Point of Care Testing

Understanding Results TEG,ACT,ABG,Haemocue and Blood Glucose Meter

Presenter

TEG® 5000 Thrombelastograph® Haemostasis Analyzer



TEG

Thromboelastograph

- Thromboelastography (TEG) is a near-patient coagulation monitor, which measures blood clot rate of formation, maximum strength and fibrinolysis.

- It is increasingly used in Cardiac Surgical Units to manage coagulopathy and guide blood component therapy following surgery.

Sample Required

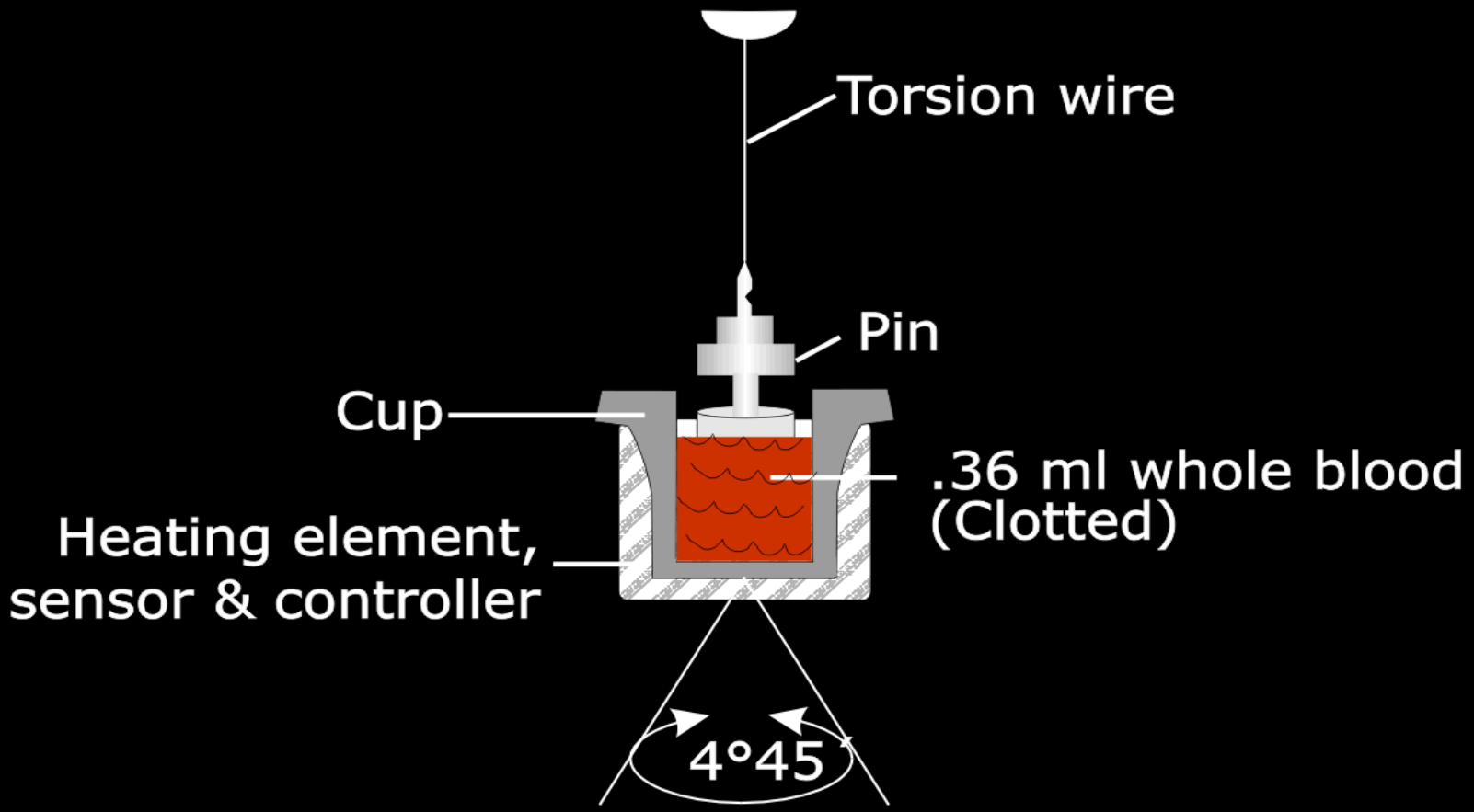
- Arterial blood sample 1 to 2 ml in a plain syringe.

- Once the blood sample is taken it should be analysed within four minutes.
- Only 1 ml blood is used to mix with the reagent and .36 mls of which is actually used to run the test.
- We use the reverse pipette method to draw the sample for accuracy.

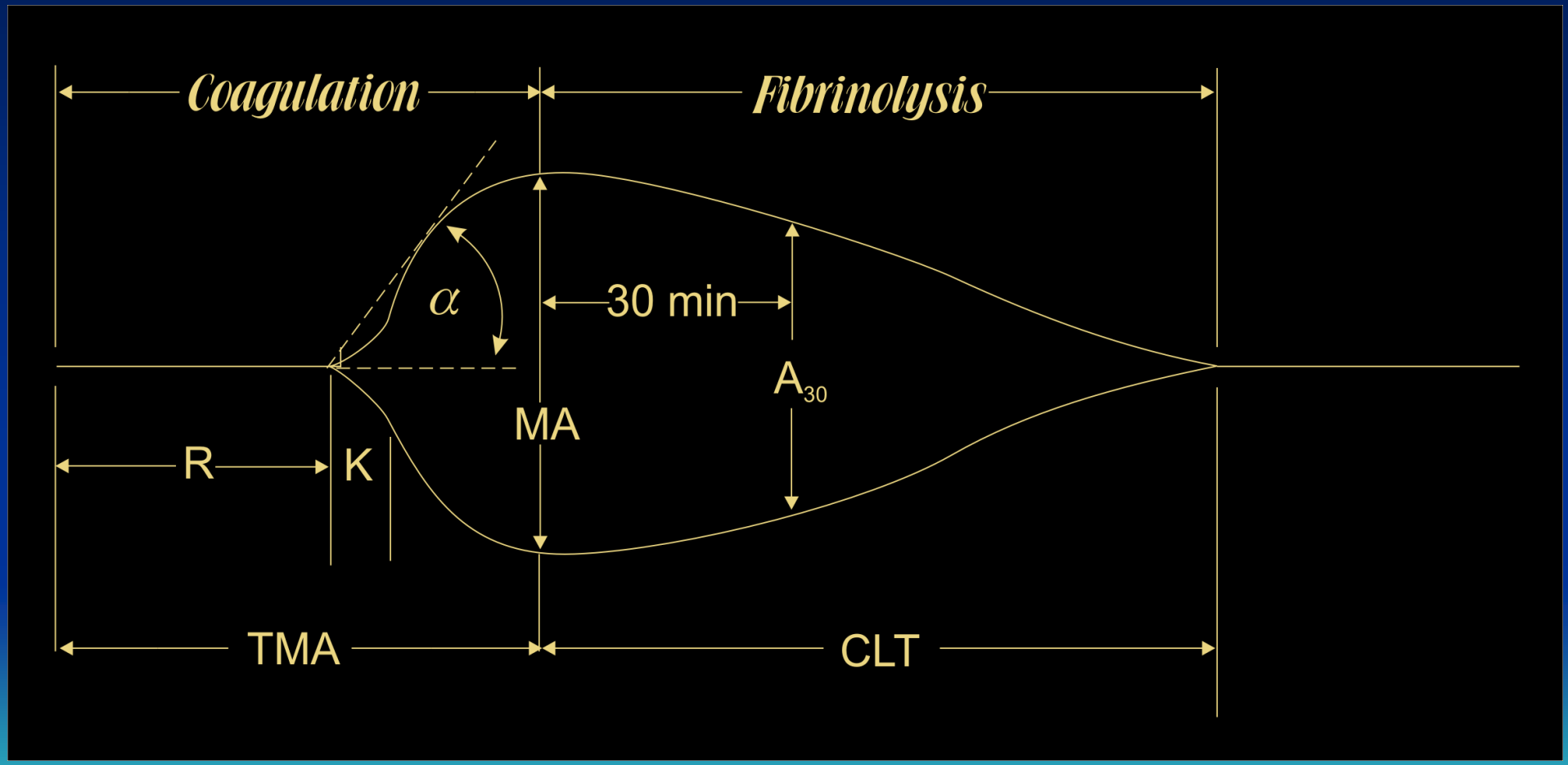
How does it work?

- **Clot formation**
- **Clot kinetics**
- **Clot strength & stability**
- **Clot resolution**

Mechanics


Torsion wire
Pin
Cup
.36 ml whole blood
(Clotted)
Heating element,
sensor & controller
4°45

Clot Kinetics and Normal Trace



Results

R - is the time of latency from the time that the blood was placed in the TEG® analyzer until the initial fibrin formation.

α Angle -The alpha value measures the rapidity (kinetics) of fibrin build-up and cross-linking, that is, the speed of clot strengthening.

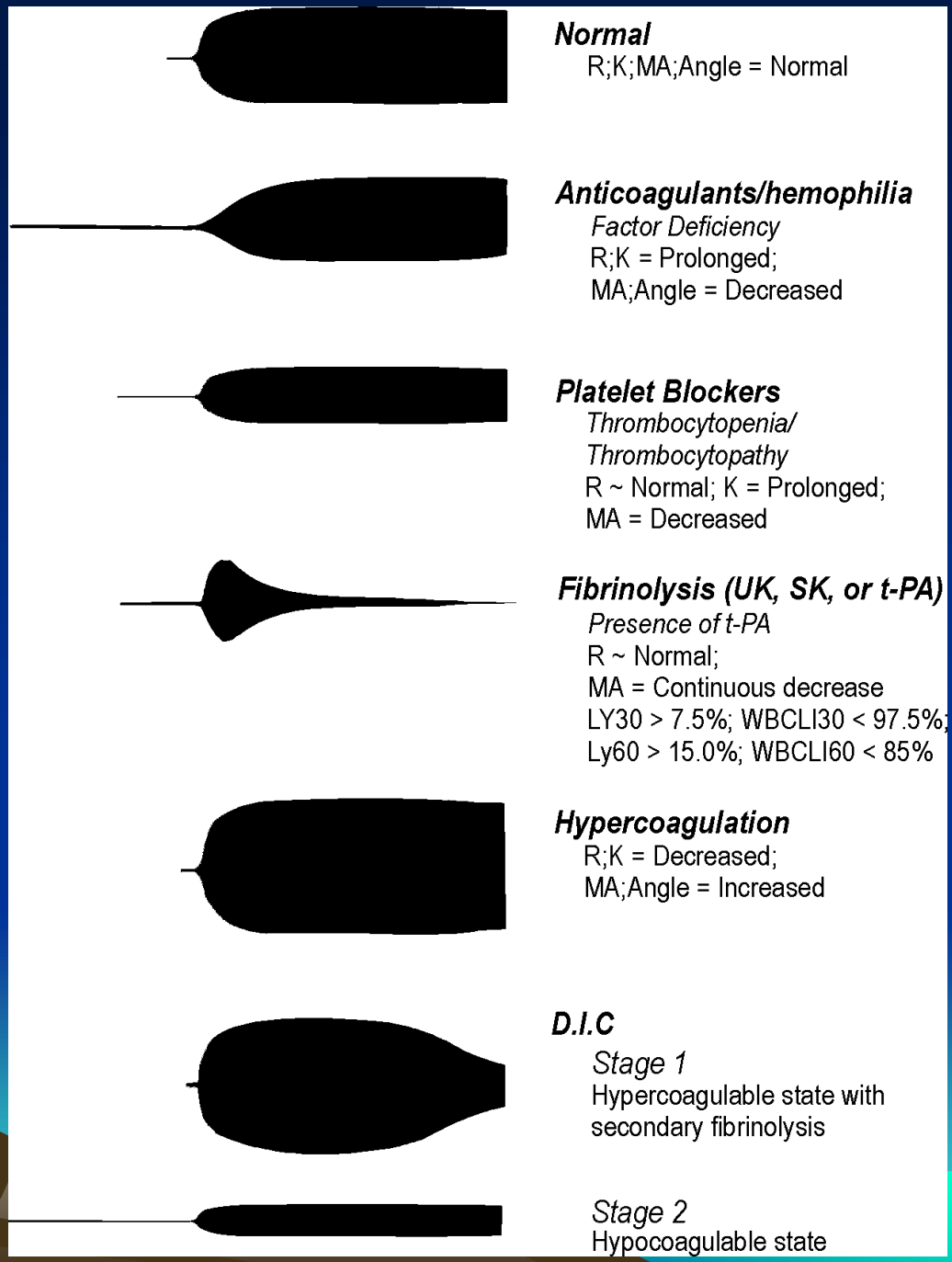
K-time is a measure of the rapidity to reach a certain level of clot strength

MA- Maximum Amplitude, is 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.

CI-Coagulation Index is linear combination of the above parameters.

LY30-LY30 measures the rate of amplitude reduction 30 minutes after MA. This measurement gives an indication of the stability of the clot.

- Pattern Recognition



Normal
R;K;MA;Angle = Normal

Anticoagulants/hemophilia
Factor Deficiency
R;K = Prolonged;
MA;Angle = Decreased

Platelet Blockers
Thrombocytopenia/
Thrombocytopathy
R ~ Normal; K = Prolonged;
MA = Decreased

Fibrinolysis (UK, SK, or t-PA)
Presence of t-PA
R ~ Normal;
MA = Continuous decrease
LY30 > 7.5%; WBCLI30 < 97.5%;
Ly60 > 15.0%; WBCLI60 < 85%

Hypercoagulation
R;K = Decreased;
MA;Angle = Increased

D.I.C
Stage 1
Hypercoagulable state with
secondary fibrinolysis

Stage 2
Hypocoagulable state

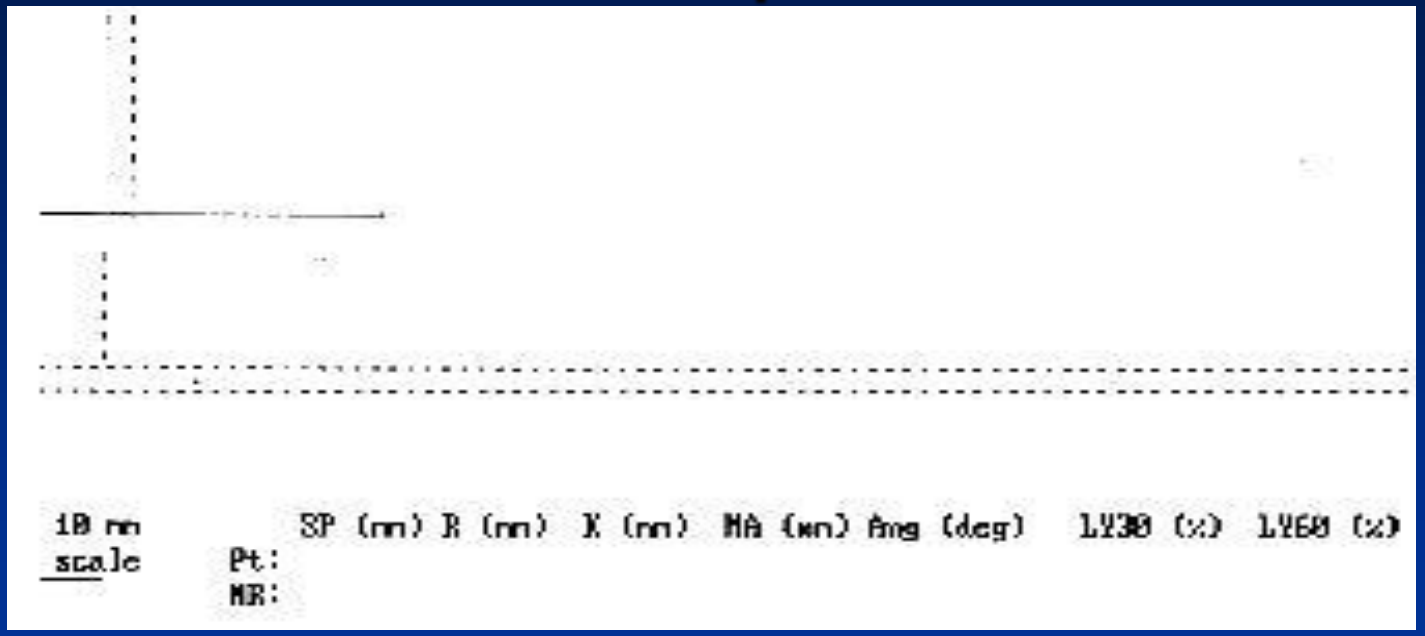
Cases where used

- Liver transplantation
- Cardiovascular surgery
- Heart assist device
- Percutaneous Transluminal Coronary Angioplasty (PTCA)
- Trauma
- Obstetrics
- ICU
- Orthopedics Ü

Post Protamine

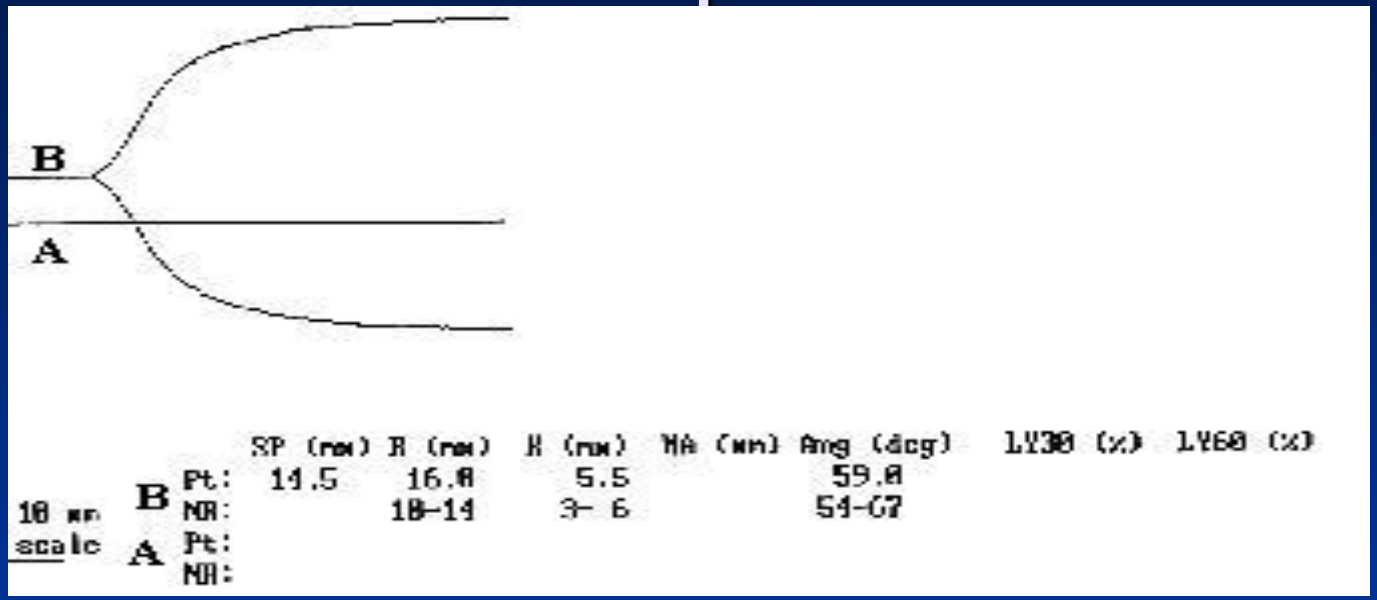
- Looking at only the R parameter, if the samples with and without heparinase are the same, the patient has received enough protamine to reverse heparin.
- If both tracings are normal and the patient is bleeding, the reason is surgical.
- If the R without heparinase is elongated and the heparinase tracing is normal and the patient is bleeding, the bleeding is due to excess of heparin.
- If the tracing with heparinase shows a coagulopathy, the patient is treated accordingly. Most likely coagulopathies will be consistent with those observed during monitoring while the patient is on the pump. Ü

Example-1



- No Clot formation
  - Very low factor levels
  - Heparin effect

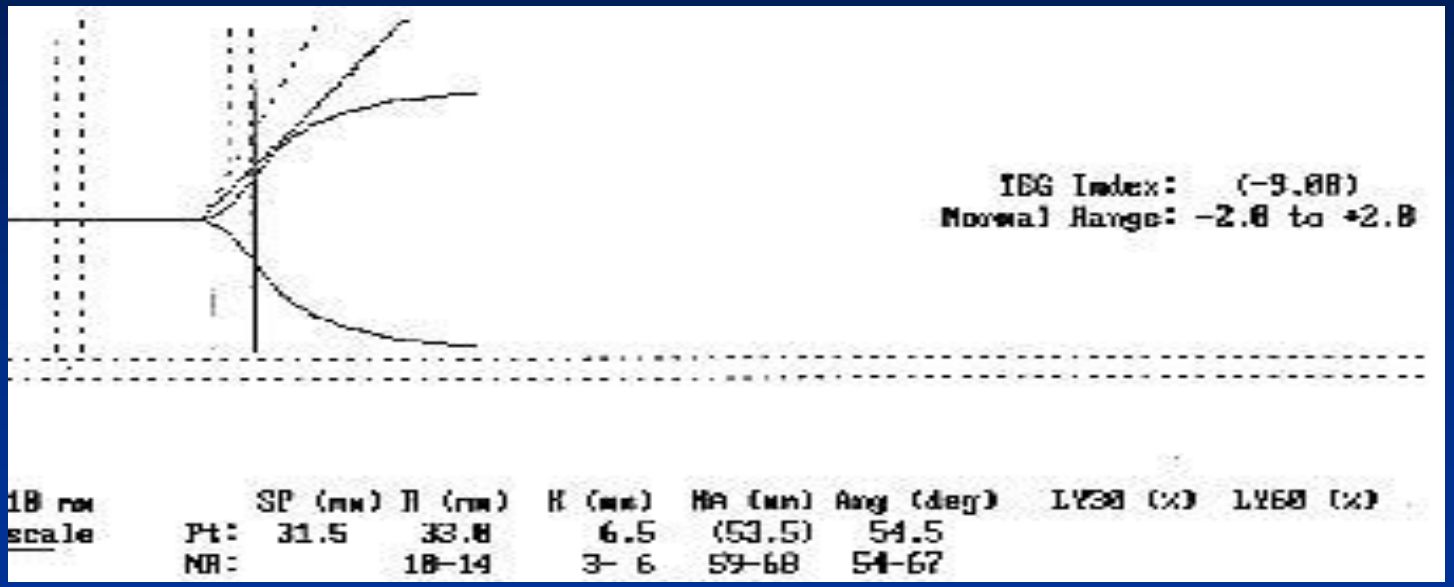
Example-2



A- No coagulation at all - Whole blood from a heparinised patient

B- Normal Curve - Whole blood after the addition of heparinise

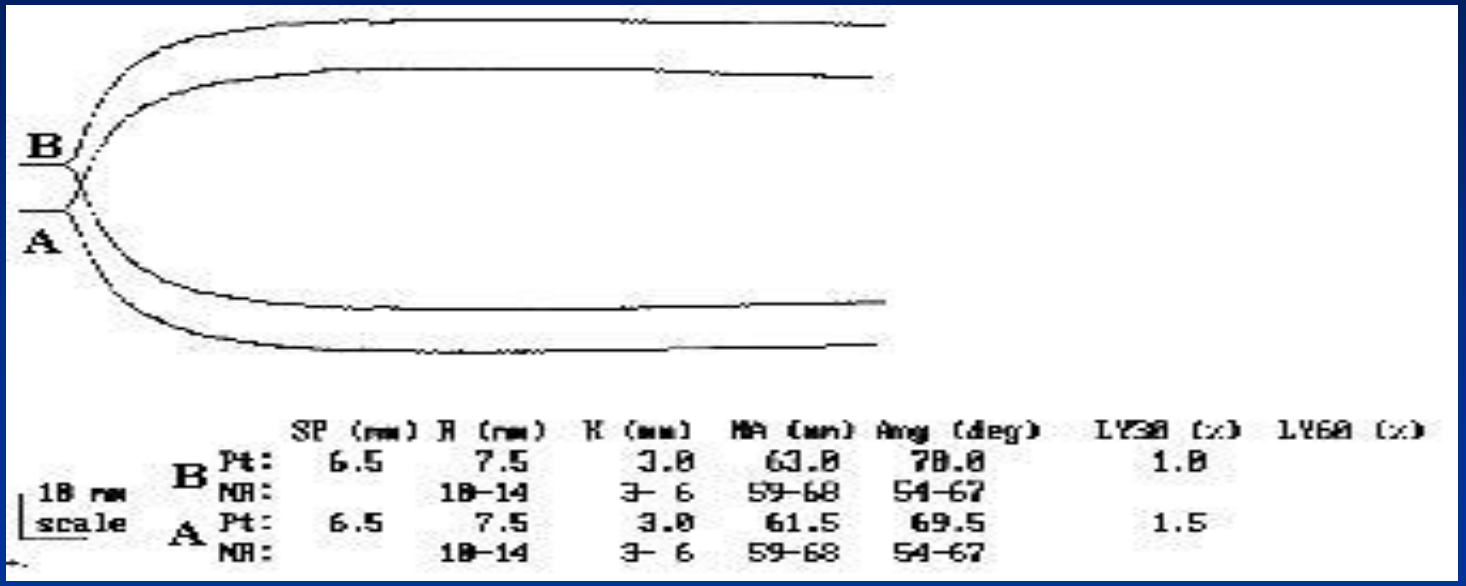
Example-3



Prolonged R value suggesting

- Factor deficiency
- Minimal heparin effect

Example-4



- Normal coagulation profile with adequate reversal of heparin by protamine, confirmed by the second trace with heparinase added

Benefits

- Advanced monitoring of haemostasis with rapid detection of many clinical conditions
- Guides transfusion requirements
- Permits point-of-care testing

ACT- Activated Clotting Time

Why Get Tested?

- To monitor heparin and other anticoagulation when undergoing cardiopulmonary bypass, coronary angioplasty.

Sample Required?

- A blood sample drawn from a vein or an artery in your arm

What is being tested?

- ACT is a clotting test that is used primarily to monitor high doses of heparin anticoagulant therapy.
- Heparin is a blood clot inhibitor that is usually given either intravenously (IV) or by injection.
- At concentrations achieved with moderate doses, heparin is monitored using the Activated partialthromboplastin time (APTT).

•High doses of heparin are given before, during, and for a short time after, open heart surgeries.

•During these operations the patients heart and lungs are often bypassed. Their blood is filtered and oxygenated outside of the body using mechanical devices.

•The bloods contact with artificial surfaces activates platelets and coagulation, initiating a sequence of steps that normally results in blood clot formation.

- ACT is a rapid test that can be performed at the patients bedside prior to surgery or other medical procedures and in or near the operating room at intervals during the surgery.

- ACT testing allows relatively rapid changes in heparin infusion, helping to achieve and maintain a constant level of anticoagulation.

- Once surgery is complete and the patient has been stabilized, heparin doses are usually decreased or reversed.

- Some ACT tests are designed to monitor lower levels of heparin while others are best at monitoring high levels of heparin.

What does the test result mean?

- The ACT is measured in seconds: the higher it is the higher the degree of clotting inhibition.
- During surgery, the ACT is kept above a lower limit, a limit at which most people will not form blood clots.
- It will vary from hospital to hospital and depends to some degree on the method used to determine ACT.

Reference Intervals

- Whole blood reference interval for High Range cartridges is 100-140 seconds

- Whole blood reference interval for Low Range cartridges is 90-130 seconds

Arterial Blood Gas(ABG)

- An arterial blood gas (ABG) test measures the acidity (pH) and the levels of oxygen and carbon dioxide in the blood from an artery.

- This test is used to check how well your lungs are able to move oxygen into the blood and remove carbon dioxide from the blood.

ABG

- Arterial blood gases (ABG), a clinical test that involves measurement of the pH of arterial blood and the amount of oxygen and carbon dioxide dissolved in arterial blood, is routinely used in the diagnosis and monitoring of predominantly critically/acutely ill patients being cared for in hospital emergency rooms and intensive care units. The test allows assessment of two related physiological functions: pulmonary gas exchange and acid-base homeostasis. This is the second of three articles intended to explain the clinical value of ABG to those with little or no experience of the test. The first article focused on the physiological aspects that underpin an understanding of patient ABG results. The concepts of pH, acid, base and buffer were explained, and the parameters generated during ABG were defined and related to pulmonary gas exchange and acid-base homeostasis. In this second article attention turns to the clinical significance of abnormal ABG results, specifically abnormality in three ABG parameters (pH, *p*CO2(a) and bicarbonate) that determine patient acid-base status. A major focus of the article will be an explanation of the four classes of acid-base disturbance: respiratory acidosis, metabolic acidosis, respiratory alkalosis and metabolic alkalosis. The causes and physiological consequence of each of these disturbances will be discussed.

- As blood passes through your lungs, oxygen moves into the blood while carbon dioxide moves out of the blood into the lungs.

- An ABG test uses blood drawn from an artery, where the oxygen and carbon dioxide levels can be measured before they enter body tissues.

Why It Is Done

- To check for severe breathing problems and lung diseases, such as asthma, cystic fibrosis, or chronic obstructive pulmonary disease (COPD).
- See how well treatment for lung diseases is working.
- To find out if you are receiving the right amount of oxygen when you are using oxygen in the hospital.
- To measure the acid-base level in the blood of people who have heart failure, kidney failure, uncontrolled diabetes, sleep disorders, severe infections, or after a drug overdose.

Sample Required

- A 3ml blood gas syringe (Dry heparin Cap) and sample is drawn up from the artery.

- 1 to 2ml arterial blood sample

Components of the Arterial Blood Gases

- pH

Measurement of acidity or alkalinity , based on the hydrogen (H) ions present.

The normal range is 7.35 to 7.45

Remember: pH>7.45= alkalosis

pH<7.35= acidosis

PO2

The partial pressure of oxygen that is dissolved in the arterial blood

The normal range is 80 to 100 mmHg

SaO2

The arterial oxygen saturation.

The normal range is 95% to 100%.

- B.E.
- The base excess indicates the amount of excess or insufficient level of bicarbonate in the system.
- The normal range is -2 to +2 mEq/Litre
- Remember:
- A negative base excess indicates a base deficit in the blood

Reference Interval

- PH Adults 7.35 – 7.45
- PCO_2 35 – 48mmHg
- pO2 83 – 108mmHg
- HCO_3 - 22 – 26mmol/L
- $BE_{(ecf)}$-2.0 – 3.0mmol/L
- 02SAT-94 – 98%
- Na+-138 – 145mmol/L
- K+-3.6 – 5.2mmol/L
- Ca++ 1.16 – 1.32mmol/L
- Cl- 98 – 107mmol/L
- Glucose-3.5 – 7.7mmol/L
- Haemoglobin (Adult)130-180 Male
- 115-165 Female
- FIO2-21 – 100%

- **7 Steps for successful blood gas analysis**
- Consider the clinical setting
- Look at PH
- Who is the culprit?...Metabolic/Respiratory
- If Respiratory….acute or chronic
- If Metabolic acidosis,
- Anion gap up and/or normal or both?
- Correlate clinically

Hemocue

- Patient end testing for the haemoglobin
- Useful tool for determining if patient needs transfusion in theatre
- Sampling done by finger prick method, venous blood or arterial blood

Haemocue

Reference Intervals:

- Cord Blood 135-225 g/L
- Adult Female 115-165g/L
- Adult Male 130-180g/L
- 1-2 yrs 105-135g/L
- 2-6 yrs 107-135g/L
- 6-12yrs 112-152g/L
- 12-14yrs 130-160g/L

Glucose meter

- Patient end testing for the blood glucose
- Useful tool for determining if patient needs transfusion in theatre
- Sampling done by finger prick method, venous blood or arterial blood

Glucose

- Fasting glucose:

Normal 3.5 – 5.5 mmol/L

>7 Diabetic

- Non Fasting:

Normal 3.5 – 7.7 mmol/L

>11.1 mmol/L Diabetic

Thanks For Your Patience

