Coagulation

Coagulation (also known as clotting) is the process by which blood changes from a liquid to a gel, forming a blood clot. It potentially results in hemostasis, the cessation of blood loss from a damaged vessel, followed by repair. The mechanism of coagulation involves activation, adhesion, and aggregation of platelets along with deposition and maturation of fibrin. Disorders of coagulation are disease states which can result in bleeding (hemorrhage or bruising) or obstructive clotting (thrombosis).

Coagulation is an essential part of a surgical procedure, especially in neurosurgery.

Beginning in the early years of this century, various techniques have been used to control bleeding at the surgical site. Over the years, these techniques have led to the invention of the bipolar coagulation and its modifications.

Disorders of the coagulation system can seriously impact the clinical course and outcome of neurosurgical patients. Due to the anatomical location of the central nervous system within the closed skull, bleeding complications can lead to devastating consequences such as an increase in intracranial pressure or enlargement of intracranial hematoma. Point of care (POC) devices for the testing of haemostatic parameters have been implemented in various fields of medicine. Major advantages of these devices are that results are available quickly and that analysis can be performed at the bedside, directly affecting patient management. POC devices allow identification of increased bleeding tendencies and therefore may enable an assessment of hemorrhagic risks in neurosurgical patients. Although data regarding the use of POC testing in neurosurgical patients are limited, they suggest that coagulation testing and hemostatic therapy using POC devices might have beneficial effects in this patient population [1)].

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see Oral anticoagulation

Coagulation disorders can have a major impact on the outcome of neurosurgical patients. The central nervous system is located within the closed space of the skull, and therefore, intracranial hemorrhage can lead to intracranial hypertension. Acute brain injury has been associated with alterations of various hemostatic parameters. Point-of-care (POC) techniques such as rotational thromboelastometry are able to identify markers of coagulopathy which are not reflected by standard assessment of hemostasis (e.g., hyperfibrinolysis). In patients with acute brain injury, POC test results have been associated with important outcome parameters such as mortality and need for neurosurgical intervention. POC devices have also been used to rapidly identify and quantify the effects of antithrombotic medication. In cases of life-threatening intracranial hemorrhage, this information can be valuable when deciding over administration of prohemostatic substances or immediate neurosurgical intervention. In elective neurosurgical procedures, POC devices can provide important information when unexpected bleeding occurs or in cases of prolonged operative time with subsequent blood loss. Initial experiences with POC devices in neurosurgical care have shown promising results but further studies are needed to characterize their full potential and limitations [2)].

The aim of study was to describe current approaches and to quantify variability between European intensive care units (ICU)s in patients with traumatic brain injury (TBI). Therefore, Huijben et al. conducted a provider profiling survey as part of the 'Collaborative European NeuroTrauma Effectiveness Research in Traumatic Brain Injury' (CENTER-TBI) study. The ICU Questionnaire was sent to 68 centers from 20 countries across Europe and Israel. For this study, they used ICU questions focused on 1) hemoglobin target level (Hb-TL), 2) coagulation management, and 3) deep venous thrombosis (DVT) prophylaxis. Sixty-six centers completed the ICU questionnaire. For ICU-patients, half of the centers (N= 34; 52%) had a defined Hb-TL in their protocol. For patients with TBI, 26 centers (41%) indicated a Hb-TL between 70 and 90 g/l and 38 centers (59%) above 90 g/l. To treat trauma related hemostatic abnormalities the use of fresh frozen plasma (N= 48; 73%) or platelets (N= 34; 52%) was most often reported, followed by the supplementation of vitamin K (N= 26; 39%). Most centers reported using DVT prophylaxis with anticoagulants frequently or always (N= 62; 94%). In the absence of hemorrhagic brain lesions, 14 centers (21%) delayed DVT prophylaxis until 72 hours after trauma. If hemorrhagic brain lesions were present, the number of centers delaying DVT prophylaxis for 72 hours increased to 29 (46%). Overall, a lack of consensus exists between European ICUs on blood transfusion and coagulation management. The results provide a baseline for the CENTER-TBI study and the large between-center variation indicates multiple opportunities for comparative effectiveness research [3].

Coagulation in intracranial tumor

see Coagulation in intracranial tumor.

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