Platelet Function

Platelets are not only the smallest blood cell, they are the lightest. Therefore they are pushed out from the center of flowing blood to the wall of the blood vessel. There they roll along the surface of the vessel wall, which is lined by cells called the endothelium. The endothelium is a very special surface, like Teflon, that prevents anything from sticking to it. However when there is an injury or cut, and the endothelial layer is broken, the tough fibers that surround a blood vessel are exposed to the liquid flowing blood. It is the platelets that react first to injury. The tough fibers surrounding the vessel wall, like an envelop, attract platelets like a magnet, stimulate the shape change that is shown in the pictures above, and platelets then clump onto these fibers, providing the initial seal to prevent bleeding, the leak of red blood cells and plasma through the vessel injury.

Preoperative laboratory assessment of the coagulation pathway and platelet function is routinely used even though these studies rarely contribute critical information in the patient with a negative history for bleeding tendencies. There are no randomized studies to assess the value of coagulation laboratory measurements to patient care.

Diagnostic platforms providing biomarkers that are highly predictive for diagnosing, monitoring, and stratifying cancer patients are key instruments in the development of personalized medicine.

Nilsson et al., demonstrate that tumor cells transfer (mutant) RNA into blood platelets in vitro and in vivo, and show that blood platelets isolated from glioma and prostate cancer patients contain the cancer-associated RNA biomarkers EGFRvIII and PCA3, respectively. In addition, gene-expression profiling revealed a distinct RNA signature in platelets from glioma patients compared with normal control subjects. Because platelets are easily accessible and isolated, they may form an attractive platform for the companion diagnostics of cancer [1)].

Different cells appear to act as triggers of the aberrant angiogenesis, and, among them, platelets act as key participants.

In order to provide further insights into the platelet features and angiogenic role in Glioblastoma, this study investigated the effects of platelet releasate on Glioblastoma-derived endothelial cells (GECs) and the levels of VEGF and endostatin, as pro- and anti-angiogenic components of platelet releasate from Glioblastoma patients. We demonstrate for the first time that: 1) platelet releasate exerts powerful pro-angiogenic effect on GECs, suggesting it might exert a role in the aberrant angiogenesis of Glioblastoma; 2) ADP and thrombin stimulation leads to significantly higher level of VEGF, but not of endostatin, in the releasate of platelets from Glioblastoma patients than those from healthy subjects; and 3) the intraplatelet concentrations of VEGF were significantly elevated in Glioblastoma patients as compared to controls. Moreover, we found a direct correlation between platelet-released VEGF and overall survival in our patient cohort. Although preliminary, these findings prompt further investigations to clarify the biologic relevance of platelet VEGF in Glioblastoma and prospective studies for screening Glioblastoma patients for anti-VEGF therapy and/or to optimize this treatment [2)].

Platelet function assay

Platelet function assay.

Platelet Function disorder

Platelet Function Disorder.

1)
Nilsson RJ, Balaj L, Hulleman E, van Rijn S, Pegtel DM, Walraven M, Widmark A, Gerritsen WR, Verheul HM, Vandertop WP, Noske DP, Skog J, Würdinger T. Blood platelets contain tumor-derived RNA biomarkers. Blood. 2011 Sep 29;118(13):3680-3. doi: 10.1182/blood-2011-03-344408. Epub 2011 Aug 10. PubMed PMID: 21832279.
2)
Di Vito C, Navone SE, Marfia G, Abdel Hadi L, Mancuso ME, Pecci A, Crisà FM, Berno V, Rampini P, Campanella R, Riboni L. Platelets from glioblastoma patients promote angiogenesis of tumor endothelial cells and exhibit increased VEGF content and release. Platelets. 2016 Nov 29:1-10. [Epub ahead of print] PubMed PMID: 27897101.