Thromboelastography as a tool for quality check of apheresis platelets

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A plateletpheresis unit was quarantined due to an apparent opacity and loss of swirling on the 4th day of collection on Trima Accel cell separator [Figure 1]. The platelet yield, residual leukocyte count in the unit, and pH value were 3.28×10^{11}, 1.8×10^{6}, and 5.8, respectively. Swirling was visually judged to have a score of 0 (score of 3 on the day of collection). The bacterial cultures (both aerobic and anaerobic) on the sample from the bag by an automated microbiological culture system (BacT/ALERT, BioMerieux, Durham, USA) were negative. Donor blood sample for bacterial culture was not available for testing; however, telephonic conversation with the male donor revealed no history/symptoms of any infection including diarrhea 2 weeks preceding plateletpheresis. In view of poor morphological parameters as indicated by low pH and absent swirling, it was decided to test the functional quality by thromboelastography (TEG, 5000 series, Haemonetics Corp., Braintree, MA, USA) which is available in the department for monitoring of hemostasis and blood component therapy in the patients using citrated whole blood sample. Briefly, 1 mL of diluted sample from single donor platelet (1:10 dilution with freshly thawed allogeneic AB plasma for adjusting the platelet count to 150×10^{9}/L) was added to a tube with kaolin. Then, 340 µl aliquot of the kaolin-activated sample was added to a warmed TEG sample cup preloaded with 20 µl of 0.2 mol/l $CaCl_2$.[1] TEG was run on kaolin-activated recalcified platelet-rich plasma (PRP) sample and R, K, angle, maximum amplitude (MA), LY30, and coagulation index values were determined. As shown in Figure 2, the MA (clot strength) was very low (22 mm; normal MA reference = 51–69 mm) thereby indicating that platelet functions were severely compromised. The K-value which is a measure of rapidity to reach a certain level of clot strength was also found to be deranged with an overall hypocoagulable tracing on TEG. The bag was discarded as it could not meet quality checks for morphology apart from poor platelet functional status detected by TEG.

The simple and rapid markers of platelet quality assessment in the blood bank are visual inspections of product color and platelet swirling. The latter is a crude and subjective test for the nonspherical shape of platelets in the bag, and moreover, there

Figure 1: Implicated plateletpheresis unit with no swirling

is little published evidence linking it with clinical outcome.[2,3] The change in color in the bag may be seen due to hemolysis, lipemia, icterus, drug, or in bacterial contamination; however, slight color change may not be appreciated as color perception is subjective. Thus, swirling, color change, or any perceived opacity may not entirely or necessarily correlate with platelet quality markers. Bacterial contamination, platelet, or leukocyte metabolism can change the pH of platelets in the bag.[4,5] The pH also decreases during storage depending on the stabilizer in plastic platelet storage bags and storage conditions used. Single pH measurement may be unreliable as few strains of bacteria show a pH rebound effect, and thus, sequential measurement is considered better method for bacterial detection in platelets.[6] We could not ascertain the reason for low pH and absent swirling in our plateletpheresis bag, but these may be markers of platelet storage lesions with resulting poor preservation of function and substantial loss

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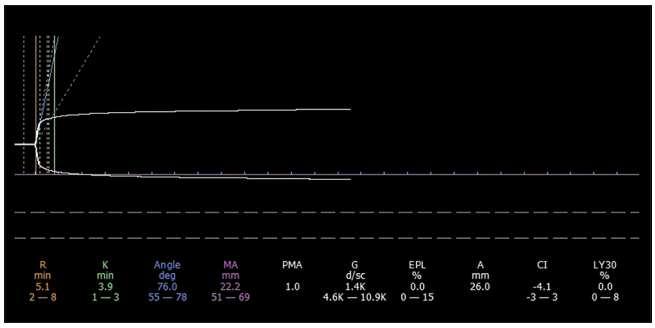

Figure 2: Thromboelastography showing very low maximum amplitude with overall hypocoagulable tracing

of viability toward the end of expiry of the unit. At our hospital, apheresis platelets are issued latest by the 3rd day of collection in majority of cases and rarely few units are stored till expiry (5th day of collection) as in this case wherein this unit was kept as reserve for a patient of idiopathic thrombocytopenic purpura undergoing cholecystectomy who did not require the platelet transfusion.

Of late, TEG has been used for functional quality testing of blood components;[7,8] however, its integration as *in-vitro* quality monitor for blood components is not common in most blood banks. In terms of hemostasis, TEG analysis on PRP sample produces the tracing which is broadly similar to whole blood TEG tracing. Platelets have the most influence on final clot strength, and the MA is significantly altered by changes in platelet number or function. The TEG could be used as a surrogate marker for platelet viability and functional quality in the blood bank and for transfusion efficacy in the clinical setting. This case highlights the importance of TEG for functional assessment of apheresis platelets and more so in cases where swirling may be difficult to assess due to biochemical or morphological platelet storage lesions.

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Conflicts of interest

There are no conflicts of interest.

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