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Perioperative Considerations in Management of the Severely Bleeding Coagulopathic Patient

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The authors present an excellent review, going in great detail through the different aspects of bleeding in coagulopathy patients, and it should be read thoroughly. They study both general and specific aspects of 3 conditions encompassing the most complex situations, such as multiple trauma, extracorporeal circulation, or postpartum hemorrhage. All of them are multifactorial, with common pathophysiology, such as hypovolemia, coagulopathy, platelet dysfunction, or inflammatory response. Managing these situations includes assessing risks, using real-time coagulation tests, and transfusion therapies. However, it is equally relevant to identify high-risk procedures and patients in order to adapt preventive strategies.

Some pathophysiology details must be noted. Thus, during trauma, an unbalance emerges between pro- and anticoagulant factors, with an impact on platelet function, fibrinolysis, and immune response, leading to **trauma-induced coagulopathy**. This can be shown as hypocoagulability, evolving into a hypercoagulable state. Risk factors include age, anticoagulants, serious lesions, brain trauma, and systemic shock, among others. Also in heart surgery, **extracorporeal circulation** can bring about hemostatic activation and acquired coagulopathy, due to initial hemodilution, blood loss during surgery, tissue factor release, the activation of inflammatory response, and platelet depletion and their function. Regarding pregnant patients, **postpartum coagulopathy** may be connected to uterine atony, genital tract trauma, placental abruption, amniotic fluid embolism, among other causes, and it can lead to rapid deterioration if not properly managed.

The section on diagnosis is particularly interesting. The text offers a detailed overview of standard and advanced laboratory tests used in the assessment of perioperative hemostasis, underlining its significance in different clinical settings and highlighting the areas where further research is required. With regard to the preoperative assessment of the bleeding risk, it must be noted that laboratory tests do not always identify mild disorders in patients undergoing elective surgery. In fact, several national guides are in favor of using bleeding assessment tools instead of performing preoperative routine coagulation tests. However, the significance of specific tests—such as TTPa—must be noted in cases such as heart surgery with high-dose heparinization, specific tests to monitor the effect of oral anticoagulants and a qualitative assessment of inherited and acquired coagulation disorders. However, to get a quick and efficient assessment of the state of hemostatic competence,

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particularly in massive transfusion situations in heart surgery and serious trauma, the use of viscoelastic tests is referenced. Several systems are mentioned, such as ClotPro, Quantra, TEG® 6s, or ROTEM, each one of them with their own characteristics and benefits. The paper also reviews clinical trials researching the impact of transfusion algorithms based on viscoelastic tests on the reduction of the bleeding and the need for transfusions in heart surgery and trauma.

Another section deals with acquired coagulation disorders connected to the use of medication such as anticoagulants and antiplatelet drugs, particularly in patients undergoing urgent surgery. The residual effects of these drugs may help causing excessive bleeding in these patients, which may require the use of specific or non-specific reversing agents. Strategies such as hemofiltration or hemoadsorption are suggested to eliminate certain drugs, although they have not been validated in large clinical trials. In scheduled surgery, specific times are set for the suspension of these drugs, although their discontinuation should be assessed on an individual basis, taking into account thrombotic vs. hemorrhagic risk balance.

In terms of management, different strategies are described for treating microvascular bleeding and reverting coagulation anomalies in the described scenarios. Interestingly, viscoelastic tests are used to guide hemostatic resuscitation and the potential use of coagulation factor concentrates. In terms of general measures, a significant factor mentioned is inadvertent hypothermia, which may lead to coagulation enzyme deregulation, platelet dysfunction, fibrinolysis, endothelial lesion, and a worsening of results. Current recommendations suggest maintaining early normothermia in order to optimize coagulation and tackle metabolic acidosis and hypocalcemia associated to hemorrhage and coagulopathy. The use of antifibrinolytic agents is also recommended—despite the controversies on side effects—in situations where they have proven efficient to decrease mortality. Regarding the replenishment of volume and coagulation factors in cases of serious hemorrhage, the importance of a balanced hemostatic resuscitation is underlined. This involves the administration of coagulation factor concentrates (fibrinogen, prothrombin complex concentrate, factor XIII, factor VIIa) as potential alternatives to plasma or whole blood in cases of uncontrollable microvascular bleeding. However, using them outside the approved label poses a challenge in terms of efficacy and safety, particularly in connection to thromboembolic events, instead of efficiency in the specific replenishment of coagulation factors. Thus, the need for more clinical trials is stressed, in order to better define their role and optimal dosing in the management of uncontrollable bleeding.

In summary, given the increasing use of anticoagulant and antiplatelet drugs, the need for multimode management strategies is pointed out, integrating data from multiple tests and considering the complexity of the coagulopathy. Special stress is made on the importance of rigorous clinical trials, the implementation of management algorithms, and their validation in multi-center studies.