Tissue Factor

Tissue factor, also called platelet tissue factor, factor III, or CD142, is a protein encoded by the F3 gene, present in subendothelial tissue and leukocytes. Its role in the clotting process is the initiation of thrombin formation from the zymogen prothrombin

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Bierwagen et al. investigated the concentration and activity of tissue factor (TF) and Tissue factor pathway inhibitor (TFPI) as well as the concentration of thrombin-antithrombin (TAT) complexes in patients with primary and metastatic intracranial neoplasms. The study included 69 patients with an average age of 62 years. Twenty-one patients were diagnosed with gliomas, 18 meningioma stage II (M) patients, and 30 metastatic brain tumour cases (Meta). The control group consisted of 30 individuals with a mean age of 57 years. In the plasma of all the participants and in tumour tissue-derived homogenate, the concentrations and activities of TF, TFPI, the concentration of TAT complexes and the concentration of total protein were measured. The results were converted per 1 mg of protein. The concentration of TF was over 80 times higher in the tumour tissue-derived homogenate in respect to patients' plasma levels. Plasma TF activity in intracranial cancer patients was almost six times higher compared with noncancer counterparts, while in the tumour tissue-derived homogenate it was more than 14 times higher than in the intracranial cancer patients' plasma, whereas the concentration of TFPI in the tumour tissue-derived homogenate was significantly lower than in the patients' plasma. However, a significantly higher TFPI activity in the tumour tissue derived than in the patients' plasma was reported. The high concentration and activity of TF, along with the coexisting low concentration and activity of TFPI in the plasma of intracranial tumour patients, is associated with a higher prothrombotic risk in these patients [1)]

Primary brain tumors are associated with an increased risk of pulmonary embolism (PE), particularly in the early post-operative period. The pathophysiological mechanisms of PE are poorly understood. A study aimed to describe prospectively extracellular vesicles (EVs) levels and investigate whether or not their variations allow to identify patients at increased risk of post-operative PE. Consecutive meningioma or glioma patients candidate to tumor resection were included in the study if a pulmonary perfusion scan (Q-scan) performed before surgery ruled out PE. EVs derived from platelets (CD41+) or endothelial cells (CD144+), tissue factor-bearing EVs (CD142+) and their procoagulant subtype (annexin V+) were analyzed by flow cytometry before surgery (T0), within 24 h (T1), two (T2) and seven days (T7) after surgery. Q-scan was repeated at T2. Ninety-three patients with meningioma, 59 with glioma and 76 healthy controls were included in the study. CD142+ and annexin V+/CD142+ EVs were increased at T0 in meningioma and glioma patients compared to healthy controls. Twenty-nine meningioma (32%) and 16 glioma patients (27%) developed PE at T2. EVs levels were similar in meningioma patients with or without PE, whereas annexin V+ and annexin V+/CD142+ EVs were significantly higher at T1 and T2 in glioma patients with PE than in those without. Procoagulant EVs, particularly annexin V+/CD142+, increase after surgery and are more prevalent in glioma patients who developed PE after surgery than in those who did not [2)].

The objective of a study was to determine the association between the expression patterns of tissue factor (TF) and interleukin 6 (IL-6) in AVMs with clinical and pathological findings. Eighteen cases of

sporadic AVM with operative specimens were included in this study. The expression of mRNA of TF and IL-6 was assayed, and association with clinical factors was investigated. The distribution of TF and IL-6 was examined with immunofluorescence. The mRNA expression of TF was significantly higher in AVM specimens than in control tissues (P = 0.002) and significantly higher in the symptomatic group than in the asymptomatic group (P = 0.037). The mRNA expression of IL-6 was likewise significantly higher in AVM specimens than in control tissues (P = 0.038). Examination of immunostained sections indicated that TF+ cells were also positive for IL-6 and were distributed around normal endothelial cells and pericytes. Moreover, TF+/IL-6+ cells also expressed CD31, vascular endothelial growth factor receptor 2 (VEGFR2), and platelet-derived growth factor receptor beta (PDGFR-beta). These results suggest that TF is elevated in AVMs and that it mediates symptomatic events. IL-6 is associated with the angiogenic activity of TF, and both are present in the same abnormal endothelial cells and pericytes. These factors may have interactive effects and may serve in a prognostic role for AVMs [3].

High perioperative concentrations of Tissue Factor TF indicate not only the presence of thrombophilia but also the importance of TF in the wound-healing process. Perioperative changes in tissue factor pathway inhibitor (TFPI) concentrations are related to its compensatory influence on hemostasis in thrombophilic conditions [4].

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Bierwagen M, Wierciński M, Góralczyk K, Góralczyk B, Janczarek A, Kulwas A, Rość D, Ruszkowska-Ciastek B. Tissue factor-dependent coagulation activation in intracranial neoplasms: a comparative study. Blood Coagul Fibrinolysis. 2022 Aug 25. doi: 10.1097/MBC.0000000000001164. Epub ahead of print. PMID: 36165076.
2)
Passamonti SM, Artoni A, Carrabba G, Merati G, Abbattista M, Capecchi M, Castellani M, Marenghi C, Trombetta E, Giammattei L, Caroli M, Bucciarelli P, Scalambrino E, Peyvandi F, Martinelli I. Plasma levels of extracellular vesicles and the risk of post-operative pulmonary embolism in patients with primary brain tumors: a prospective study. J Thromb Thrombolysis. 2021 Apr 10. doi: 10.1007/s11239-021-02441-3. Epub ahead of print. PMID: 33837918.
3)
Noshiro S, Mikami T, Kataoka-Sasaki Y, Sasaki M, Hashi K, Ohtaki S, Wanibuchi M, Mikuni N, Kocsis JD, Honmou O. Biological relevance of tissue factor and IL-6 in arteriovenous malformations. Neurosurg Rev. 2016 Aug 19. [Epub ahead of print] PubMed PMID: 27542852.
4)
Ślusarz R, Głowacka M, Biercewicz M, Barczykowska E, Haor B, Rość D, Gadomska G. Tissue Factor and Tissue Factor Pathway Inhibitor in the Wound-Healing Process After Neurosurgery. Biol Res Nurs. 2015 Aug 14. pii: 1099800415598860. [Epub ahead of print] PubMed PMID: 26276512.