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BIBLIOGRAPHIC REVIEW ON HOW IT AFFECTS THE MEAN PLATELET VOLUME IN CANCER

KEY WORDS: Platelet, Volume, Cancer, Tumors, Platelet Distribution Width

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ABSTRACT

Introduction: Platelets are anucleated cytoplasmic fragments derived from megakaryocytes, they are oval in shape, 1 to 2 millimeters in diameter, and have a half-life of 8 to 10 days. MPV is measured by automated cell counters based on impedance and optical effect, and can be modified by the anticoagulant ethylene aminotetraacetic acid (EDTA), temperature and storage time of the sample;Therefore, it is recommended that the analysis of the sample and its reading be carried out ideally in the first hour after taking the sample and preferably in the first 30 min.

Another concept that is important to include in the interpretation of platelet activity is platelet mass, which is defined as the relationship between the platelet count and MPV; from which it has been found that the inverse platelet count-MPV relationship is not linear, so several normograms have been described to evaluate this relationship.3,4 The number, density and size of platelets is determined by a complex interaction between growth factors, cytokines, hormones and the megakaryocyte in the bone marrow. Megakaryopoiesis is programmed to maintain platelet function and mass, a mechanism in which thrombopoietin, granulocyte colony-stimulating factor, interleukins 1 and 6, and tumor necrosis factor are closely involved. Thrombopoietin levels are determined by gender and the number of platelets. In situations of stress, platelet production and mass are increased, resulting in the release into the circulation of large numbers of large, highly reactive platelets that migrate to sites of injury. An intense stimulus at the medullary level induces a hyperproduction of platelets that is characterized by a high MPV.

Platelets play an important role in the pathogenesis of various infectious or inflammatory disorders (3). Total platelet count and mean platelet volume (MPV) have been studied within the field of inflammatory markers in relation to disease activity. MPV may increase in mild inflammation due to the appearance of large platelets in the peripheral circulation and, conversely, may decrease in severe inflammation due to the consumption of large platelets in the inflammatory area (3). Platelet activation is a link in the pathophysiology of diseases prone to thrombosis and inflammation (1-4). Numerous platelet markers, including MPV, have been studied in relation to thrombosis and inflammation. The initial physiological response to the development of hemostatic plugs or blood clots involves a change in platelet shape from discoid to spherical, an extrusion of pseudopods, and a change in volume (4).

Importantly, platelet activation is associated with a rapid intracellular reorganization of actin and microtubule components of the cytoskeleton, resulting in a significant enhancement of platelet surface area reflected by a parallel increase in MPV (5). Several lines of research suggest that there is a significant association between MPV and some diseases, especially cardiovascular disorders.

Larger platelets produce overexpression of surface activation markers and it appears that they are metabolically and enzymatically more active, thus establishing a prothrombotic environment that increases the risk of thrombosis. But we can't know what happens first, yes, are the larger platelets the cause of the thrombosis? Or has the thrombotic process directly contributed to triggering platelet activation and increased MPV?

Platelet size assessment could be considered a valuable tool for diagnosis and therapeutic monitoring of a broad spectrum of arterial and venous disorders (5). MPV is universally available with routine blood counts by CBC and is a simple method of assessing platelet function. To achieve a larger surface area, platelets undergo changes in structure through activation.

The vertical diameter of platelets is the most important method to measure their volume, which is achieved by a hematology analyzer, using electric field deformation, based on impedance technology. The volume is determined by measuring the transverse diameter of the platelet (1,2,4-6).

Established cardiovascular risk factors, such as smoking,

hypertension, dyslipidemia, and diabetes, can influence MPV. Evidence, particularly from prospective studies and a meta-analysis, suggests a correlation between an increase in MPV and the risk of thrombosis.

High MPV is generally associated with a variety of established risk factors, cardiovascular and cerebrovascular disorders, and low-grade inflammatory conditions with a tendency to arterial and venous thrombosis (1,2,4-17). High-grade inflammatory diseases, such as rheumatoid arthritis (RA), are associated with low MPV levels, which are reversed during the course of anti-inflammatory therapy (18,19). Lifestyle modification, antihypertensives, lipid-lowering drugs, and dietary therapies may also affect MPV values, but these effects need to be investigated in large prospective studies with thrombotic endpoints (4,5,9-12,15,17).

In the automated blood count we are going to find two fundamental related parameters, your total count and the mean platelet volume (MPV); Of these, the first is the most widely used and easiest to interpret. On the other hand, despite the importance of MPV, it is not considered an evaluated or interpreted parameter in the clinical context by most physicians. 1.2

STRUCTURE AND FUNCTION OF PLATELET

Platelets originate from the cytoplasm of bone marrow megakaryocytes, do not have genomic DNA, but contain megakaryocyte-derived messenger RNA (mRNA) and the translation machinery necessary for protein synthesis (6, 8, eleven).

Circulating platelets are discoid in shape, with dimensions of approximately 2.0–4.0 by 0.5 m, and a mean volume of 7–11 fl. Their shape and small size allow them to be pushed toward the edges of blood vessels, placing them in an optimal position for constant monitoring of vascular integrity. They circulate in concentrations of 150,000-450,000 cells/mL.

Of the total number of platelets in the body, 70% remain in circulation, while the remaining 30% remain transiently but constantly in the spleen, remaining in circulation for an average of 10 days. The spleen and liver are responsible for removing most platelets after senescence, although a small fraction is constantly removed as a result of their involvement in maintaining vascular integrity (21).

Its internal structure has been divided into four zones:
1. Peripheral zone
2. Sol-gel zone
3. Organelle zone
4. Membrane area

The peripheral zone contains the plasma membrane, glycoproteins, and submembranes. The platelet has a system of channels connected to the surface called the open canalicular system. The walls of this system are included in this area and offer access to plasmatic substances inside the platelet and an exit channel for platelet products, through which GPIIb/IIIa and GP1b are transported to the α granules. (25,26).

The peripheral zone is responsible for cell function, helping in the interaction between platelets, hence the number of granules determines the functional value of the cell. The release of platelet products through the open canalicular system after platelet activation is called the "release reaction" (21,24-26). Platelet membranes have multiple platelet receptors, which determine their specific cellular identity.

Receptors are constitutively expressed on platelets and require conformational changes during platelet activation in order to express their receptor function (21). Within the peripheral zone we also find the membrane phospholipids that are an important component of coagulation, since they help in the surface on which the coagulation proteins react. They also serve as the initial substrate for platelet enzymatic reactions to produce thromboxane A2 (TXA2), an important product of platelet activation and a potent platelet agonist (a substance that promotes platelet aggregation).

The platelet membrane also has the ability to translate surface signals into internal chemical signals (21).

The sol-gel zone is located below the peripheral zone and forms the structure of the platelet, the cytoskeleton, which is the support for the maintenance of the discoid shape of the platelet, as well as the contractile system that, after activation, allows change of shape, pseudopodal prolongation, internal contraction and release of granular constituents. The cytoskeleton comprises between 30%-50% of the total platelet protein. It is a viscoelastic gel that contains cross-linked actin filaments, connected to GPIb by actin-binding proteins. Its functions are the regulation of the properties of the membrane, such as its contours and stability, the mediation of the lateral distribution of the receptor glycoproteins in the membrane and it constitutes a barrier for exocytosis. (21,25,26).

The organelle zone is made up of granules and cellular components such as lysosomes, mitochondria, and peroxisomes. These organelles serve in the metabolic processes of the platelet, store enzymes and a wide variety of other substances critical for platelet function. There are two compartments of adenine nucleotides: the storage or secretable pool in the dense granules and the metabolic or cytoplasmic pool.

Alpha and dense granules are the most important in this zone (21,24-26). Among the three types of platelet secretory granules (α-granules, dense granules, and lysosomes), the α-granule is the most abundant. There are approximately 50–80 α granules per platelet, ranging in size from 200–500 nm. They comprise approximately 10% of the total volume of platelets (25). Upon platelet activation, the α-granules fuse with the plasma membrane, releasing their cargo and increasing the surface area of the platelets. α granules are essential for normal platelet activity, deriving their cargo from both regulated secretory and endocytic pathways in megakaryocytes.

The development of α-granules begins in the megakaryocyte but continues in the circulating platelet. Their membranes contain GPIIb/IIIa, small amounts of GPIb, Glycoprotein IX (GPIX), and P-selectin. They have an important role in cell function, by promoting the interaction between platelets, they also participate in the interaction with other cells through the release of their content (25,26). Dense granules appear as dense bodies in electron microscopy due to high calcium and phosphate contents, are approximately 10 times less abundant than α-granules, and measure approximately 150 nm in diameter. They also release their contents to the extracellular environment upon platelet activation. They store the nucleotides adenosine diphosphate and triphosphate (ADP and ATP).

ATP can modulate inflammatory pathways by activating dendritic cells, while ADP provides a feedback mechanism that activates platelets. Serotonin can mediate vascular tone and also recruit neutrophils to sites of inflammation.

Other constituents include cations, such as calcium and magnesium, that can support signal transduction processes (25,26). Lysosomes are approximately 200 to 250 nm in diameter and can be identified microscopically by staining for lysosomal enzymes, such as acid phosphatase or arylsulfatases. They contain proteases such as carboxylpeptidase, which contribute to the inflammatory potential of platelets (25,26).

Platelet Function And Its Relationship With Size

Platelets are critical for primary hemostasis and endothelial repair, play a key role in the development of acute coronary syndromes, and contribute to cerebrovascular events (9,12,13,22). They also participate in the process of formation of atherosclerotic plaques. The relationship between vascular inflammation has not yet been clarified; however, it is known that platelets are a source of inflammatory mediators and that platelet activation may be a key component in ather othrombosis and in different pathological processes (9,15,22). Large platelets are metabolically and enzymatically more active than small ones and have a high thrombotic potential due to the increase in TXA2 and B2 per unit/volume, the expression of the glycoprotein IIb-IIIa receptor, and they are also denser and contain more -granules. that can release prothrombotic substances including platelet factor, P-selectin and platelet growth-derived factor, chemotactic and mitogenic factor that contributes to neo-intimal vascular proliferation.

Being more cross-linked than normal-sized platelets, they have a poor response to antiplatelet therapy (12,13,22,25,26). Glycoprotein Ib Adenylate cyclase Glycoprotein IIb/IIIa Glycoprotein Ib Adenylate cyclase TXA2 Fibrinogen von Willebrand factor cAMP Prothrombin Thrombin ADP P2Y Glycoprotein IIb/IIIa Prothrombin Thrombin ADP P2Y von Willebrand factor PLA2 COX A A PGH2 TXAS TXA2 cAMP.

In experimental models, and also in humans, it has been shown that large platelets rapidly aggregate with ADP and collagen, contain more dense granules, and produce more prothrombotic factors, such as TXA2, serotonin, and thrombomodulin, compared with large platelets. normal or reduced sized platelets (13). MPV is determined in megakaryopoiesis and thrombopoiesis and has no relation to platelet age. MPV is associated with the concentrations of thrombopoietin and interleukin-6, cytokines that regulate the ploidy of megakaryocytes and the number of platelets (13).

Under normal circumstances there is an inverse relationship between the size and number of platelets. For this reason, the total platelet mass, the product of MPV, and the platelet count ("platelet tocrit") is tightly regulated. When there is a decrease in the platelet count, thrombopoietin stimulates bone marrow megakaryocytes and their nuclei become lobulated, with a high DNA content (increased ploidy). Stimulated megakaryocytes produce larger platelets. Therefore, high MPV platelets are expected to be seen in destructive thrombocytopenia when megakaryocyte stimulation coexists. Conversely, low MPV platelets are expected to be seen in thrombocytopenic states associated with bone marrow hypoplasia or aplasia (13). An exception to this relationship occurs in splenic sequestration during splenomegaly. Under normal conditions, the spleen sequesters 1/3 of the circulating platelets. When it increases in size, it sequesters more platelets, decreasing both the count and the MPV. In hypo-splenic states a high MPV is seen because there is no spleen to sequester the large platelets (12,13,23).

MPV

Platelets are anucleated cytoplasmic fragments derived from megakaryocytes, they are oval in shape, 1 to 2 millimeters in diameter, and have a half-life of 8 to 10 days. MPV is measured by automated cell counters based on impedance and optical effect, and can be modified by the anticoagulant ethylene aminotetraacetic acid (EDTA), temperature and storage time of the sample; Therefore, it is recommended that the analysis of the sample and its reading be carried out ideally in the first hour after taking the sample and preferably in the first 30 min. In samples anticoagulated with EDTA, the evaluation of MPV after one hour is increased by 9% due to platelet edema. In samples anticoagulated with sodium citrate, this modification is not observed. MPV measures platelet volume, which is directly related to platelet size. It is measured in phentoliters (fL) and its normal value is 7.5 to 10 fL. There is an inverse relationship between the number of platelets and MPV. Thus, in thrombocytopenia the MPV is elevated and in thrombocytosis it is decreased. From this observation it was concluded that MPV has an important role in platelet function.3,4

Another concept that is important to include in the interpretation of platelet activity is platelet mass, which is defined as the relationship between the platelet count and MPV; from which it has been found that the inverse platelet count-MPV relationship is not linear, so several normograms have been described to evaluate this relationship.3,4 The number, density and size of platelets is determined by a complex interaction between growth factors, cytokines, hormones and the megakaryocyte in the bone marrow. Megakaryopoiesis is programmed to maintain platelet function and mass, a mechanism in which thrombopoietin, granulocyte colony-stimulating factor, interleukins 1 and 6, and tumor necrosis factor are closely involved. Thrombopoietin levels are determined by gender and the number of platelets. In situations of stress, platelet production and mass are increased, resulting in the release into the circulation of large numbers of large, highly reactive platelets that migrate to sites of injury. An intense stimulus at the medullary level induces a hyperproduction of platelets that is characterized by a high MPV.

As the platelet ages, surface glycoproteins are lost, which significantly alters the activation and aggregation processes. On the other hand, the decrease in density, determined by the loss of its granular content, reduces its function. The decrease in size evaluated with MPV is the result of the consumption of large and functional platelets, resulting in a predominance of smaller platelets in circulation, which does not necessarily impact their function.5 The correlation between platelet count and MPV has been described in various entities; In cases of a normal platelet count with decreased MPV, it is inferred that there is compensatory thrombopoiesis, as has been observed in patients with compensated idiopathic thrombocytopenic purpura and Mediterranean macrothrombocytopenia. The association of thrombocytosis with an elevated MPV is related to autonomic thrombopoiesis. There are several hereditary diseases characterized by thrombocytopenia and high MPV, of which the MayHegglin anomaly and the Bernard-Soulier, Epstein, Fechtner and gray platelet syndromes stand out. In cases of thrombocytopenia of different aetiology, it has been described that an independent risk factor and predictor of hemorrhage can be considered a decrease in MPV, an event that can occur in cases of bone marrow toxicity and in Wiskott-Aldrich syndrome. . In patients with bone marrow recovery after chemotherapy or sepsis, increased MPV is considered one of the earliest manifestations.

VPM Variations in Inflammatory Processes At present, the biological functions of platelets are considered far beyond hemostasis and thrombosis. Platelets have also been linked 31 to inflammation, atherosclerosis, autoimmunity, and tumor immunology (19,53,54,58).

MPV is significantly elevated in diseases that have an inflammatory substrate, being a marker of inflammatory activity, evolution and response to treatment (4, 5,7,16). Platelet size and reactivity have been shown to be related to the severity of the inflammatory process, depending on whether it is acute or chronic (6,12-15,17,19,21,23,59,60).

The more acute and intense the inflammation, activation, and platelet consumption, the more MPV decreases. In more chronic processes when platelet reactivity stabilizes, MPV tends to increase (12).

From this point of view, high-grade inflammatory conditions (eg, active CD, RA, or FMF attacks) are associated with

circulating predominantly small platelets, whereas the same disorders in remission and controlled by anti-inflammatory drugs are associated with large platelets. circulating platelets (15). Established cardiovascular risk factors such as smoking, hypertension, diabetes, as well as age, gender, and possibly ethnicity can modify changes in MPV by affecting the expected inverse relationship between MPV and platelet count in inflammatory thrombosis. Specific pathophysiological factors of the disease (for example, antiphospholipid antibodies in SLE or vasculitis in EB) can also decrease or increase MPV (15,16,22).

In contrast to conditions where thrombopoiesis determines long-term changes in MPV (eg, MI and stroke), platelet release from the spleen can determine rapid changes in MPV values (in minutes/hours). The rapid increase in MPV due to the release of large platelets is more likely in the presence of underlying prothrombotic conditions (9,11,13,15). MPV has a positive correlation with diseases in which there is a prothrombotic tendency and that manifest with thrombosis at different levels, highlighting thrombotic cerebral vascular events and venous thromboembolic disease (VTE) (9,11,13,15,22).

Platelet Distribution Width (ADP)

ADP determines the degree of platelet anisocytosis, it correlates closely with MPV and CP. The reference value is between 15.4 and 16.8. This parameter does not vary greatly in thrombocytopenias, compared to myeloproliferative syndromes (MPS) and pernicious anemia, clinical entities in which it is elevated. (18) In the classification of thrombocytopenias, isolated PC does not allow an adequate classification; therefore, platelet indices make a difference.

Studies show that ADP is increased in thrombocytopenias due to destruction and not hypoproliferation, as is the case in megaloblastic anemias, aplastic anemias, among others, so this simple platelet index can be used routinely as an initial evaluation in patients with thrombocytopenia. (10)

As mentioned above, the predictive value in thrombocytopenias related to neoplastic processes is significant for both ADP and MPV, in which case they are decreased, unlike P-CSF.3,7 In non-neoplastic entities with thrombocytopenia , as in liver cirrhosis, this parameter is increased, it also happens in the case of tuberculosis in the acute phase, where platelet indices are increased. In a study where patients with tuberculosis in the acute phase were evaluated, before and after treatment, it was possible to appreciate the alteration of platelets as an immune response and thus justify the changes in these parameters. 19 Similarly, in patients with acute cardiovascular compromise in states of ischemia, ADP is increased indicating platelet activity.

Platelet tocrit (PL) This parameter represents the percentage of the platelet volume over the total blood volume and is obtained from the ratio of the platelet count to the mean platelet volume. From the clinical point of view, it has little diagnostic utility.

The Large Platelet Range (P-CSF)

The use of P-CSF is little used in hematology due to a lack of knowledge about its application, it is related to platelets larger than 12 fL, with a reference value of 10% to 30%. 20 It is useful for the diagnosis of thrombocytopenia, thrombocytosis or in cases of normal counts that occur with alterations in the shape and size of platelets. Several studies show that P-CSF is significantly decreased in patients with elevated platelet counts, such as in reactive thrombocytosis secondary to neoplasia, it is increased in patients with destructive thrombocytopenia and in patients with cardiovascular compromise, where it presents figures greater than 22, 3%. In contrast, in thrombocytopenias due to bone marrow hypoproliferation, the P-CSF is normal because the platelets are even abnormally smaller.

In some myeloproliferative neoplastic processes where there is thrombocytosis, such as essential thrombocythemia (ET), chronic myeloid leukemia (CML) and polycythemia vera (PV) in which P-CSF is increased, it is used as a differential parameter from other entities that present with increased platelets of benign origin, such as reactive thrombocytosis (RT) due to sepsis, among others. In studies carried out in Japan, P-CSF was related to other laboratory parameters such as lactate dehydrogenase (DHL) and it was observed that in patients with ET and CML the LDH was much higher than in patients with PV, but that all preserved a P-CSF increased. 21, 22 Similarly, P-CSF is inversely proportional to total platelet count.

Properly used P-CSF can be a very useful parameter in the diagnosis of entities associated with abnormal platelet counts with morphological alterations. The correlation of the plateletogram with the morphology in peripheral blood, in patients with increased platelet size, is very high. Figure 3 shows a histogram that shows a high variation in the size of the platelets, which is confirmed with the peripheral blood smear (PBS).

Autoimmune Disorders

In autoimmune diseases such as SLE, immune complexes activate platelets by interacting with Fc receptors; in RA, the platelet is a well-known source of prostaglandins within the inflamed synovial membrane (18,19,61). Recent studies (63) correlated MPV with inflammatory and disease indices with rheumatic disorders. An inverse correlation of 33 MPV was found with erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) in patients with RA and Lupus. In general, a low MPV is related to inflammatory states in a large number of rheumatic patients (2).

In patients with antiphospholipid syndrome (APS) and thrombotic diathesis, it is observed that MPV is significantly high during the thrombotic event, normalizing around three months after starting treatment (2).

RA is an autoimmune inflammatory disorder that typically affects the synovial joints of the hands and feet (2,18,19). The relationship between platelet activation and RA has been demonstrated in various studies, identifying platelet-derived microparticles (MPPs), small membrane vesicles, as the main mediators involved in the pathogenesis of this process (19).

The chronic inflammation characteristic of this pathology is amplified by MPPs, which promote the activation of synovial fibroblasts in a mechanism dependent on IL-1α and -1β (19). Although the mechanisms that modulate the formation of MPPs in the context of RA have not been fully elucidated, it has been shown that MPPs are released after platelet activation, which is induced by the interaction of glycoprotein VI (GPVI) expressed on the platelet surface with abnormally deposited collagen in the synovium of the joints (19). More recent studies have shown that at the molecular level, the signaling pathways triggered through the collagen/GPVI junction involve overlapping activation of the lectin-like receptor C-2 (CLEC-2) (64,65).

However, and in contrast to the negative role of platelets in RA, in a pig model it has been shown that intra-articular injection of platelet-rich plasma attenuates the morphological degeneration of synovium and cartilage characteristic of this disease (66).

These data show that, although it is clear that platelets participate in the pathogenesis of this disease, the positive and negative effects of said contribution remain to be elucidated.

According to a 2015 report (67) lower MPV values were found in patients with active RA than inactive RA. Notably, the use of TNF α blockers promoted a significant increase in MPV levels after therapy.

Cancer

Platelets serve as "first responders" during normal wounding and homeostasis, initiating rapid coagulation, vasoconstriction, inflammation, and wound biology leading to tissue sterilization, repair, and resolution. They are also among the first to detect, phagocytose, or react to pathogens in the circulation.

These properties of platelets as first responders are useful in chronic inflammation, cancer progression, and metastasis. The genesis of blood vessels during the inflammatory reaction or leaking during carcinogenesis provides opportunities for platelet invasion into tumors (53).

Cancer is thought to be a chronic or non-healing wound that may be actively aided by the mitogenic properties of platelets to stimulate tumor growth. This growth ultimately overwhelms circulatory support and leads to angiogenesis and intravasation of tumor cells into the bloodstream. Circulating tumor cells rebind additional platelets, facilitating tumor cell adhesion, arrest, extravasation, and metastasis.

This process, along with the hypercoagulable states associated with malignancy, is amplified by IL6 production in tumors that stimulates TPO production in the liver and increases the number of circulating platelets by thrombopoiesis in the bone marrow. These complex interactions and the "immediate response" role of platelets during various physiological stress situations provide a useful therapeutic target that deserves further exploration (53).

As part of the metastatic process, platelet receptors recognize tumor cell receptor complexes, surface-bound matrix proteins, or cell products when they invade blood vessels due to first responder platelet-tumor cell interactions (19). ,26,52-54). Tumor cells form extensive membrane/cytoskeleton processes that interdigitate largely with a central platelet aggregation and involve the uptake of platelet and mitochondria fragments (19,26,53). These interactions are thought to result in suppression of immune recognition/cytotoxicity or promotion of cell arrest in the endothelium, or entrapment in the microvasculature. All of these responses support the survival and spread of cancer cells and the establishment of secondary lesions. Additional mechanisms of the platelet-metastasis relationship may include the production of platelet exosomes or the extravascular migratory behavior of platelets that help drive cancer progression or the preconditioning of secondary metastatic sites (19,53,72,74).

MPV has been proposed as a predictor of venous thromboembolism in cancer. Patrizia Ferroni (70) and colleagues investigated the effects of different anticancer drugs on MPV in order to assess their possible value in predicting the risk of a first thromboembolic event in outpatients with cancer during treatment. Table XIII 46 A low MPV prior to chemotherapy could be considered as a predictor of increased risk of venous thromboembolism in cancer patients.

Chemotherapy further reduces platelet volumes, possibly due to drug-induced platelet activation and destruction. Changes in MPVs during chemotherapy may provide additional insight into the thromboembolic risk of patients treated with anticancer drugs, particularly platinum compounds (72). A recent report from investigators of the Vienna Cancer and Thrombosis Study (CATS) showed that MPV levels of 10.8 fl or higher (i.e., the 75th percentile of all cancer patients they include in their study) were associated with a significantly increased risk. minor venous thromboembolism (VTE) (73).

The risk of VTE in cancer patients is approximately 4 times higher than in the general population, and is associated with various risk factors such as tumor site, stage, comorbidities, or a variety of biological variables, including count of platelets. Chemotherapy, meanwhile, can act as an additional trigger on this already fertile ground, contributing to a higher incidence of thrombotic events that ultimately impact active treatment, quality of life, and life expectancy.

Little information is available on the value of MPV in predicting risk, and data on the effects of chemotherapy on this platelet index are conflicting. In fact, MPV has been reported to increase after adjuvant tamoxifen treatment in patients with breast cancer.

Vmp And Sepsis

In sepsis, researchers from the Klinikum St. Georg (Leipzig, Germany) (6) conducted a study with 191 patients (mean age 72 years, 38% women) with documented sepsis. The investigators prospectively evaluated VMP at admission, at sepsis onset, at sepsis diagnosis, and during the course of illness, as a marker for predicting outcomes. These data were compared with data from 56 patients (median age, 74 years, female, 45.5%) with acute upper and lower gastrointestinal (GI) bleeding, who served as controls. At the same time, data on other standard laboratory biomarkers and clinical parameters were collected (6). The results showed that VMP at admission and at symptom onset was strongly associated with mortality as an outcome. Of 183 patients with sepsis, 41 (21.5%) of those who died had a higher MPV than the survivors (9.6 vs 9.19 fl, respectively). By the time blood cultures were positive, those values had increased (11.2 vs 9.7 fl). Parameters such as temperature, leukocyte count, lactate, procalcitonin, and C-reactive protein (CRP), on the other hand, were not entirely predictive of outcome. The researchers then determined that the best predictor of death or survival was when using a VMP cutoff value of 8.7 fl.

In 2015, Ates et al, carried out a case-control study trying to determine if the VMP and the ratio VMP/platelet count could determine if the systemic inflammatory response syndrome was due to septic processes, without success since the values of sensitivity and The specificity of both the MPV and the MPV/platelet count ratio were low and without statistical significance (10).

Sánchez-Calzada et al, in a prospective study with 202 patients, determined that the MPV lower than 7.7 fl is a useful tool to rule out infectious aetiology of systemic inflammatory response syndrome (9).

In 2016, Oh GH et al. conducted a retrospective study in 120 adult patients diagnosed with severe sepsis and septic shock resuscitated by goal-guided therapy and showed that the MPV and platelet count alone were not good estimators of mortality; however, the PMV/platelet count ratio at admission and at 24 hours were good predictors of mortality at 28 days (> 3.71 at admission HR: 4.274; 95% CI: 1.228 to 14.874; p=0.023) and (> 6.49 at 24 hours HR: 2.719; 95% CI: 1.048-7.051; p = 0.04) (11).

Wang et al. conducted a retrospective study in patients with acute pancreatitis, evaluating platelet distribution width as a predictor of organ dysfunction, finding a sensitivity of 0.867, specificity of 0.771 and an area under the curve (AUC) of 0.87 (12).

Tajarernmuang et al. carried out a meta-analysis of 11 observational studies with 3274 patients, which did not show that the initial VMP was a good predictor of mortality; however, there was better test performance from the third day, the heterogeneity of the analyzed studies is high; so the conclusions are uncertain (2).

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