Acute pathologie van de late zwangerschap

Les pathologies aiguës de fin de grossesse

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12/09/2017

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'Arnolfini Wedding Portrait'
J. van Eyck 1434

Sandro Botticelli, The Birth of Venus (c. 1486)

Nativity - Lorenzo Costa 1490
Critical care of the obstetric patient

diseases / trauma ‘s - unrelated to pregnancy
- worsening during pregnancy
- with higher incidence during pregnancy

typical pregnancy-related complications
# Obstetric admissions to the intensive care unit

## Review UZLeuven 2000-2012:

<table>
<thead>
<tr>
<th>Therapeutic admissions</th>
<th>159 (83.7%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct obstetric</strong></td>
<td></td>
</tr>
<tr>
<td>hypertension</td>
<td>12 (6.3%)</td>
</tr>
<tr>
<td>hemorrhage</td>
<td>14 (7.4%)</td>
</tr>
<tr>
<td>infections</td>
<td>10 (5.3%)</td>
</tr>
<tr>
<td>cardiomyopathy</td>
<td>10 (5.3%)</td>
</tr>
<tr>
<td>AFLP</td>
<td>5 (2.6%)</td>
</tr>
<tr>
<td>volume overload</td>
<td>2 (1.1%)</td>
</tr>
<tr>
<td><strong>Indirect obstetric</strong></td>
<td></td>
</tr>
<tr>
<td>TTP/HUS</td>
<td>2 (1.1%)</td>
</tr>
<tr>
<td>thrombo-embolism</td>
<td>6 (3.2%)</td>
</tr>
<tr>
<td>cardiac</td>
<td>19 (10.1%)</td>
</tr>
<tr>
<td>endocrine</td>
<td>8 (4.2%)</td>
</tr>
<tr>
<td>respiratory</td>
<td>17 (8.9%)</td>
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</tr>
</tbody>
</table>

| Non-obstetric          |             |
| trauma                 | 6 (3.2%)    |
| burns                  | 3 (1.6%)    |
| neurologic             | 6 (3.2%)    |

- Neonatal outcome: † 13.7%, NICU admission 36.7%
- Low admission rate
- Low maternal mortality:
  - 2 † < 42 days after delivery
  - 2 † < 1 year  † 1.1%
Obstetric admissions to the intensive care unit

emotional context!

altered maternal physiology

medical emergency associated with pregnancy

foetal considerations

significant challenges to medical/nursing staff...
Normal physiological changes in pregnancy
Normal physiological changes in pregnancy

Crucial for healthy pregnancy and normal development of foetus

But ...
Normal physiological changes in pregnancy
Normal physiological changes in pregnancy

(a)

Gravid uterus

Compression of inferior vena cava

Aorta

Distended azygous veins

L   R
Normal physiological changes in pregnancy

(a)

Gravid uterus

Aorta

Distended azygous veins

Compression of inferior vena cava

15° tilt using the operating table

15° tilt using a wedge

L R

30°
Normal physiological changes in pregnancy

Respiratory system

- Anatomic and physiologic changes
  - Capillary engorgement of mucosa
  - Risk for regurgitation / aspiration (>28w)
  - Weight gain
  - Increased breast size
  - Pre-eclampsia

- Physiologic changes => prompt desaturation!

- Urgent nature of the obstetrical practice
  - Failed intubation 1/2330 (general surgery)
  - Incidence X8 in obstetrics
Normal physiological changes in pregnancy

- Increase in prothrombin, VII, VIII, X, XII, vwf, fibrinogen
- (fall in XIII)
- Prot S ↓, aPC resistance
- Antithrombine ↓ or =

\[ \uparrow \text{coagulation} \]

- tPA en uPA \( \ll \) PAI 1 and PAI 2 (placental)
- TAFI \( \uparrow \)

\[ \downarrow \text{fibrinolysis} \]

+ Δ Venous blood flow
=> Incidence of DVT and VTE ↑
Normal physiological changes in pregnancy

- ↓ oxygen reserve - airway management
- decreased cell-mediated immune response
- prothrombotic state
- delayed gastric emptying - ↓ LOS
- higher metabolic rate
- altered drug absorption / metabolismisation
- ...

Considerations for mother:

- Lack of autoregulation: uterine vasculature is normally maximally dilated and cannot adapt to a fall in maternal CO
- diffusion across the placenta (lipophilic agents)
- Teratogenic medication - medication affecting foetal development

Considerations for foetus:

2 young patients!
CPR in pregnancy
CPR in pregnancy

- Cardiac arrest is a rare condition in pregnancy!
- Pregnancy = high flow low resistance state
- Heimlich maneuver is contra-indicated (chest trusts)
- Left uterine displacement
- Aggressive airway management
- Continuous cricoid pressure to avoid aspiration
- Increased chest wall compression force
- Delivery <5min if fetus is viable
- Do not administer NaHCO$_3$
- Do not use lower extremities for venous access
- If defibrillation is required, first remove all internal fetal monitoring devices
CPR in pregnancy

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Key steps for BLS in a pregnant patient

• Call for **expert help early** (including an obstetrician and a neonatologist).
• Start BLS according to standard guidelines.
• Ensure high-quality chest compressions with minimal interruptions.
• The **hand position** for chest compressions may need to be slightly higher on the sternum for patients with advanced pregnancy e.g. third trimester.
• **Manually displace the uterus** to the left to reduce IVC compression.
• Add **left lateral tilt** if this is feasible and ensure the chest remains supported on a firm surface (e.g. in the operating room) – the optimal angle of tilt is unknown. Aim for between 15 and 30°.
• Start preparing for **emergency Caesarean section** – the fetus will need to be delivered if initial resuscitation efforts fail.
Modifications to advanced life support

- **Attempt defibrillation as soon as possible.** Use standard shock energies
- **Early endotracheal intubation**
  - Smaller ETT, cave aspiration of gastric contents!
- **IV access above diaphragm**
- **‘reversible’ causes**
  - **4 Hs 4Ts**
  - **Haemorrhage** (ectopic pregnancy, placental abruption, placenta praevia, placenta accreta, uterine rupture)
  - **Cardiovascular disease**
  - **Pre-eclampsia**
  - **Pulmonary embolism**
  - **Amniotic fluid embolism**
- **Peri-mortem delivery of fetus**
  - Within 5min!
European Resuscitation Council Guidelines for Resuscitation 2015: Section 4. Cardiac arrest in special circumstances

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Life-threatening gestation-related disorders:
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- hypertensive disorders: pre-eclampsia / eclampsia, HELLP
- major hemorrhage
- shock:
  - sepsis
  - amniotic fluid embolism (anaphylactoid syndrome of pregnancy)
  - PTE
- peripartum cardiomyopathy
- Acute Fatty Liver of Pregnancy
HIGH

BLOOD PRESSURE

- DANGER
- GET HELP
- ELEVATED
- NORMAL
**Life-threatening gestation-related disorders:**

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Pre-eclampsia: definition

Hypertension (>20w)
Systolic blood pressure $\geq 140$ mmHg and/or
Diastolic blood pressure $\geq 90$ mmHg

And one or more abnormality of the:
Central nervous system
Cardiorespiratory system
Gastrointestinal system
Haematological system
Renal system
Uteroplacental/fetal circulation

Alarm signal!
### Pre-eclampsia: a multisystem disease ...

<table>
<thead>
<tr>
<th>System</th>
<th>Conditions/Manifestations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central nervous system</td>
<td>Seizures (eclampsia), Headache, Visual disturbances, Papilloedema, Clonus/hyperreflexia</td>
</tr>
<tr>
<td>Cardiorespiratory system</td>
<td>Pulmonary oedema</td>
</tr>
<tr>
<td>Gastrointestinal system</td>
<td>Elevated liver transaminase enzymes, Liver tenderness, Nausea and vomiting, Epigastric pain</td>
</tr>
<tr>
<td>Haematological system</td>
<td>Haemolysis, Thrombocytopenia ( &lt; 100 \times 10^9.l^{-1} ), Disseminated intravascular coagulation</td>
</tr>
<tr>
<td>Renal system</td>
<td>Proteinuria, Renal failure</td>
</tr>
<tr>
<td>Uteroplacental circulation</td>
<td>Placental abruption, Intrauterine growth restriction, Umbilical artery/uterine artery blood flow abnormalities</td>
</tr>
</tbody>
</table>
Pre-eclampsia – eclampsia – HELLP Continuum?

- **cerebral effects**: blurred vision, headache, cva, ...
  
  ![cerebral vasospasm with local ischemia](image)

- **Convulsions**: Cerebral vasospasm with local ischemia => ECLAMPSIA
  - Hypertensive encephalopathy
  - Vasogenic oedema
  - Endothelial damage
  ...

- **PRES** (posterior reversible leukoencephalopathy syndrome)

  Severe hypertension
  - Post partum
  - Eclampsia / preeclampsia
  - Acute glomerulonephritis
  Haemolytic uraemic syndrome (HUS)
  Thrombocytopenic thrombocytic purpura (TTP)
  Systemic lupus erythromatosis (SLE)
  **Drug toxicity**
  - Cisplatin, Interferon, Erythropoietin, Tacrolimus,
  Cyclosporin

Pre-eclampsia-associated lung oedema

- (PEC =>> vasoconstriction (hypertension) - volume-depletion) **Alarm signal**!

- **pulmonary oedema**: 2.9% of PEC
  - cave: high mortality !!

- **DD**: cardiogenic/non-cardiogenic
  - ↓ COD in pregnancy:
    - renal albumin loss, impaired liver synthesis
    - blood loss, fluid shifts
  - Increased PCWP (LV dysfunction, IV fluids, autotransfusion during contractions)
  - Capillary leak (endothelial damage)
  - LV dysfunction

- **Iatrogenic**: fluids!
# HELLP syndrome

<table>
<thead>
<tr>
<th>H</th>
<th>Hemolysis</th>
<th>microangiopathic hemolytic anemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Elevated Liver enzymes</td>
<td>focal fibrinoid liver necrosis</td>
</tr>
<tr>
<td>L</td>
<td>Low Platelets</td>
<td>megakaryocytosis</td>
</tr>
</tbody>
</table>

**Differential diagnosis**
- thrombotic thrombocytopenic purpura
- hemolytic-uremic syndrome
- acute fatty liver of pregnancy (AFLP)
- Sepsis, DIC

Often occurs **before week 32** of pregnancy

**Perinatal morbidity and mortality** 14-20%

The clinical presentation is non-specific
- general malaise
- right upper quadrant or epigastric pain
- nausea or vomiting
- oedema
- headache
- hypertension or proteinuria may be mild / absent
**Hypertensive disorders : THERAPY**

Main cause of death = **pulmonary oedema**

**Standard of therapy :**

<table>
<thead>
<tr>
<th>- treatment of hypertension :</th>
</tr>
</thead>
<tbody>
<tr>
<td>* hydralazine</td>
</tr>
<tr>
<td>* labetalol, nifedipine, methylldopa</td>
</tr>
<tr>
<td>* no ACE-i</td>
</tr>
<tr>
<td>* fluids (cave)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>- Seizure prophylaxis (?) - therapy</th>
</tr>
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<tr>
<td>MgSO4 &gt; diazepam / phenytoïn</td>
</tr>
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<table>
<thead>
<tr>
<th>- delivery of the foetus - cave post-partum!</th>
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<tr>
<th>- supportive treatment – monitoring – transfert to ICU ?</th>
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  - PTE
- peripartum cardiomyopathy
- Acute Fatty Liver of Pregnancy
PeriPartum Hemorrhage

Uterine bloodflow at term: 700 ml/

Antepartum:
- uterine rupture
- abruptio placentae
- placenta praevia
- rupture of aneurysm of the aortic branches

Vaginal delivery: 600 ml - Caesarean section: 1000 ml
- placenta accreta, placenta percreta
- uterine rupture

Postpartum:
- uterine atony
- lacerations
- liver hemorrhage / rupture
- HELLP

Prolonged hemodynamic compensation
Concealed blood loss
Physiological tachycardia, vasodilation
PeriPartum Hemorrhage

- Management:

  first stabilize mother!
  ("maternal deaths due to hemorrhage are often considered to be associated with substandard care ")

  - volume replacement - resuscitation
  - uterine massage - uterotonica
  - surgical exploration – evacuation of retained products - packing
  - repair of trauma
  - reversal of coagulation defects
  - hysterectomy
  - embolization of uterine or intern iliac artery

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1/ Amniotic fluid embolism

- Triad of 
  - acute peripartum hypoxia (pulmonary vasoconstriction)
  - hemodynamic collapse
  - coagulopathy (DIC)

- High incidence of cardiopulmonary arrest (87%)

- High mortality (61%), mostly within 1 hour of the event

- Subsequent neurologic impairment (80%), ARDS, LV dysfunction, ...

Mechanical obstruction theory
Amniotic fluid activates complement cascade
  <1ml amniotic fluid may induce immunologic response through exposure at cervical vessels

- Management is supportive!
1/ Amniotic fluid embolism

**Treatment = SUPPORTIVE !**

1. Treat hypoxia
2. Treat hypotension (fluid resuscitation and vasopressors)
3. Treat cardiac failure
4. Treat coagulation abnormalities
5. Treat anaemia

New, not evidence-based, or controversial strategies:

CVVH, iNO, inhaled prostacyclin, exploration, hysterectomy, uterine artery embolization, IABP, ECMO, CPB, plasma exchange, high-dose corticosteroids, aprotinin, aFVII, ...
2/ Pulmonary Thrombo-Embolism

Risk of VTE is 5X higher in pregnancy! (Δ coagulation and venous blood flow)

Challenging Diagnosis:
- Aspecific symptoms: dyspnea, hypoxia, pain, hypotension/shock, ...
- US
- (impedance plethysmography)
- (ventilation-perfusion scanning)
- CTAngio
- MRI

Treatment:
* Anticoagulation!
  - Either unfractionated heparin or LMWH (do not cross the placenta)
  - Heparin: treatment of choice surrounding delivery

* Warfarin is generally not used during pregnancy
* Minimal data on thrombolytic therapy, IVC filters and embolectomy
* Surgery - Trendelenburg
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Peripartum CMP

- **Definition**
  Rare but severe left ventricular dysfunction of unclear cause occurring in late pregnancy and the early puerperium
  1 : 3000 - 4000 live births (USA - NEJM, 2001) **80 % postpartum** (0 – 5 months)

- **Risk factors**
  advanced maternal age, multiparity, African descent, Twinning, long-term tocolysis

- **Etiology**? non specific (myocarditis?) Felker et al, NEJM, 2000

- **Symptoms and signs** of heart failure (fatigue, dyspnea, swollen ankles, palpitations, hypotension, …)

- **Medical therapy**
  is similar to that of other forms of heart failure
  - cave ACE-inhibitors
  - anticoagulation
  - immunosuppression?
  - IABP, LVAD
  - cardiac transplantation

- **Mortality** ± 20% (Elkayam et al, NEJM, 2001)
Life-threatening gestation-related disorders:

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Acute Fatty Liver of Pregnancy

“yellow atrophy of the liver”, Seehan, 1934

1/15.000 primigravidae third trimester etio unknown, only in humans

■ Clinical picture

hypertension, proteinuria, abdominal pain, jaundice, small liver
fulminant hepatic failure with coagulopathy, coma, renal failure

Labo:

high bilirubin, moderately elevated transaminase level
hepatic dysfunction: hypoglycemia, hyperNH3, coagulopathy, ...

■ Etiology ?

deficient mitochondrial FFA oxidation / LCHAD – deficiency (20%) ?
microvesicular fatty infiltration (~ reye syndrome, tetracycline and hypoglycine toxicity, hormonal changes + other insults ?)

■ Radiology

« bright liver » on US / CT
Acute Fatty Liver of Pregnancy

- **Differential diagnosis**
  - viral hepatitis, toxins
  - alcoholic hepatitis
  - tetracycline-induced hepatotoxicity
  - preeclampsia
  - cholestasis of pregnancy
  - acute cholecystitis
  - liver rupture

- **Therapy**
  - self-limiting (7-9 d) after delivery
  - delivery / supportive (transfer to liver unit) / transplantation

- **Evolution**
  - 20 % both fetal and maternal mortality

---

Alarm signal!
Take home message  ...
Take home message ...

➢ The **spectrum of obstetrical complications is wide** with a low admission rate in the ICU but potential high morbidity and mortality.

➢ A **multidisciplinary approach** and the application of basic principles for the care of the critically ill are warranted for the obstetric patient.

➢ The management of obstetric emergencies requires **special considerations of the unique physiology** of pregnancy, as well as attention to a possible second patient, the foetus.
Take home message ...

**Watch out for alarm symptoms!**

- Hypertension
- Hypotension
- Jaundice
- Abdominal pain
- Neurologic symptoms
- Laboratory abnormalities
- …
THANK YOU