# LABORATORY APPROACH TO BLEEDING DISORDERS

**DR NISHANTH**

**PG 1ST YEAR**

**DEPARTMENT OF PATHOLOGY**

# WHEN IS THE LAB REQUIRED TO INVESTIGATE FOR A POSSIBLE BLEEDING DISORDER ?

- Clinically suspected bleeding tendency

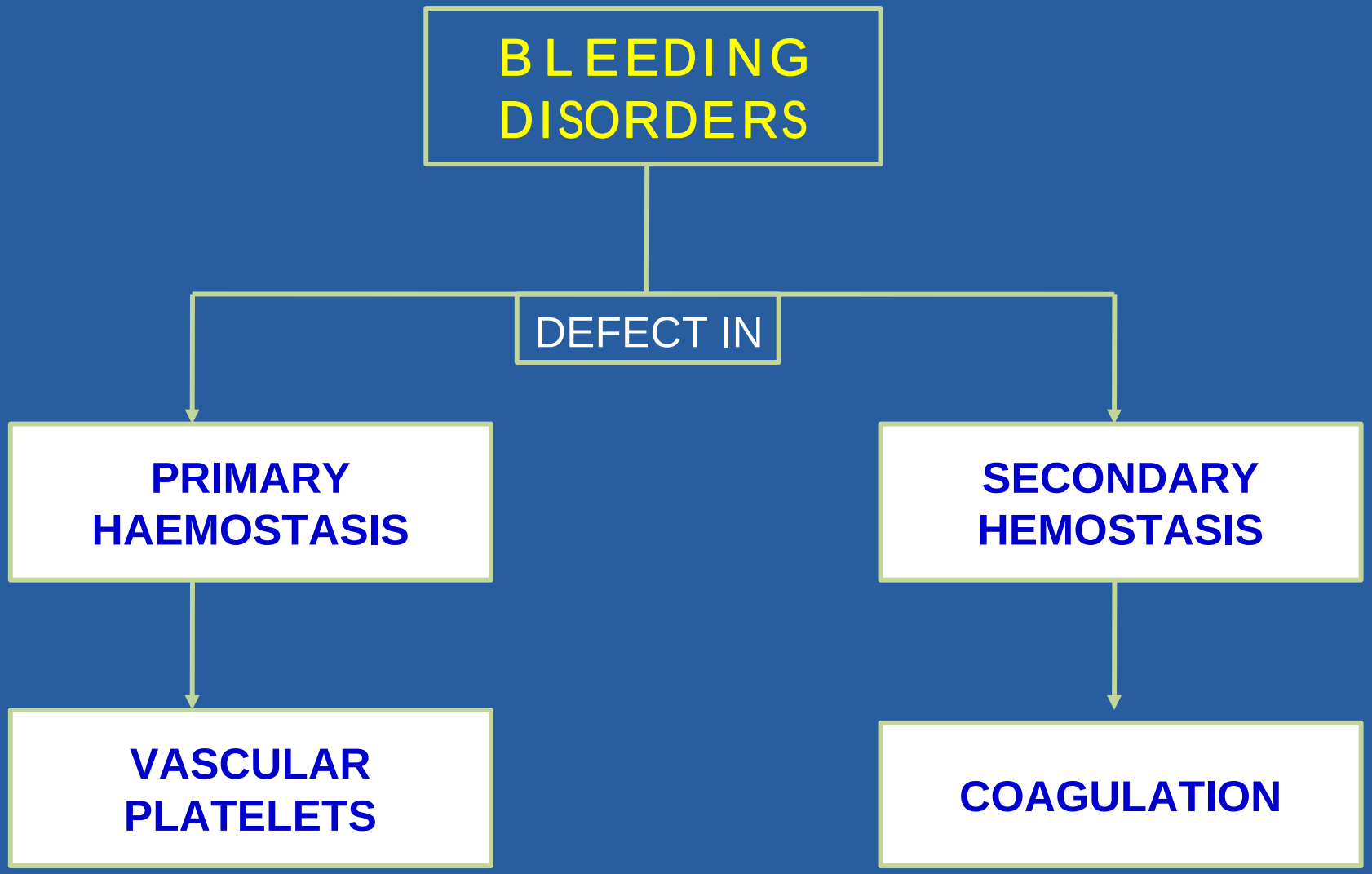
  **H/O bleed following trivial trauma**

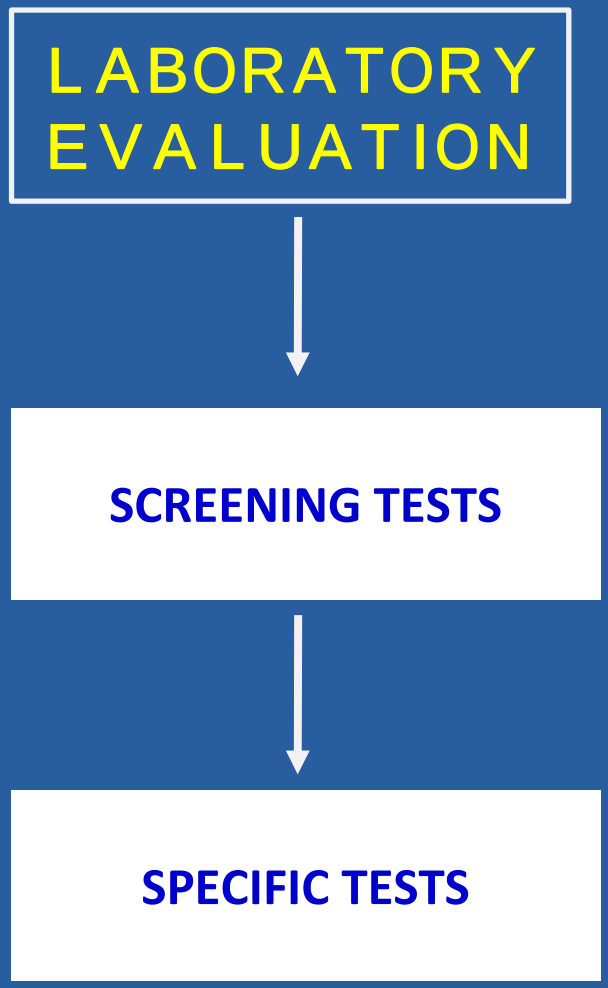
- Following up an abnormal first line test

  **Incidental/ intended testing**

- Intractable bleed

  **Surgical/ Non surgical trauma**


BLEEDING DISORDERS
DEFECT IN
PRIMARY HAEMOSTASIS
SECONDARY HEMOSTASIS
VASCULAR PLATELETS
COAGULATION


LABORATORY EVALUATION
SCREENING TESTS
SPECIFIC TESTS

# SCREENING TESTS

# SCREENING TESTS

- Simple to perform, rapid
- Assess the integrity of primary or secondary haemostasis
- Do not pinpoint the nature of defect

- Complete blood count and blood smear
- Platelet count
- Mean platelet volume
- Clotting time
- Prothrombin time
- Activated partial thromboplastin time
- Thrombin time
- Platelet function analyser-100

# PRIMARY HAEMOSTASIS



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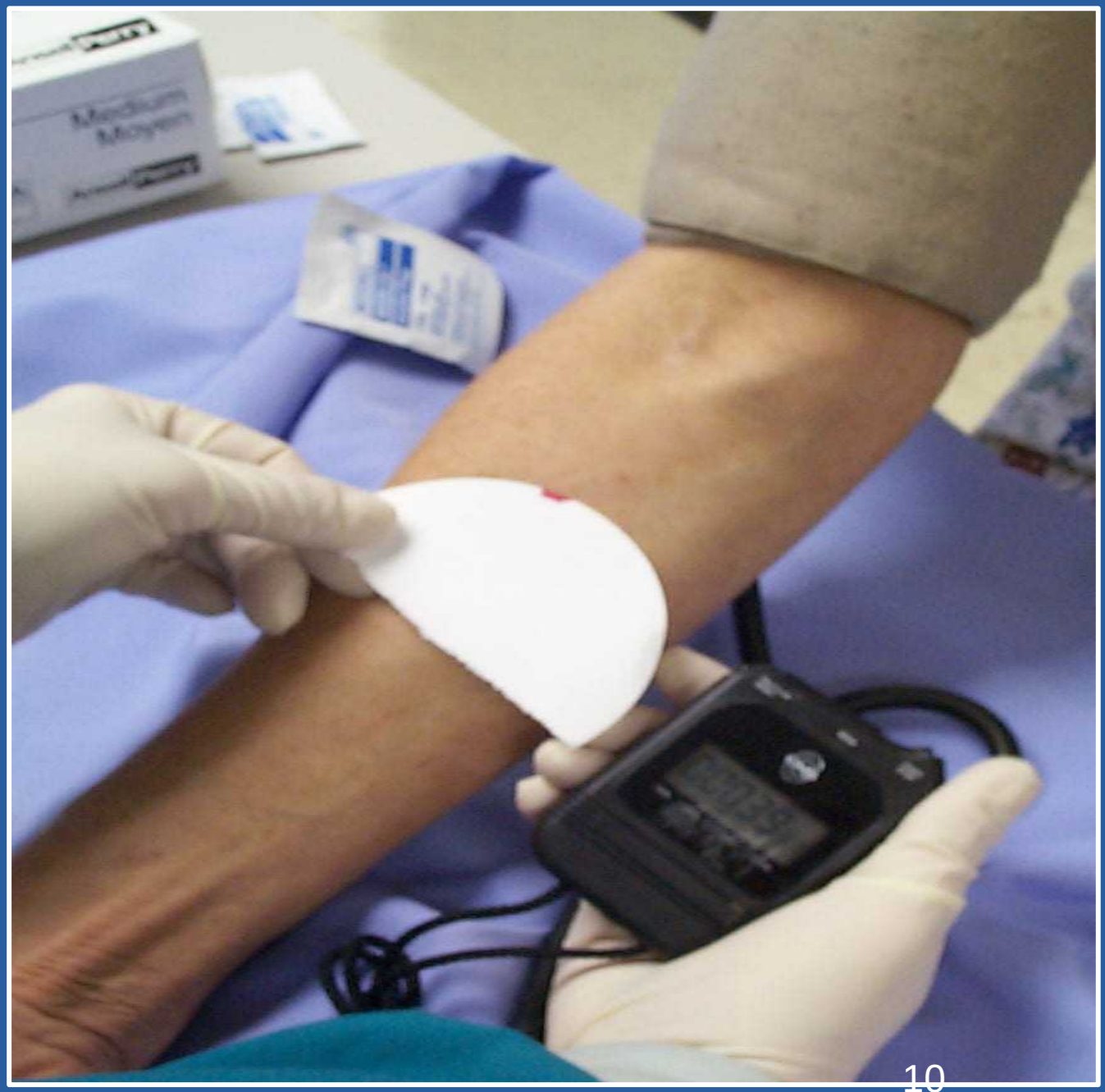
# SCREENING TEST FOR PRIMARY HAEMOSTASIS

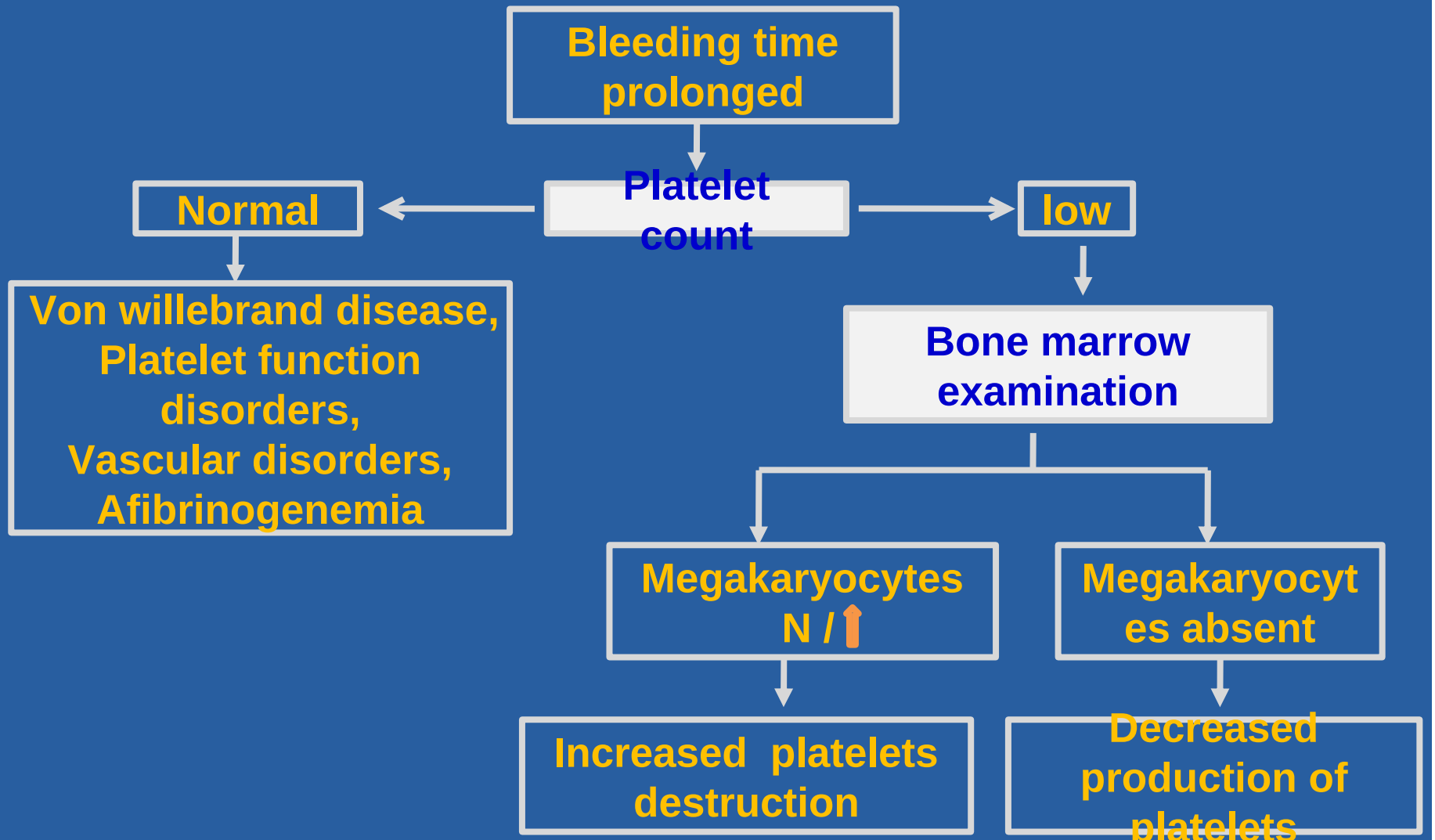
| Test | Assessment |
|---|---|
| • Bleeding time | Platelet and vascular phases |
| • PFA-100 system | Platelet function |
| • Platelet count | Quantitation of platelets |
| • Blood smear | 1] Quantitative and morphological abnormalities<br>2] Detection of underlying heamatological disorder |

# SCREENING TEST FOR PRIMARY HAEMOSTASIS

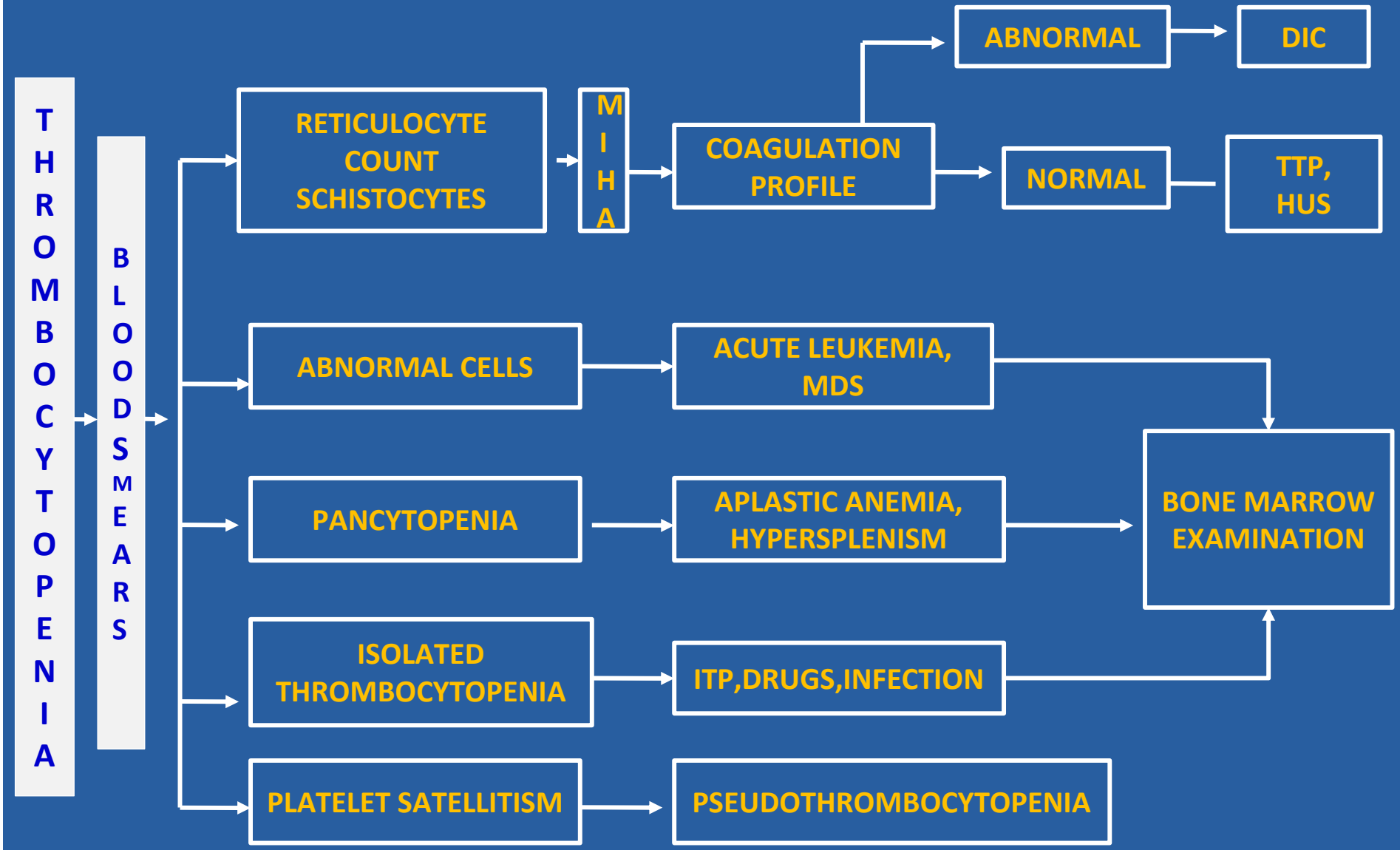
- **Bleeding time :** Normal 2 - 7 minutes
- **Platelet count :** Normal 1.5 - 4 lakh/cmm


Medium
Moyen

# EVALUATION OF PROLONGED BLEEDING TIME

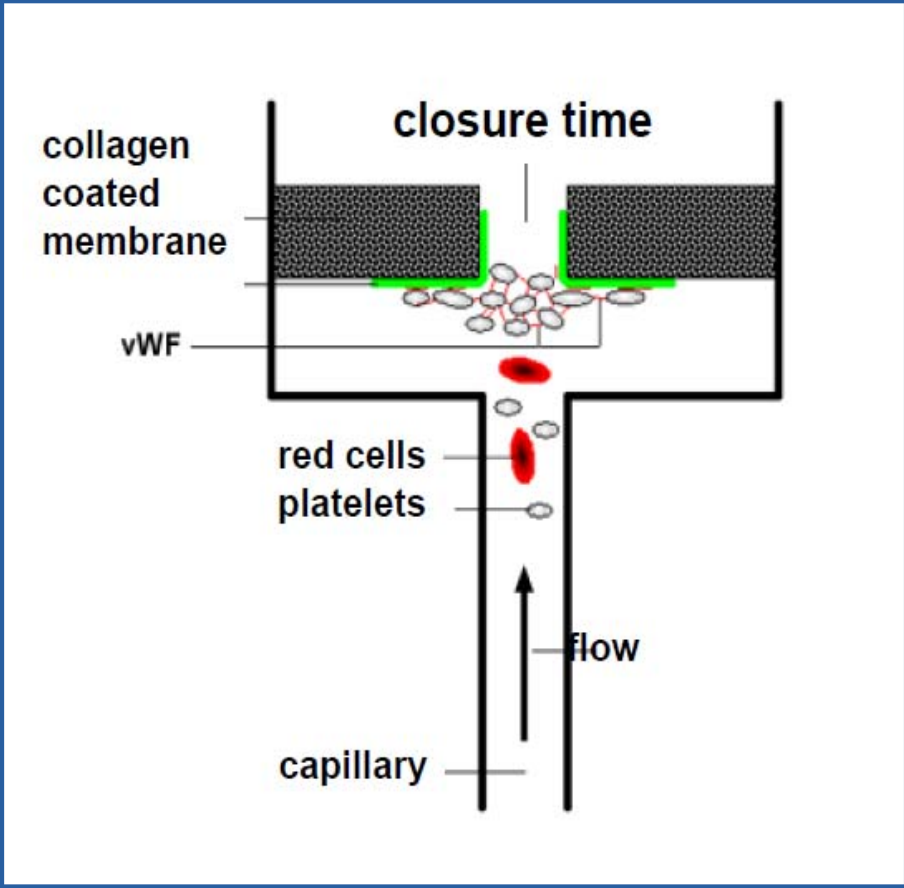


# EVALUATION OF THROMBOCYTOPENIA



# PLATELET FUNCTIONAL ANALYSER-100 (PFA-100)

- Used to assess platelet adhesion and aggregation
- Normal closure :1-3 min
- If results abnormal then platelets aggregation studies is definitive



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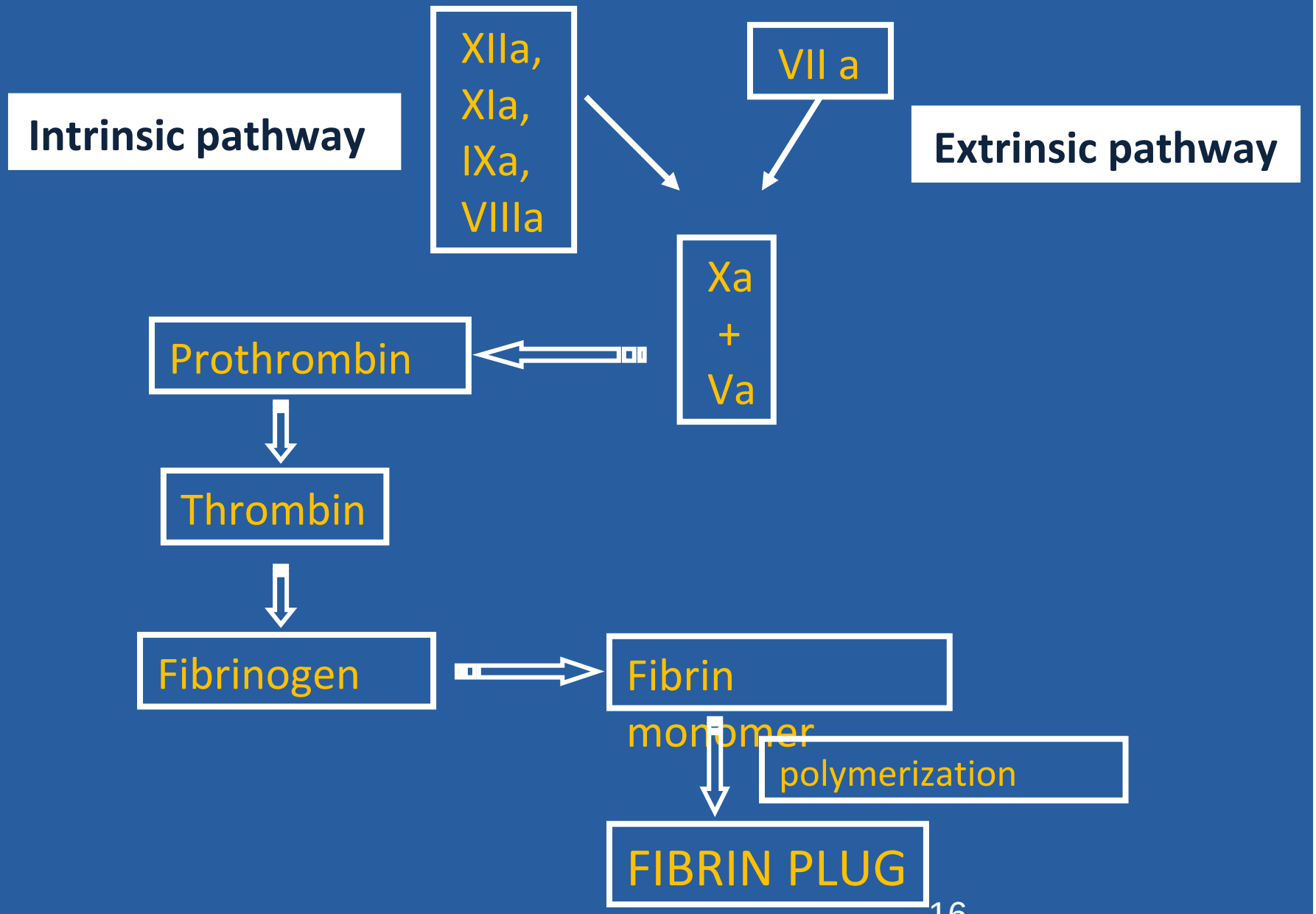
# SECONDARY HEMOSTASIS

# COLLECTION OF BLOOD SAMPLE FOR COAGULATION STUDIES

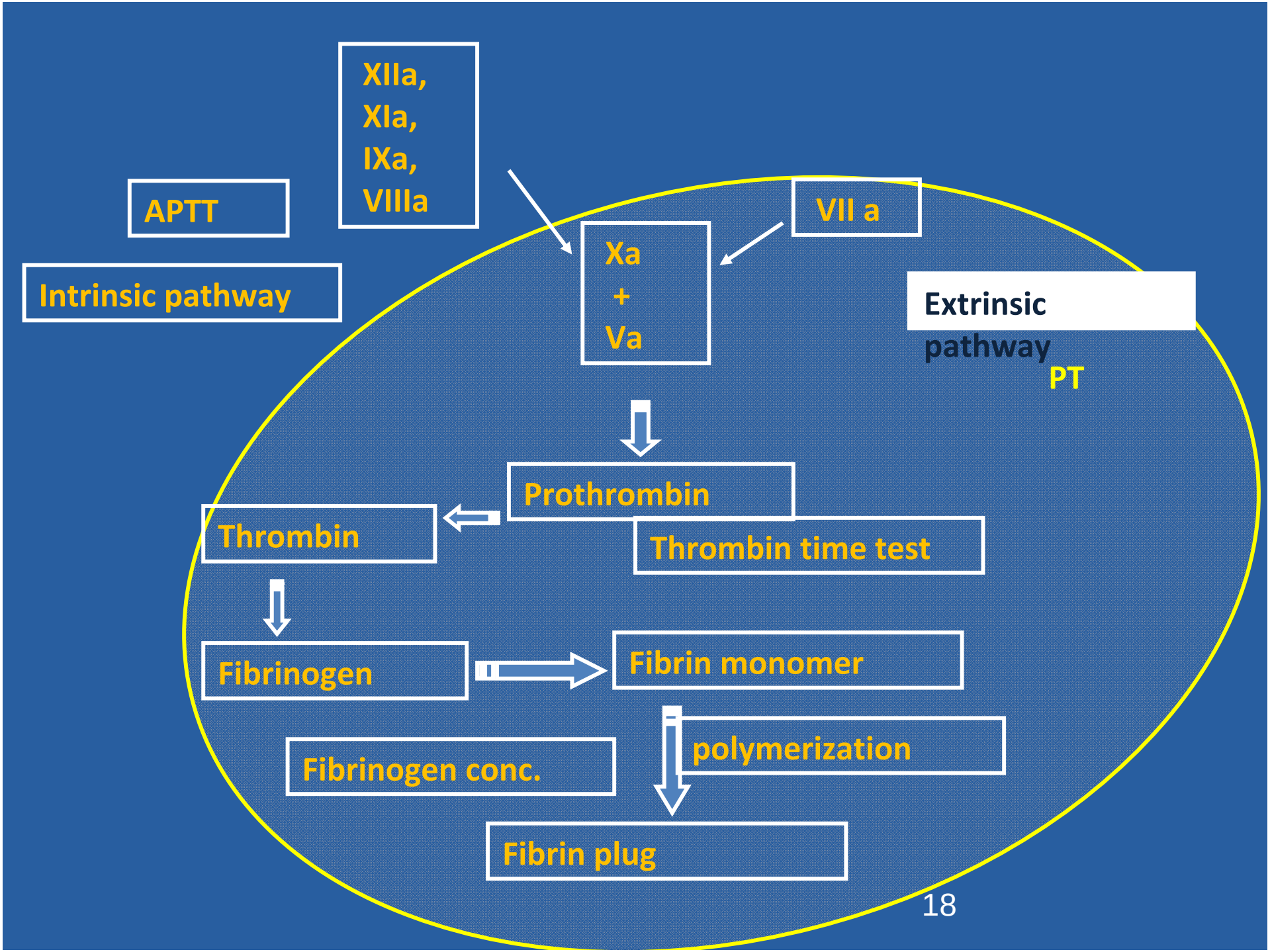
- Venous blood sample.
- Should not be collected from indwelling catheter – heparin.
- Glass syringe/glass tube should not be used – contact factor.
- Anticoagulant - Aqueous trisodium citrate(3.2%)
- Proportion blood to anticoagulant - 9:1
- Platelet poor plasma – cetrifugation at 3000 rpm for 15 to 30 mins.
- Studies done within 2hours of collection of sample

# MECHANISM OF NORMAL CLOT FORMATION



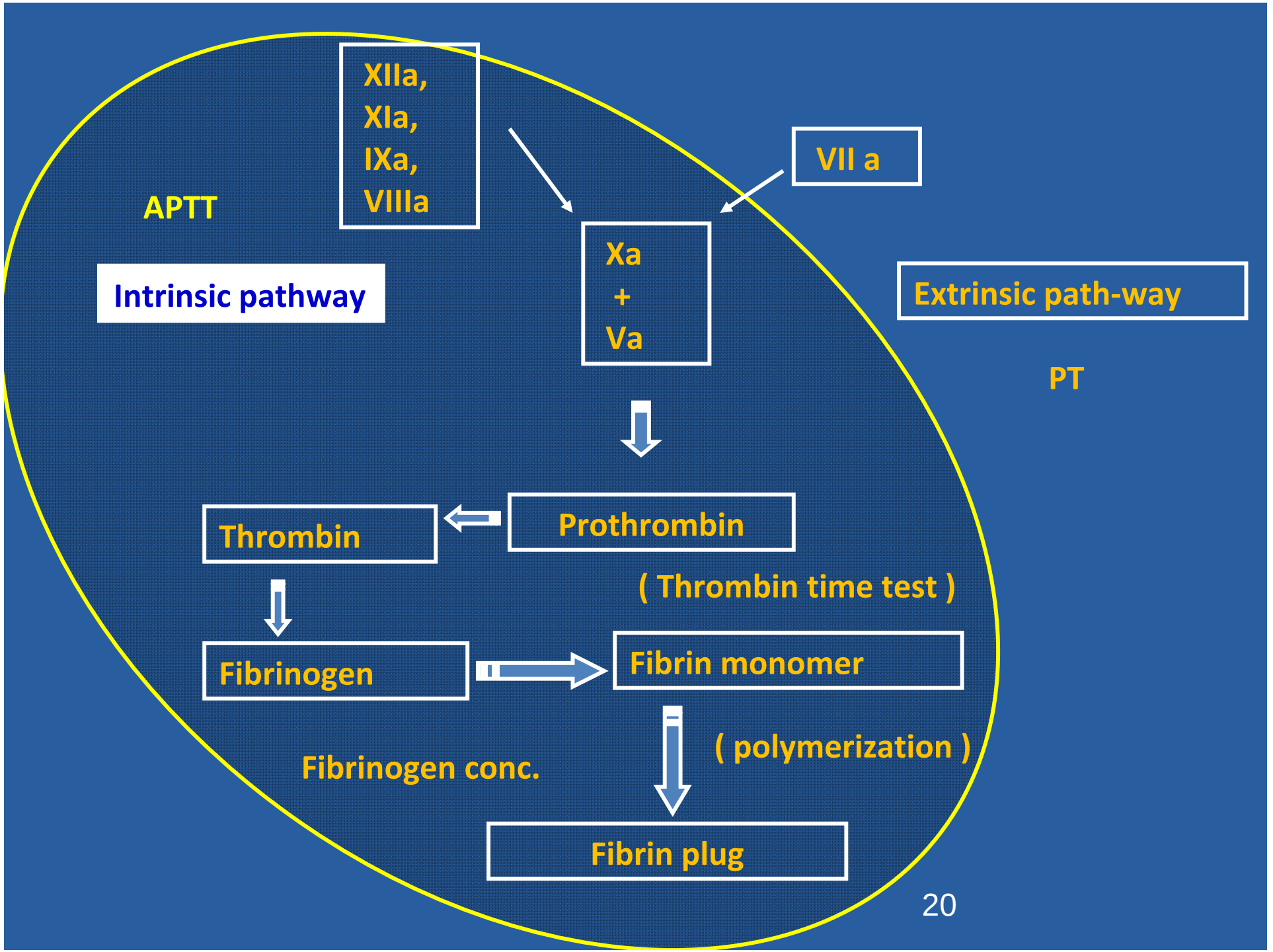
# SCREENING TEST FOR SECONDARY HAEMOSTASIS

| Test | Assessment |
| --- | --- |
| Clotting time(CT) | Crude test of coagulation phase |
| Prothrombin time(PT) | Extrinsic and common pathway |
| Activated partial thromboplastin time(APTT) | intrinsic and common pathway |


XIIa,
XIa,
IXa,
VIIIa
APTT
Intrinsic pathway
VII a
Xa
+
Va
Extrinsic
pathway
PT
Prothrombin
Thrombin
Thrombin time test
Fibrinogen
Fibrin monomer
polymerization
Fibrinogen conc.
Fibrin plug

# PROTHROMBIN TIME ( PT )

- Normal range : 11-16 sec
- Prolonged in 1) Treatment with oral anticoagulants
  2) Liver diseases
  3) Vitamin k deficiency
  4) DIC
  5) Inherited deficiency of extrinsic or common pathway


XIIa,
XIa,
IXa,
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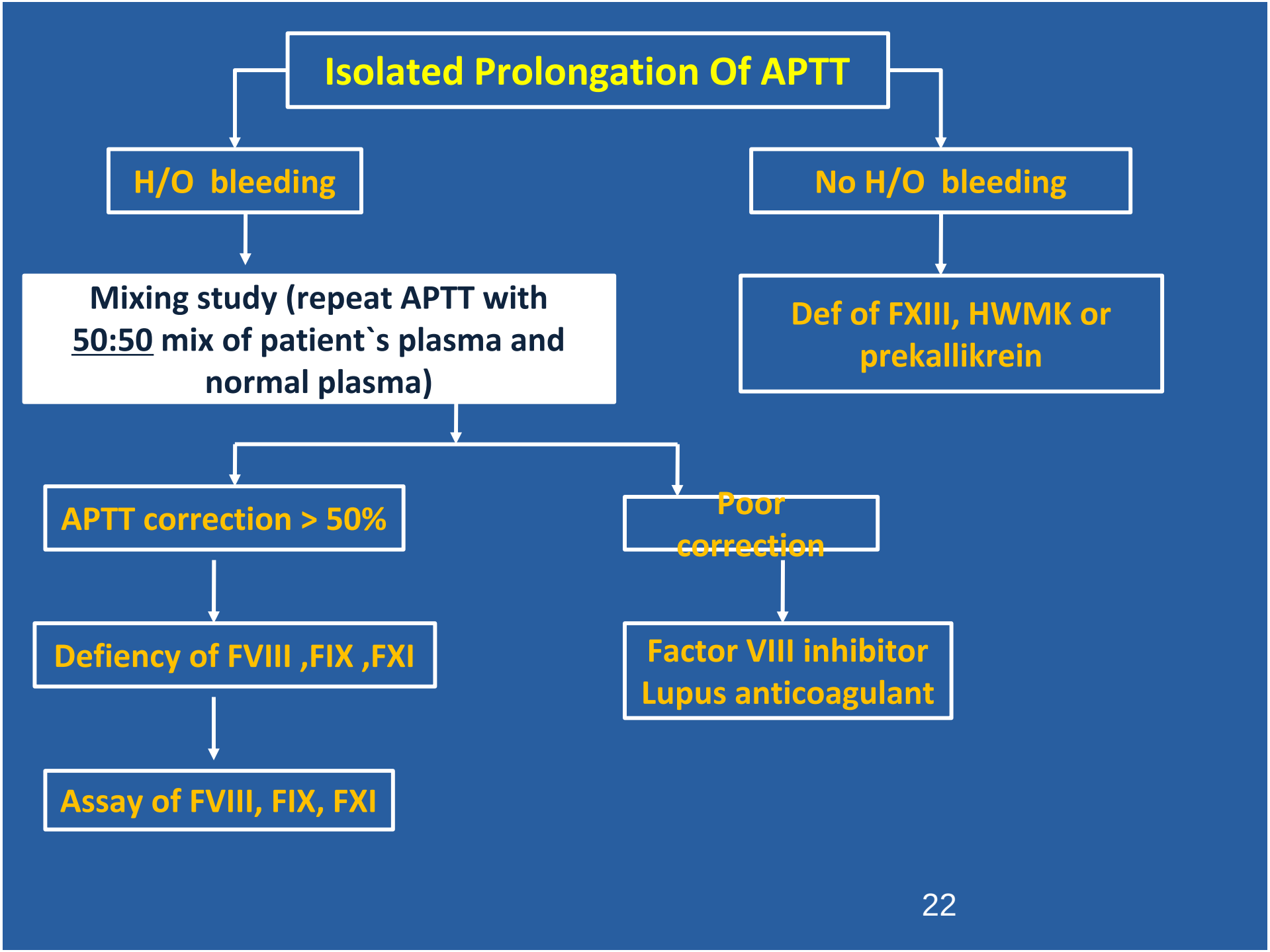
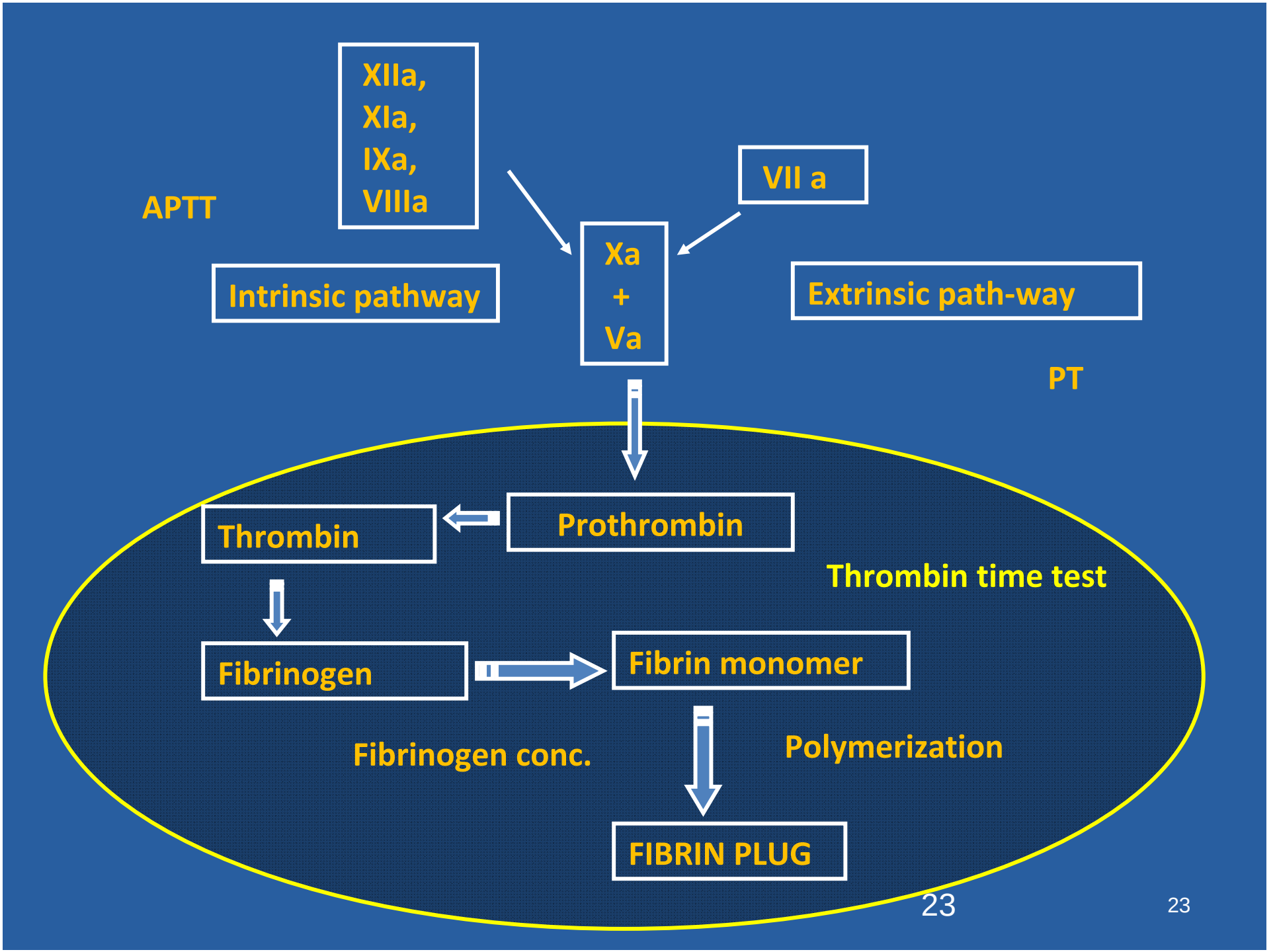
APTT
Intrinsic pathway
VII a
Xa
+
Va
Extrinsic path-way
PT
Thrombin
Prothrombin
( Thrombin time test )
Fibrinogen
Fibrin monomer
Fibrinogen conc.
( polymerization )
Fibrin plug

# ACTIVATED PARTIAL THROMBOPLASTIN TIME - APTT

- Normal range : 30 to 40 seconds
- Prolonged in 1) Hemophilia A or B
  2) Circulating inhibitors
  3) DIC
  4) Heparin therapy
  5) Liver disease
  6) Vitamin k deficiency


Isolated Prolongation Of APTT
H/O bleeding
No H/O bleeding
Mixing study (repeat APTT with 50:50 mix of patient`s plasma and normal plasma)
Def of FXIII, HWMK or prekallikrein
APTT correction > 50%
Poor correction
Defiency of FVIII ,FIX ,FXI
Factor VIII inhibitor Lupus anticoagulant
Assay of FVIII, FIX, FXI


XIIa,
XIa,
IXa,
VIIIa
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VII a
Intrinsic pathway
Xa
+
Va
Extrinsic path-way
PT
Thrombin
Prothrombin
Thrombin time test
Fibrinogen
Fibrin monomer
Fibrinogen conc.
Polymerization
FIBRIN PLUG



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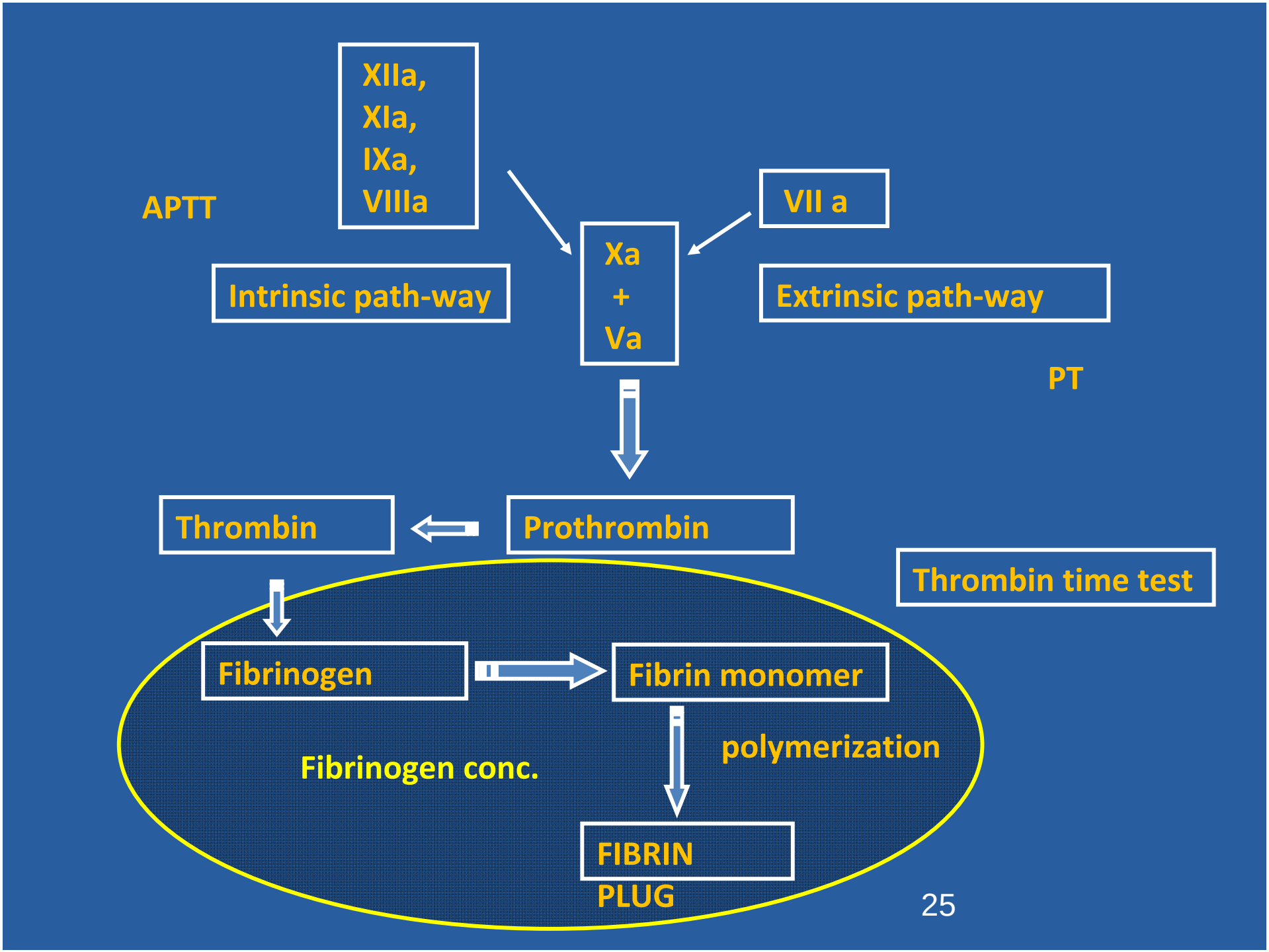
# THROMBIN TIME ( TT )

- Normal range : 8 to 12 seconds
- Prolonged in 1) Afibrinogenaemia
  2) Presence of heparin in plasma
  3) Chronic liver disease
  4) Fibrinogen/fibrin degradation products


XIIa,
XIa,
IXa,
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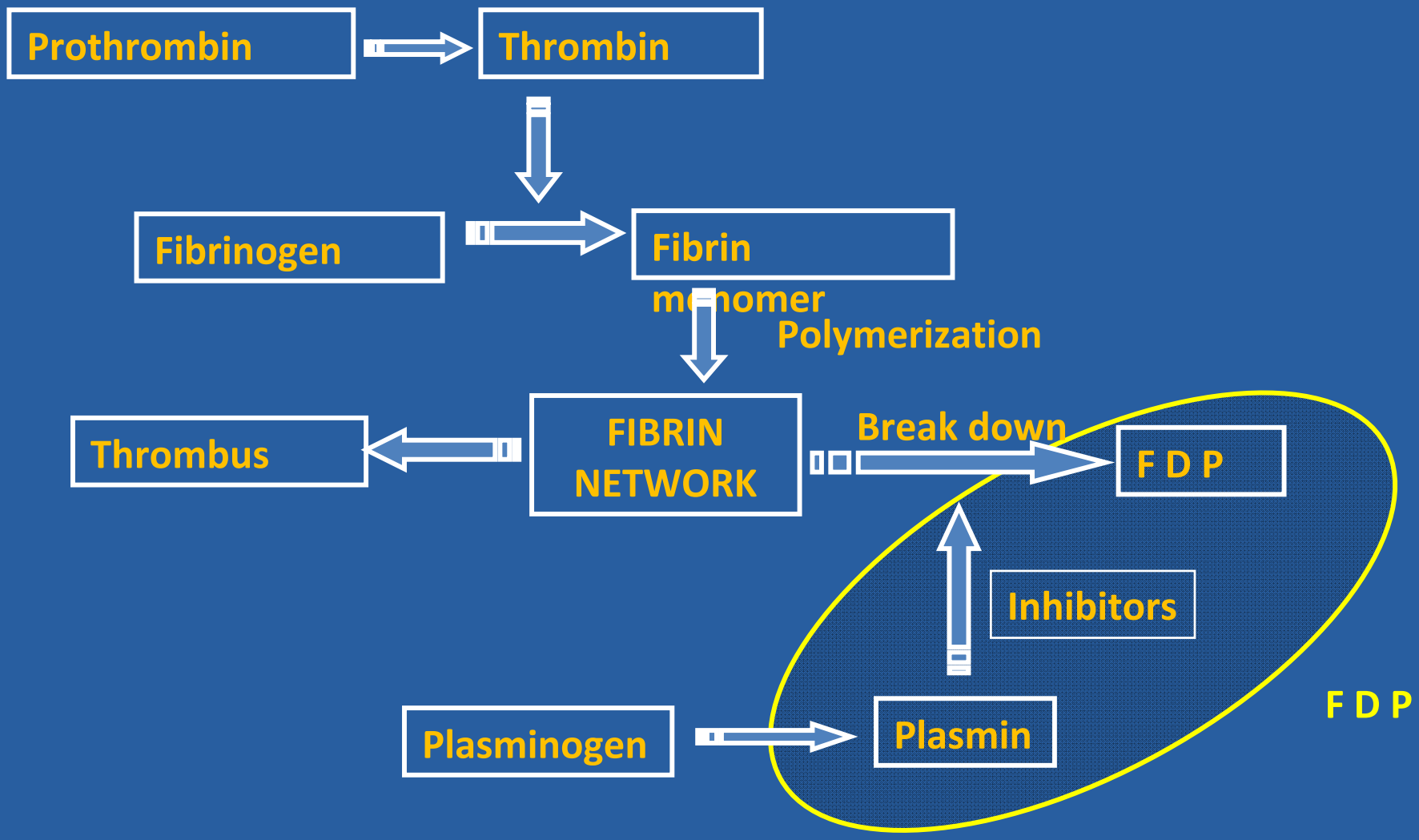
VII a
Intrinsic path-way
Xa
+
Va
Extrinsic path-way
PT
Thrombin
Prothrombin
Thrombin time test
Fibrinogen
Fibrin monomer
polymerization
Fibrinogen conc.
FIBRIN
PLUG

# FIBRINOLYTIC PATHWAY



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# SPECIFIC TESTS

# SPECIFIC TESTS FOR PRIMARY HAEMOSTASIS

- Platelet aggregation studies
- Flow cytometric detection of glycoprotein on platelet surface

# SPECIFIC TEST FOR COAGULATION PHASE

- Mixing studies
- Coagulation factor assays
- Thromboplastin generation test
- Quantitative estimation of fibrinogen

# TESTS FOR FIBRINOLYSIS

- Detection of fibrinogen/fibrin degradation products(FDPs)
- Detection of D-dimers

# In SUMMARY..

| BT | PLT C. | PT | APTT | COMMON CAUSES |
|---|---|---|---|---|
| ↑ | N | N | N | VWD, asprin, storage pool defect |
| ↑ | D | N | N | Secondary drugs, ITP |
| N | N | ↑ | N | Oral anicoagulants, vitamin k defiency, def of F VII |
| N | N | N | ↑ | Heparin, haemophillia A or B, VWD, inhibitors |
| N | N | ↑ | ↑ | Heparin, liver disease, vit k deficiency, oral anti coagulant, liver disease |
| ↑ | D | ↑ | ↑ | DIC, Liver disease |
| N | N | N | N | Mild VWD, vascular disorder, platelet function defect, FXIIIdefiency |

# REFERENCES


1. *Wintrobe`s clinical hematology;11 edition;2nd volume;chapter 51; 1512-1528*
2. *Essentials of haematology; Kwathalkar 2nd edition chapter 13; 382-398*
3. *Essentials of clinical pathology; Kwathalkar; chapter 29;288-331*
4. *Atlas and text of hematology; Tejindar singh; 3rd edition; chapter 16; 427.*

# THANK YOU