PPH – Singapore Workshop for Obstetric Emergencies

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TOO LITTLE – TOO LATE

Too Little (IV fluids, oxytocics, BLOOD, Clotting factors)

Too Late (PG, resuscitation – blood replacement, decision for surgery & getting senior surgeon & anaesthetist involved)

Algorithm for management of Atonic PPH

‘HAEMOSTASIS’

- **H** - Ask for Help
- **A** - Assess vital parameters & blood loss and Resuscitate – (Rule of 30)
- **E** - Establish etiology + Ecbolics (syntometrine, ergometrine, bolus syntocinon) + Ensure availability of blood.
- **M** - Massage Uterus – bimanual compression
- **O** - Oxytocin infusion / prostaglandins - intravenous / per rectal / intramuscular / intra-myometrial / Tranexamic acid

Algorithm for management of Atonic PPH

‘HAEMOSTASIS’

- **S** - (?Stabilise Clotting), Shock Garment (anti) & Shift to theatre – Aortic compression/ Bimanual compression
- **T** - (4 T’s) Tissue/ Trauma/Tone/Thrombin > Tamponade – Balloon / uterine packing (Fibrin concentrate)
- **A** - Apply compression sutures – B- Lynch / modified +/- Balloon
- **S** - Systematic Pelvic devascularisation – Uterine / Ovarian / Quadrupe / internal iliac
- **I** - Interventional Radiology – If appropriate, Uterine artery embolisation
- **S** - Subtotal / Total abdominal hysterectomy
Prevention of PPH – Active management of Labour

Syntometrine (5 iu) is a combination of syntocinon and ergometrine. It is active in the prevention of PPH. Syntometrine reduces minor PPH by 50% to 100 ml.

Misoprostol is not as effective as oxytocin but use when oxytocin is not available. Women with placenta accreta/previa are at very high risk of major PPH. If placenta accreta/previa is diagnosed antenatally, there should be a multidisciplinary planning for delivery. Consult obstetric and anaesthetic staff to be present, prepare availability of blood, fresh frozen plasma and platelets be confirmed and the timing and location for delivery chosen to facilitate consultation, presence and access to intensive care.

Syntocinon vs Syntometrine

Syntometrine is better than syntocinon to reduce PPH 500-1000 ml. Five fold increase in nausea, vomiting and raised BP.

Prostaglandins for prevention of PPH

Prostaglandins are not the choice drug for prevention of PPH but may be considered for treatment.

Use of misoprostol for prevention of PPH

Misoprostol (600 micrograms) is not as effective as 10 iu intravenous oxytocin in preventing PPH. It also carries increased adverse effects, which are dose related. However, in situations where no oxytocin is available or birth attendants facilities are limited (for example, a home birth), misoprostol reduces the risk of haemorrhage.

Carbetocin 100 Ugm - good as oxytocin infusion following CS

Following Vaginal Delivery more data is needed – may be considered when there is risk of haemorrhage.
Modified Early Warning System, Rule of 30, Shock Index

- 30% blood loss > moderate shock
- Pulse rate – increase > 30 bpm
- Respiratory rate > 30/min
- Systolic BP – drop by 30 mm Hg
- Urinary output < 30 ml/hour
- Haematocrit drop > 30% & to be kept at an absolute value of > 30
- Shock Index = Pulse rate / Systolic BP – Change by 30%
  Normal = 0.5 to 0.7 : >0.9 indicates state of shock that needs urgent resuscitation

Emergency Trolley

- Emergency protocols
- Laryngoscope
- Endotracheal tube
- General Management
  - Increase inspired O2
- Essential drugs
  - Crystalloids, giving sets, haemacel

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Medical management – non oxytocin aspects

- Basic measures for MINOR PPH (blood loss 500-1000 ml, no clinical shock)
  - Intravenous access (14 gauge cannula x 2)
  - Compress crystalloid infusion.
- Full protocol for MAJOR PPH (blood loss > 1000 ml and continuing to bleed OR clinical shock)
  - Assess airway.
  - Assess breathing.
  - Evaluate circulation
  - Oxygen by mask at 10-15 litres/min.
  - Intravenous access (14 gauge cannula x 2, orange cannulae).
  - Position flat.
  - Keep the woman warm using appropriate available measures.
- Transfuse blood as soon as possible.
- Until blood is available, infuse up to 3.5 litres of warmed crystalloid Hartmann's solution (2 litres and/or colloid (3-2 litres)) as rapidly as required.
- The best equipment available should be used to achieve rapid warmed infusion of fluids.
- Special blood filters should NOT be used, as they slow infusions.
- Recombinant factor VIIa therapy should be based on the results of coagulation.

Fluid, Blood and Blood Products

- Fluid therapy and blood product transfusion (please refer to sections 6.2.1 and 6.2.2)
  - Crystalloid
    - Up to 2 litres Hartmann's solution
  - Colloid
    - up to 3-2 litres colloids until blood arrives
  - Blood
    - Crossmatched
      - If crossmatched blood is still unavailable, give uncrossmatched group-specific blood OR give 0 RH negative blood
  - Fresh frozen plasma
    - 4 units for every 6 units of red cells or prothrombin time/activated partial thromboplastin time > 1.5 x normal (12-15 ml/kg or total 1 litres)
  - Platelet concentrates
    - if PLT count < 50 x 10^9
  - Cryoprecipitate
    - If fibrinogen < 1 g/l
      - haemoglobin > 8g/dl
      - platelet count > 75 x 10^9/l
      - prothrombin < 1.5 x mean control
      - activated prothrombin times < 1.5 x mean control
      - fibrinogen > 1.0 g/l
**Medical Treatment of PPH**

When severe preeclampsia is perceived to be a cause of the bleeding, the following mechanical and pharmacological measures should be instituted, in turn, until the bleeding stops:

- Manual uterine compression (rubbing up the fundus) to stimulate contractions.
- Ensure bladder is empty (Foley catheter, leave in place).
- Syntocinon 5 units by slow intravenous injection (may have repeat dose).
- Ergometrine 0.5 mg by slow intravenous or intramuscular injection (contraindicated in women with hypertension).
- Syntocinon infusion (40 units in 500 ml Hartmann's solution at 125 ml/hour) unless fluid restriction is necessary.
- Carboprost 0.25 mg by intramuscular injection repeated at intervals of not less than 15 minutes to a maximum of 8 doses (contraindicated in women with asthma).
- Direct intravenous injection of carboprost 0.5 mg (contraindicated in women with asthma), with responsibility of the administering clinician as it is not recommended for intramuscular use.
- Misoprostol 1000 micrograms rectally.

Use of carbetocin/ oxytocin infusion/ carboprost/ misoprostol

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**Cannula Characteristics**

<table>
<thead>
<tr>
<th>Gauge</th>
<th>Colour code</th>
<th>Catheter O.D. mm</th>
<th>Catheter length</th>
<th>Flow rate ml/min</th>
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<tbody>
<tr>
<td>14</td>
<td>Orange</td>
<td>2.10</td>
<td>45</td>
<td>240</td>
</tr>
<tr>
<td>16</td>
<td>Grey</td>
<td>1.74</td>
<td>45</td>
<td>180</td>
</tr>
<tr>
<td>17</td>
<td>White</td>
<td>1.4</td>
<td>45</td>
<td>125</td>
</tr>
<tr>
<td>18</td>
<td>Green</td>
<td>1.2</td>
<td>45</td>
<td>80</td>
</tr>
<tr>
<td>19</td>
<td>Pink</td>
<td>1.11</td>
<td>32</td>
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<tr>
<td>20</td>
<td>Blue</td>
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<tr>
<td>21</td>
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<td>0.60</td>
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<td>13</td>
</tr>
<tr>
<td>22</td>
<td>Dark Blue</td>
<td>0.60</td>
<td>19</td>
<td>13</td>
</tr>
</tbody>
</table>

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**Why Misoprostol**

Synthetic analog of prostaglandin E1

- Shelf life of several years if kept in their aluminum blister packets
- Low cost
- Can be administered orally, rectally, vaginally and by sublingual route
- Being selective for the PGE1 receptors: no clinically significant effects on bronchi or blood vessels, hence fewer systemic side-effects → “has been used in patients with underlying diseases such as asthma or cardiovascular disorders”

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**PPS recommendations**

**Drug regimens for prevention and treatment of PPH**

**PPH prevention**

- Prophylaxis options
  - Supplementation with intravenous iron: 50 mL over 15 min, or 24-48 h, intravascular
  - Ergometrine or syntocinon: 5 units over 5 h, within the first 24 h after delivery
  - Misoprostol 600 micrograms

**PPH treatment**

- Treatment options
  - Syntocinon 5 units
  - Ergometrine 2 mg intramuscularly
  - Prophylactic doses of oxytocin: 4 units every 4 h, with a maximum of 2 doses + 1 h per 24 h at least

**Fig. 2. Controlled cord traction.**
Examination of the maternal side or chorionic plate of the placenta

Examination of the Fetal side/ amniotic side of the placenta

External Bimanual Massage

Bimanual Uterine Compression

Compression of Abdominal Aorta

ANTI-SHOCK GARMENT

Fig. 3. Examining the maternal side of the placenta. Reproduced, with permission, from Ref. [16].

Fig. 4. Examining the fetal side of the placenta. Reproduced, with permission, from Ref. [17].

Fig. 6. External bimanual massage.

Fig. 7. Internal bimanual compression of the uterus. Reproduced, with permission, from Ref. [17].

Fig. 8. Compression of abdominal aorta and palpation of femoral pulse. Adapted, with permission, from Ref. [26].

Courtesy - Suzielen Miller

Figures 1-5. Various designs of the anti-shock garment.
Non Pneumatic Anti Shock Garment

Balloon Tamponade – Glove; Rusch; Sengstaken; Condom; Cooke’s/Bakri

TAMPONade TEST
Therapeutic & Prognostic
For severe PPH

Stomach balloon
Oesophageal balloon

Condous G, Arulkumaran S et al.
Obstetrics & Gynecology. 2003

Sengstaken-Blakemore tube (stomach balloon inflated)

Rubber glove
E&B balloon
Volume varies
Pressure not an issue – mechanism of action

B- LYNCH COMPRESSION SUTURES

MODIFIED VERTICAL COMPRESSION SUTURES

Anterior view
Posterior view

Cornu
Fallopian tube
Ovary

Rayman B, Arulkumaran S, Due A
Obstetrics & Gynecology. 2002

Multiple vertical compression sutures

Lower segment through and through vertical sutures should reduce bleeding in cases of placenta praevia
### Conservative Surgical Treatment for PPH

<table>
<thead>
<tr>
<th>Method</th>
<th>No of Cases</th>
<th>Success rates</th>
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<tbody>
<tr>
<td>B-Lynch + other Compression sutures</td>
<td>54</td>
<td>90.4%</td>
</tr>
<tr>
<td>Arterial embolization</td>
<td>218</td>
<td>91%</td>
</tr>
<tr>
<td>Arterial ligation</td>
<td>264</td>
<td>83.7%</td>
</tr>
<tr>
<td>Uterine balloon tamponade</td>
<td>135</td>
<td>83.7%</td>
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</table>

Massive PPH - Surgical Techniques Near Miss Enquiries - Scotland
- Use of Balloon techniques – 6 in ’03 > 42 in ’06
- Haemostatic compression sutures – 10 in ’03 > 24 in ’06.
- Over 4 years; 106 balloon techniques - 95% success rate; 76 brace sutures – 83% success rate
- Peripartum hysterectomy – 15% in 2003 > 8% in 2006
- Avoidable delay in diagnosis & management – 8%
- Failure to follow protocol/plan – 6%

THE GOLDEN HOUR
- As more time elapses between the point of severe shock and the start of resuscitation, the percentage of surviving patient decreases (metabolic acidosis)
- The “Golden Hour” is the time in which resuscitation must begin to achieve maximum survival – with arrest of bleeding

PPH Coagulation disorders ‘Wash Out Phenomenon’
- DIVC- FDP inhibits clotting
- "Washout phenomenon" (Consumptive) - the coagulation factors are consumed and washed out at the site of bleeding
- The ‘Consumptive’ is the major phenomenon that prevents arrest of haemorrhage
- Laboratory tests/ Use of thromboelastograph -TEG

Reason for Excessive Uncontrolled Bleeding
- Consumptive coagulopathy
- Excessive fibrinolysis -
- Dilutional coagulopathy - haemodilution
- Hypothermia – slow enzymatic process of clot. cascade + impaired platelet function
- Multi-transfusion syndrome – Depleted platelets and clotting factors
- Metabolic changes – acidosis + citrate

Does Military Experience Translate to Civilian (Trauma Center) Life
Mortality declined from 65% to 20% in casualties receiving > 10 units PRBC in 24 hours IF FFP to PRBC ratio 1:1 vs 1:4
- Of 2746 surgery patients, 135 (4.9%) received > 10 units PRBC + FFP
  - When FFP:PRBC ratio 1:1, mortality 26%; if ratio 1:4, mortality 87.5% (P=0.0001)
  - RR mortality significantly greater for those receiving ratio 1:4 vs 1:1
  Duchesne et al J Trauma 2009; 65:272-6
Tranexamic Acid
ANTIFIBRINOLYTIC AGENT
Antifibrinolytic agent that prevents clot breakdown by blocking lysine sites on plasminogen molecules
Can be used when there is a RISK of hemorrhage
Inhibits fibrinolysis with no effect on clotting parameters
Use in trauma patients within 1 hour reduces risk of death 1/3 (RR 0.68 95% CI 0.57-0.82)
Lancet 377 (9771):1096 PMID 21439633

Tranexamic Acid
WHO now sponsoring double-blinded RCT with 15,000 women to determine effect on death and other morbidities
No clear direction if it should be used widely until trial results are available
Shakur et al Trials 2010;11:40

Mechanism of Action
Action at site of vascular injury
needs tissue factor
FV + t-PA complex directly activated
F IX > F IX a
F X > F Xa
TF - t-PA complex initiates coagulation via F V
Prothrombin > Thrombin
Fibrinogen > Fibrin
Stable fibrin plug
Figure 3: The mechanism of action of rVIIa in Obstetric haemorrhage – NZ & Australia Registry data: Phillips et al., Anaesth Analg 2009. 1 PE & 1 DVT – no mortality. North European Registry 2000-2007: Obs Gynaec 2007; 110; 1270-78. 4 TE, 1 MI, 1 SR.

Emergency Obstetric Functions – Basic & Comprehensive:
Consider Adding:
Use of misoprostol & Tranexamic acid + anti shock garments as appropriate +
TAMPONADE TEST FOR BASIC EMERGENCY OBSTETRIC FUNCTIONS & COMPRESSION SUTURES FOR COMPREHENSIVE OBSTET. FUNCTIONS

More Medical and Simpler Surgical Techniques should help to reduce morbidity & mortality.

THANK YOU