



Critical care in pregnancy

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未懷孕

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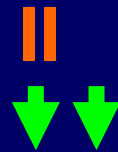
120 / 80

100 / 60



115 / 75

?



110 / 70

120 / 80



120 / 80

?

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# **Estrogen** ( <-- DHEAS placenta <--- fetal adrenal )

----> renin-angiotensin - **aldosterone** : 血量增加

----> **PG I2, E2, NO** 血管擴張 , 阻力減低 , 血壓降低

# **Cytotrophoblast** invade spiral a.--> 血管擴張

- **Tidal volume** : + from 500 to 700 ml ( 10cc/kg )
- **Minute ventilation** : + 40 % from 7.5 to 10.5 l/min
  - **PCO<sub>2</sub>** : 27--32 mmHg ; **HCO<sub>3</sub>** 19.5 meq/l
  - Progesterone -- deep not frequency (16:15 nonpreg)
- **Functional residual capacity** : - 500cc-- atelectasis
- **Residual volume** : - from 1500 to 1200cc
- **Expiratory reserve volume** : - from 1300 to 1100 cc
- **Inspiratory capacity** : +300 cc late pregnancy
- **Vital capacity** : + 100-200 cc
- **Ventilator respiratory rate** (15 - 18 / min)
- **PEEP ventilation**--> decrease V return--> Lt lateral

**More susceptible to and less tolerant of major cardiovascular and respiratory insult**

- **Metabolism and O<sub>2</sub> consumption increase**  
( + 20 - 40 ml/ min second half )
- **FRC reduce** - collapse **shunt** - high mortality & morbidity of pneumonia in pregnancy
- **Low HCO<sub>3</sub><sup>-</sup>** : -- buffer for **acidosis**
- **Low Oncotic pressure** --> pulmonary **edema**  
Hydrostatic pressure **up** ( = permeability )
- **Low resistance, high uterine flow , Uterine compression** -- intolerance to **shock**

- **GI :** **Nausea vomiting** -- hyperemesis , HELLP  
**Gastric reflux**  
**Long emptying time** --> **Aspiration**
- **Hema :** **Leukocytosis**  
**Dilution anemia**  
**Hypercoagulation :** **T-Embolicism**  
**high heparin**
- **Sugar :** **HPL ( halflife min. ) anti - insulin** -- **GDM**  
**low kidney threshold - UTI ; Fungus**

# Preeclampsia

水腫  
尿蛋白  
高血壓

抽筋

中風

肺水腫

擴散性凝血

腎功能不足

溶血 肝功能不足 低血小板 HELLP

# Convulsion

- **MgSO<sub>4</sub>** ( 10% 20cc = 2g )

4g ( in D5w ) iv for 15'-30'; 1-2 g / hr

**beware** urine < **500cc** /d ; not pass BBB ?

- **Antidote** : **Ca gluconate** 10%, 10 cc iv 3 ' -5'

1.5 - 2.5 meq/l

normal

**4.3 - 8.3**

therapy

9 - 12

**DTR (-)** , flush, slurred, sleepy

12 - 15

heart block

15 - 17

paralysis , respiratory arrest

30 - 35

cardiac arrest

# Convulsion

- **Valium:** 5-10 mg slowly iv push ( < 1-2 mg / min )  
not drip - adhered to iv set no effect  
peak (CNS) 10' - 15' ; duration 15' - 20'  
**delayed fetal metabolism ; intubation**
- **Dilantin:** 1g ( 4 amp) in 500 cc N/S > 40' ( <25mg / min)  
15-20 mg/kg loading; 0.4amp=100mg q8h for 1hr  
peak ( brain) < 1 hr ; too fast low BP, heart block  
**not glucose -- ppt.** ; Discarded 4hrs later  
**not extravasation** ; 10-20 microgram / ml  
long term 100mg tid ; **Folic acid** 5mg /d  
**Vit K** 10mg/ d last 2 M ; 20mg/d last 2 W  
in labor Vit K injection ; delivery newborn



# Convulsion

- **Pentothal**

3-5 mg/ kg iv slowly , 30'' work , peak 5'-10'

**intubation** ( pre given atropine 0.4mg )

beware **asthma** ( histamine) ; low BP

- **Phenobarbital**

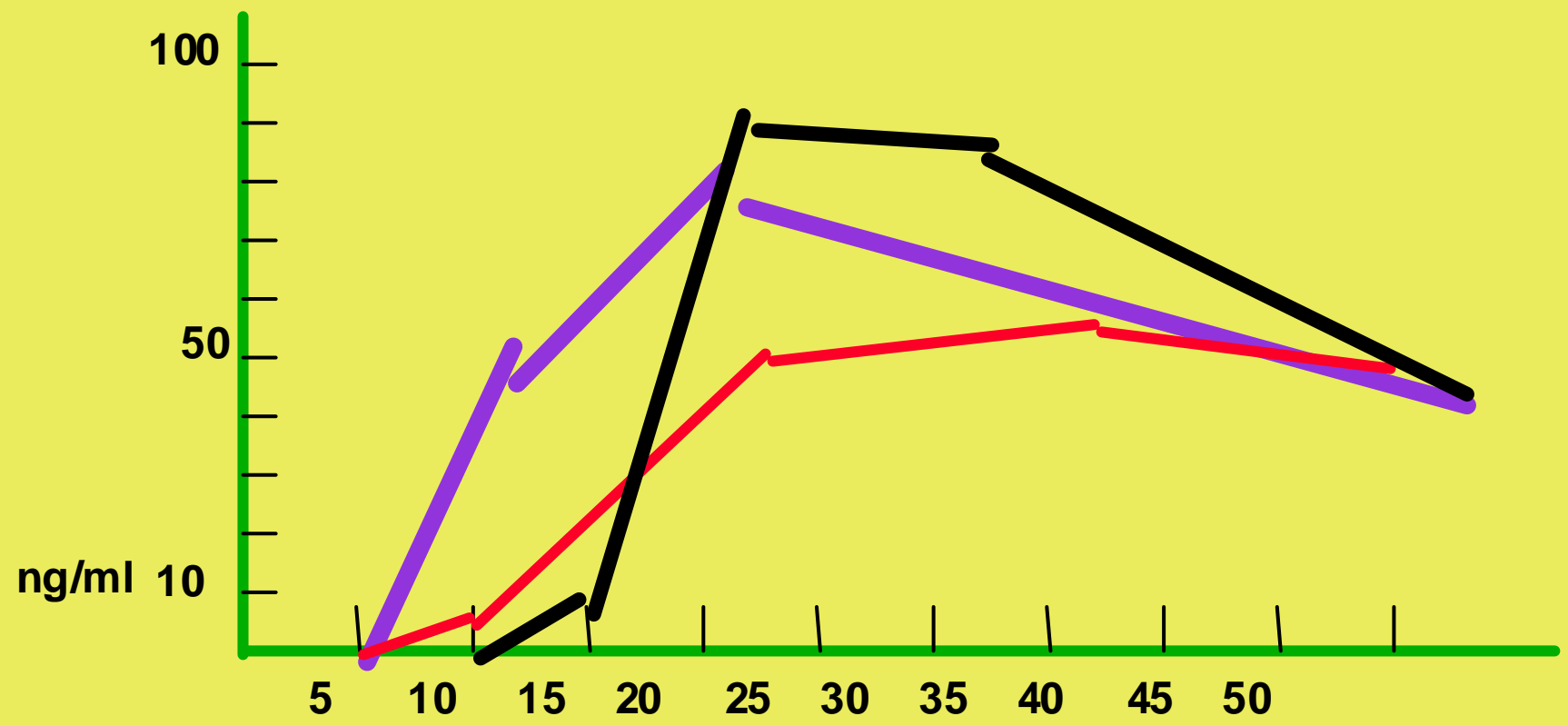
100 mg iv for 2' ( < 50 mg/min) -- **intubation**

persistent: 10mg/ kg loading -- maintain 1-5mg/kg/d

half-life 48- 96 hrs ; discard in 30'; oral peak 12 hrs

oral      sublingual      bite + swallow

# NIFEDIPINE Ca blocker



time ( min ) after dosing 10 mg of Towarat

● **Trandate** (labetalol) (b: a = 7:1 block ) 20cc =100mg

**Fast ; short term**

**20mg** iv push **q10'** ---> 50mg iv total < 300mg

till diastolic BP < **105 mmHg**

( aim = **105-90** mmHg )

# 400mg ( 80cc) + 120 cc N/S --> 20 mg/hr=10cc/hr

increase 20mg/hr per 30' maxim. 160 mg/hr ( <2400mg/d)

\* (+ PGE2) **uterine contraction ; asthma**  
posture hypotension

\* I trimester : ? ; newborn bradycardia , BP

● **Apresoline** -- C -- **arteriole vasodilator**

**Acute** high diastolic P

**x chronic** -- reflex

1. Beta: tachycardia -- tenormin
2. Na retention - lasix (x preg.)

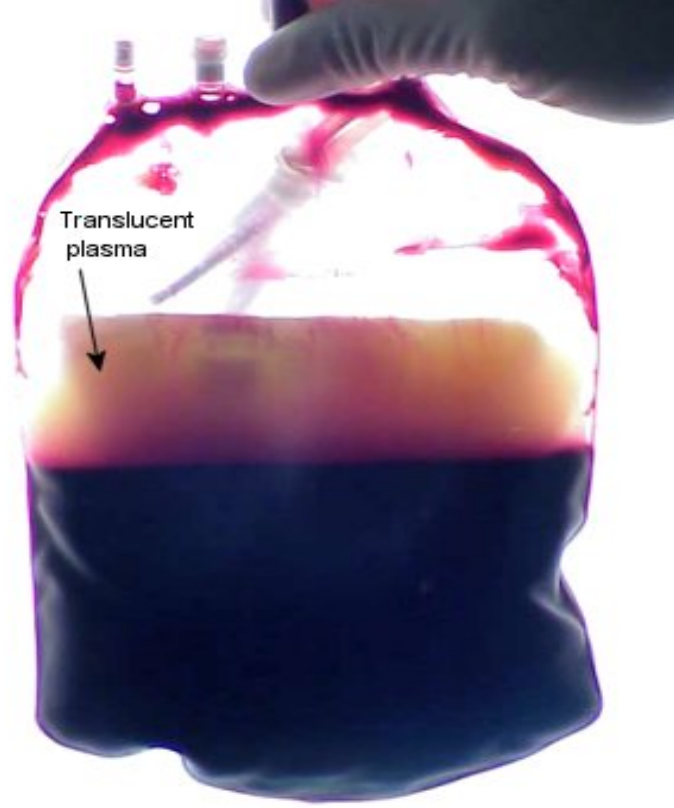
5 mg iv per 20' till stable --> 100mg+200cc N/S drip

**10% lupus like** or ANA (+) esp. > 200mg /d ; stop  
liver meta ; duration 4-6 hr

- **Angiotension-converting enzyme inhibitor**
  - I: CVS, CNS
  - II: (fetus: low perfusion pressure; GFR need ATII)  
fetal oligouria; limb defect, IUFD
- **Lasix** C: only in **pulmonary edema** , CHF  
F & M : high (uric acid) , low (Na,K) ;  
**ototoxic, low ut-pl flow**  
x I trimester, breast feeding
- **Thiazide** D: low ut-pl perfusion ; less breast secretion  
low (K) : fatigue ;GI ; impotence ,  
low insulin ; high uric acid  
neonatal thrombocytopenia

# HELLP

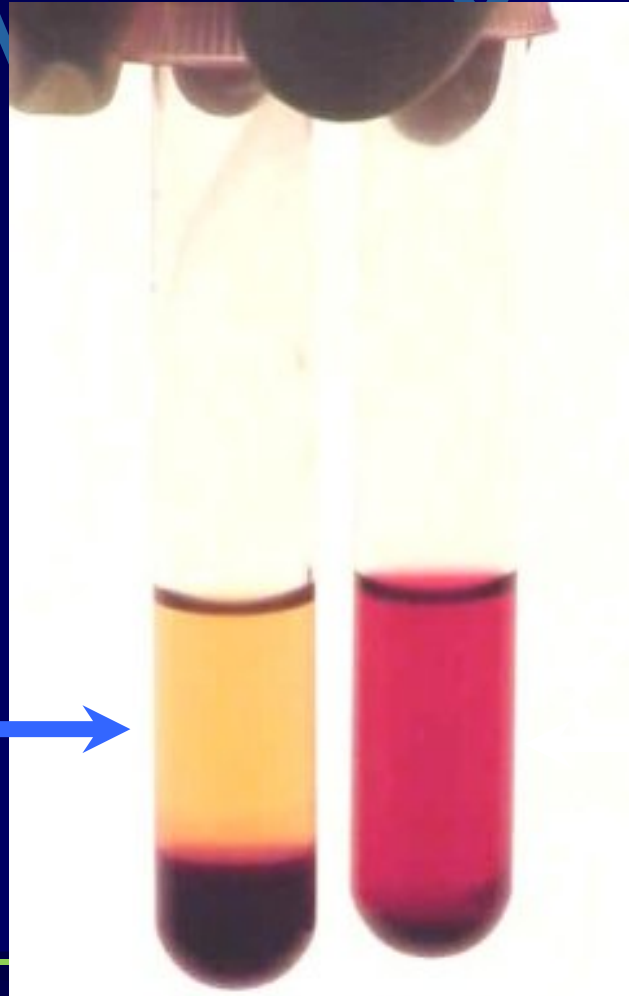
- **Hemolysis**
- **Elevated Liver Enzyme**
- **Low Platelet**



Picture of whole blood bag with normal appearance



Picture of blood bag after expiration -- free hemoglobin in plasma



Normal Serum

Patient's Serum

Renal Failure

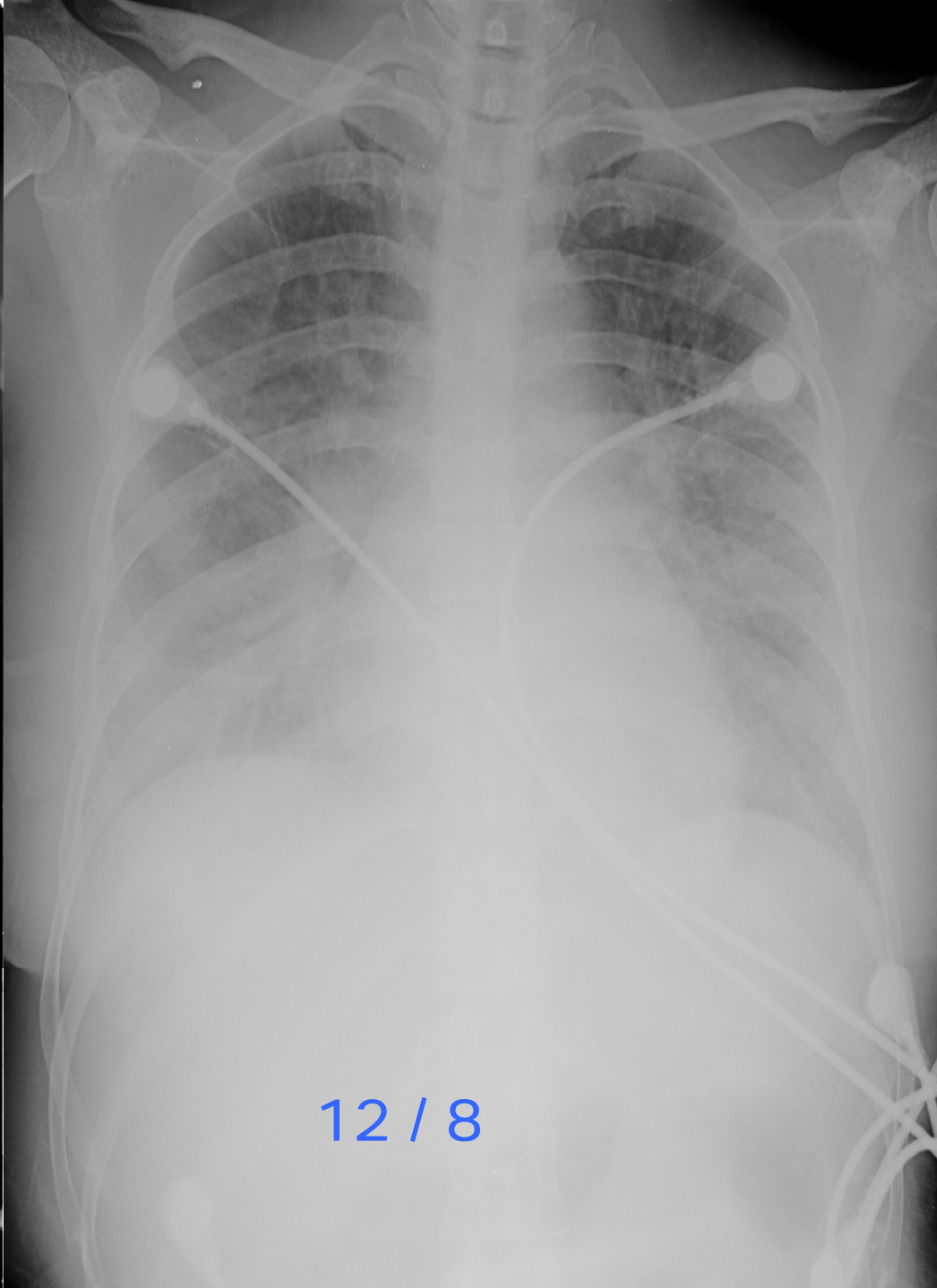
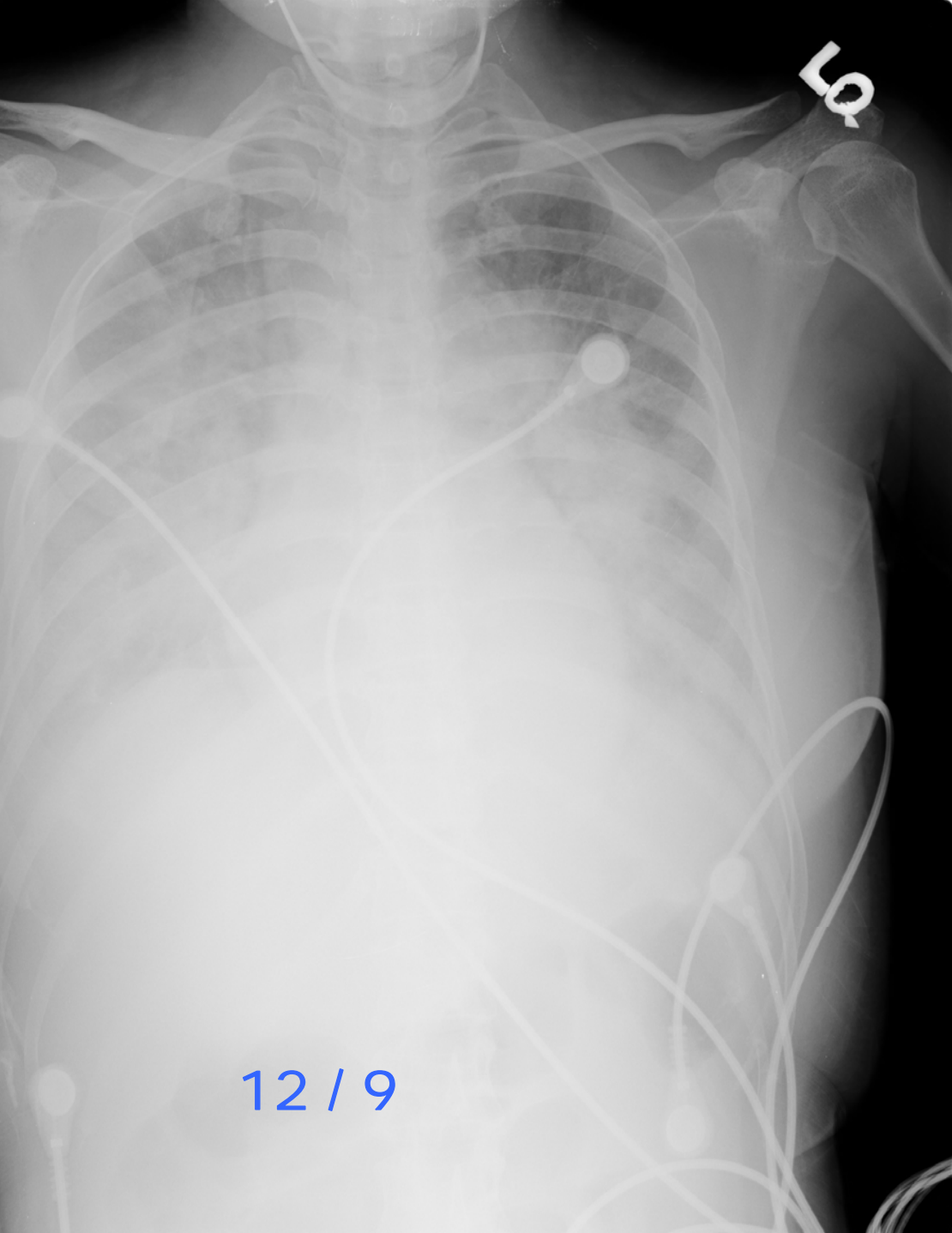


Normal  
Urine



Patient's Urine  
following  
centrifugation





**PIH**  
**shock**  
**sepsis**

**endothelial injury**

→ **collagen**

**12** → **12a**

**11** → **11a**

**9** → **9a**

**8**

**thromboplastin**

**7** → **10**

→ **10a**

**abruptio**  
**AF embolism**  
**IUFD**  
**mole , accreta**  
**in-utero sepsis**

**phospholipid**

**5** → **2** → **2a**

**hemolysis**  
**sepsis**

**fibrinogen** → **fibrin**

- **DIC in pregnancy : 3/ 5**

**FDP** > 32 mg/l ( **early** )

**PT INR** > 1.5

( **APTT > 50 “** , **protamine sulfate (+)** , **TT** )

**fibrinogen** < 300 mg % ( **nonpreg 150** )

**platelet** < 100,000 / mm<sup>3</sup>

**anti T III** < 80%

- **FDP : high in pul emboli, DVT, liver ( clear ), DIC**

- \* **anticoagulation** --> long thrombin time

- \* **inhibit uterus ( atony ) & toxic to heart**

# DIC

- Remove underlined: delivery, bleeding, antibiotics
- **Fibrinogen > 150 mg %**
  - **Cryoprecipitate** : VIII , fibrinogen
  - **FFP** : **Packed RBC** = 1: 1
  - **Fresh** whole blood ( half life eg. VII = 6 hr )
  - normal **liver** produce factor in **24 hrs**
- **Platelet > 50,000 / mm<sup>3</sup>**
  - **1 u** elevated **5000 / mm<sup>3</sup>**
  - normal half -life 3-4 d ; produce **normal 5 -7 d**
- **Heparin**: use prevent, early chronic (only high FDP)  
**not** in acute bleeding, abruptial, NSD (6h), C/S (24 hr)

# Fibrinogen

- **120 mg / dl** save for delivery
- **> 50 mg/dl** coagulation slightly prolonged  
**< 50 mg/dl** need supply
- **4g** fibrinogen to raise to **100 mg /dl**
- **1U FFP = 1 g** fibrinogen
- **1U cryoprecipitate = 0.25 g** fibrinogen
- **Repeat transfusion induced Ab to fibrinogen**

ob gyn survey 1997 , 52 ,9 ; 575-97

## ● Heparin

Not cross PL : no embryopathy

High thrombosis ( I ,PP ), bleeding br heart j 1994;71 (2) :196-201 ; eur keart j 1995;16:1317-9

Multiple injection - fluctuation, narrow therapeutic  
infection ( endocarditis -S aureus ) lancet 1994,334;10 1644

APTT , anti Xa , protamine

## ● Coumarin

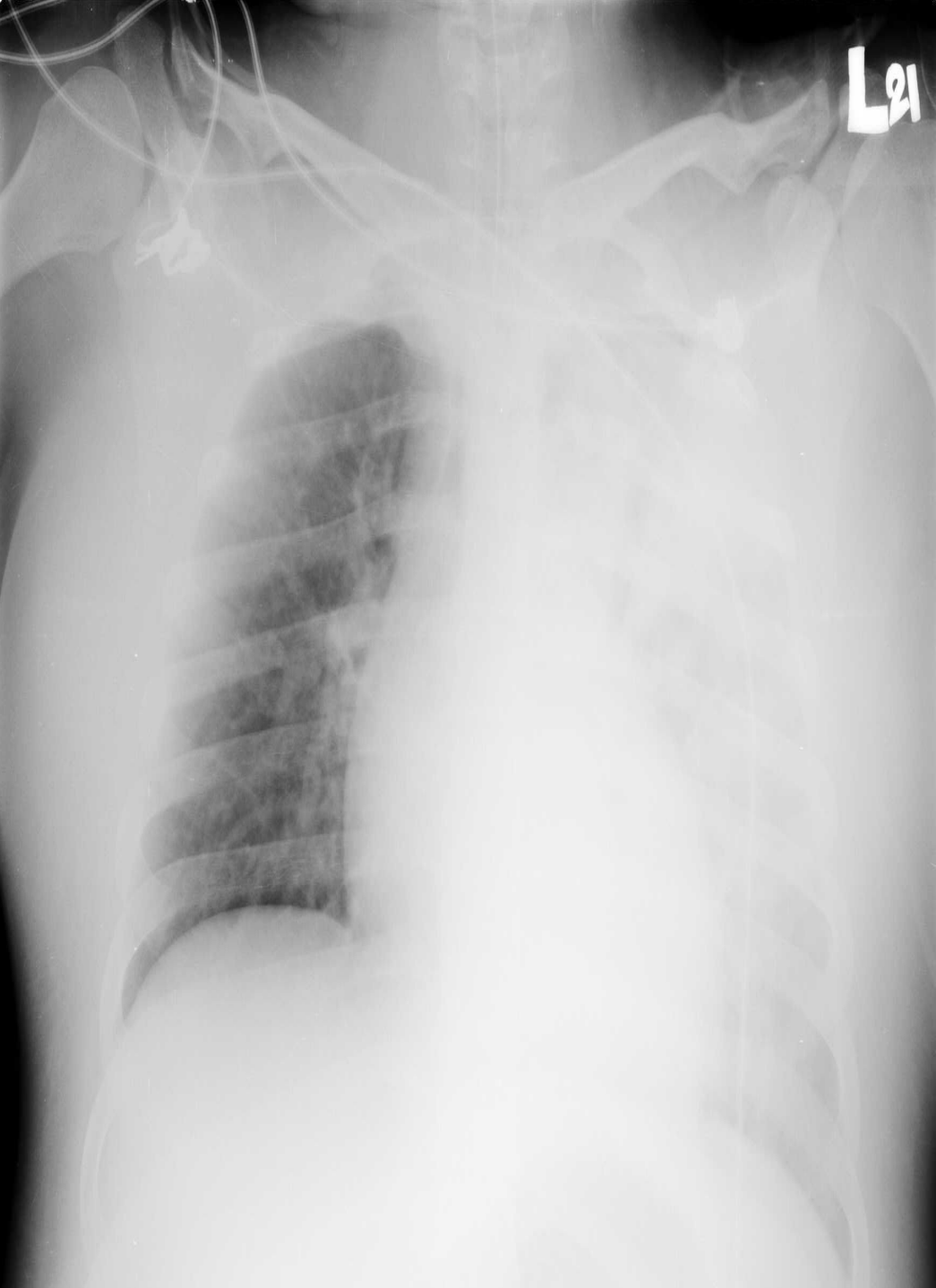
Cross PL : Embryopathy N eng j med 1985;27:1390-3 dose

ICH ( 2w before delivery ) clin card 1996 ,19 :682 Richard Conti

Delayed onset ; long half-life

Low thrombosis ; low hemorrhage

Easy administration , easy monitor -- PT ( INR )



# Anaphylactic Shock

- **Epinephrine** : 0.5mg iv slowly q5-10 min  
0.3 - 0.5 mg sc q 20-30 min up to 3 dose
- **Endo + O2 + iv** lactated ringer + **vasopressor**
- **Aminophylline** 6mg/kg iv for 20' then 0.5 -  
0.6 mg/kg/hr for bronchospasm ( 250mg/10cc)
- **Hydrocortisone** 500mg iv q6 h not first line , peak  
effect 6-12 hr , prevent later s/s
- **Antihistamine** : not for acute episode for short  
duration and prevent relapse . **Allermine** 5mg iv



