Etiology and management of uterine atony

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A maternal ward of horrors

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Every minute of every day a women dies from complication of pregnancy and childbirth

Global maternal mortality ratio is 402/100,000 births, 99% in developing countries (Finland 1.6/100,000)

Haemorrhage accounts for 30% of cases and is a leading cause of maternal death

Should we be concerned?

Yes!!!!

In UK annually 17 maternal deaths due to maternal haemorrhage and the number is increasing!

Cca 75% of "near misses" cases in Scotland due to haemorrhage (5/1000), 50% substandard care!

Shajapur, Madhya Pradesh: Imagine bringing a baby into this world on a threadbare towel, stained and infected! That's the experience of poor women across India. It's a miracle many of them make it out alive.

With government's intervention, more mothers are coming to the hospital for their babies. But the images unfolding in hospitals show that both the mother and the baby are exposed to greater risk.

At the civil hospital, in Agar Tehsil of Madhya Pradesh, there is just one delivery table. The table has got blood stains on it; it gets a wipe over with blood-stained clothes.

It is then readied for the next mother in queue, with another swift wipe; no disinfectant, risking fatal infection for the next mother.

Here the disposable surgical gloves are not thrown; simply rinsed and kept. They are not
Uterine atony

- Uterine atony - failure of the uterus to contract adequately following delivery
- The most common cause of postpartum haemorrhage (PPH)
- A critical step in the prevention of PPH is the simultaneous contraction of myometrial fibers during and after the third stage of labour
Uterine contractility

Our knowledge still insufficient!

Uterine contractility regulated by:

- **Ca**<sup>++</sup> (nifedipine as first line medication for treatment of premature contractions)
- **progesterone** (im injections weekly in cases of previous premature birth)
- **oxytocin** (induction of labor, prophylactic administration immediately after second stage of labor completed, treatment of atony)
- **prostaglandines** (misoprostol, sulprostone)

### Uterine atony

**Table 1 Risk Factors for Uterine Atony**

Factors associated with uterine overdistension
- Multiple pregnancy
- Polyhydramnios
- Fetal macrosomia

Labor-related factors
- Induction of labor
- Prolonged labor
- Precipitate labor
- Oxytocin augmentation
- Manual removal of placenta

Use of uterine relaxants
- Deep anesthesia (especially halogenated anesthetic agents)
- Magnesium sulfate

Intrinsic factors
- Previous postpartum hemorrhage
- Antepartum hemorrhage (placental abruption or previa)
- Obesity
- Age > 35 years

Uterine atony – management options

Fig. 1. Goals in management of a postpartum hemorrhage (PPH). The management of a severe PPH requires a multifaceted approach with attention being given to all components often simultaneously which necessitates well-organized and co-ordinated teamwork. CBC, complete blood count; PT, prothrombin time; APTT, activated partial thromboplastin time; FFP, fresh frozen plasma.

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Figure 1.
Management plan for PPH.

from: Ahonen J, Stefanovic V, Lassila R: 
Management of post-partum haemorrhage, Acta Anaesthesiologica Scandinavica, 2010
Uterine atony management

- Identifying risk factors and prevention
- Surgical management of lacerations
  - Medical
  - Surgical (pelvic arterial ligation, uterine brace suture)
  - Other (balloon tamponade, embolization)
Uterine atony

- Identifying risk factors

- Prophylactic oxytocin immediately after delivery of infant (10 IU bolus im or iv), early clamping of umbilical cord and controlled cord traction RR 0.5

- Oxytocin or ergometrine? No statistical difference. Cave ergot alcaloids in patient with hypertension and HIV!
<table>
<thead>
<tr>
<th>Agent</th>
<th>Dose</th>
<th>Cautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxytocin (Pitocin, Syntocinon)</td>
<td>10 IU IM/IV followed by IV infusion of 20 IU in 500 mL crystalloid titrated versus response (eg, 250 mL/h)</td>
<td>Hypotension if given by rapid IV bolus Water intoxication with large volumes</td>
</tr>
<tr>
<td>Ergometrine (Ergonovine)</td>
<td>0.25 mg IM (ergometrine)</td>
<td>Contraindicated in hypertensive patients Can cause nausea/vomiting/dizziness</td>
</tr>
<tr>
<td>Methergonovine (Methergine)</td>
<td>0.20 mg IM (methergonovine)</td>
<td></td>
</tr>
<tr>
<td>Carboprost (15-methyl-PGF₂α) (Hemabate)</td>
<td>0.25 mg IM/intramyometrial. Can be repeated every 15 min. Max. 2 mg.</td>
<td>Bronchospasm (caution in patients with asthma, hypertension, cardiorespiratory disease)</td>
</tr>
<tr>
<td>Dinoprostol (Prostin/Prepidil)</td>
<td>2 mg p.(r) 2-hourly</td>
<td>Hypotension</td>
</tr>
<tr>
<td>Gemeprost (Cervagen)</td>
<td>1-2 mg intrauterine placement/1 mg p.r.</td>
<td>Gastrointestinal disturbance</td>
</tr>
<tr>
<td>Misoprostol (Cytotec)</td>
<td>600 µg-1000 µg p.(r)/intracavitary</td>
<td>Gastrointestinal disturbance, shivering, pyrexia</td>
</tr>
<tr>
<td>Tranexamic acid (Cyclokapron)</td>
<td>1g 8-hourly IV</td>
<td>Can increase risk of thrombosis</td>
</tr>
<tr>
<td>RFVIIa (novo Seven)</td>
<td>60-120 µg/kg IV</td>
<td>Fever, hypertension</td>
</tr>
</tbody>
</table>

Uterine atony

- Placental retention
  - incidence cca 2.5%
  - associated with atonic bleeding
  - only definite treatment is MANUAL REMOVAL
  - usually D&C necessary → late sequelae
  - nitroglycerine, misoprostol, sulprostone (1 report with success rate of 44%)
Table 2. Selected characteristics of the study population.

<table>
<thead>
<tr>
<th></th>
<th>Successful placental expulsion with sulprostone (Group 1)</th>
<th>Failed placental expulsion with sulprostone (Group 2)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primiparity</td>
<td>28</td>
<td>41</td>
<td>0.856</td>
</tr>
<tr>
<td>Duration of pregnancy (mean ± SEM)</td>
<td>269 ± 4 d</td>
<td>268 ± 3 d</td>
<td>0.699</td>
</tr>
<tr>
<td>History of cesarean section</td>
<td>7</td>
<td>8</td>
<td>0.383</td>
</tr>
<tr>
<td>History of dilatation and curettage</td>
<td>9</td>
<td>13</td>
<td>1.0</td>
</tr>
<tr>
<td>History of retained placenta</td>
<td>3</td>
<td>3</td>
<td>0.681</td>
</tr>
<tr>
<td>Labour induction</td>
<td>13</td>
<td>18</td>
<td>0.834</td>
</tr>
<tr>
<td>Vacuum extraction</td>
<td>10</td>
<td>15</td>
<td>1.0</td>
</tr>
<tr>
<td>Episiotomy or vaginal laceration</td>
<td>29</td>
<td>48</td>
<td>0.574</td>
</tr>
<tr>
<td>Birth weight (singleton) (mean ± SEM)</td>
<td>3127 ± 130 g&lt;sup&gt;1&lt;/sup&gt;</td>
<td>3141 ± 89 g&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.838</td>
</tr>
<tr>
<td>Blood loss (mean ± SEM) (range)</td>
<td>582 ± 61 ml (50-2200 ml)</td>
<td>1275 ± 83 ml (200-3500 ml)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

<sup>1</sup> n = 48 (twins excluded), <sup>2</sup> n = 73 (twins excluded)

SEM (Standard Error of the Mean)

Stefanovic, Paavonen, Tikkanen, Ahonen et al., Intravenous sulprostone reduces need for manual removal of placenta, submitted BJOG

success rate 39.4%
Figure 2a–c  Summary of the application of the B-Lynch procedure
SOS BAKRI TAMPONADE BALLOON CATHETER
**Table 3. Indications for using Bakri balloon tamponade**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uterine atony</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Cervical rupture</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Vaginal rupture or paravaginal hematoma</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Placenta previa</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Placenta accreta (PAD)</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Placental retention partialis</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Placental retention totalis</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Placental retention totalis</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5. Additional treatment after failure of Bakri balloon tamponade**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lynch sutures and Bakri</td>
<td>1 (3)</td>
<td>0,5</td>
</tr>
<tr>
<td>Uterine artery embolization</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Uterine artery ligation during cesarean section</td>
<td>1</td>
<td>0,5</td>
</tr>
<tr>
<td>Peripartum hysterectomy</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Uterine artery embolization and peripartum hysterectomy</td>
<td>1</td>
<td>0,5</td>
</tr>
<tr>
<td>Lynch sutures and peripartum hysterectomy</td>
<td>1</td>
<td>0,5</td>
</tr>
</tbody>
</table>

Success rate                                      | 80    |
Department of Angioradiology
Helsinki University Central Hospital

- Over 1100 interventions/year
- Four angiologists
- 24 hrs/day availability
Embolization history

- Nussbaum 1965, selective mesenterial angiography
- Rösch 1972, superselective angiography and embolization with autologic patch
- Brown 1979, the first postpartum embolization with gelatine
Materials

GELFOAM

MICROCOILS
Our study

- April 2004 - June 2007
- 39 patients
- Data collection from the hospital register
- 2 patients with gynaecological haemorrhage (cervical ectopic pregnancy and postoperative bleeding in the patient with ovarian cancer)
- 37 obstetric patients
37 embolizations or balloon occlusions due to the obstetric haemorrhage

a) 19 emergency embolizations
   - uterine atony (n=11)
   - cervical/vaginal rupture (n=5)
   - paravaginal haematoma (n=2)
   - placenta accreta as intrapartum finding (n=1)

b) 12 prophylactic arterial balloon occlusions in the cases of suspected placenta accreta

c) 4 elective occlusions and prophylactic embolisations in the cases of anticipated placenta accreta/percreta
Case report

• 28- primipara
  - Vaginal birth, placental partial retention
  - 3 D&C
  - Atonic bleeding, 7000 ml (Bakri balloon not still in use in our hospital)
After gelatine
**The best treatment?**

<table>
<thead>
<tr>
<th>Method</th>
<th>No. Cases</th>
<th>Success Rates (%)</th>
<th>95% CI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-Lynch/compression sutures</td>
<td>108</td>
<td>91.7</td>
<td>84.9–95.5</td>
</tr>
<tr>
<td>Arterial embolization</td>
<td>193</td>
<td>90.7</td>
<td>85.7–94.0</td>
</tr>
<tr>
<td>Arterial ligation/pelvic devascularization</td>
<td>501</td>
<td>84.6</td>
<td>81.2–87.5</td>
</tr>
<tr>
<td>Uterine balloon tamponade</td>
<td>162</td>
<td>84.0</td>
<td>77.5–88.8</td>
</tr>
</tbody>
</table>

There was no statistically significant difference between the 4 groups ($P = 0.06$).
<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| Uterine brace sutures (Lynch)  | 1. fast  
2. suitable for atony treatment with simultaneous use of Bakri balloon | 1. requires laparotomy  
2. haematometra/uterine necrosis/bowel incarceration possible |
| Bakri Balloon tamponade        | 1. easy application  
2. suitable for both uterine and birth canal tamponade  
3. suitable during patient’s transport  
4. does not require laparatomy | 1. price (350 €) |
| Pelvic arterial ligation       | 1. fast                                                                 | 1. requires long surgical experience  
2. requires laparatomy  
3. embolisation often not possible afterwards |
| Embolization                   | 1. identifies small vessels not visible (not accessible) by surgery         | 1. requires facilities (often far away from the place of labor)  
2. not available 24/7 in many places |
Uterine atony

• Prevention
• Recognition
• Optimal treatment
Tänan väga!
Thank U!
Kiitos!