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What's happening?

The potential usefulness of thrombelastography in quality monitoring and quality improvement of blood components

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Thrombelastography (TEG) technology is a cell-based methodology for analysis of the viscoelastic changes that occur during coagulation of a whole blood sample in vitro, providing a unique opportunity to evaluate initiation, propagation, formation and stability of the clot strength of citrated blood and the derived haemostatic components. The potential clinical applications of modern TEG are well established. This brief report deals with additional potential applications of TEG in quality monitoring of haemostatic blood components, for clinical use. This is of particular relevance as with the recent technological advances, the TEG technology becomes well standardised and digitalisation of the procedure made it possible to be used as an essential tool in monitoring haemostasis in either laboratory or near the bed side.

Currently numerous blood collections, processing and storage procedures are used for the production of blood components for clinical use. It is well established that even prolonged collection time for blood or poor agitation during collection, can lead to thrombin generation, as measured by FPA. In many apheresis procedures different ratio anticoagulant are used and blood come into contact with different artificial surfaces. Moreover several newer processes, such as different leucoreduction and viral inactivation/reduction procedures are introduced to improve safety of blood components, having variable degree of cellular damage on cellular products. In fact, in our experience, any additional processing used for preparation of safer and purer products, has some bearing on cellular damage and microvesiculation which can influence various TEG parameters. Hence TEG has a great value in quality monitoring and quality improvement and standardisation of blood components destined for correction of haemostasis.

As a cell-based whole blood analysis, TEG not only found to be valuable in evaluating thrombin generation in platelet rich plasma from patients with Bernard Soulier syndrome, but it is indicated that the TEG patterns of aged platelet concentrates, expressing more procoagulant activity differing from fresh products of the same origin .This is possibly due to increased levels of apoptotic cells having higher levels of PS exposure and formation of microvesicles (MV) during processing and storage.

In respect to quality monitoring of FFP, in practice such a product is prepared either from blood on the day of donation <8 h or after overnight hold blood stored at cold <18 h. The quality of FFP derived from these procedures appear to be different in term of haemostasis, the later showing increased coagulability as measured by the dynamics of clot formation in FFP. This emphasizes that TEG reflecting the kinetic of thrombus formation is a better quality indicator of haemostatic components of blood, than estimating the potency of factor VIII, currently used for the quality monitoring of FFP. While the clinical significance of microvesicle in various clinical FFP is unknown but based on TEG data it appear that there is a relationship between the levels of MV and increased haemostasis. Therefore on reflection, it may be possible that even traces of MV present in FFP-derived from overnight hold blood or stored platelet concentrates, similar to MV found in blood salvaged intraoperatively and returned to patient, may improve haemostasis, as measured by TEG.

Finally, the issue of standardization of tests currently in use for assessment of clot formation remained an unresolved problem. This is of particular clinical relevance as several methodologies are currently in use, each measuring different aspects of coagulation process, through clot formation. Although results are not analogous and there might be some subtle differences due to the nature of samples or the concentration of diverse reagents used in different technologies, making them more or less sensitive to various components of haemostasis process.

To conclude the simplicity of modern thrombelastography procedure, providing information on the full coagulation status within 30 min, in a well standardised fashion, make it a unique tool for quality monitoring/quality

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improvement of blood components for clinical use and should, at least, supplement other standard biochemical testing for this purpose. It is therefore expected that the targeted use of TEG, combined with information derived from other analyses, may prove to be beneficial for the continual improvement of blood components for clinical use. Trends in this direction are already on the way. Haemostasis also involves interaction with other cells and endothelium. In future trends it is expected that for completeness TEG could be performed in the presence of live endothelial cell monolayer bring it more closely to the in vivo condition.