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OBSTETRICS

Maternal haemorrhage

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Maternal haemorrhage is the leading cause of preventable maternal death worldwide and encompasses antepartum, intrapartum, and postpartum bleeding. This review highlights factors that predispose to severe bleeding, its management, and the most recent treatment and guidelines. Advances in obstetric care have provided physicians with the diagnostic tools to detect, anticipate, and prevent severe life-threatening maternal haemorrhage in most patients who have had prenatal care. In an optimal setting, patients at high risk for haemorrhage are referred to tertiary care centres where multidisciplinary teams are prepared to care for and deal with known potential complications. However, even with the best prenatal care, unexpected haemorrhage occurs. The first step in management is stabilization of haemodynamic status, which involves securing large bore i.v. access, invasive monitoring, and aggressive fluid management and transfusion therapy. Care for the patient with maternal bleeding should follow an algorithm that goes through a rapid and successive sequence of medical and surgical approaches to stem bleeding and decrease morbidity and mortality. With the addition of potent uterotonic agents and the advent of minimally invasive interventional radiological techniques such as angiographic embolization and arterial ligation, definitive yet conservative management is now possible in an attempt to avoid hysterectomy in patients with severe peripartum bleeding. If these interventions are inadequate to control the bleeding, the decision to proceed to hysterectomy must be made expeditiously. Recombinant factor VIIa is a relatively new treatment that could prove useful for severe coagulopathy and intractable bleeding.

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Obstetric haemorrhage is the single most significant cause of maternal mortality worldwide accounting for 25–30% of all maternal deaths.[54 55] From 1991 to 1999, 17% of pregnancy-related deaths in the USA were due to haemorrhage.[13] The most recent report of the Confidential Enquiries into Maternal Deaths in the UK showed that 17 of 132 direct deaths were due to haemorrhage.[15] Life-threatening postpartum haemorrhage (PPH) occurs in ~1:1000 deliveries in the developed world.[22] Serious morbidity resulting from haemorrhage includes adult respiratory distress syndrome, coagulopathy, shock, loss of fertility, and pituitary necrosis.[2] Although the risk of dying from pregnancy decreased dramatically during the last century, 60–90% of deaths from PPH are potentially preventable with better medical care.[5 15] This review covers the aetiology, evaluation, and management of maternal haemorrhage.

Definition

A variety of definitions for PPH have been proposed, yet no single satisfactory definition exists.[2] The World Health Organization defines PPH as blood loss >500 ml in the first 24 h after delivery.[56] However, there is evidence that 500 ml is actually normal blood loss after vaginal delivery and 1000 ml after Caesarean section with little clinical relevance. Practitioners are poorly trained in estimating blood loss leading to an inaccurate and often underestimated value.[19] Another popular definition of haemorrhage is a 10% decrease in either the haemoglobin or the haematocrit, but determinations of these values are often delayed and might not reflect the patient's current haemodynamic status.[14] Commonly, PPH is diagnosed when the amount of bleeding exceeds the practitioner's estimates of 'normal'.[58] Clinical signs and symptoms of blood loss including weakness, sweating, and tachycardia might not

Table 1 Stages of hypovolaemic shock

	Stage			
	I Compensated	**II Mild**	**III Moderate**	**IV Severe**
Blood loss	<15%; 750–1000 ml	15–30%; 1000–1500 ml	30–40%; 1500–2000 ml	>40%; ≥2000 ml
Heart rate (beats min^{-1})	<100	>100	>120	>140
Arterial pressure	Normal; vasoconstriction redistributes blood flow, slight increase in diastolic pressure	Orthostatic changes in arterial pressure, vasoconstriction intensifies in non-critical organs (skin, muscle, gut)	Markedly decreased (systolic arterial pressure <90 mm Hg); vasoconstriction decreases perfusion to abdominal organs	Profoundly decreased (systolic arterial pressure <80 mm Hg); decreased perfusion to vital organs (brain, heart)
Respiration	Normal	Mild increase	Moderate tachypnoea	Marked tachypnoea—respiratory failure
Mental status	Normal, slightly anxious	Mildly anxious, agitated	Confused, agitated	Obtunded
Urine output (ml h^{-1})	>30	20–30	<20	None (anuria)
Capillary refill	Normal (<2 s)	>2 s; clammy skin	Usually >3 s; cool, pale skin	>3 s; cold, mottled skin

occur until 15–25% of total blood volume is lost with haemodynamic collapse occurring only at losses between 35% and 45%.[6] Given the wide range of definitions applied to maternal haemorrhage and their limitations, it is important to combine the clinical presentation and objective data, while keeping in mind the probability of concealed bleeding within the uterus, peritoneal cavity, and retroperitoneal space, and the relative masking of haemodynamic signs of haemorrhagic shock (Table 1) due to the physiological adaptations of pregnancy.[9]

Antepartum haemorrhage

Antepartum haemorrhage is defined as bleeding from the genital tract after 24 weeks of gestation and has an incidence of 2–5% of all pregnancies beyond 24 weeks.[11] The causes of antepartum haemorrhage range from cervicitis to placental abnormalities, most commonly placental praevia or placental abruption.[35] A proactive approach should be used for patients at high risk for haemorrhage since preoperative preparedness can improve outcome.[17] Complications of antepartum haemorrhage include maternal shock, a greater risk of premature delivery, fetal hypoxia, and sudden fetal death, making antepartum haemorrhage an even greater risk to the fetus than to the mother.[11]

Placental abruption

Haemorrhage arising from premature separation of a normally situated placenta is known as placental abruption (Table 2).[11] Abruption complicates about 1% of pregnancies and is the leading cause of vaginal bleeding in the latter half of pregnancy. The classic presentation consists of vaginal bleeding, uterine tenderness, and increased uterine activity.[43] Known risk factors include: hypertension, pre-eclampsia, advanced maternal age, multiparity, maternal/paternal tobacco use, cocaine use, trauma, premature rupture of membranes, chorioamnionitis, and prior abruption.[35] The diagnosis of abruption is made clinically with ultrasound confirmation in certain cases.[11] The maternal effect of abruption depends primarily on its severity, but its effect on the fetus is determined by both its severity and the gestational age at which it occurs.[43] In cases of concealed abruption, vaginal bleeding can be absent, and an underestimation of maternal hypovolaemia can occur.[35] The management of placental abruption, including the timing and route of delivery, depends on the degree of maternal and fetal compromise, presentation, and gestational age.[43] The major complications of abruption include haemorrhagic shock, acute renal failure, coagulopathy, and fetal demise.[35] Abruption is the most common cause of disseminated intravascular coagulation in pregnancy.[43] Epidural analgesia can be offered to a patient with partial abruption as long as coagulation and volume status are considered.[35] Most urgent cases of placental abruption, with a non-reassuring fetal heart rate, are performed under general anaesthesia. After delivery, the patient should be monitored closely due to the risk of persistent haemorrhage from uterine atony or coagulopathy.[43]

Table 2 Placental abruption

Signs and symptoms	Vaginal bleeding (although about 20% of cases have no bleeding)
	Uterine tenderness
	Rapid contractions
	Abdominal pain
	Fetal heart rate abnormalities
Causes	Specific cause, often unknown
	Trauma or injury to abdomen
	Rarely, short umbilical cord or rapid loss of amniotic fluid
Risk factors	Multiparity, hypertension, polyhydramnios, abdominal trauma, substance abuse, prior abruption
Diagnosis	Clinical signs/symptoms
	Ultrasound
Treatment	Assess fetal well-being
	Assure adequate i.v. access
	Type and cross-match blood
	Vaginal delivery *vs* Caesarean section