



Department of Medical Laboratory Techniques
Hematology / Practical
Dr. Karrar Salih Mahdi



Lecture 13

prothrombin time and partial thromboplastin time

Prothrombin time (PT)

This test measures the formation of a blood clot in vitro, as it estimates the time required for clot formation after exposure to tissue factors.

That is measured efficiency and concentration coagulations factor include 7, 10, 5, 2 and 1, in extrinsic clotting pathway.

Why we make this analysis?

1-bleeding disorder that lasts for a long time, 2-coagulation abnormalities
3-bleeding with urine, 4-liver problems, 5-before surgery, 6-Vitamin K deficiency, 7-monitoring patients receiving anticoagulant therapy

Procedure:

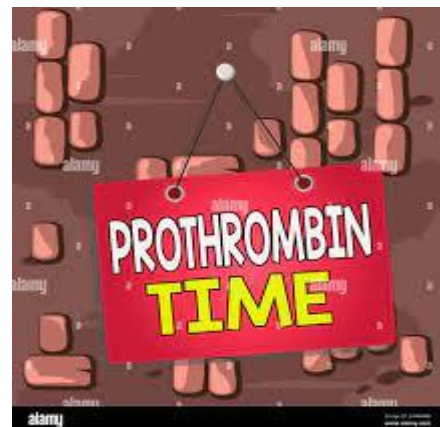
- 1-Taking a blood sample by sodium citrate tube.
- 2-Sample preparation using centrifugation 3000 rpm for 15 minutes or 1500 rpm for 30 minutes to obtain plasma free of platelets.
- 3-Addition 50 µl of plasma to the test tube
- 4-Addition 50 µl of reagent 1 to plasma
- 5-Incubate this mixture at 37 °C in a water bath for 3 minutes
- 6-Then addition 50 µl of reagent 2 to the previous mixture
- 7-Using watch stop to determine time required for clotting

Reagent 1= activation partial thromboplastin time aptt + sodium oxide

Reagent 2= CaCl_2

Normal value:

11-14 seconds





Department of Medical Laboratory Techniques
Hematology / Practical
Dr. Karrar Salih Mahdi



Lecture 13

prothrombin time and partial thromboplastin time

Partial thromboplastin time (PTT)

It is also known as the activated partial thromboplastin time (aPTT or APTT), a historical name for this measure is the kaolin-cephalin clotting time (KCCT), which making to test the efficiency of coagulation factors include 8, 9, 11 and 12 in intrinsic clotting pathway.

When PTT elevated that refer to:

- 1-patient take heparin, or sample contaminant with heparin
- 2-patient take coagulations therapy (urokinase or streptokinase)
- 3-coagulation factors deficiency
- 4-liver disease
- 5-sepsis
- 6-antibody against coagulation factors.

Procedure:

- 1-separation plasma sample by using sodium citrate tube.
- 2-gently mixing of 100 μ l from reagent 1 and 100 μ l of plasma sample, in the water bath at 37 °C for 3 minutes.
- 3- then addition 100 μ l from reagent 2 and determine time of clotting by watch stop.

Reagent 1= phospholipid + clot activator.

Reagent 2= CaCl_2

Normal values:

- 1 - 4 days (31.5 ----- 54.3 seconds).
- 5 - 30 days (25.4 -----59.8 seconds).
- 30 - 90 days (32 ----- 55.2 seconds).
- 90 - 180 days (28.1 ----- 42.9 seconds).
- More than 180 days (26.1 ----- 40.3 seconds).



Department of Medical Laboratory Techniques
Hematology / Practical
Dr. Karrar Salih Mahdi



Lecture 13

prothrombin time and partial thromboplastin time

PT and PTT important to determine 95% of coagulation problems.

International normalization ratio (INR)

It is a laboratory measurement of how long it takes blood to form a clot. It is used to determine the effects of oral anticoagulants on the clotting system. In an attempt to overcome the variability between laboratories, prothrombin times were initially expressed as a ratio of the prothrombin time of a control value.

$$INR = \frac{PT \text{ sample}}{PT \text{ control}} \times ISI$$

ISI= international sensitization index.

The ISI is a numerical value representing the responsiveness of any given commercial system relative to the international standard. It takes into account the variability in results obtained using different commercial systems in calculating the result. In this way, results from different laboratories and countries can be compared more readily.

Why do we monitor the INR?

We regularly monitor the INR of people using warfarin in order to balance the risk of excessive bleeding (when the INR is too high, meaning that the blood is too thin) against the risk of clotting or thrombosis (when the INR is too low or the blood is too thick). INR values over 4.5 increase the risk of major haemorrhage (bleeding), and an INR less than 2 increases the risk of thromboembolism (formation of blood clots within the blood vessels) and associated conditions such as heart attack and stroke.

Reference:

Hoffbrand AV, Steensma DP. Hoffbrand's essential haematology. John Wiley and Sons; 2019 Dec 31.

Kruse-Jarres, R., Singleton, T. C., & Leissinger, C. A. (2014). Identification and basic management of bleeding disorders in adults. *The Journal of the American Board of Family Medicine*, 27(4), 549-564.



Department of Medical Laboratory Techniques
Hematology / Practical
Dr. Karrar Salih Mahdi



Lecture 13

prothrombin time and partial thromboplastin time

APTT

V E R S U S

PTT

aPTT (activated partial thromboplastin time) refers to a test of activated blood coagulation used to evaluate the clotting factors of the intrinsic pathway

An activator is used

Reference range is 30-40 seconds

Reference range is narrowed by adding an activator

More than 70 seconds signifies spontaneous bleeding

Measures factors such as V, VIII, IX, X, XI & XII

More sensitive to heparin

Evaluates bleeding disorders and heparin therapy

PTT (partial thromboplastin time) refers to a test used to measure the time taken for the blood clotting in order to diagnose bleeding problems

An activator is not used

Reference range is 60-70 seconds

Reference range is the regular time of blood clotting

More than 100 seconds signifies spontaneous bleeding

Measures factors such as VIII, IX, X, & XII

Less sensitive to heparin

Evaluates the intrinsic pathway as well as the common pathway