

THE TEG® THROMBELASTOGRAPH® HEMOSTASIS ANALYZER

The TEG system is comprised of an analyzer and software which together provide a complete picture of the formation and dissolution of the clot, showing the balance or imbalance of the two systems.

What can TEG analysis measure?

Consistent with advances in the understanding of hemostasis, TEG technology analyzes platelet function. Because the TEG analyzer monitors the elasticity of clotting blood, the system is sensitive to all the interacting cellular and plasmatic components such as coagulation and fibrinolytic factors, activators, and inhibitors that may affect the rate or structure of a clotting sample and its breakdown.

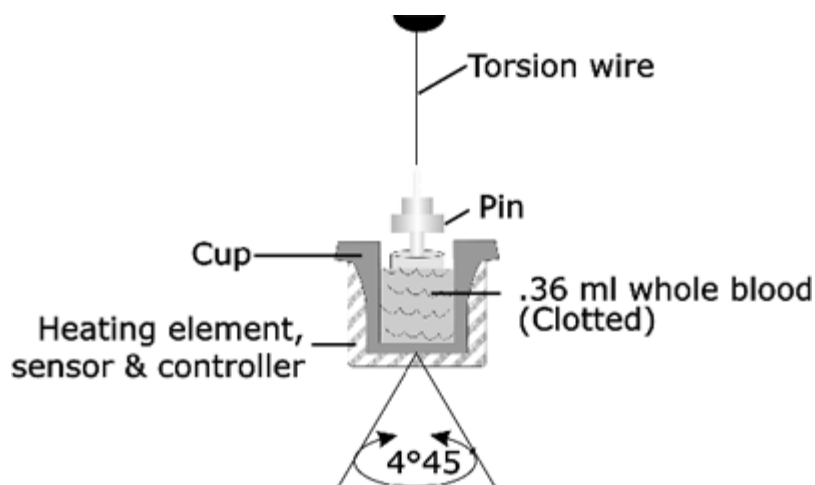


The TEG analyzer measures the mechanical properties of the developing clot:

- The time until initial fibrin formation;
- The kinetics of the initial fibrin clot to reach maximum strength; and,
- The strength and stability of the fibrin clot and its ability to do the work of hemostasis, that is, to mechanically impede hemorrhage without permitting inappropriate thrombosis.

THE TEG ANALYZER TECHNOLOGY

The TEG analyzer has a sample cup that oscillates constantly at a set speed through an arc of 4°45'. Each rotation lasts ten seconds. A whole blood sample of 360 ul is placed into the cup, and a stationary pin attached to a torsion wire is immersed into the blood. When the first fibrin forms, it begins to bind the cup and pin, causing the pin to oscillate in phase with the clot. The acceleration of the movement of the pin is a function of the kinetics of clot development.



The torque of the rotating cup is transmitted to the immersed pin only after fibrin-platelet bonding has linked the cup and pin together. The strength of these fibrin-platelet bonds affects

the magnitude of the pin motion, such that strong clots move the pin directly in phase with the cup motion. Thus, the magnitude of the output is directly related to the strength of the formed clot. As the clot retracts or lyses, these bonds are broken and the transfer of cup motion is diminished. The rotation movement of the pin is converted by a mechanical-electrical transducer to an electrical signal which can be monitored by a computer.

The resulting hemostasis profile is a measure of the time it takes for the first fibrin strand to be formed, the kinetics of clot formation, the strength of the clot (in shear elasticity units of dyn/cm²) and dissolution of clot.

Clot dynamics

The resultant hemostasis profile can be evaluated and individual points in the profile indicate specific parameters of patient hemostasis:

| | | |
|---------------------------|-------|--|
| Clotting time | R | The period of time of latency from the time that the blood was placed in the TEG analyzer until the initial fibrin formation. |
| Clot kinetics | K | A measure of the speed to reach a specific level of clot strength. |
| | alpha | Measures the rapidity of fibrin build-up and cross-linking (clot strengthening) |
| Clot strength | MA,G | A direct function of the maximum dynamic properties of fibrin and platelet bonding via GPIIb/IIIa and represents the ultimate strength of the fibrin clot. |
| Hemostasis profile | CI | Coagulation Index, a linear combination of the above parameters. |
| Clot stability | LY30 | Measures the rate of amplitude reduction 30 minutes after MA. |

It is important to stress that the standard coagulation tests - PT, PTT, TT, fibrinogen level, etc. - stop measuring at the first stage of coagulation, when the first clot is formed. They are plasma tests measuring plasma hemostasis and not patient hemostasis, which is in whole blood, and they ignore the important role of platelets and phospholipids in the role of coagulation.

Other parameters (shown in the figure above) measure other aspects of hemostasis, such as time to maximum clot strength (TMA), and clot lysis time (CLT).

Modified Blood Samples

Native whole blood samples provide the most sensitive method for analysis. However, often it is not practical or necessary to run a straight native sample. For instance, samples can be citrated to prolong storage time. A wealth of additional information can be obtained by running blood samples that have been modified before application on the analyzer. For example:

- measure heparin effect using heparinase cups and pins
- speed analysis by adding kaolin or other activators
- test functional fibrinogen level by adding tissue factor and ReoPro
- test in vitro for the effect of any drug on a patient by adding it to the sample in a similar concentration

TEG ANALYTICAL SOFTWARE

The TEG Analytical Software provides a feature-rich interface to the TEG hardware. It is provided in two versions:

- **TEG-enabled**, which lets operators run samples for hemostasis analysis
- **Remote**, which lets clinicians view tracings at point of care and in real time.

Running the TEG-enabled version in the laboratory or point of care provides real-time results to any Remote user. Since data can be shared across a network, any TEG software workstation can access and view the data from any other TEG software workstation on the network.

TEG Remote software

The Remote version can be used in the OR, ICU, nursing station, or any other location close to the patient, to view tracings as they develop at another location:

- View the signature graphs (tracings), along with numeric data and normal values
- Superimpose patient tracings, including normal values tracings, to aid in differential diagnosis
- Project an estimate of clot strength (MA) within minutes for assessing platelet dysfunction
- View the "clot," an alternate representation of the clotting and lysis parameters in another graphical format
- Invoke the Guide(TM) module to provide software-assisted interpretation
- Use eConsult to e-mail tracings anywhere for remote interpretation consultation including on PDAs and cell phones
- Generate comprehensive single or multiple sample reports with CPT codes for reimbursement
- Enter related non-TEG test or clinical data
- Export numeric and/or graphical data for use in other systems
- Use optional touch screen for easy navigation
- Customize test display by selecting tests, units, display order, and colors.

TEG-enabled software

In addition to all the options listed above for the Remote version, the TEG-enabled version provides the TEG screen that lets operators start and stop samples. In addition, laboratory support is provided with many other features for supporting quality assurance functions such as:

- Automated biological control results storage
- Quality control history reports (Levey - Jennings)
- Automated maintenance history reports
- Eight simultaneous samples via 4 analyzers, each with 2 channels
- Two independent channels per instrument
- Full network support with remote viewing
- Comprehensive Windows-based software