III Съезд Congress

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The Obstetric Patient
Physiology for the Anaesthetist

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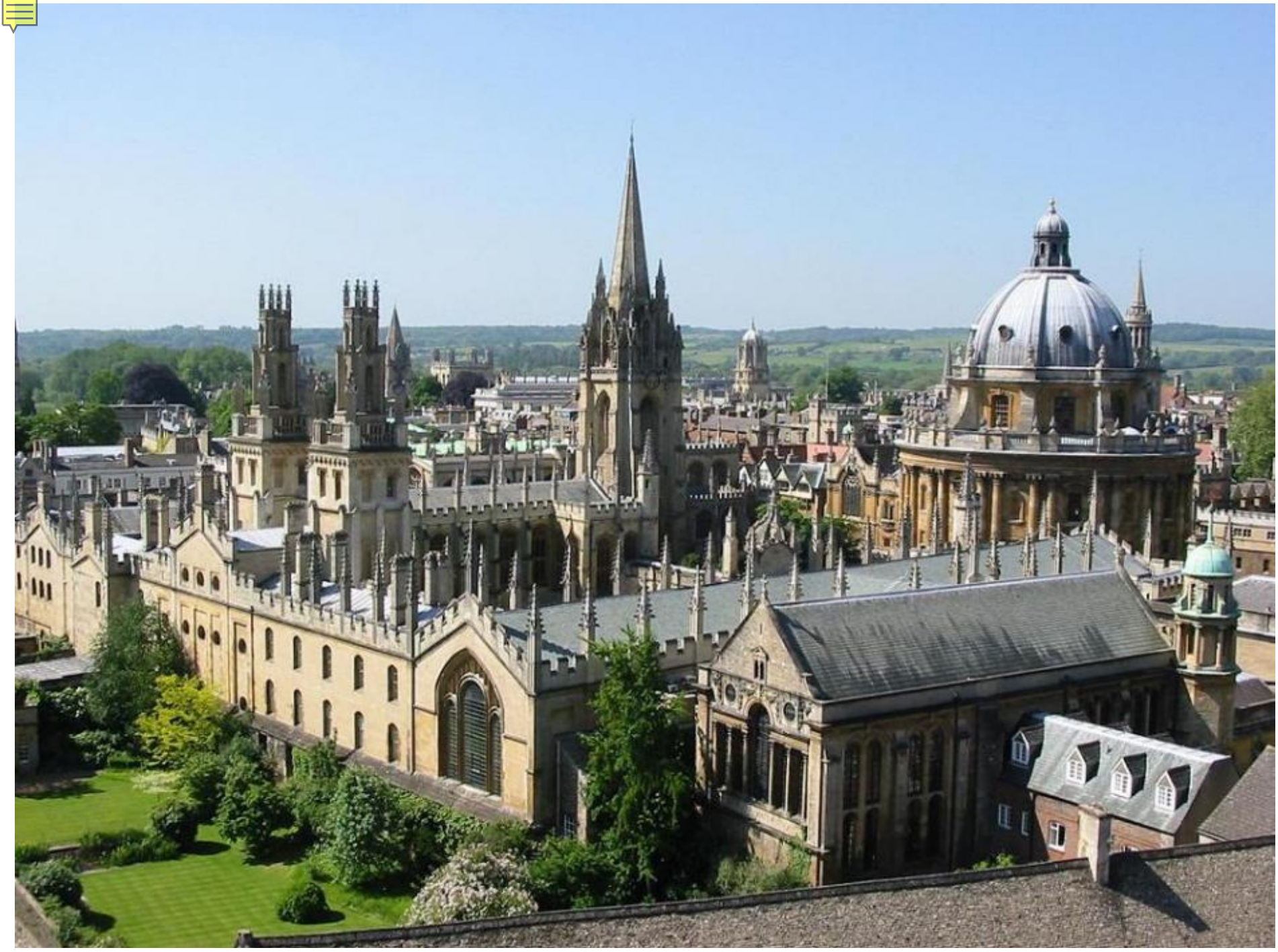
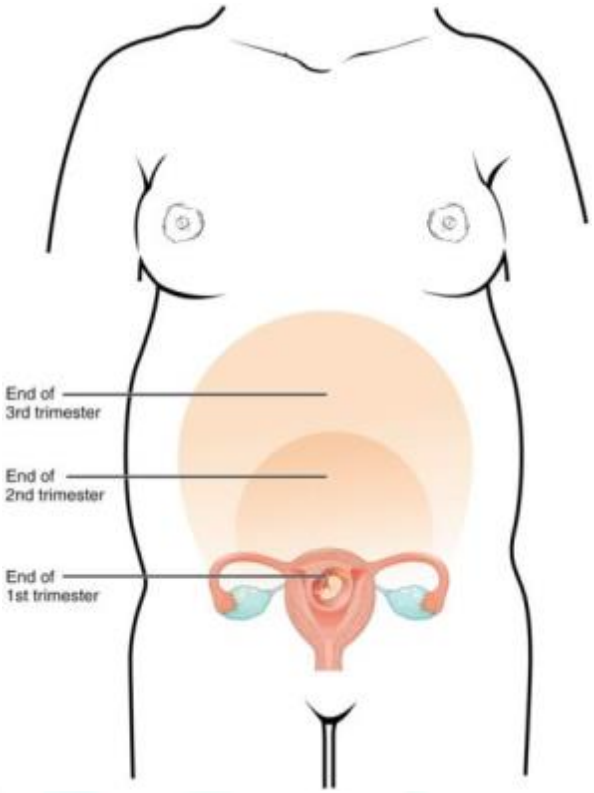


Summary

- Cardiovascular
- Respiratory
- Gastrointestinal
- Haematological
- Hepatic
- Renal
- Neurological
- Immunological
- Musculoskeletal
- Placenta



Cardiovascular changes

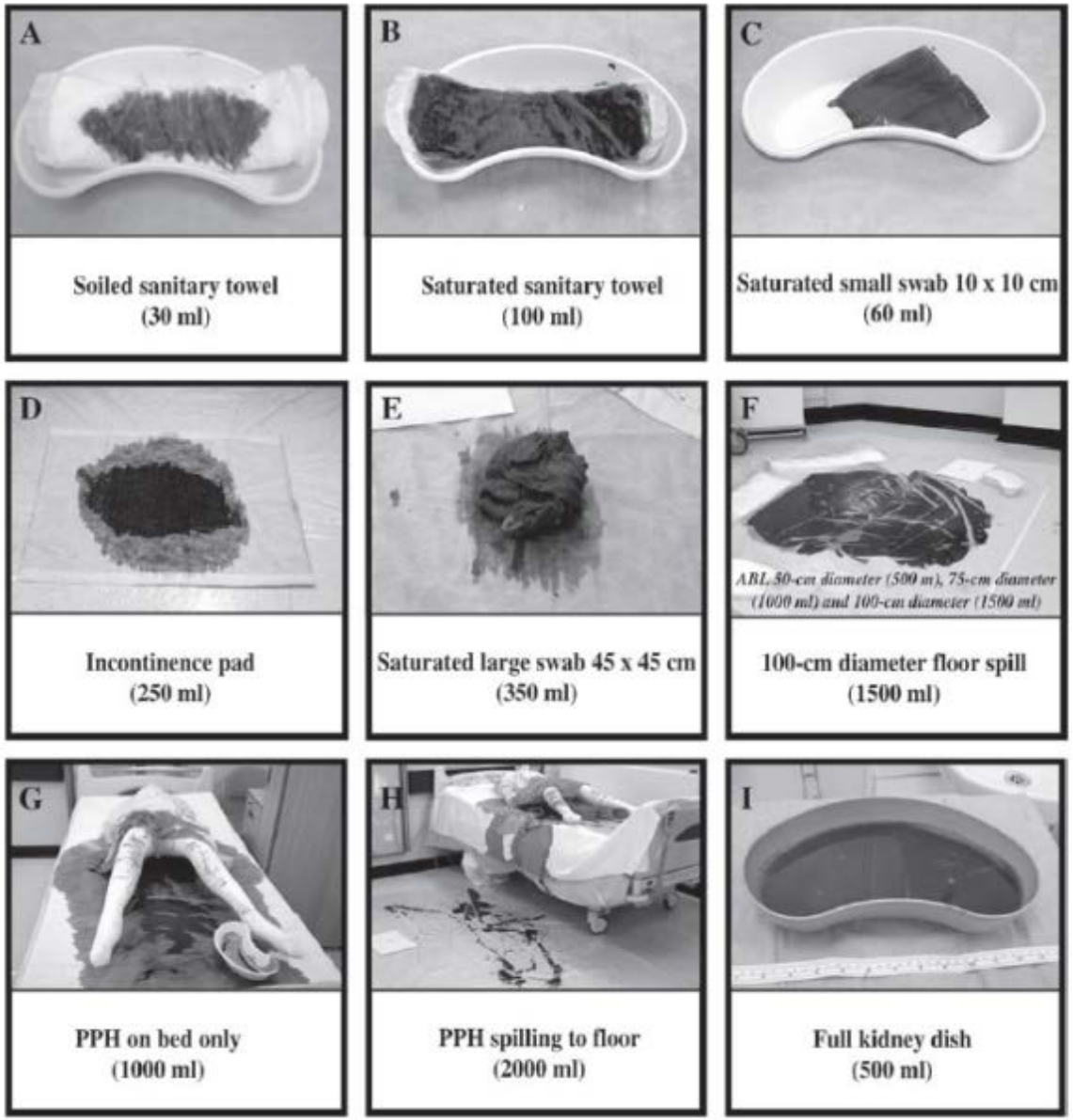
- Blood pressure
- Filling pressures
- Blood volume
- Cardiac output
- Aortocaval compression

Blood volume changes

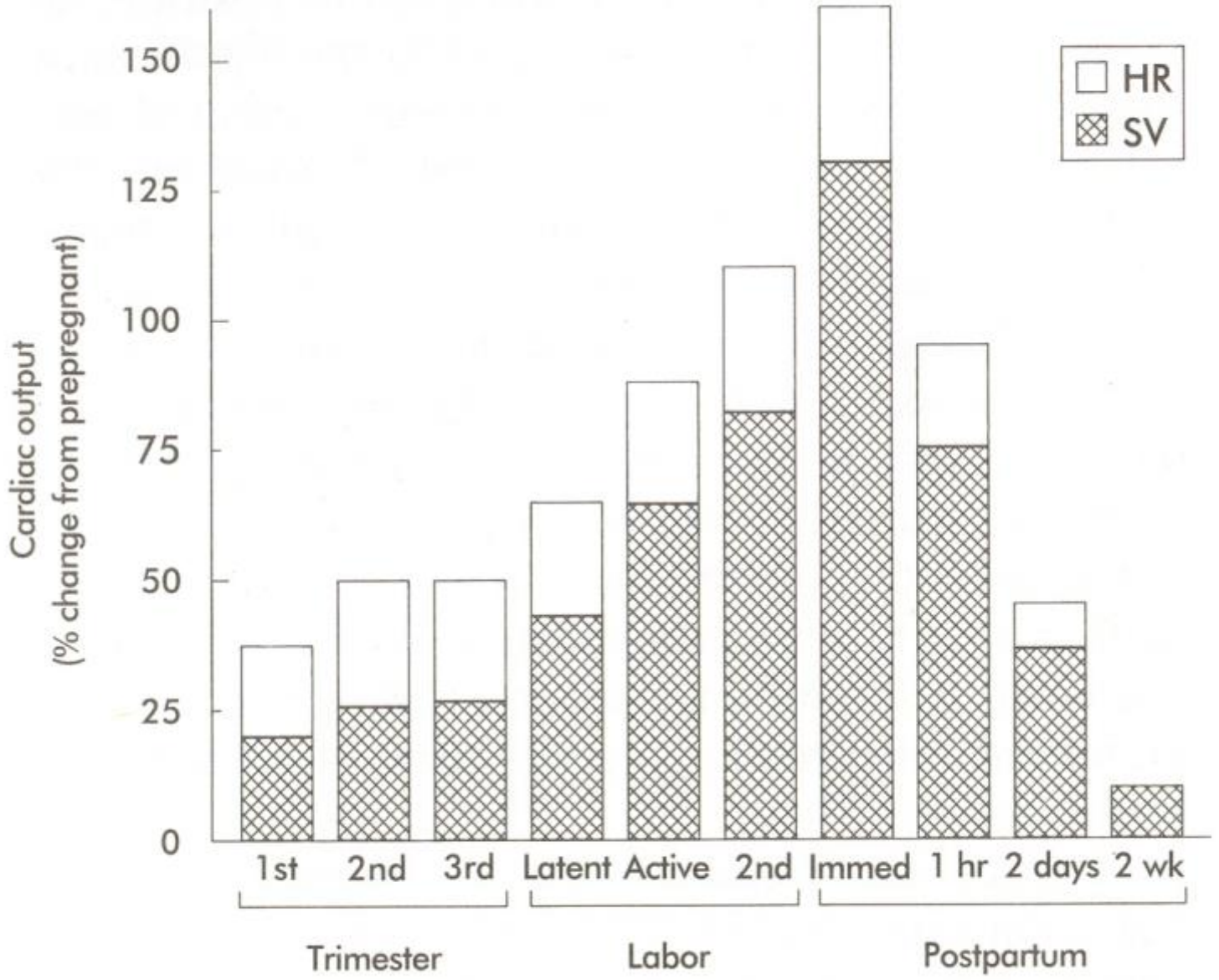
	term
Blood volume	+ 45%
Plasma volume	+ 55%
Red cell volume	+ 30%
Haemoglobin	↓115 g/L
Haematocrit	↓ 35%

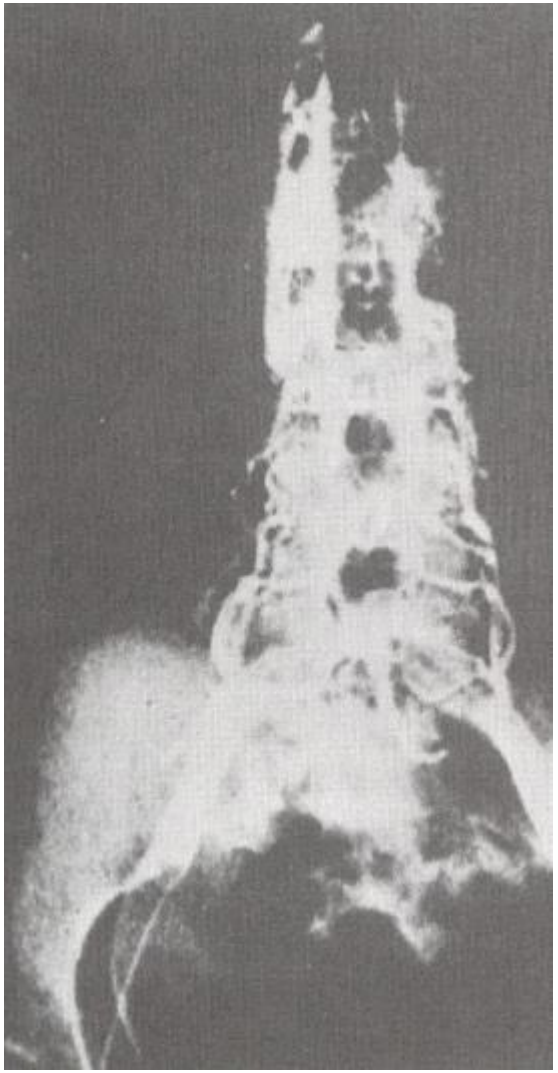
Signs of haemorrhage in pregnancy

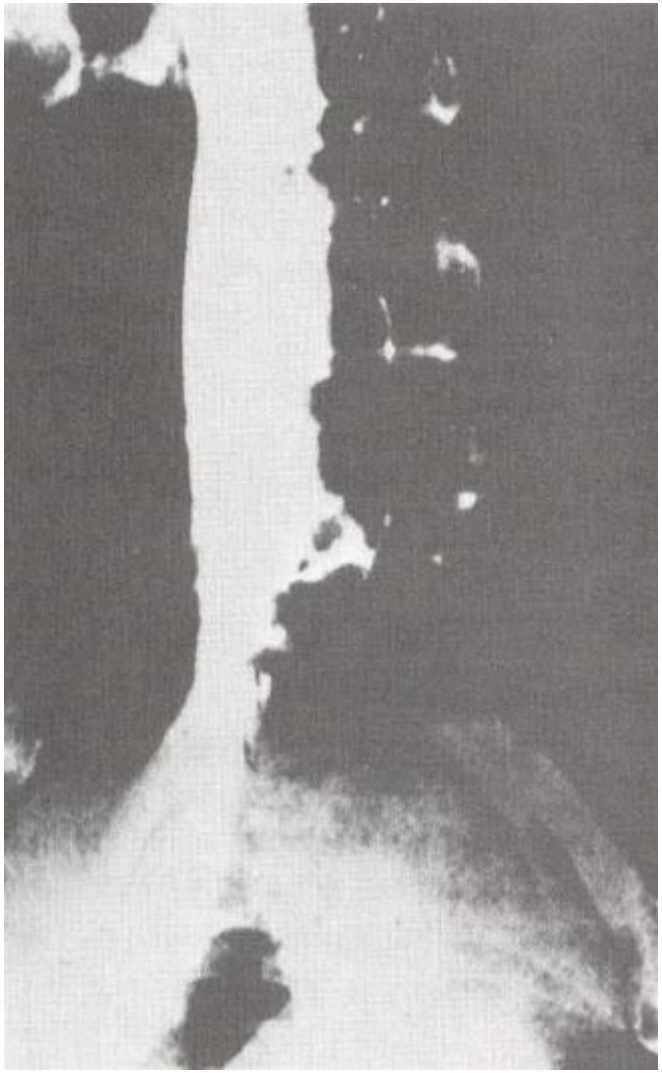
	0-15% 1000 ml	15-30% 1500 ml	30-40% 2000 ml	>40% 2500 ml
Heart rate (beats/min)	<100	>100	>120	>140
Systolic BP	→	→	↓	↓↓
Diastolic BP	→	↑	↓	↓↓
Respiratory rate (breaths/min)	15-20	20-30	30-40	40+
Urine output (ml/h)	>30	20-30	5-15	<10
Mental state	anxious	confused	agitated	lethargic



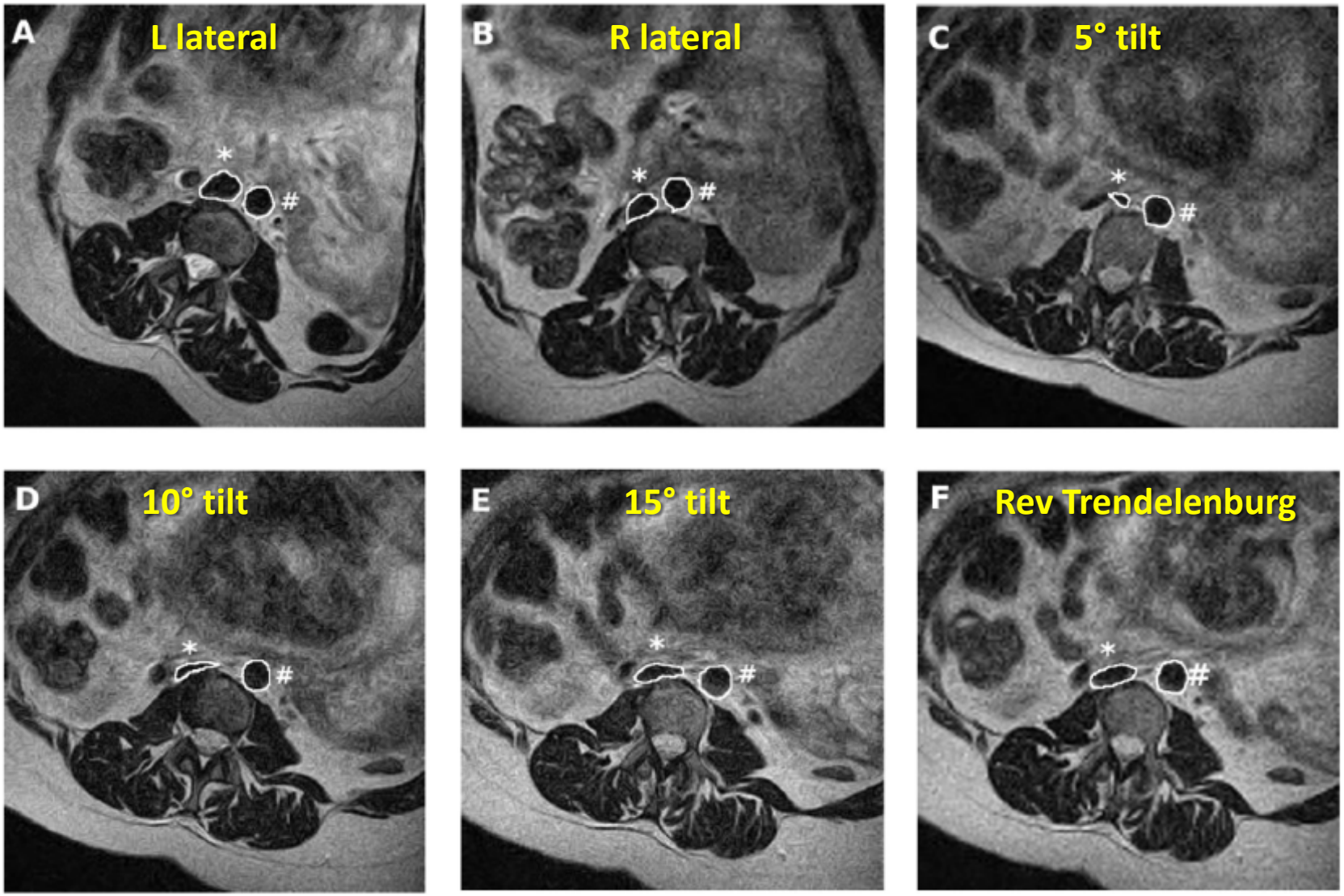
Bose *et al. BJOG* 2006


Cardiac output
(% change from prepregnant)
150
125
100
75
50
25
0
HR
SV
1st
2nd
3rd
Latent
Active
2nd
Immed
1 hr
2 days
2 wk
Trimester
Labor
Postpartum





Kerr *et al. BMJ* 1964



Saravanakumar *et al. IJOA* 2016

NARRATIVE REVIEW ARTICLE

Aortocaval Compression Syndrome: Time to Revisit Certain Dogmas

Allison J. Lee, MD, and Ruth Landau, MD

More than 70 years ago, the phenomenon of "postural shock" in the supine position was described in healthy women in late pregnancy. Since then, avoidance of the supine position has become a key component of clinical practice. Indeed, performing pelvic tilt in mothers at term to avoid aortocaval compression is a universally adopted measure, particularly during cesarean delivery. The studies on which this practice is based are largely nonrandomized, utilized a mix of anesthetic techniques, and were conducted decades ago in the setting of avoidance of vasopressors. Recent evidence is beginning to refine our understanding of the physiologic consequences of aortocaval compression in the context of contemporary clinical practice. For example, magnetic resonance imaging of women at term in the supine and tilted positions has challenged the dogma that 15° of left tilt is sufficient to relieve inferior vena cava compression. A clinical investigation of healthy term women undergoing elective cesarean delivery with spinal anesthesia found no difference in neonatal acid-base status between women randomized to be either tilted to the left by 15° or to be in the supine position, if maternal systolic blood pressure is maintained at baseline with a crystalloid coload and prophylactic phenylephrine infusion. This review presents a fresh look at the decades of evidence surrounding this topic and proposes a reevaluation and appraisal of current guidelines regarding entrenched practices. (Anesth Analg 2017;125:1975–85)

Aortocaval compression

- Evidence base practice?
- Haemodynamic change in 10% when supine
- IVC compression only relieved by > 30° tilt
- Aortic compression less significant
- 15° tilt rarely achieved
- Maintenance of lateral tilt in uncomplicated cases?
- Obstetric difficulty
- Avoid supine position when hypotensive

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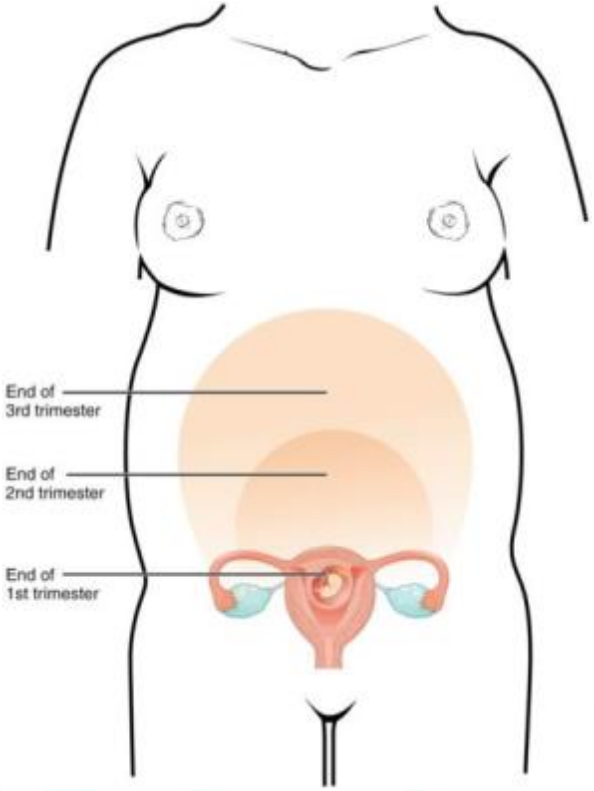
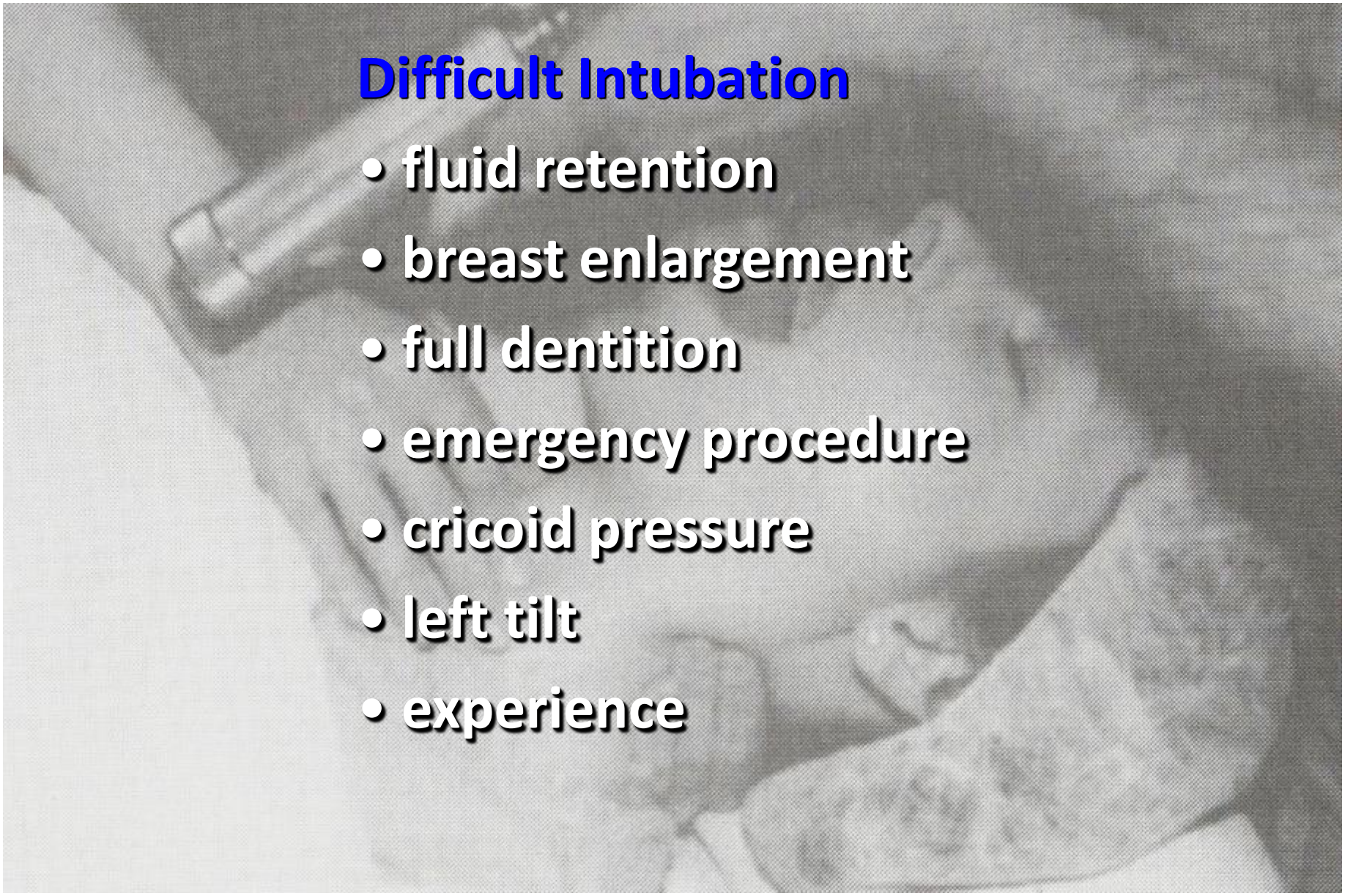
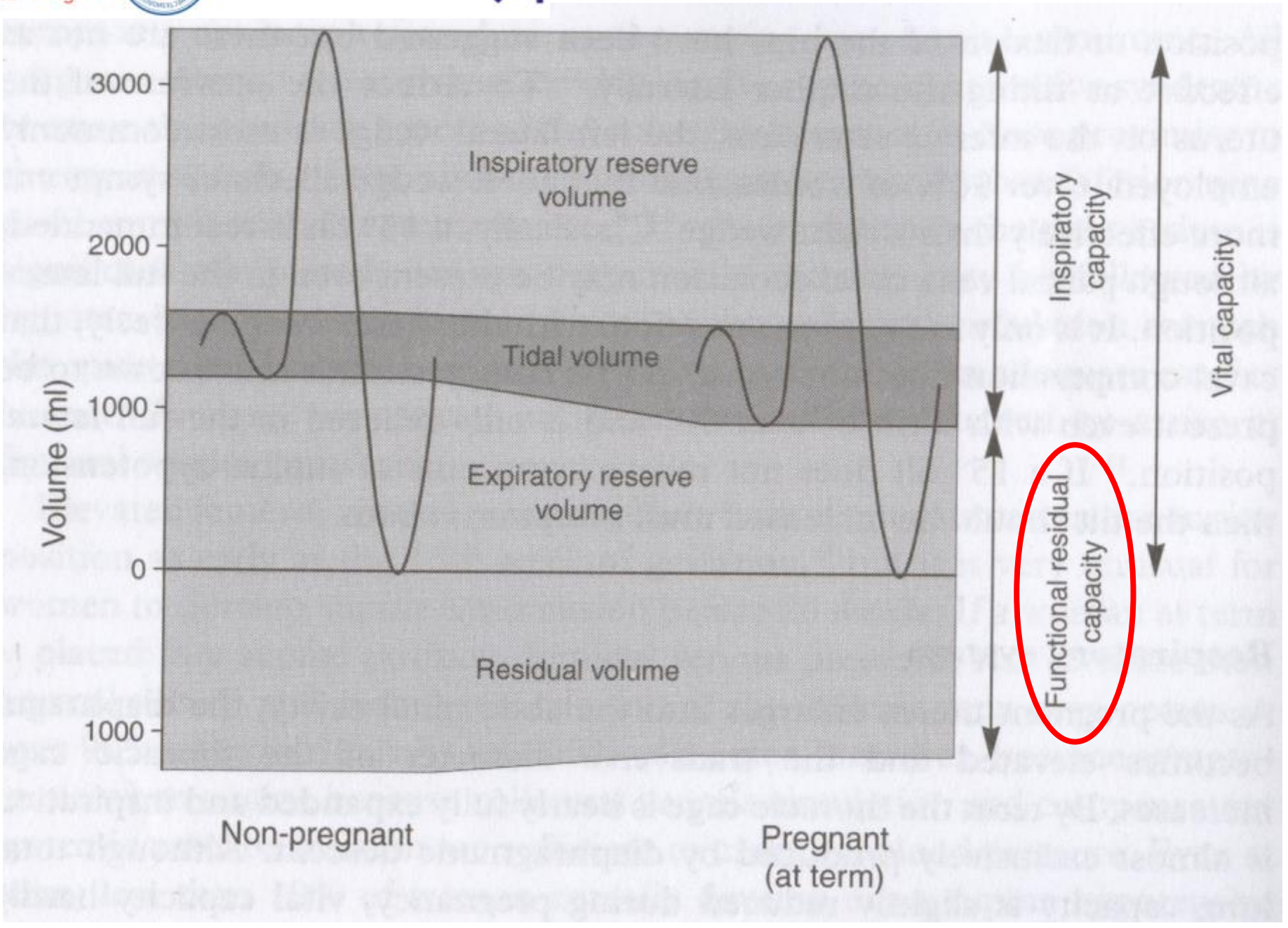




Difficult Intubation

- fluid retention
- breast enlargement
- full dentition
- emergency procedure
- cricoid pressure
- left tilt
- experience


3000
2000
1000
0
1000
Volume (ml)
Inspiratory reserve volume
Tidal volume
Expiratory reserve volume
Residual volume
Inspiratory capacity
Vital capacity
Functional residual capacity
Non-pregnant
Pregnant (at term)

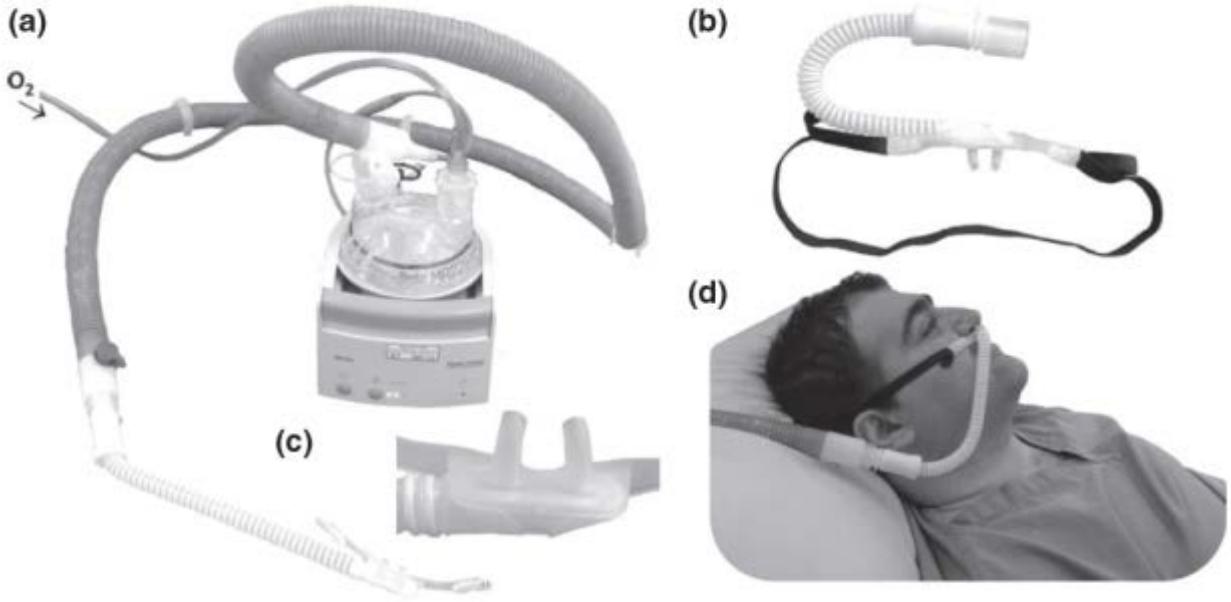


Figure 1 The OptiFlow high-flow humidified oxygen delivery system. The oxygen humidification unit (a) receives oxygen from a standard oxygen regulator and delivers humidified oxygen to a custom-built transnasal oxygen cannula (b and c) like a standard nasal oxygen cannula (d).

Blood gases during pregnancy

	non-pregnant	3rd trimester
pH	7.40	7.44
PaO_2	13.0	13.5
$PaCO_2$	5.3	4.0
HCO_3	24	20

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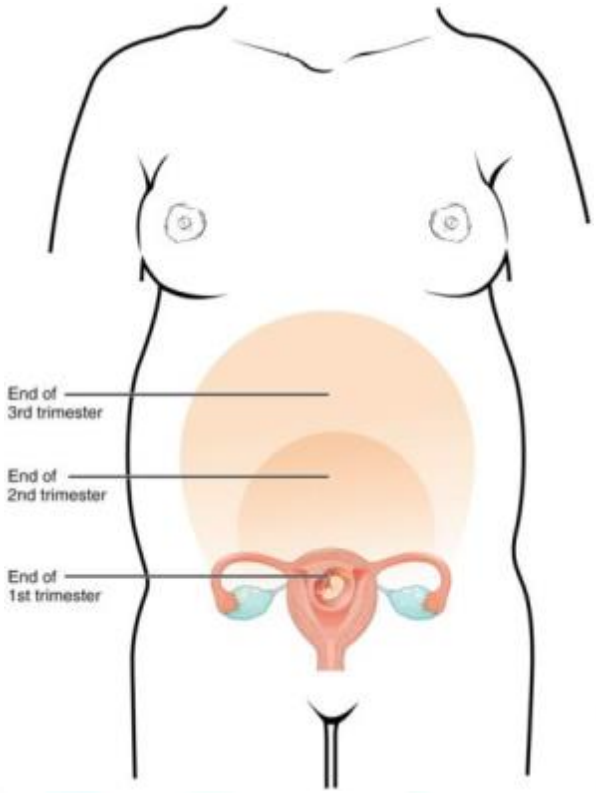
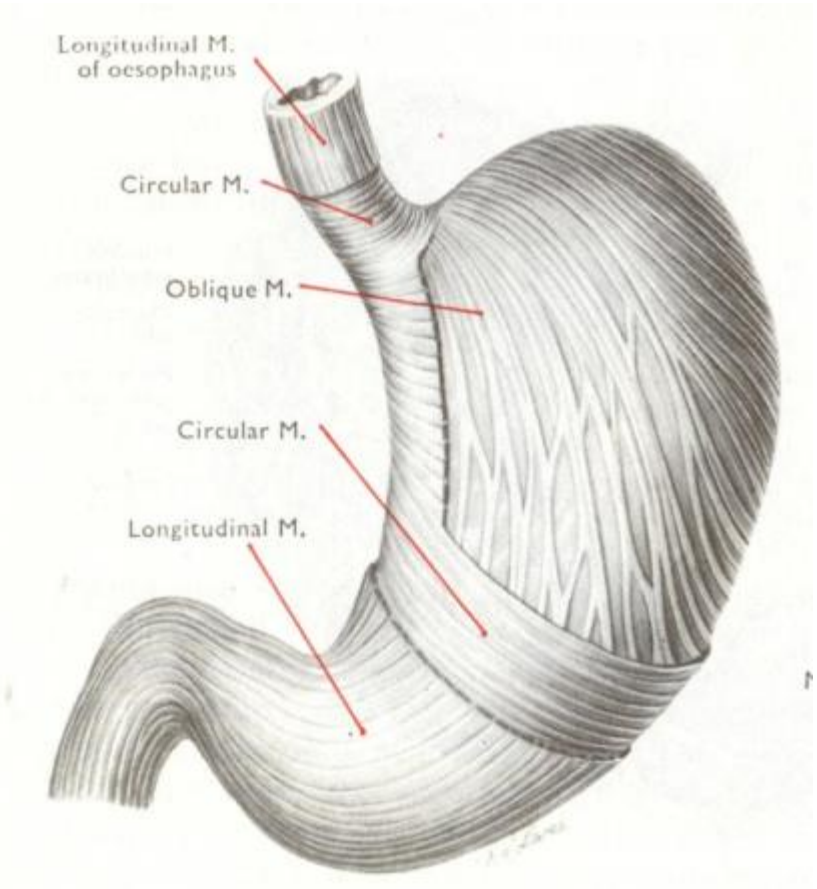
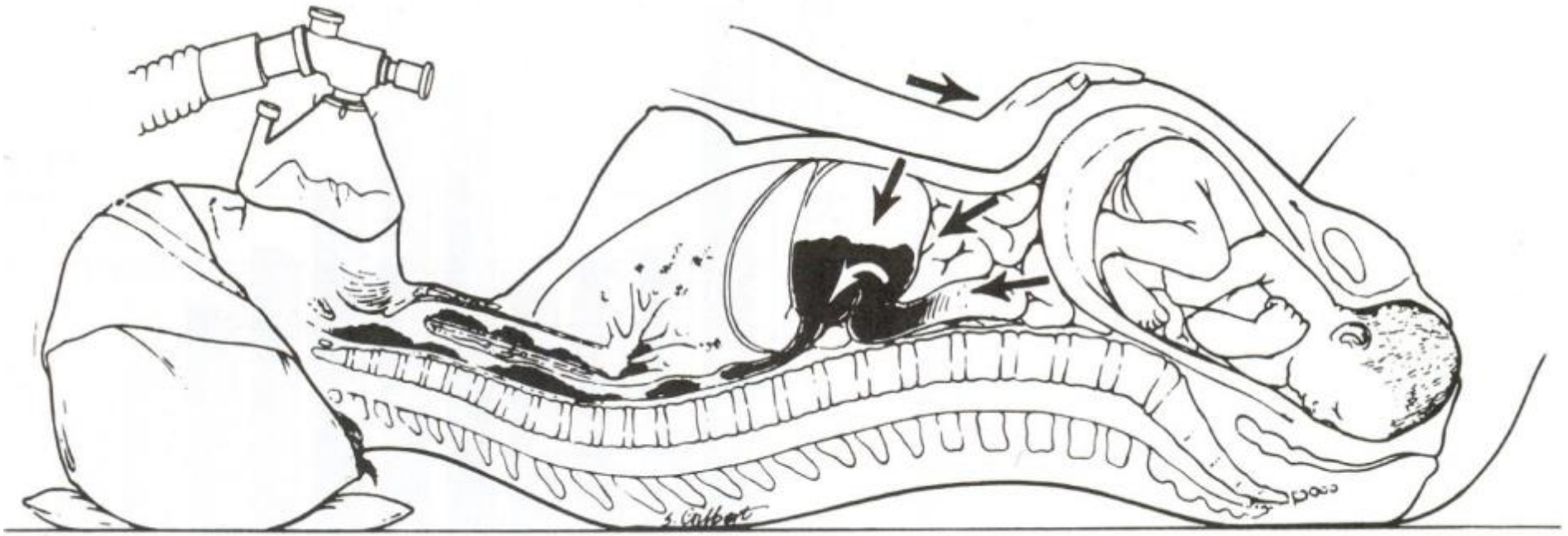


Gastrointestinal System

- lower oesophageal sphincter
- intra gastric pressure
- motility
- gastric volume
- acidity





GASTRIC CONTENTS IN PHARYNX AND ASPIRATED INTO TRACHEA AND LUNGS

REGURGITATION OF GASTRIC CONTENTS

Indications for rapid-sequence induction

- **Pregnancy** **12-20 weeks**
- **Postnatal** **48 hours**
- **Check for other risk factors**

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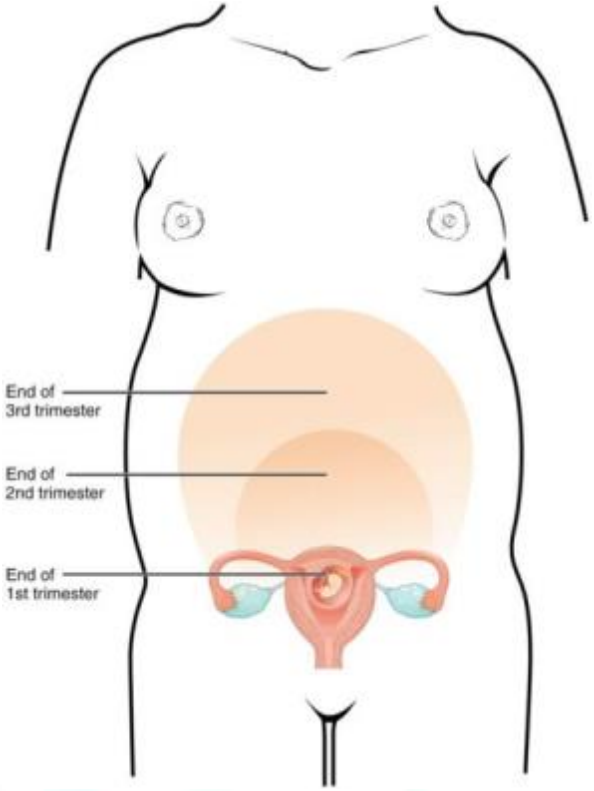
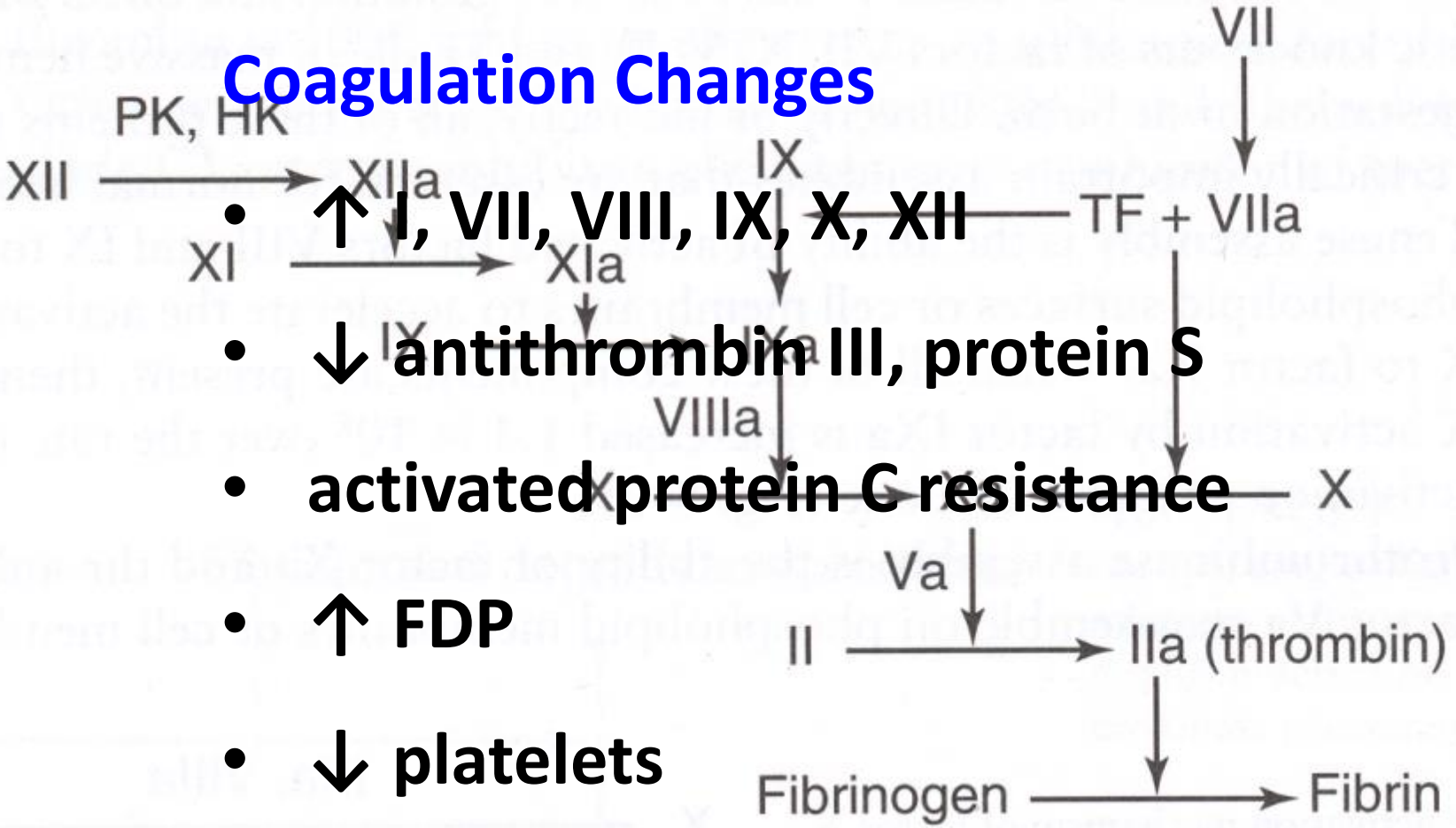
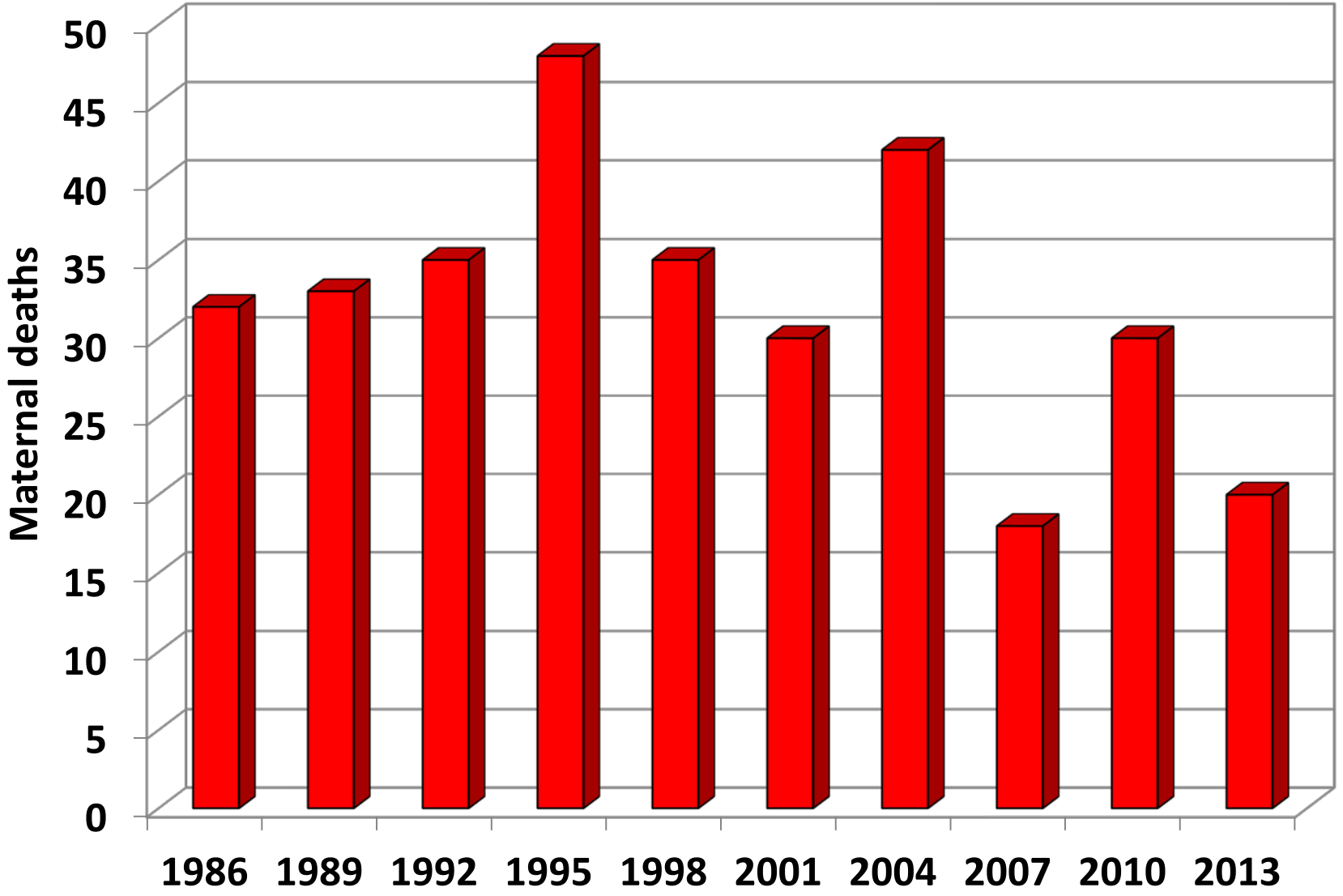


Coagulation Changes

- ↑ I, VII, VIII, IX, X, XII
- ↓ antithrombin III, protein S
- activated protein C resistance
- ↑ FDP
- ↓ platelets



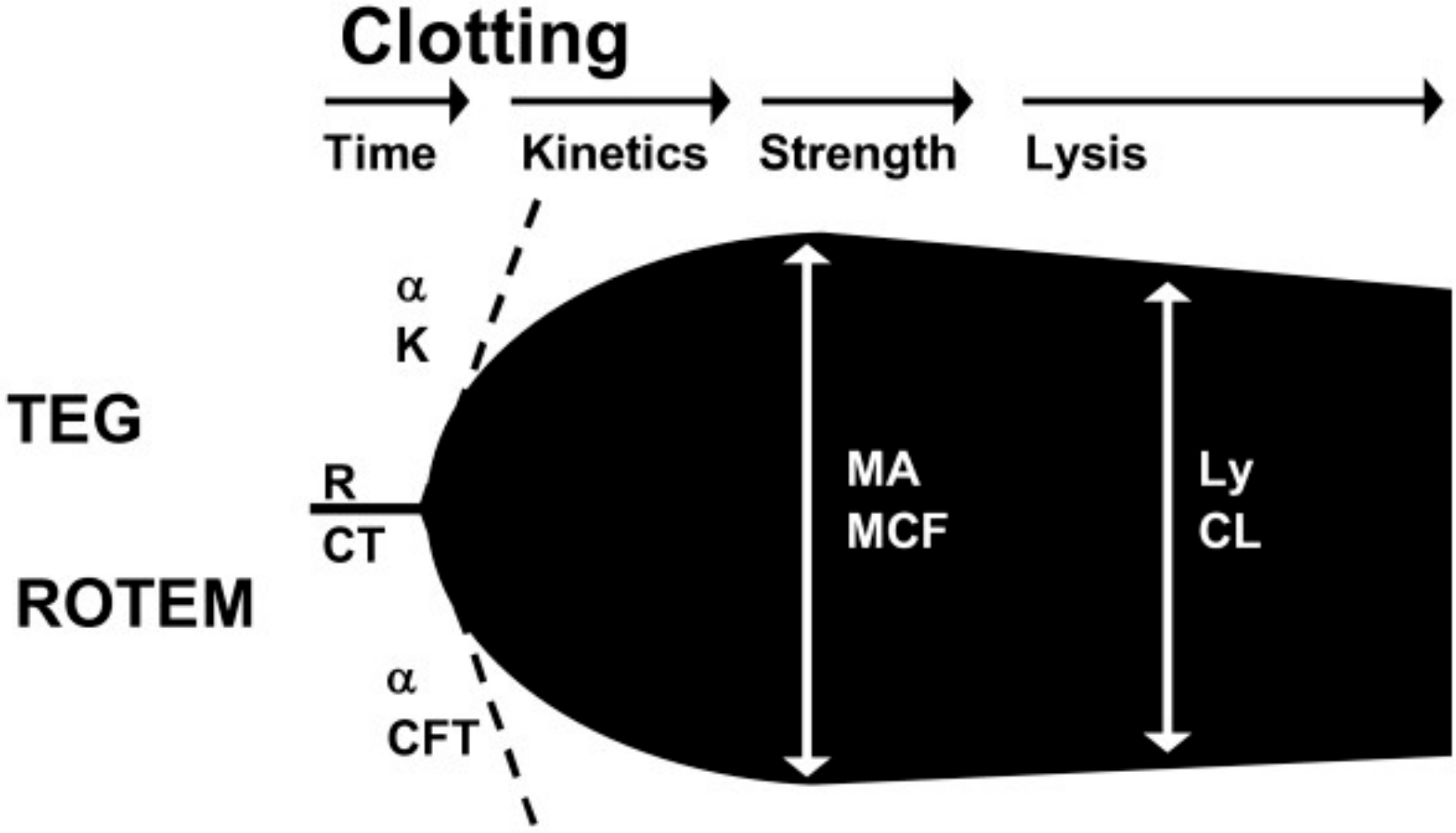
UK Maternal Deaths from Thrombosis & Thromboembolism



Assessment of coagulation

- Platelet count
- Clotting studies
- Factor assays
- TEG / ROTEM

Viscoelastic point-of-care testing


Clotting
Time
Kinetics
Strength
Lysis
TEG
ROTEM
α
K
R
CT
α
CFT
MA
MCF
Ly
CL

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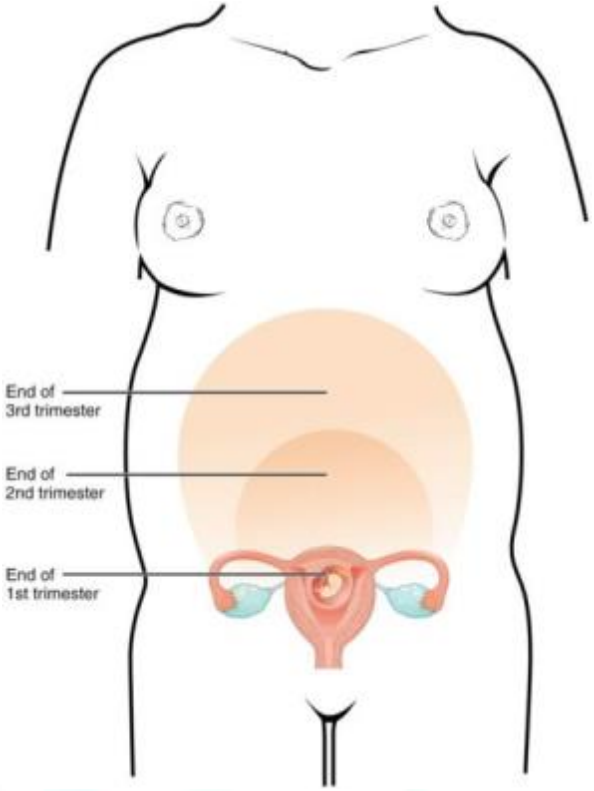
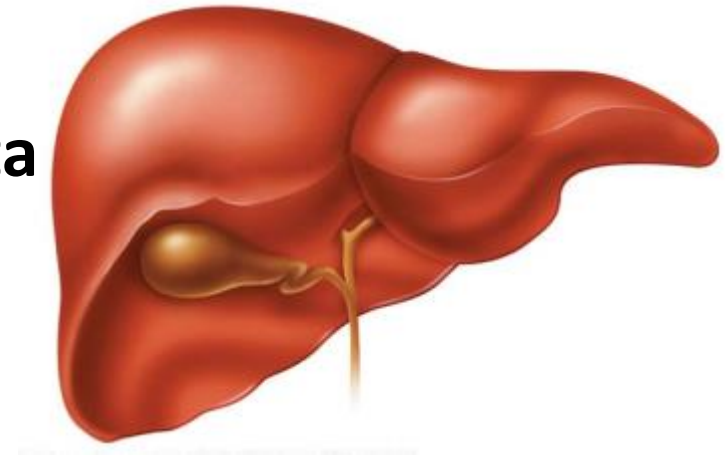


Liver

- ↑ total body albumin
- ↓ serum albumin
- ↑ liver enzyme activity
- alkaline phosphatase from placenta
- ↓ cholinesterase
- ↑ gallstones
- palmar erythema
- spider naevi



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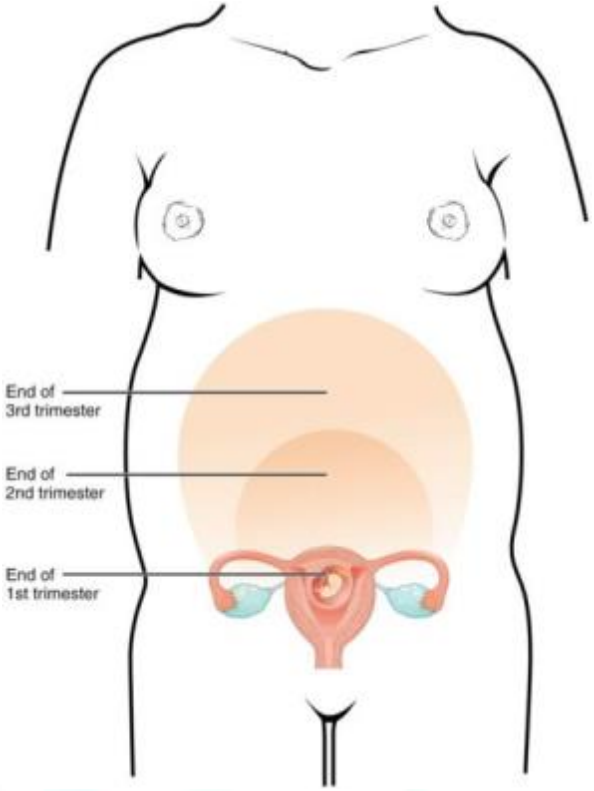
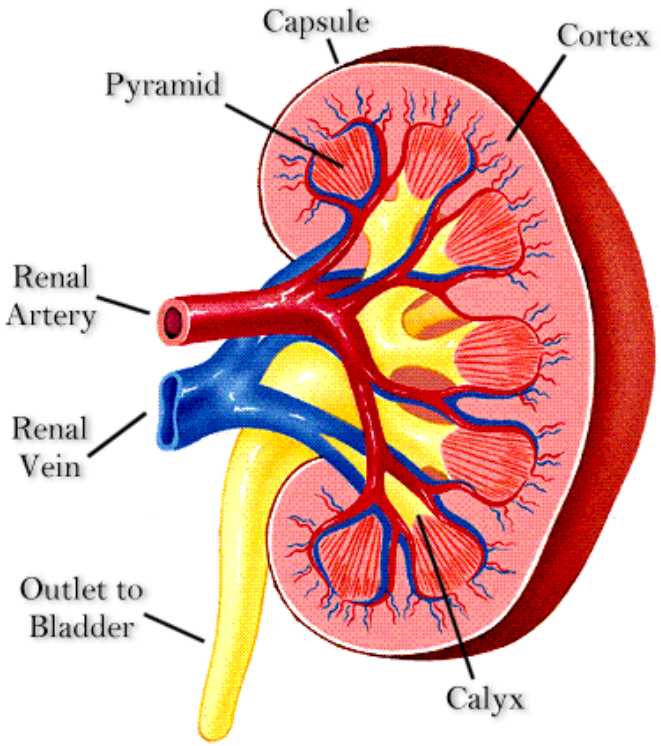


Kidney

- ↑ size
- dilation of ureters
- partial ureteric obstruction
- ↑ renal blood flow
- ↑ GFR
- ↓ urea & creatinine
- glycosuria



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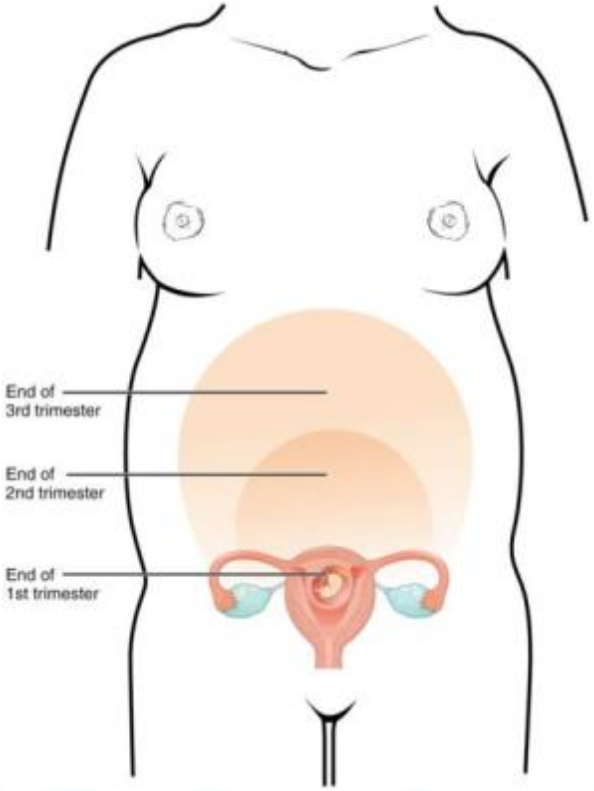

Central nervous system

- ↑ cerebral blood flow
- ↑ enkephalins / endorphins
- ↑ pain threshold
- ↓ MAC 25 - 40%
- ↓ LA requirement
- distension of epidural veins

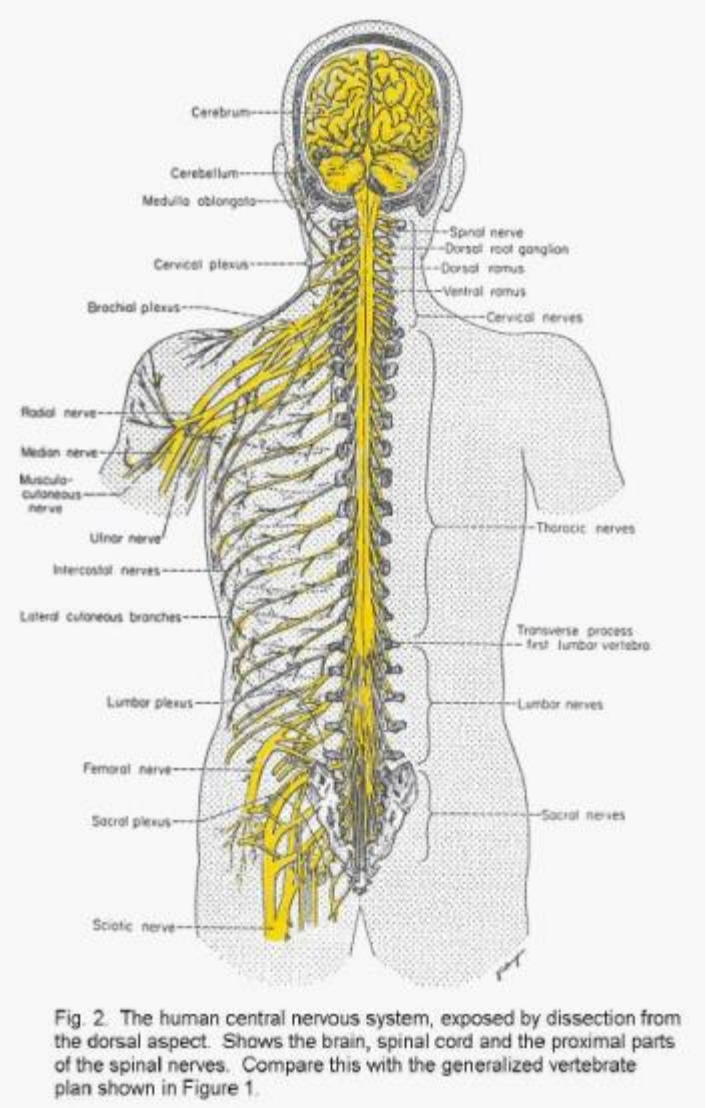

Fig. 2. The human central nervous system, exposed by dissection from the dorsal aspect. Shows the brain, spinal cord and the proximal parts of the spinal nerves. Compare this with the generalized vertebrate plan shown in Figure 1.

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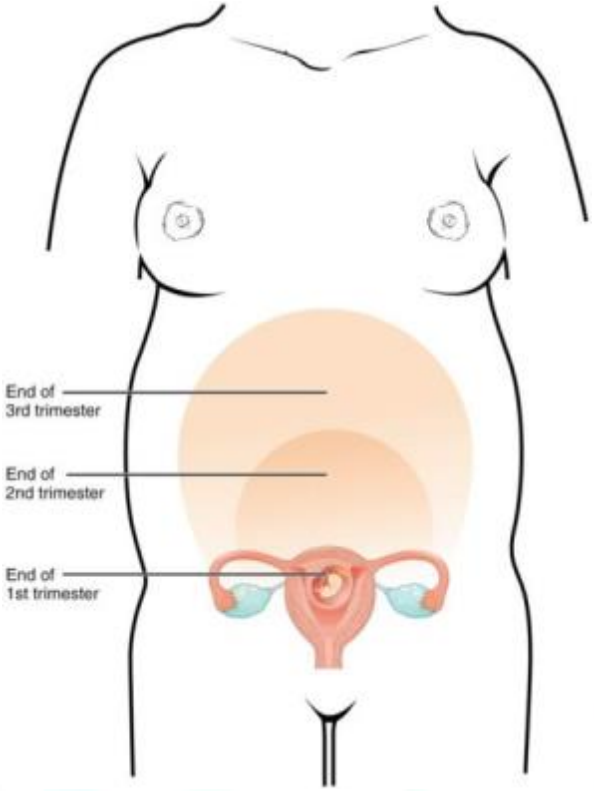
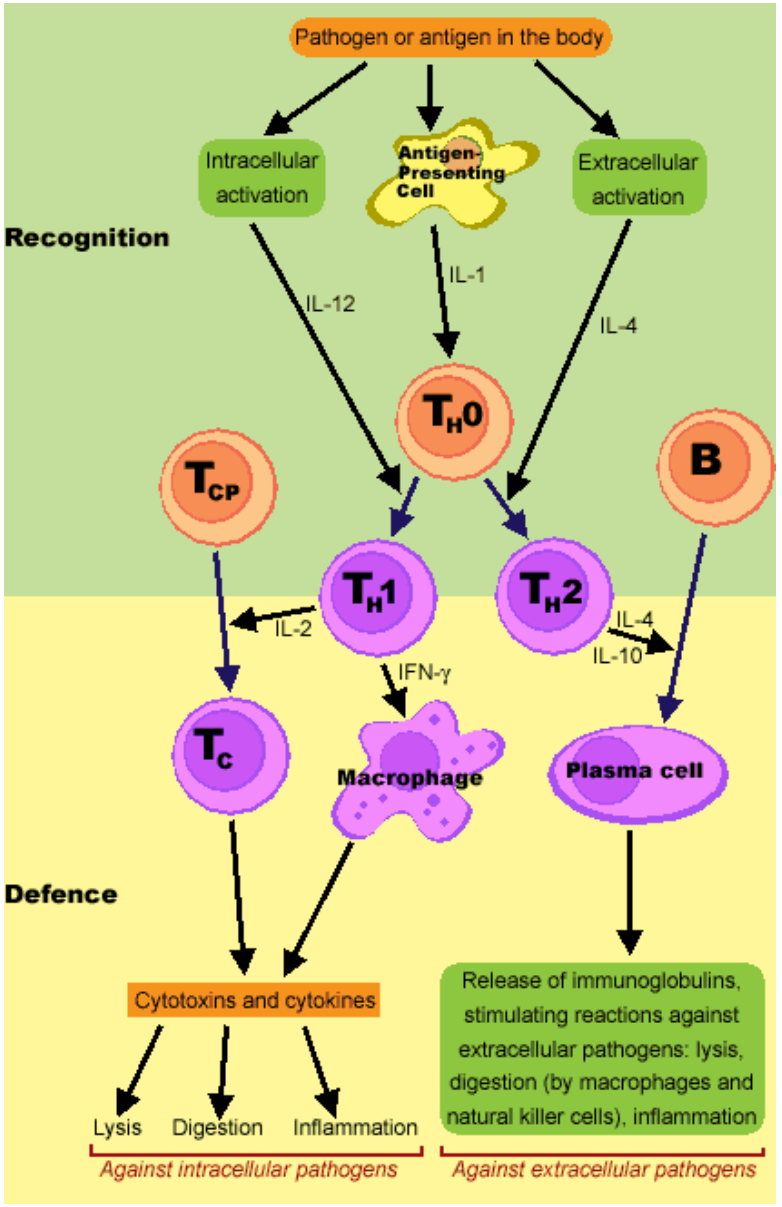


Immune function

- cell mediated
  - T cell activity normal
  - ↓ natural killer function
  - ↑ leucocytes in labour
- humoral
  - IgA, G & M unchanged
  - ↓ B lymphocytes post delivery
- ?↑ viral infections
- autoimmune disease
- role of cytokines
  - pre-eclampsia
  - recurrent miscarriage
  - pre-term labour



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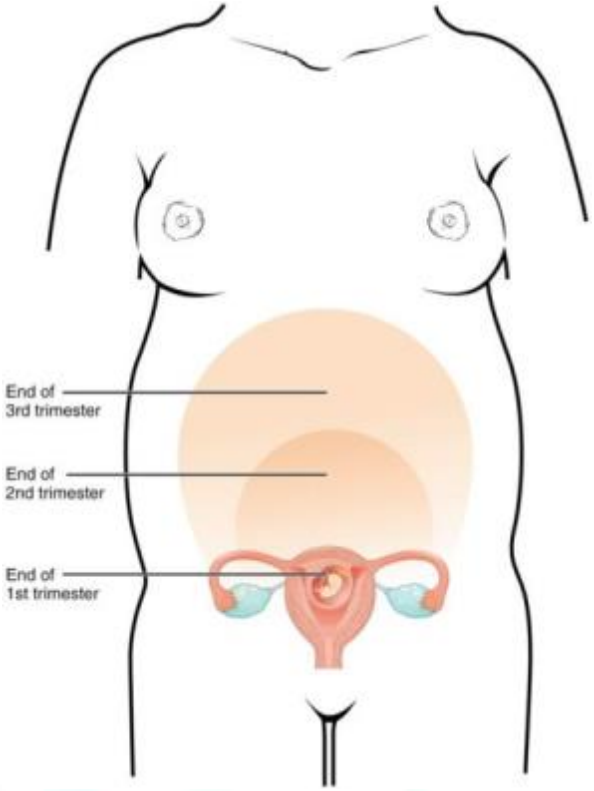
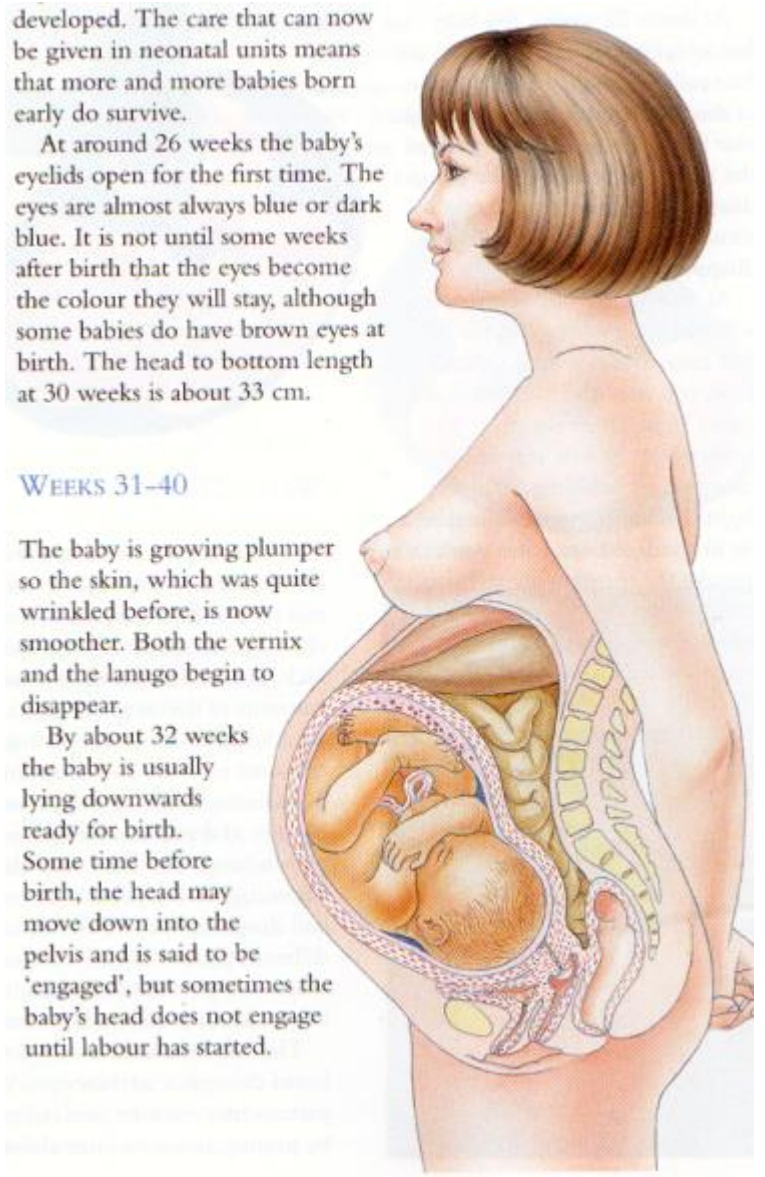


Musculoskeletal system

- lumbar lordosis
- relaxin
- backache
- SI joint dysfunction
- pelvic girdle pain
- disc prolapse



developed. The care that can now be given in neonatal units means that more and more babies born early do survive.

At around 26 weeks the baby's eyelids open for the first time. The eyes are almost always blue or dark blue. It is not until some weeks after birth that the eyes become the colour they will stay, although some babies do have brown eyes at birth. The head to bottom length at 30 weeks is about 33 cm.

WEEKS 31–40

The baby is growing plumper so the skin, which was quite wrinkled before, is now smoother. Both the vernix and the lanugo begin to disappear.

By about 32 weeks the baby is usually lying downwards ready for birth. Some time before birth, the head may move down into the pelvis and is said to be 'engaged', but sometimes the baby's head does not engage until labour has started.

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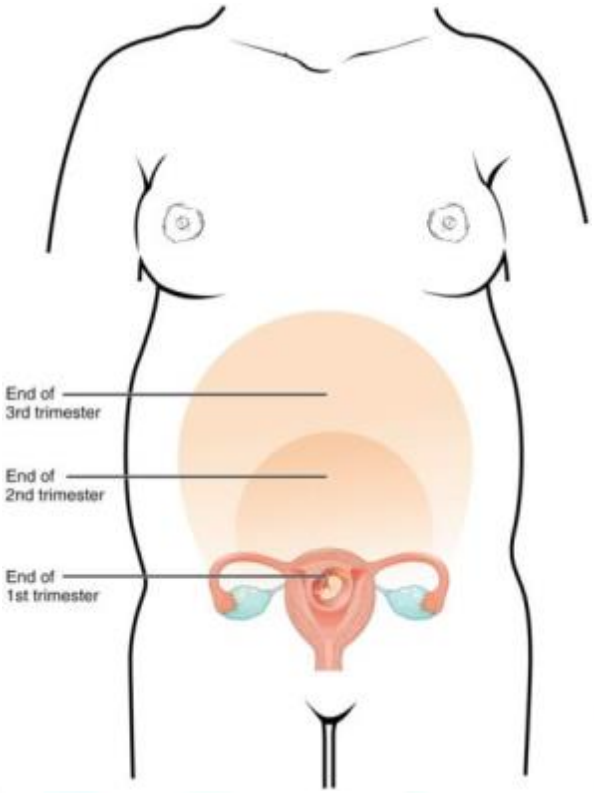

Placenta

- **Functions**
  - gas & nutrient transfer
  - hormone production
  - regulatory
- **Blood flow**
  - uterine
  - umbilical
- **Drug transfer**
  - physicochemical properties
  - concentration gradient
  - membrane thickness
  - surface area
  - placental metabolism
- **Effects of anaesthesia**

Fetal Welfare & Anaesthesia

• Teratogenicity	up to 71 days
• Miscarriage	1st trimester
• Neurodevelopment	2nd trimester
• Pre-term labour	3rd trimester
• Intrauterine asphyxia	labour & delivery

Спасибо