DVT in pregnancy and post partum period

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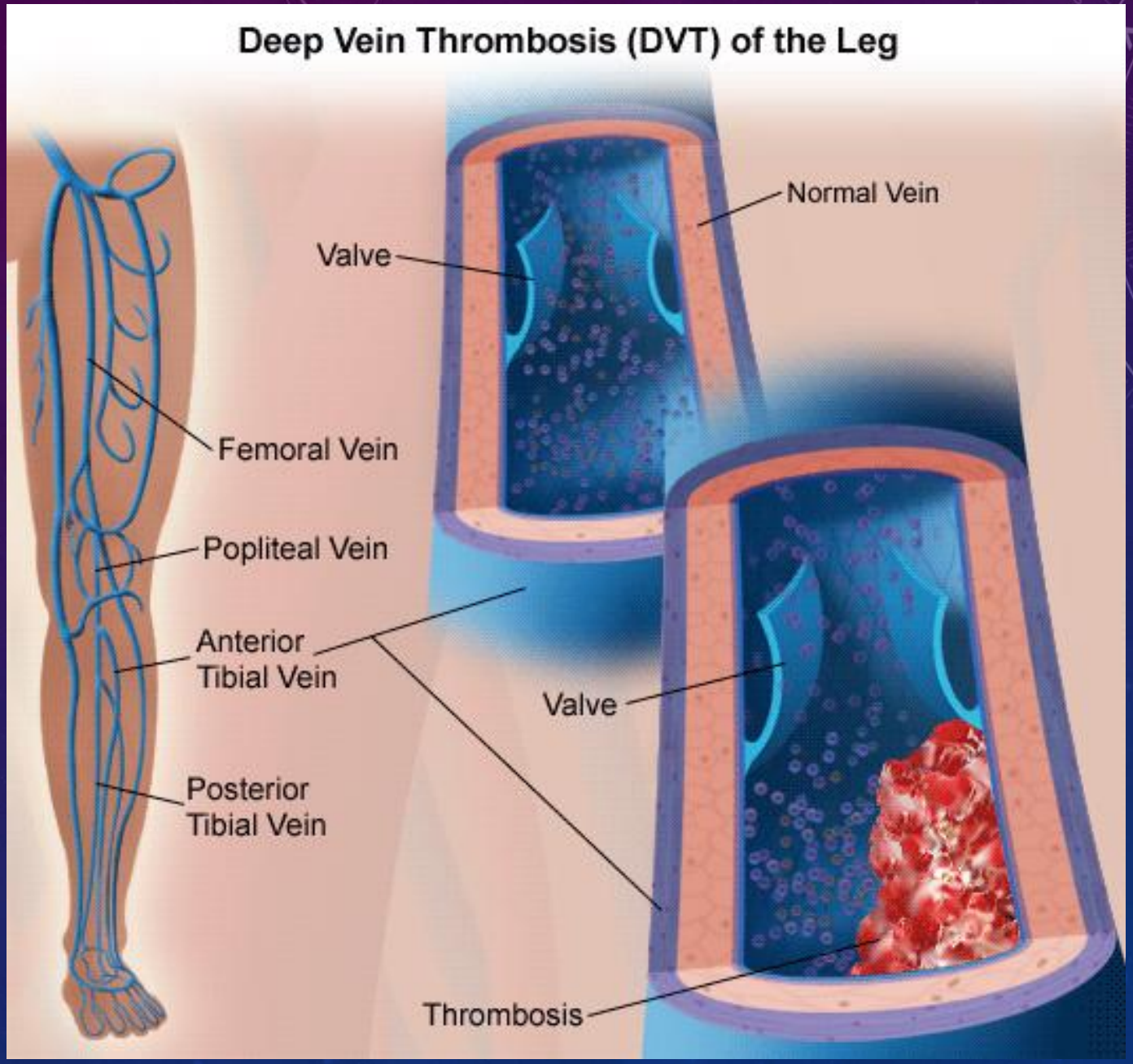

Deep Vein Thrombosis (DVT) of the Leg
Normal Vein
Valve
Femoral Vein
Popliteal Vein
Anterior
Tibial Vein
Posterior
Tibial Vein
Valve
Thrombosis

Venous Thromboembolism (VTE)

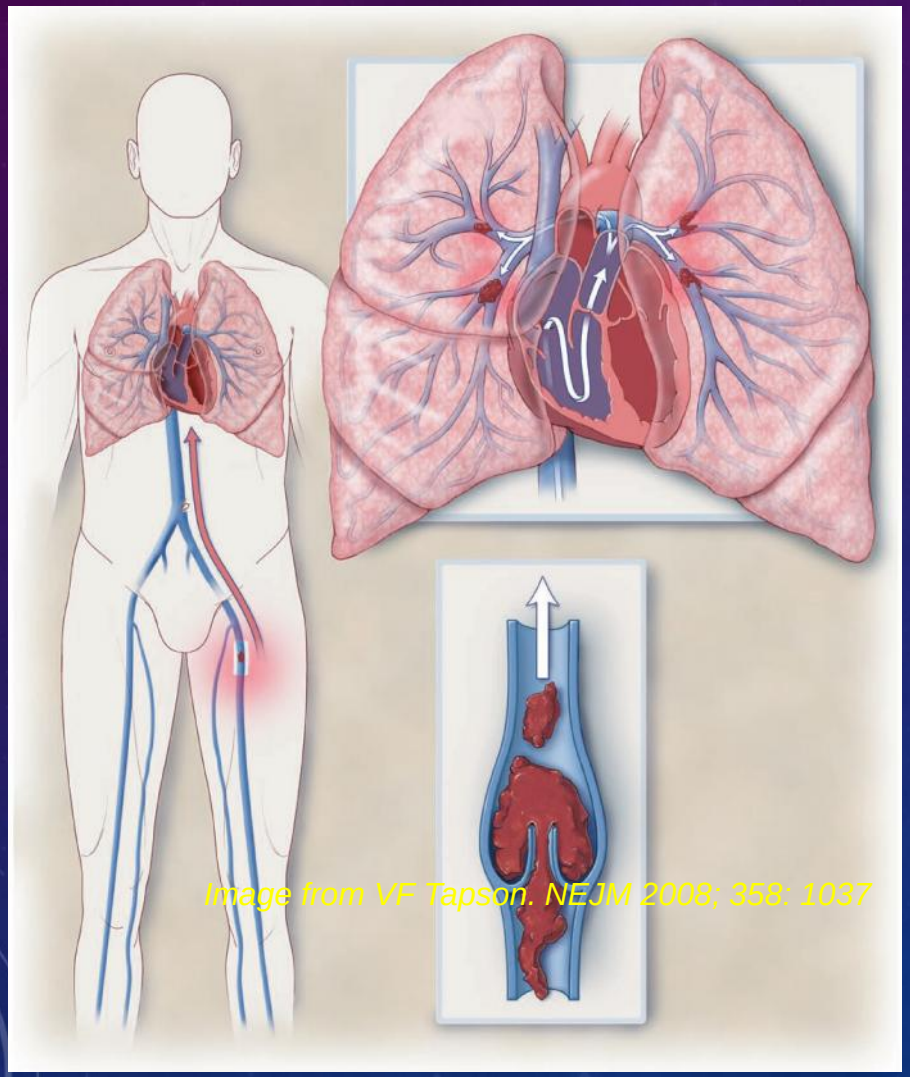


Image from VF Tapson. NEJM 2008; 358: 1037

Pulmonary embolism (PE)

40% of non-fatal cases

Severity depends on size and cardiopulmonary reserve

Sub-segmental PE has important risk of recurrence

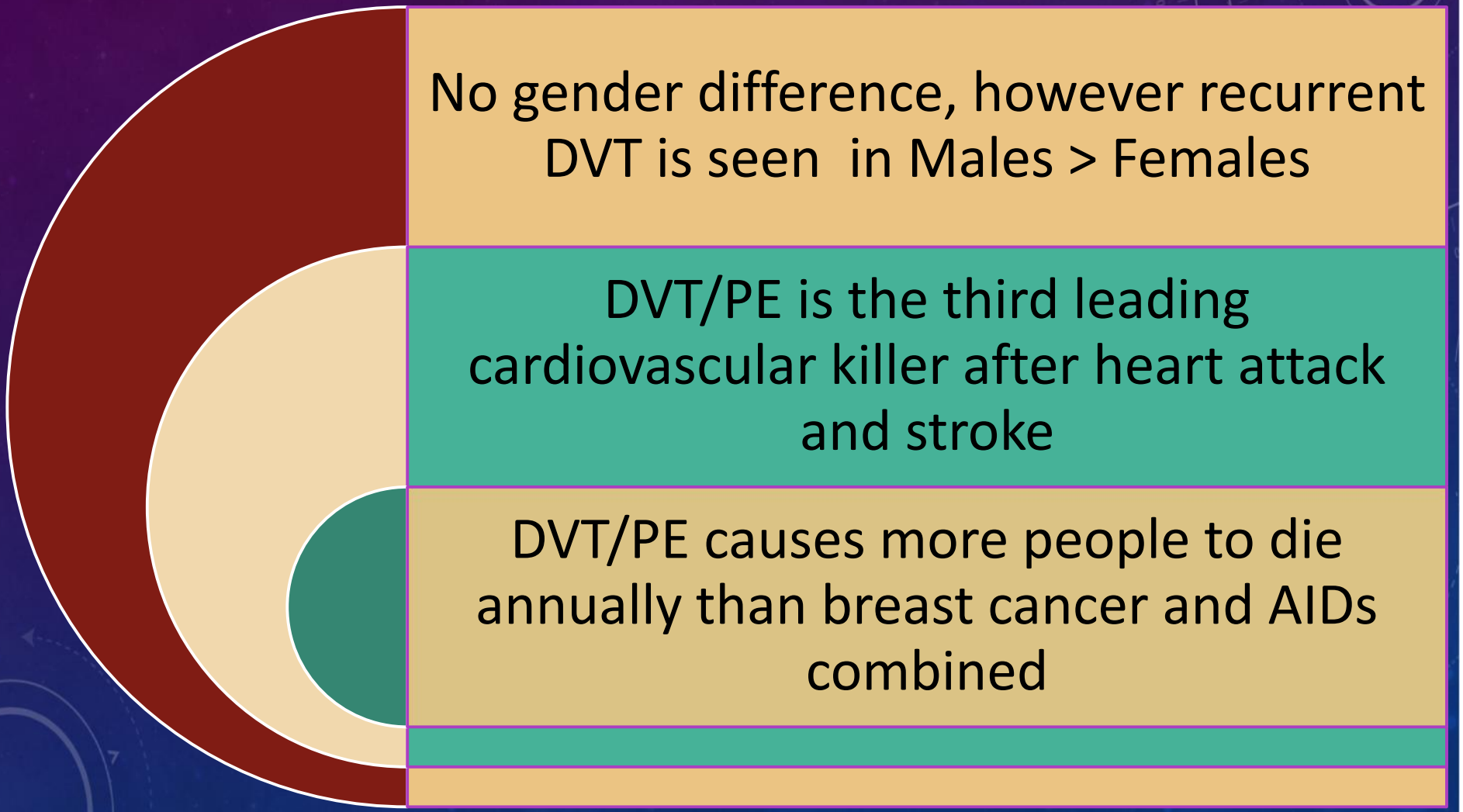
30% to 70% have residual DVT

Deep-vein thrombosis (DVT)

60% of non-fatal cases

Proximal DVT prognostic marker for recurrence and mortality

DVT/PE - extent of the problem



Epidemiology of Venous Thrombo-Embolism (DVT+PE) Global & India

3rd most common cause of CV disease[1]

Is it underestimated in India?

9 lac events p.a.[2]

7.5 lac events p.a.[3]

<2.5 lac events p.a[4]

1. Goldhaber SZ. Pulmonary embolism thrombolysis: a clarion call for international collaboration. *J Am Coll Cardiol* 1992;19:246-7.
2. Cohen AT et al. Thromb Haemost. 2007;98:756-64;
3. Roger VL et al. Circulation 2012;125:e2-220;
4. Ray G et al. VTE- Indian Perspective, Med Update 2010; 20: 329-34.

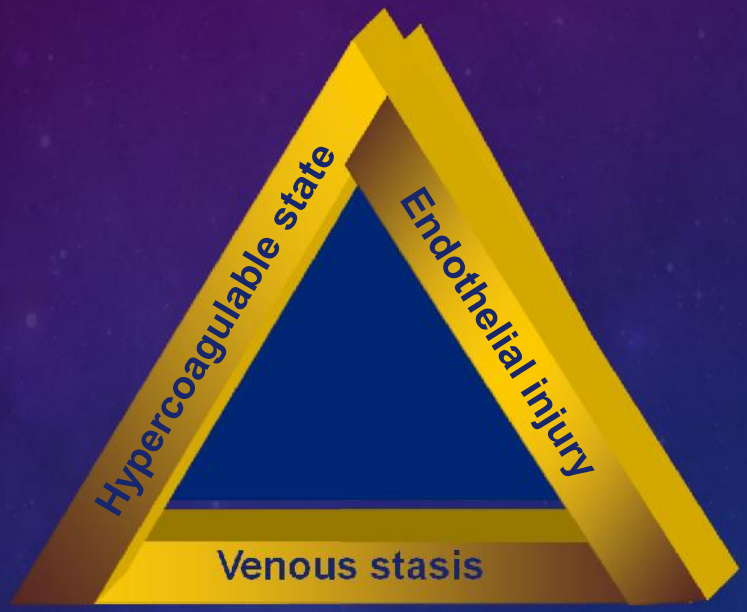
Incidence

- Pregnant women have a 4 to 5 times increased risk of symptomatic venous thrombo-embolism (VTE)
- Estimated incidence is 1 to 2 per 1000 pregnancies
- 85% of cases of DVT are in the left lower extremity
- In developed countries, pulmonary embolism is the leading cause of maternal mortality

Andersen B, et al. Acta Obstet Gynecol Scand. 1998;77:170-173

Virchow's Triad

- Acute phase postop
- Cancer
- Thrombophilia
- Estrogen therapy
- Pregnancy and postpartum period
- Inflammatory bowel disease

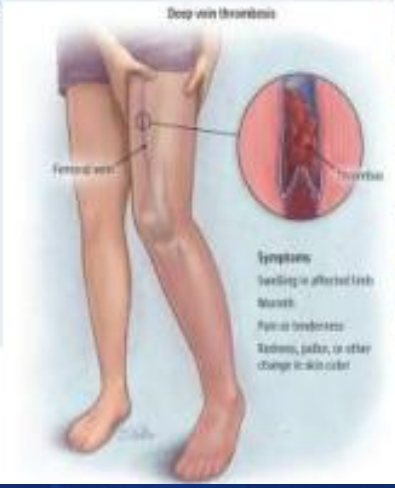


- Surgery
- Trauma
- Indwelling catheter
- Atherosclerosis
- Heart valve disease or replacement

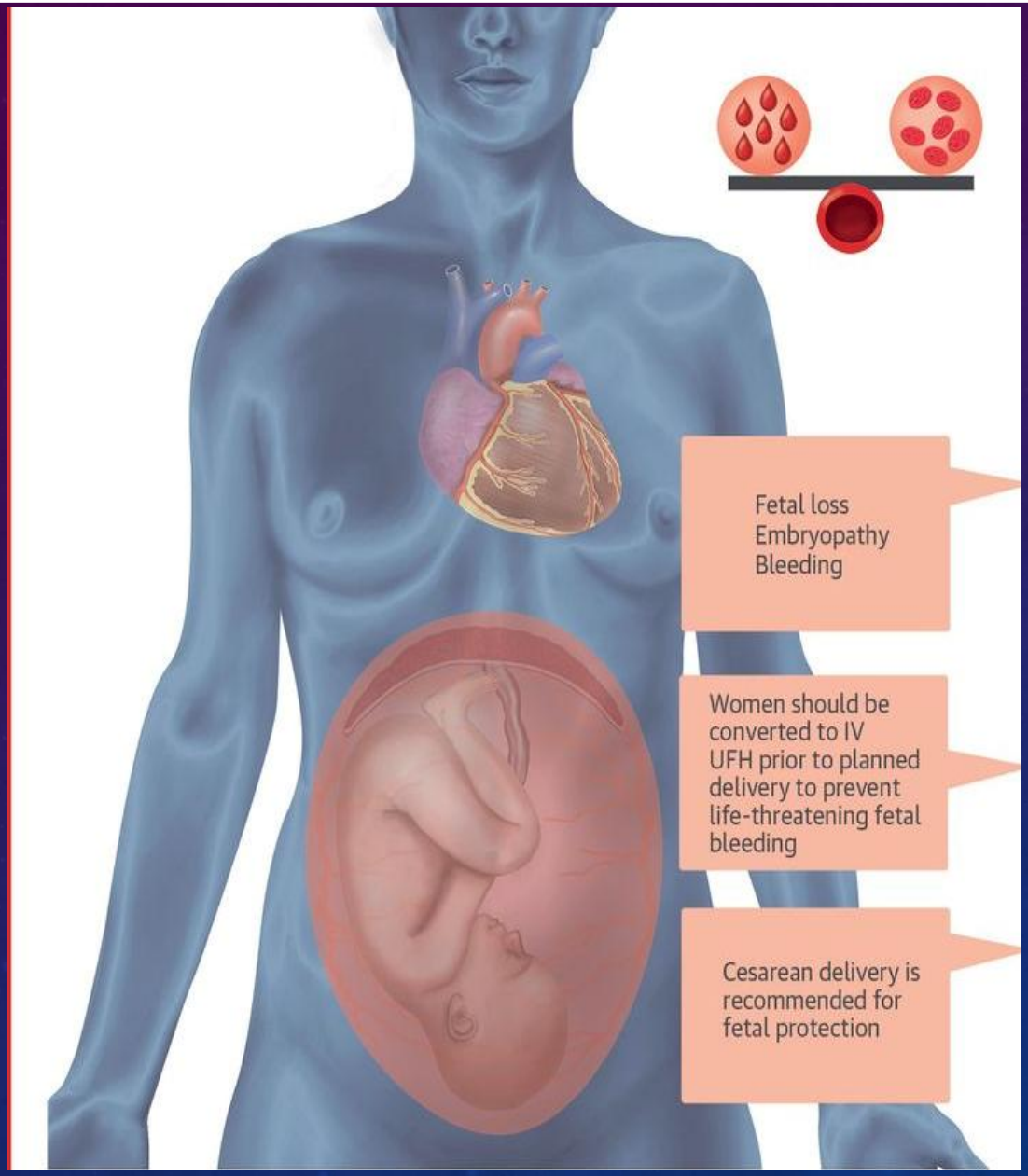
- Immobility or paralysis
- Heart failure
- Venous insufficiency or varicose veins
- Venous obstruction from tumour, obesity or pregnancy

Virchow R, ed. *Gesammelte Abhandlungun zur Wissenschaftichen Medicin*. Von Meidinger Sohn, Frankfurt, 1856

Clinical Presentation

Type	Signs and Symptoms
Pulmonary embolism 	• Dyspnea • Palpitations • Pleuritic chest pain • Hemoptysis • Cyanosis/hypoxia in massive PE • Tachycardia • Tachypnea • Hypotension • Collapse • +/- symptoms or signs of DVT
Deep vein thrombosis 	• DVT in pregnancy usually proximal • Unilateral leg pain/tenderness • Swelling in an extremity • Increase calf/thigh circumference • Increased temperature • Prominent superficial veins • Pitting edema

Balancing risk of anti coagulation in Pregnancy



- Pregnancy is a Prothrombotic state with a 5 fold increase in VTE
- Choice of anti coagulant
- Must balance maternal risk with fetal risk
- VKA are safest for mother and risk to fetus is dose dependent
- LMWH is preferred, but thrombotic events cn occur
- Frequent monitoring is essential
- Risk of maternal thrombosis remains in post partum period

Laith Alshawabkeh et al. JACC 2016;68:1804-1813

When does VTE occur ?

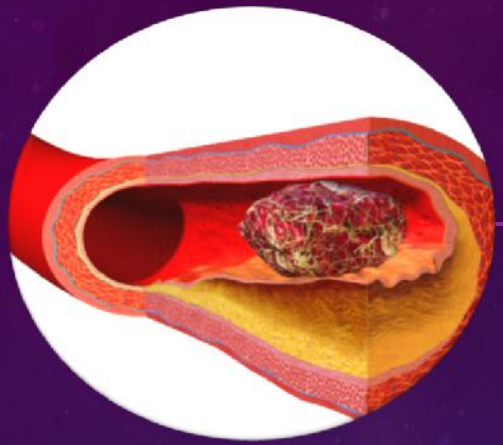
A meta-analysis showed that two-thirds of cases of deep vein thrombosis (DVT) occur ante partum, distributed equally throughout all three trimesters.

In contrast, 43% to 60% of pregnancy related PE occurs 4 to 6 weeks postpartum.

What is the duration of the postpartum risk?

- The prothrombotic changes associated with pregnancy do not revert completely to normal until several weeks after delivery
- Clinical data suggest the persistence of an increased risk for up to 6 weeks postpartum


Can we identify women who are at greatest risk ?
In whom to start prophylaxis?
Is pregnancy-related VTE preventable?



Why does Venous Thrombosis occur in Pregnancy ?

- Physiological process of Pregnancy
- Inherited Coagulopathy
- Acquired Risk Factors

Physiological changes in Pregnancy

Risk Factors for Thrombosis

Increased Level of Pro Coagulant Factors	• II, VII, VIII, X and XII
Decreased Serum Levels of	• Protein C • Protein S
Decreased Fibrinolytic State	• **Increased Serum Plasminogen Activator Inhibitor 1 (PAI-1)** • **Placental Activator Inhibitor 2 (PAI-2)**

Acquired Risk Factors for Coagulopathy

- Age > 35 years
- Operative Delivery (Caesarean Section)
- Blood Group A
- Hypertension
- Post Partum Bleeding
- Previous history of
  - VTE : Unprovoked or during previous Pregnancy
  - Oral Contraceptive Use

Inherited Coagulopathy

Risk Factor	Prevalence	Odds Ratio
Factor V Leiden Mutation Heterozygote	2.7	9
Factor V Leiden Mutation Homozygote	0.2-0.5	34
Prothrombin G20201OA Heterozygote	2	7
Prothrombin G2021OA Homozygote	Rare	26
Antithrombin Deficiency	<0.1-0.6	5
Protein C Deficiency	0.2-0.3	5
Protein S Deficiency	<0.1-.1	3

Inherited Coagulopathy -Thrombophilia

Thrombophilia is present in 20% to 50% of women who experience VTE during pregnancy

3 Groups of patients:

- pregnant women with thrombophilia and previous VTE,
- pregnant women with thrombophilia, no previous VTE but a family history of VTE
- pregnant women with thrombophilia, no previous VTE and no family history.

Guidelines in Pregnant Patients with Thrombophilia

History of previous VTE event

Postpartum thromboprophylaxis for 6 weeks post partum

No previous VTE, with or without a family history of VTE

A minimum of 7 days thrombo-prophylaxis is usually recommended; the duration can be extended to 6 weeks depending on the number of concomitant risk factors.

Specific situations

Anti phospholipid syndrome

Antiphospholipid antibody syndrome (commonly called or APS) is an autoimmune disease present mostly in young women.

Those with APS make abnormal proteins called antiphospholipid autoantibodies in the blood.

This can lead to dangerous clotting in arteries and veins

Antiphospholipid antibodies are present in 15 - 20% of all cases of deep vein thrombosis occurring in people under the age of 50.

Antiphospholipid antibodies are a major cause of recurrent miscarriages and pregnancy complications when no other causes are found.

Anti phospholipid syndrome

History of venous or arterial thrombosis with Positive test for anti-phospholipid antibodies.

- Antenatal therapeutic doses of LMWH until after delivery and then switch to oral anticoagulants. Those on warfarin convert to LMWH before 6 weeks of pregnancy
- Women not on anticoagulants should start LMWH as soon as possible in the first trimester, which should be continued for at least 6 weeks after delivery.

In the presence of anti-phospholipid antibodies alone, without APS, LMWH for 7 days postpartum.

Caesarean delivery

Caesarean section carries an increased risk of VTE regardless of whether it is performed in the presence or absence of labor

Prophylaxis should be provided after caesarean delivery to women with the following risk factors:

**** History of one or more of prior VTE***

**** History of antepartum immobilization***

**** Significant postpartum infection***

**** Postpartum hemorrhage of at least 1000 mL requiring re-operation***

**** Pre-eclampsia with growth restriction***

**** SLE, heart disease, or sickle cell disease or a known thrombophilia***

**** BMI > 30***

**** Fetal Growth Restriction***

**** Multiple Pregnancy***

**** Greater than 10 cigarettes per day***

Caesarean delivery

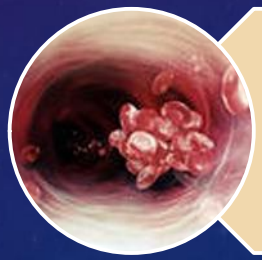
Caesarean section carries an increased risk of VTE regardless of whether it is performed in the presence or absence of labor

However, postpartum infection after vaginal delivery remained a stronger risk factor for VTE than postoperative infection after any type of caesarean section.

High body mass index / immobilization

Antepartum immobilization, defined as strict bed rest for at least 1 week, was the strongest risk factor for both ante- and postpartum VTE

The effect of immobilization is modified by body mass index (BMI), which has a multiplicative effect



Obesity is a well-known risk factor for VTE both in the general population and during pregnancy

Management of women receiving long-term vitamin K antagonists

In such women who want to become pregnant, repeat pregnancy tests should be proposed and Warfarin should be replaced by full-dose LMWH when pregnancy is confirmed.

How to treat VTE that occurs during pregnancy

Use of Unfractionated Heparin

Loading Dose: 80 units / kg / hour
Infusion Rate: 18 units / kg / hour

Infusion Rates of Heparin according to the APTT

APPT Ratio	Dose Change(units/kg/hr)	Additional action	Next APTT (hrs)
< 1.2	+4	Re-bolus 80 u/kg	6
1.2 – 1.5	+2	Re-bolus 40 u/kg	6
1.5 – 2.5	No change		24
2.5 – 3.0	-2		6
>3.0	Stop infusion for 1 hour		6

How to treat VTE that occurs during Pregnancy

- LMWH is the Preferred Drug
- VKA such as Warfarin should be avoided
- Once or twice daily regimens should be used
- A Weight based regimen to be used
- Monitoring of anti-Xa is not routinely required
- After a full dose treatment for one month, in the absence of additional risk factors, an intermediate dose regimen can be considered
- At least 3 months of anti coagulation is required
- 6 months or longer for Idiopathic DVT/PE.
- In all cases anti coagulation throughout Pregnancy, and at least 6 weeks post partum

LMWH is preferred to UFH for several reasons

- A better safety profile both for the fetus and the mother
- Potentially reduced risk of bleeding.
- LMWHs are not associated with an increased risk of severe peripartum bleeding.
- Significantly lower bone density in patients receiving UFH than in those receiving LMWHs
- Heparin intolerance and heparin induced thrombocytopenia not seen with LMWH
- Anti-Xa factor monitoring is not necessary during treatment of VTE in pregnancy

Weight adjusted dose of LMWH

Enoxaparin 1 mg/kg every 12 hours or 1.5 mg/kg once daily

Dalteparin 100 Units/kg every 12 hours or 200 units/kg once daily

Tinzaparin 175 Units/kg once daily

What is Intermediate dose therapy of LMWH ?

Many experts continue with the full treatment dose while others switch to an intermediate dose regimen.

Greer et al (UK) suggest a full dose for a minimum of one month before reducing to an intermediate dose of LMWH in the absence of additional risk factors such as underlying thrombophilia, immobility, and obesity.

The ACCP recommends intermediate-dose LMWH: Dalteparin 5000 U/12 h or Enoxaparin 1 mg/kg/24 h.

Intermediate regimens therefore range from 50% to 75% of the full treatment dose.

What about Other Anti coagulants

Penta saccharides. **(Fondaparinux)**	• As per ACCP guidelines, the available evidence for efficacy is low, and should be avoided
Newer Anti coagulants: Direct Thrombin inhibitors and anti Xa inhibitors	• Insufficient data regarding safety in pregnant women

Which Anti Coagulant can be used in Nursing Women

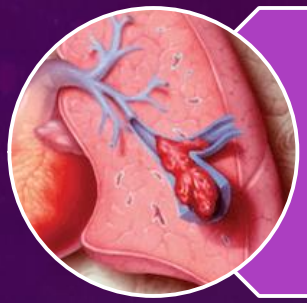
Warfarin: There are many reports which confirm the absence of detection in breast milk and anticoagulant effect of warfarin in breastfed infants

Unfractionated Heparin: Because of its high molecular weight and strong negative charge, UFH does not pass into breast milk.

LMWH: Small amounts of LMWH were found in breast milk. However, due to the low bioavailability of orally ingested LMWH, a clinically relevant effect on the nursing infant is unlikely.

Why are vitamin K antagonists not used during Pregnancy ?

Warfarin readily crosses the placenta and has been associated with congenital malformation (exposure from 6 to 12 weeks) and fetal and neonatal bleeding



Treatment of Massive life-threatening VTE in Pregnancy

Intravenous UFH is the preferred treatment in massive VTE with cardiovascular compromise.

There is also a case for considering thrombolytic therapy, as anticoagulant treatment may not reduce obstruction of the pulmonary circulation

Data on thrombolytic therapy in pregnancy are limited, with concerns about maternal bleeding and adverse fetal effects.

Removable vena cava filters are a reasonable approach to women who have a transient contraindication to anticoagulants, such as the development of a VTE within 1 to 2 weeks of delivery

What is the duration of treatment of VTE in pregnancy?

A minimum of 3 months of anticoagulation proposed for secondary VTE

6 months of anti coagulation should be considered for idiopathic VTE.

Treatment should be employed during the remainder of the pregnancy and for at least 6 weeks post-partum

Mobilization with graduated elastic stockings (at least class II) should be encouraged to reduce pain and swelling and also to reduce the risk of post thrombotic syndrome for 2 years after the occurrence of VTE.

Management of anticoagulant therapy at the time of delivery of the baby

ACCP recommendations advise stopping 24 to 36 hours before elective induction of labor or cesarean section.

If the patient is considered to be at high risk (i.e. VTE within 4 weeks), it is important to minimize the time off anticoagulation

Replace LMWH by intravenous UFH, due to a shorter half-life, and to discontinue treatment 4 to 6 hours prior to the expected time of delivery. If spontaneous labor occurs, careful monitoring with a PTT is required and protamine sulfate may be needed to reduce the risk of bleeding.

Anticoagulation in the immediate Post Natal period

LMWH should be restarted as soon as it is safe to do so, usually within 12 hours of delivery, and warfarin can be started at the same time.

A thrombo prophylactic dose of LMWH should be given by 3 hours postoperatively (more than 4 hours after removal of the epidural catheter, if appropriate)


THANK YOU

Role of D Dimer Test for suspected DVT in Pregnancy

Non Pregnant

- Rapid and Inexpensive
- Useful for excluding DVT if the result is normal (not elevated)
- With highly sensitive assay – only 4% false negative results

Pregnant

Elevated levels of D Dimer seen in Pregnancy due to

- Physiological changes of Pregnancy
- Pre eclampsia

Should not be used to diagnose DVT in Pregnancy

Radiation to Fetus during Pregnancy

Maximum Permitted dose: 5 rads = 50,000 uGy

Imaging	Radiation dose
Chest X Ray	<10
Limited Venography	<500
Unilateral Venography without Abdominal Shield	3140
Perfusion Lung Scan (Technetium 99m)	60-120
Ventilation Lung Scan (Xenon 133)	40-90
Ventilation Lung Scan (Technetium 99m)	10-350
CT Pulmonary Angiography	60-1000
CT Pulmonary Angiography (Femoral Route)	2210-3740
CT Pulmonary Angiography (Brachial Route)	<500

X RAY Chest in Pulmonary Embolism

Normal in 50% of cases

Abnormal Features in Pulmonary Embolism

- Atelectasis
- Effusion
- Focal Opacities
- Regional Oligemia or Pulmonary Edema

The Radiation Dose to the Foetus at any stage of Pregnancy is Negligible

CT PA in suspected PE in Pregnancy

Advantage over V/Q Scan

1. Better Sensitivity and Specificity
2. Lower Radiation dose to the Fetus
3. Identifies other Pathology: Aortic Dissection

1. High Radiation dose to the Maternal Breasts
2. May not identify small PE
3. Iodinated contrast material may potentially alter fetal or neonatal thyroid function

Disadvantage

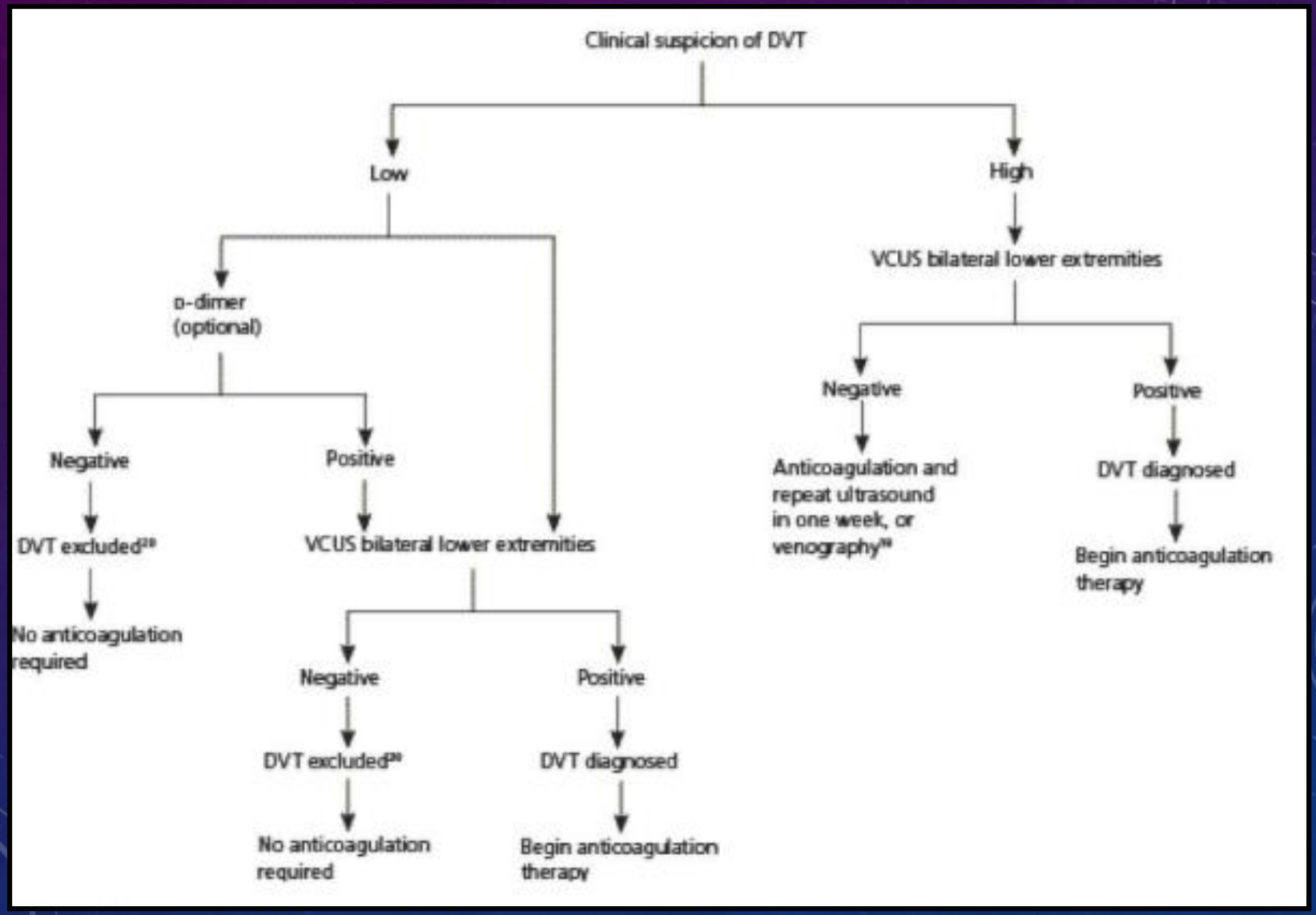
Early Mobilization

- Does not increase the progression of PTE
- No need for bed rest in a stable patient on anti coagulation for PTE
- Pain and swelling improve faster with mobilisation
- Also helps in preventing development of Post Thrombotic syndrome

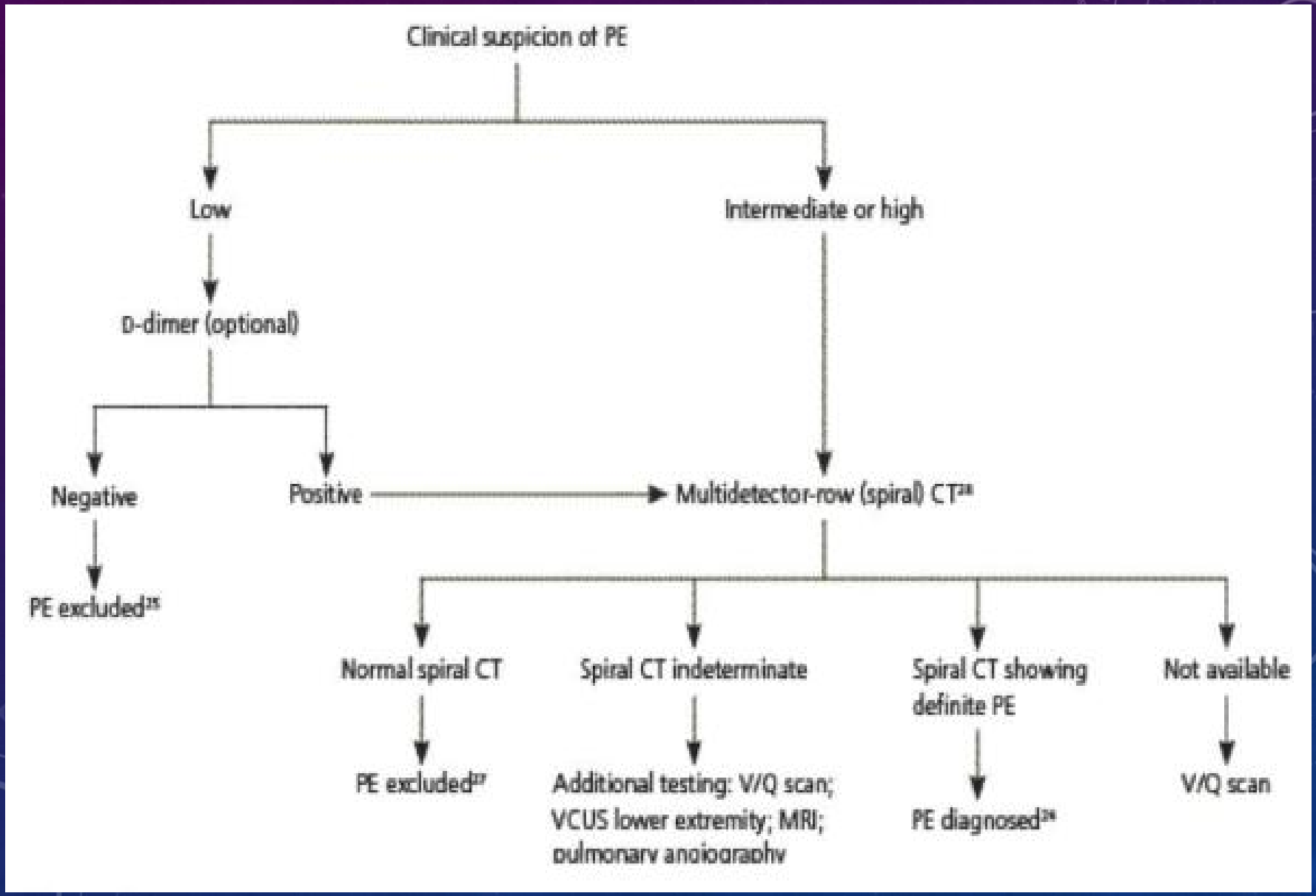
Compression Stockings

- Class 2 compression stockings (18-23 mm Hg)
- Not to be worn at night
- Thigh length stockings for thigh swelling
- Below knee stockings for below knee swelling
- Not to wear on unaffected leg
- At least 3 months post DVT

Diagnosis and Treatment of DVT in Pregnancy



Diagnosis of PE in Pregnancy



Prevention of VTE in Pregnancy - **Antenally**
Guidance from Royal College of Obstetretians and Gynecologists

Avoid Dehydration and Immobilization

Those at high risk of VTE, offered counselling and plan for Thromboprophylaxis

All with h/o VTE, receive post partum prophylaxis

LMWH antenatally and post partum for all with

- h/o VTE which was Idiopathic, unprovoked, with family history and with Estrogen use
- Family h/o VTE in first degree relative

Those with previous VTE, on warfarin

- Stop Warfarin and switch to LMWH as soon as pregnancy is confirmed
- Stop Warfarin within two weeks of missed period and before 6 weeks of pregnancy
- If not already on warfarin, to start LMWH as soon as pregnancy is confirmed

Asymptomatic Inherited or Acquired Thrombophilia: LMWH for 7 days post partum

If Anti Thrombin deficiency, or more than one factor – consider antenatal prophylaxis

Prevention of VTE in Pregnancy – Intra Partum

Those on LMWH during Pregnancy : If there is bleeding or contractions begin, stop injections immediately. Further management in hospital

Prevention of VTE in Pregnancy – Post Partum

7 days of Post delivery LMWH

- **Obese women (BMI > 40kg/sq. mt)**
- **Prolonged labor**
- **Immobility**
- **Infection**
- **Hemorrhage / Blood Transfusion**
- **Emergency Caesarean Section**
- **Elective Caesarean Section with more than one above risk factor**

Rationale for thromboprophylaxis

Direct causes of death	Rate per 100,000 maternities
Thrombosis and thromboembolism	1.01
Antepartum haemorrhage and postpartum haemorrhage	0.55
Amniotic fluid embolism	0.42
Genital tract sepsis	0.29
Early pregnancy/ectopic pregnancy	0.25
Pre-eclampsia and eclampsia	0.25
Anaesthesia	0.13

Saving Lives Improving Mothers' Care - Surveillance of maternal deaths in the UK 2011-13 and lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009-13; MBRRACE-UK, Dec 2015

Rationale of thromboprophylaxis

Maternal Mortality at a Referral Centre in Andhra Pradesh: A five year study

In a Cross sectional hospital based study at a tertiary care centre from Jan '11 to '15. A total 43 maternal deaths occurred .The live birth rate was 42,456.

- In 2011, the MMR was 96.37, and 2015 it was 91.99.
- Hemorrhage is the leading direct cause of death [30.23%] followed by thromboembolism [25.58%]. Indirect cause for maternal mortality is anemia (67.44%)

Maternal mortality in India: A review of trends and patterns IEG Working Paper No. 353, 2015

Changing patient profile

- Older
- Heavier
- Smokers
- Previous CS
- IVF pregnancies
- Multiple pregnancies
- Medical disorders

Whom to give thromboprophylaxis?

Pre-existing Risk Factors

Previous VTE (except a single event related to major surgery)	4
Previous VTE provoked by major surgery	3
Known high-risk thrombophilia	3
Medical comorbidities e.g. cancer, heart failure; active systemic lupus erythematosus, inflammatory polyarthropathy or inflammatory bowel disease; nephrotic syndrome; type I diabetes mellitus with nephropathy; sickle cell disease; current intravenous drug user	3
Family history of unprovoked or estrogen-related VTE in first-degree relative	1
Known low-risk thrombophilia (no VTE)	1[a]
Age (> 35 years)	1
Obesity	1 or 2[b]
Parity ≥ 3	1
Smoker	1
Gross varicose veins	1

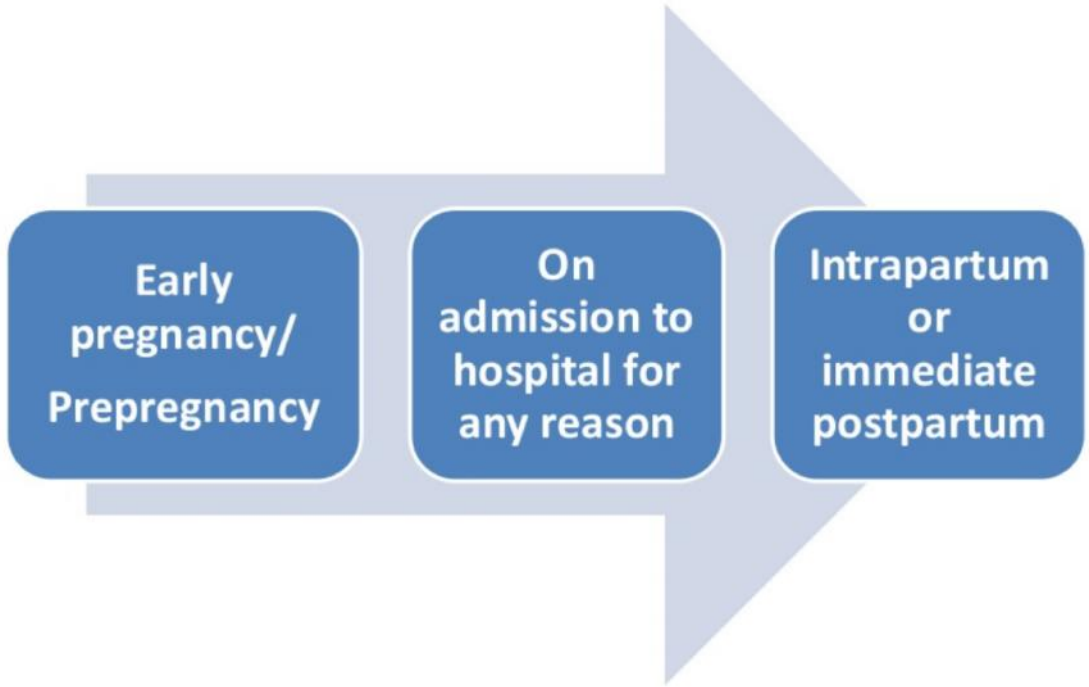
Obstetric Risk Factors

Pre-eclampsia in current pregnancy	1
ART/IVF (antenatal only)	1
Multiple pregnancy	1
Caesarean section in labour	2
Elective caesarean section	1
Mid-cavity or rotational operative delivery	1
Prolonged labour (> 24 hours)	1
PPH (> 1 litre or transfusion)	1
Preterm birth < 37^{+0} weeks in current pregnancy	1
Stillbirth in current pregnancy	1

Transient Risk Factors

Any surgical procedure in pregnancy or puerperium except immediate repair of the perineum, e.g. appendicectomy, postpartum sterilisation	3
Hyperemesis	3
OHSS (first trimester only)	4
Current systemic infection	1
Immobility, dehydration	1

Risk assessment



When to initiate thromboprophylaxis?

Timing of Initiation of thromboprophylaxis

4 or > Risk factors	3 Risk factors	2 Risk factors
• Throughout pregnancy • 6 weeks postpartum	• After 28 wks pregnancy • 6 weeks postpartum	• Postpartum 10 days

Any previous VTE except a single event related to surgery: As early as possible usually after pregnancy is confirmed

Which agents are used for thromboprophylaxis?

Heparins

- Unfractionated or low molecular weight
- Do not cross placenta or cause fetal anticoagulation
- Safe in breast feeding
- LMWH is the agent of choice
- UFH preferred peripartum when increased risk of haemorrhage is there or where regional may be required

LMWH for thromboprophylaxis and treatment of venous thromboembolism in pregnancy: a systematic review of safety and efficacy. Greer IA, Nelson-Piercy C Blood. 2005;106(2):401.

Heparins: UFH vs LMWH

- UFH is cheaper, shorter half life, S/C or I/V and can be reversed rapidly
- UFH causes HIT, bone loss, needs monitoring baseline platelet count, after 2-3 days, weekly x 2 weeks then monthly.
- UFH preferred in patients with severe renal insufficiency.
- LMWH is effective, easy to administer S/C, has more predictable response and do not require routine monitoring

LMWH for thromboprophylaxis and treatment of venous thromboembolism in pregnancy: a systematic review of safety and efficacy. Greer IA, Nelson-Piercy CBlood. 2005;106(2):401.

Heparin anticoagulation dosing

- Prophylactic dose anticoagulation

  Reduce risk of thromboembolism

  Minimize risk of bleeding
- Intermediate dose anticoagulation

  Adjustment of prophylactic dose with weight gain in pregnancy
- Therapeutic dose anticoagulation

  Doses reserved for treatment of thromboembolic disease

Suggested doses of LMWH for antenatal and postnatal prophylaxis

Weight	Enoxaparin	Dalteparin	Tinzaparin (75 u/kg/day)
< 50 kg	20 mg daily	2500 units daily	3500 units daily
50–90 kg	40 mg daily	5000 units daily	4500 units daily
91–130 kg	60 mg daily*	7500 units daily	7000 units daily*
131–170 kg	80 mg daily*	10 000 units daily	9000 units daily*
> 170 kg	0.6 mg/kg/day*	75 u/kg/day	75 u/kg/day*
High prophylactic dose for women weighing 50–90 kg	40 mg 12 hourly	5000 units 12 hourly	4500 units 12 hourly

*may be given in 2 divided doses

Doses of UFH

Inj Heparin 5000 IU subcutaneously 12 hrly throughout pregnancy

Inj Heparin subcutaneously 12 hrly with increasing doses as pregnancy progresses

5000 IU – 7500 IU 1st trimester

7500 IU – 10000 IU 2nd trimester

10,000 IU 3rd trimester

No monitoring usually but aPTT done if any concerns about bleeding or thrombosis

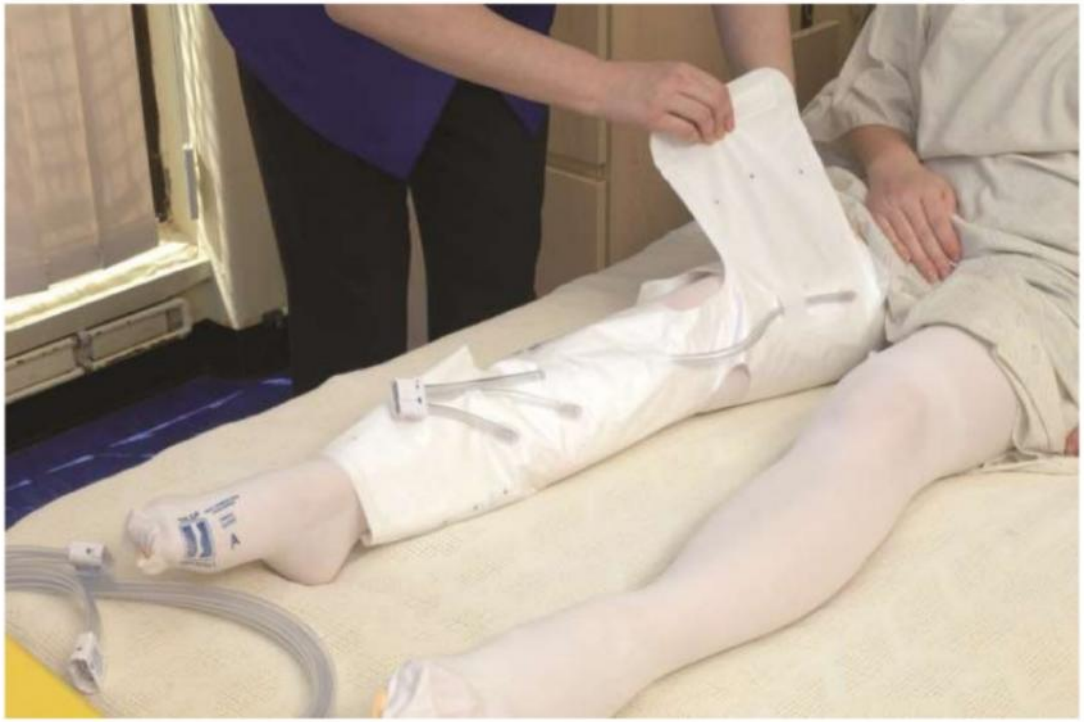
Contraindications/cautions to LMWH

Known bleeding disorder (e.g. haemophilia, von Willebrand's disease or acquired coagulopathy)
Active antenatal or postpartum bleeding
Women considered at increased risk of major haemorrhage (e.g. placenta praevia)
Thrombocytopenia (platelet count $< 75 \times 10^9$/l)
Acute stroke in previous 4 weeks (haemorrhagic or ischaemic)
Severe renal disease (glomerular filtration rate [GFR] < 30 ml/minute/1.73m^2)
Severe liver disease (prothrombin time above normal range or known varices)
Uncontrolled hypertension (blood pressure > 200 mmHg systolic or > 120 mmHg diastolic)

Warfarin

- Avoided as it crosses placenta
- Teratogen cause fetal embryopathy (6-12 weeks)
- Fetal anticoagulation resulting in intracranial haemorrhage
- Considered only for women with high risk of thrombosis like mechanical valves
- Safe in breast feeding

Anti embolism stockings



Thromboprophylaxis during labour and delivery : Do's and Don'ts

Thromboprophylaxis interrupted if.....

- Woman has any vaginal bleeding or labour pains start
- If elective CS is planned:

  Regional technique avoided for at least 12 hrs after prophylactic dose of LMWH and 24 hrs of therapeutic dose 6 hrs and 12 hrs with UFH
- If epidural catheter is to be removed:

  Epidural catheter not to be removed within 12 hrs of recent injection

When to initiate thromboprophylaxis postnatally

LMWH/ UFH

- Vaginal delivery: after 6-12 hrs
  if no PPH and no epidural
- Caesarean section: after 12-24 hrs

- Resumption in patients receiving antenatal thromboprophylaxis can be earlier 4-6 hrs after vaginal delivery and 6-12 hrs after CS in the absence of significant bleeding.

For how long should thromboprophylaxis continued after delivery ?

High risk women

- 6 weeks

Intermediate risk women

- 10 days

Additional persistent risk factors

- Extend for 6 weeks or till factors persist

Antenatal assessment and management (to be assessed at booking and repeated if admitted)

Any previous VTE except a single event related to major surgery

Hospital admission

Single previous VTE related to major surgery

High-risk thrombophilia + no VTE

Medical comorbidities e.g. cancer, heart failure, active SLE, IBD or inflammatory polyarthropathy, nephrotic syndrome, type I DM with nephropathy, sickle cell disease, current IVDU

Any surgical procedure e.g. appendicectomy

OHSS (first trimester only)

Obesity (BMI > 30 kg/m^2)

Age > 35

Parity ≥ 3

Smoker

Gross varicose veins

Current pre-eclampsia

Immobility, e.g. paraplegia, PGP

Family history of unprovoked or estrogen-provoked VTE in first-degree relative

Low-risk thrombophilia

Multiple pregnancy

IVF/ART

Transient risk factors: Dehydration/hyperemesis; current systemic infection; long-distance travel

HIGH RISK

Requires antenatal prophylaxis with LMWH

Refer to trust-nominated thrombosis in pregnancy expert/team

INTERMEDIATE RISK

Consider antenatal prophylaxis with LMWH

Four or more risk factors: prophylaxis from first trimester

Three risk factors: prophylaxis from 28 weeks

Fewer than three risk factors

LOWER RISK

Mobilisation and avoidance of dehydration

RCOG Green top guidelines No. 37A, 2015

Postnatal assessment and management (to be assessed on delivery suite)

- Any previous VTE
- Anyone requiring antenatal LMWH
- High-risk thrombophilia
- Low-risk thrombophilia + FHx

→ **HIGH RISK**
At least 6 weeks' postnatal prophylactic LMWH

- Caesarean section in labour
- BMI ≥ 40 kg/m²
- Readmission or prolonged admission (≥ 3 days) in the puerperium
- Any surgical procedure in the puerperium except immediate repair of the perineum
- Medical comorbidities e.g. cancer, heart failure, active SLE, IBD or inflammatory polyarthropathy; nephrotic syndrome, type I DM with nephropathy, sickle cell disease, current IVDU

→ **INTERMEDIATE RISK**
At least 10 days' postnatal prophylactic LMWH

NB If persisting or > 3 risk factors consider extending thromboprophylaxis with LMWH

- Age > 35 years
- Obesity (BMI ≥ 30 kg/m²)
- Parity ≥ 3
- Smoker
- Elective caesarean section
- Family history of VTE
- Low-risk thrombophilia
- Gross varicose veins
- Current systemic infection
- Immobility, e.g. paraplegia, PGP, long-distance travel
- Current pre-eclampsia
- Multiple pregnancy
- Preterm delivery in this pregnancy (< 37+0 weeks)
- Stillbirth in this pregnancy
- Mid-cavity rotational or operative delivery
- Prolonged labour (> 24 hours)
- PPH > 1 litre or blood transfusion

Two or more risk factors → (INTERMEDIATE RISK)

Fewer than two risk factors → **LOWER RISK**
Early mobilisation and avoidance of dehydration

RCOG Green top guidelines No. 37A, 2015

To summarize

- All women should undergo risk assessment for venous thromoembolism in early pregnancy/ prepregnancy
- Reassessment on any antenatal admission, during delivery/postpartum period
- Both LMWH or UFH can be used for thromboprophylaxis
- LMWH is effective and easy to administer in dose of 40 mg S/C once a day and does not require any monitoring

- Any woman with 4 or > current risk factors should be offered prophylactic LMWH throughout antenatal and 6 weeks postnatal period
- Any woman with 3 current risk factors should be offered prophylactic LMWH from 28 weeks gestation and 6 weeks postnatal period
- Any woman with 2 current risk factors should be offered prophylactic LMWH for at least 10 days postpartum

- Short term thromboprophylaxis should be considered for pregnant women admitted with hyperemesis gravidarum or ovarian hyperstimulation syndrome
- Risk of VTE should be discussed with all women at risk
- Necessary precautions should be observed during delivery to avoid complications
- Thromboprophylaxis can be started after 6-12 hrs after vaginal delivery and 12-24 hrs after caesarean delivery