed using statistical Package for Social Sciences (SPSS) 15.0 statistical software. The adequacy of all parameters to normal distribution was tested by using a Kolmogorov–Smirnov test. Parametric tests were applied with normal distribution, while non-parametric tests were used for those which did not have normal distribution. Normally distributed variables were given as mean±standard deviation (SD). Student's t-test was used for a statistical comparison of normally distributed data and a Mann–Whitney U test was used for the data that were not normally distributed between these two groups. Spearman or Pearson correlation coefficients examined the degree of association between examined variables and the statistical significance was defined as $p<0.05$.

RESULTS

This study was performed with 50 patients operated on osteochondral disease of the talus. The mean age of patients was 36.7 (18 to 67) years. Demographic data and laboratory findings of patients are shown in Table 1. As expected, acute phase reactant (APR) levels were significantly high in term of preoperative examination of patients. When compared with the MPV values, the average of patients before arthroscopic debridement (9.47±1.06), the increase in MPV seen after arthroscopic debridement (9.07±0.99) was found to be statistically significant ($p<0.01$). Levels of hs-CRP preoperatıve (2.98±1.62) and postoperatıve (2.54±1.25) decreased significantly after treatment and it is shown in Table 2 and Figures 1 and 2. AFAS scores of patients increased

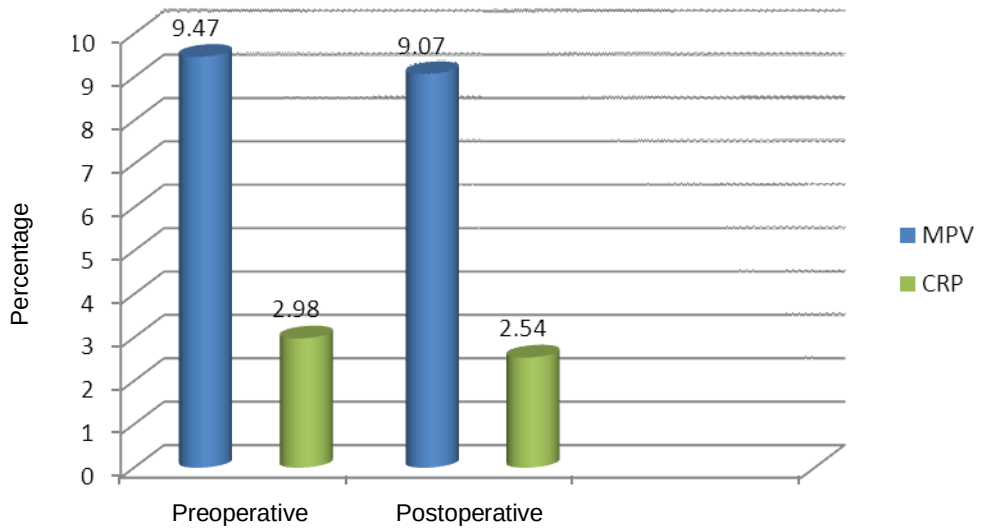

Figure 1. Preoperavite and postoperative MPV and CRP levels alternation.

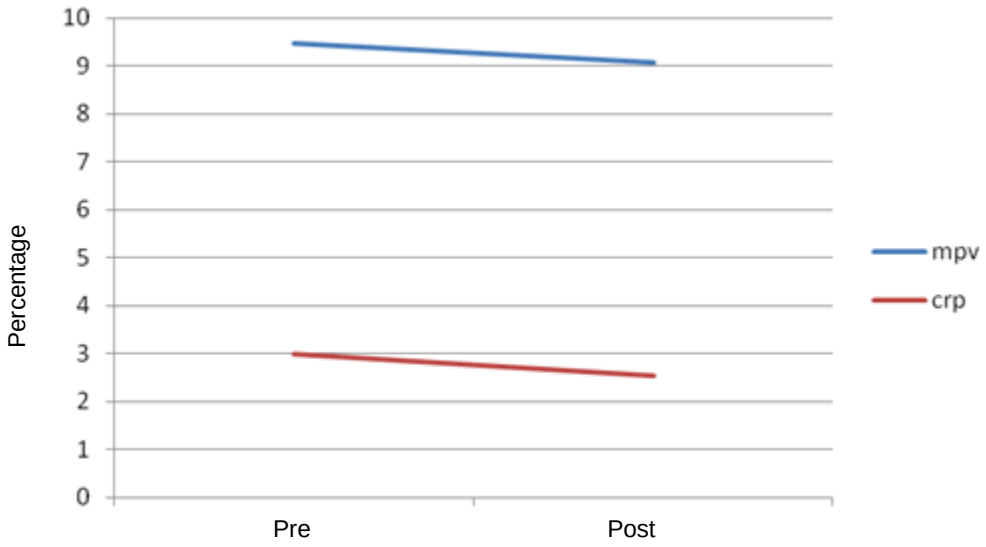

Figure 2. Preoperavite and postoperative MPV and CRP levels alternation.

significantly, VAS scores decreased significantly after 3 weeks and it is shown in Figures 3 and 4.

DISCUSSION

This study revealed that MPV decreased in active talar osteochondral disease patients as compared to preoperative and postoperative levels. Furthermore, MPV increased after treatment of patients. Platelets are enucleated cells measuring 1 to 2 Wm in length with an average life span of 7 to 8 days; they are derived from the cytoplasmic fragmentation bone-marrow megakaryocytes and play a crucial role in the process of inflammation, thrombosis and atherosclerosis (Wagner and Burger, 2003; Davi and Patrono, 2007). Platelets are a source of inflammatory mediators and it has been reported that the activation of platelets by inflammatory triggers may be a critical component of inflammatory response (Wagner and Burger, 2003). In some studies in which MPV was tested as a simple inflammatory marker, MPV was reported to have been affected by inflammation, and that it increases significantly in myocardial infarction, sepsis, cerebrovascular diseases, respiratory distress syndrome and chronic pulmonary diseases and bone diseases (Mercan et al., 2010; Xue-

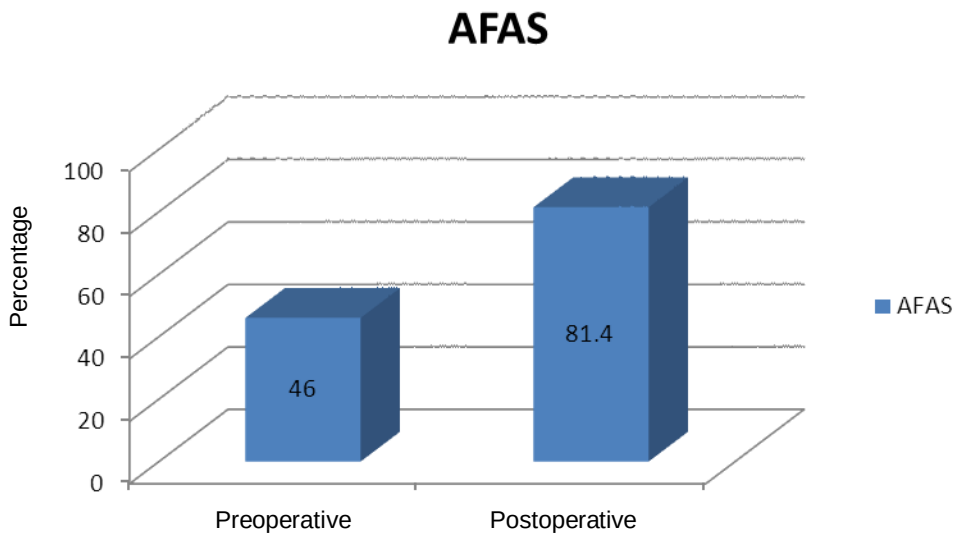

Figure 3. Preoperavite and postoperative AFAS score.

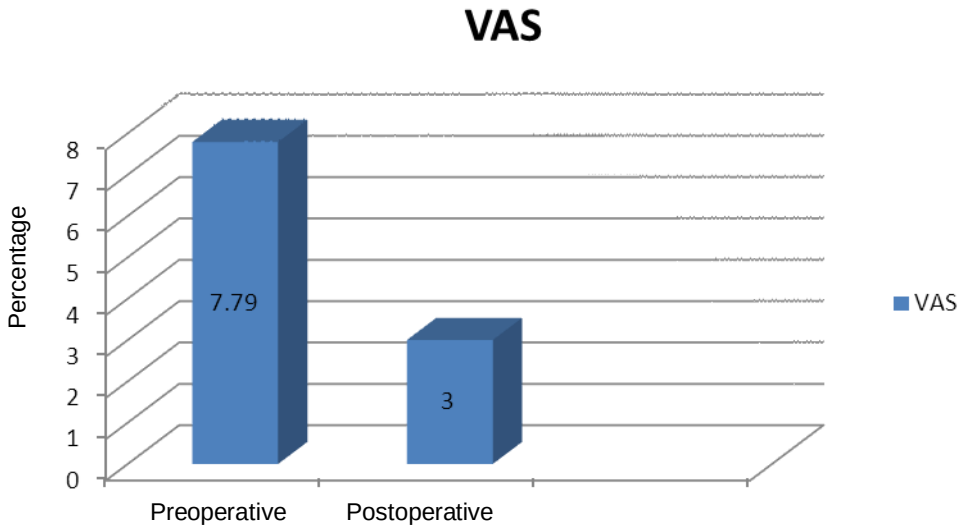

Figure 4. Preoperavite and postoperative VAS score.

song et al., 2012). Kisacik et al. (2008) found the platelet volume to be low in active ankylosing spondylitis and rheumatoid arthritis, and that MPV levels increased and normalized with treatment. In the literature, MPV has been reported to decrease in some inflammatory bowel diseases such as ulcerative colitis, especially in the active period, and that it could be used for determination of the disease activity (Kisacik et al., 2008; Gasparyan et al., 2011). However, in this study, MPV and CRP levels are not correlated, that is why, the reason why this study had adequate confidence about the results. The other limitation of the study is the small sample size. Large-scale population studies are needed to support our findings. Additionally, other limitations can be solved with, multi-centre study design and long study duration.

In conclusion, our results suggest that MPV values predict the prognosis of patients with talar OCD and reflect increased inflammatory response and platelet activation. Therefore, it may be used as an additional parameter for the preliminary approach of monitoring patients in clinical practice.

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