

NCT EVIDENCE BASED BRIEFING

Third Stage of Labour

Part 1: Physiological third stage

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This is the first of a two-part briefing on the third stage of labour. Part 1 includes:

- the physiology of normal placental separation
- how the baby adapts to life outside the womb
- physiological management of the third stage
- possible problems and ways of responding.

Part 2 will include active management of the third stage, mixed methods or variations in management and comparison of active and physiological management.

Introduction

The third stage of labour is the phase from the time the baby fully emerges until the placenta and membranes are detached and expelled from the uterus, and bleeding from the placental site is controlled. Although it is convenient to divide labour into three stages, the process of labour is a continuous one with each preceding phase affecting what follows. Physiologically, there is more continuity than difference. The dilatation of the cervix, the birth of the baby, the contracting down of the uterus and the separation and delivery of the placenta are all controlled by a fine balance of neurological, hormonal, physiological and psychological interactions.¹⁻⁶ The mind and body work together throughout the whole of labour. Dick-Read described this interplay during the third stage as follows:

'Once the baby is born... the sympathetic nervous system sweeps in with all its joy and pleasure, and so there is no desire for relaxation. The weariness of muscular effort is swept from the mother's memory by the sound and sight of her newborn child, and this stimulates the uterus into the action of the third stage.'¹

The third stage is 'physiological' if its progress occurs as a result of normal processes within the mother and baby, which are determined by impulses of the autonomic nervous system and the release of hormones.

Physiology of placental separation and delivery

Placental separation

During labour, the muscle fibres of the uterus retract; that is, they become progressively shorter and thicker with each contraction. Once the baby is born, the uterus contracts down rapidly. This leads to compression of the placental tissue, and when the uterus has reduced to about half its normal size, the placenta detaches.^{2,3,7-10} Simultaneously, the criss-crossed oblique muscle fibres which surround the mother's blood vessels, sometimes referred to as 'living ligatures',⁸ continue to contract

preventing excess bleeding. These 'living ligatures' are present mainly in the upper uterine segment where the placenta is normally attached. Blood loss is also limited by a temporary increase in activation of the mother's blood clotting system.^{3,9-11} Once the placenta has separated, it will either slide down the uterine wall into the vagina and be expelled, with the margin coming first (Matthew Duncan method), or it will invert and deliver with the fetal side first (Schultze method).^{3,9} Contraction and retraction continue after the placenta has been delivered, preventing excess bleeding and ensuring that over the next week or so, the uterus contracts back to its approximate pre-pregnancy size.¹²

Placental transfusion

Following birth, and usually at the baby's first breath, placental transfusion begins where blood is redistributed between the placenta and the baby, giving the baby more blood – reported to be possibly as much as 30% more in some circumstances.^{7,13-17} Assessing the amount of blood passing to the baby physiologically is difficult, as many of the studies have not been clear on whether or not interventions, which were commonly used at the time (giving oxytocic drugs, clamping the cord early, leaving the cord unclamped but holding the baby either raised up or lowered down), were used in the studies.^{18,19} Before birth, when the baby's blood circulates through the umbilical cord and the placenta, about two thirds of the blood is in the baby and one third in the placenta.¹⁵ In addition, about 10% of the baby's cardiac output (the volume of blood that is pumped from the heart, measured in ml per minute^{20,21}) is reported to go to the baby's lungs and 45-50% goes to the placenta.^{14,15,22}

Once the baby has been born, dramatic changes are necessary so that oxygen can be obtained through the lungs rather than from the mother's blood via the placenta. It is believed that in physiological circumstances approximately 90ml of the blood is diverted from the placenta to fill the newly expanding bed of blood vessels around the baby's lungs.⁷ About 50% of the baby's cardiac output is reported to now be going to the lungs, and over the next few minutes the circulation to the placenta is terminated.^{13-15,22-25} The transfusion of blood from the placenta to the baby is initially very rapid and then slows down.²⁶ Gravity (the position in which the baby is held relative to the level of the placenta) and the strength of the uterine contractions have been shown to influence the amount of blood transfused.²³ There is debate, however, as to whether the onset of breathing significantly influences the process.^{13,26-30} The benefits of placental transfusion for pre-term babies seem fairly clear^{19,31} but there is still much debate on the benefits for full term babies^{32,33} and this will be discussed further in Part 2.

Hormonal balances

In all stages of labour, the effectiveness of uterine contractions depends upon impulses of the autonomic nervous system (the parts of the nervous system not under conscious control) and the release of hormones.^{2,4,5} Following a natural labour, the joy within the mother at the sight, sound and touch of her newborn baby sparks a surge of oxytocin that stimulates strong uterine contractions which cause the placenta to separate and be pushed out.^{1,3} It is hypothesised that the inter-relationship between the psychological and physical aspects of labour are as important in the progress of the third stage as in the first and second stages.¹ Fear or tension, perhaps as a result of inadequate emotional support, lead to an excess increase in circulating adrenaline, which can affect the ability of the uterus to contract.^{4,6,34} Other factors, such as immobility, or lack of adequate hydration or nutrition, may also disrupt the process,³⁵⁻³⁷ as can medical interventions during labour, particularly from drugs; for example, it is suggested that exogenous oxytocin may desensitise oxytocin receptors.^{34,38} The Royal College of Midwives report:

'The physiological and psychological needs of women in labour are inextricably linked. If a woman's emotional needs are not being met or she feels distressed, this will affect the progress of her labour.'³

Blood loss

There is a natural loss of blood when the placenta separates from the uterine wall, but how much blood loss is normal during childbirth is the subject of some debate.^{39,40} Women make an extra one to one and a half litres of blood during pregnancy⁴¹ that is no longer required after the birth. Blood volume is reduced in various ways, as well as by a readjustment of the plasma and red-cell balance (a physiological change in blood volume whereby the blood becomes more concentrated and fluid is passed as urine, via the woman's kidneys).^{3,12,40,42} The change in blood concentration increases the woman's haemoglobin levels following birth, or helps maintain the haemoglobin level if there has been increased blood loss.^{12,20,40,41} It is suggested that fit, healthy women appear to suffer no ill effects from the loss of 500ml, or even up to 1,000ml, of blood at birth.³⁹ It has also been proposed that keeping every woman's blood loss at delivery as low as possible may not always be advantageous.⁴⁰

Care for a physiological third stage

Care provided during the third stage of labour is described as 'physiological management' when the normal stimulation of the nervous system and hormonal processes within the mother and baby result in the delivery of the placenta and membranes.⁴³ Good contraction of the blood vessels is required to prevent excessive bleeding. When the baby is born, the cord continues to pulsate for several minutes as placental transfusion occurs, and blood is redistributed between the baby and the placenta. The placenta separates and is pushed out by the mother, along with the membranes, when she feels the urge to bear down. The cord is usually clamped and cut after the placenta is delivered, although sometimes it may be more convenient to clamp

and cut the cord when pulsation has ceased and just before placental delivery. This phase of labour can last from about five minutes to an hour or so, and during this time, as long as there is no bleeding, there seems to be no need to hurry. If the baby is held skin-to-skin at the breast or, better still, latches on to breastfeed, this releases further oxytocin, stimulating further uterine contractions.⁴³⁻⁴⁶ The support and calm, reassuring presence of the midwife is as important immediately after the birth as during the earlier stages of labour.^{3,4}

A physiological third stage relies on the natural contraction of the uterus, stimulated by the surge of oxytocin at birth, and anything that interferes with this oxytocin release may reduce the effectiveness of the physiological process in the third stage.⁸ Hence, a physiological third stage will only be appropriate following a labour where there has been no pharmacological or other medical intervention. This is more likely when the woman has positive psychological support from her midwife, or another trained supporter⁴⁷ who encourages her to listen to her body's messages about movement, positioning, hydration and nutrition.^{1,4,5,48,49}

Where circumstances during pregnancy or labour suggest that a woman's uterus may not respond normally, then prophylactic intervention during the third stage is probably required to reduce the risk of postpartum haemorrhage. The extent of the risk varies according to circumstances. Increased risk includes: history of previous postpartum haemorrhage, multiple pregnancy, polyhydramnios, a very large baby, severe anaemia, antepartum haemorrhage, placenta praevia, known or suspected placenta accreta, pre-eclampsia, hypertensive disease, general anaesthesia, fibroids, tocolytic drugs given to suppress contractions, infection, and oxytocin or syntocinon for induction or acceleration of labour.^{38,50} In addition, situations which will interfere with the woman greeting her baby at birth (for example, the use of pethidine or other narcotics which make women sleepy) may interfere with the initial surge of oxytocin.³⁴ Epidurals interfere with the woman's neurological and physiological processes and so may also interfere with the third stage.³⁴ In essence, the uterus can only be expected to function 'physiologically' during the third stage if there has been no interference with the 'physiological' functioning of the woman's body during the earlier parts of labour and if she has had a normal pregnancy.^{3-5,34,48}

Midwives should discuss options for the third stage with women during pregnancy. Women, especially those who want a physiological third stage, may need to raise the subject because a 'managed' third stage tends to be routine practice in most hospitals in the UK.

Possible problems and ways of responding

Possible problems during the third stage include excessive bleeding (haemorrhage) and retention or incomplete delivery of the placenta. However, this section begins with discussion of potential problems for the baby that affect management of the third stage, evidence of a nuchal cord or short cord in the late second stage, and breathing difficulties once born.

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Nuchal cord or short cord

If the cord is round the baby's neck when the head emerges (nuchal cord), it may need to be clamped and cut before the baby can be born, and a physiological third stage may not be possible. However, often the cord can be slipped over the baby's head and the birth can progress as planned.²² Alternatively, there is a somersault manoeuvre that may free up the cord.^{22,51} Both these methods allow the cord to remain intact and physiological care can proceed. It has been suggested that babies with a nuchal cord may have had reduced oxygen supply due to cord compression and are likely to benefit from delayed cord clamping which allows oxygenated blood from the placenta to transfuse into the baby.²² If the cord is clamped and cut early, either for a nuchal cord or a short cord, this will interfere with the passage of blood from the placenta to the baby leaving the placenta larger and heavier.⁵² In this case, releasing the cord clamp to allow blood to drain from the placenta may reduce its volume, assisting the separation and delivery process.^{52,53}

Breathing difficulties for the baby

There is anecdotal evidence that when a baby has difficulty breathing at birth the cord will pulsate for longer, thus providing a back-up oxygen supply.^{10,15,22,54} If resuscitation is considered necessary, then bringing the resuscitator to the baby rather than cutting the cord to take the baby to a resuscitator, will allow the baby to receive the benefits of full blood volume through continued cord pulsation.^{15,22}

Excessive blood loss for the mother (haemorrhage)

Once the baby has been born, excessive bleeding is probably the most significant potential complication for the mother. Postpartum haemorrhage is referred to as primary when it occurs within the first 24 hours after birth,⁵⁵ and secondary when the blood loss is considered abnormal or excessive between 24 hours and 12 weeks.⁵⁶ The rest of this paper will concentrate on primary postpartum haemorrhage. Postpartum haemorrhage is generally defined as blood loss greater than 500ml (about one pint) at birth⁵² but for healthy women this normally causes no problems.³⁹ So it can be argued that blood loss of 1,000ml may be a more appropriate definition and others define major haemorrhage as over 2,500ml.⁵⁷ So, the evidence on what level of blood loss is clinically significant is incomplete and unclear, with definitions appearing to be somewhat arbitrary.

The danger from postpartum haemorrhage depends not only on the amount of blood lost but on the speed of the loss, and on the woman's ability to compensate for it. Morbidity and mortality from haemorrhage after birth have reduced dramatically over the years in high-income countries, due mainly to improved standards of health, hygiene and nutrition.⁸ Antenatal care and the treatment of anaemia during pregnancy have helped to ensure that women start labour in better condition. Better surgical techniques for removing any fragments of placenta not expelled, and the use of antibiotics to control infection from such fragments, have also improved outcomes.⁸ In addition, the administration of oxytocic drugs to treat haemorrhage have had a major impact. However, major

obstetric haemorrhage, defined as blood loss of over 2,500ml, still remains a cause of maternal mortality and serious morbidity for a small number of women.^{57,58}

Haemorrhage can arise from the uterus not contracting properly, infection, problems with the woman's coagulation system or fragments of placenta or membranes left behind. Any interference which delays the oxytocin surge, the action of the living ligatures, or the activation of the maternal blood clotting system, may cause more bleeding. The midwife's careful attention to the mother in the first hour or so after birth is very important. The midwife will examine the placenta to check it is complete and will watch carefully for possible signs of excessive blood loss such as poor tone of the uterus, pale complexion, abnormal pulse rate, and low or falling blood pressure.⁵⁰

Where there is excess bleeding, the mother can hold her baby close and may breastfeed to encourage the release of further oxytocin.^{46,59} The midwife can 'rub up' a contraction by massaging the fundus and she can administer an oxytocic drug.⁵⁰ If a great deal of blood has been lost, packing the uterus is a further option and additional oxytocics can be administered (e.g. IV oxytocin; ergometrine; prostaglandins; Carbprost). The obstetrician may choose to have recourse to surgery, with hysterectomy as the final option.^{55,57,60,61}

Delay in delivery of the placenta

It sometimes happens that the placenta does not deliver after an hour or so. Delay may be due to the placenta not having separated or not having been pushed out. As long as there is no bleeding there seems to be no clinical need to intervene, though some action is often taken at around this time to try to encourage progress.

There is some evidence that there is increased blood loss with increased length of third stage⁶² but it is unclear if this is due to the intervention of cord traction. Cord traction is often used in these circumstances to aid delivery but may cause increased bleeding and haemorrhage if placental separation has not occurred.⁵⁰ If there is delay, getting up and walking to use the toilet may be one way of triggering separation or expulsion (personal communication). Breastfeeding the baby can be helpful and midwives can rub up a contraction by massaging the uterus.⁵⁰ Alternatively, the bladder can be emptied using a catheter or an oxytocic can be given. An oxytocic will make the uterus contract down hard and the placenta will often then be expelled within a few minutes.⁵⁰

From a physiological perspective, non-invasive methods should generally be tried first because the risks associated with them are small or non-existent. Midwives should only apply cord traction to the clamped cord if there are clear signs of separation, such as the visible part of the cord having lengthened.¹⁰

Adherent placenta

The reasons for an adherent placenta are not always clear, and if other methods are unsuccessful an oxytocic usually has the desired effect. Very occasionally, adherence may be due to placenta accreta, where the placenta has grown into the uterine wall and there is no plane of separation. Although this very serious

complication is rare, the incidence has increased in recent years as it occurs more frequently when there is a scar on the uterus from a previous caesarean.⁶³ If placenta accreta is suspected during pregnancy, radiological interventions are recommended^{57,58} and a physiological third stage is not appropriate.

Retained placenta

This is defined as when the placenta has not delivered within an hour after the baby has been born.⁹ In such situations, if less invasive methods (described above) do not have the desired effect, manual removal can be undertaken in theatre. Retained placenta is associated with an increased risk of major haemorrhage,^{50,62} the causes of which may be multi-factorial, involving lack of optimal care in some circumstances – such as inappropriate cord traction as well as the underlying problem.^{9,50} New techniques such as the injection of an oxytocic or prostaglandin drug onto the placenta via a clamped umbilical cord are under investigation as possible ways of dealing with a retained placenta, which might avoid the mother having to go to theatre for a manual removal.⁶⁴

Summary

The third stage is one phase of the whole process of labour and is affected by how the earlier phases have developed. In fact, labour can be seen as a complex system where changes in one part affect other parts. For a safe and effective physiological third stage, the whole system needs to be in balance. A skilled midwife will assist the woman to cope in ways that help labour to flow smoothly from one phase to the next, and minimise the need for interventions that may affect the later phases of labour. Impulses of the autonomic nervous system and the release of hormones play a significant part in the separation and delivery of the placenta, though the process of the third stage, and what keeps it in balance, is still not fully understood.

As the baby is born, there is a surge of oxytocin – partly stimulated by the feel, sight and sound of the baby. This, combined with the placenta reducing in size as the blood transfuses to the baby, helps the placenta to separate and be expelled. The muscles of the uterus contract to seal the torn blood vessels and an increase in the mother's clotting factors helps to control the blood loss.

There are two main risks for the mother during the third stage: excessive bleeding and retaining all or part of the placenta. With good midwifery support, and minimal use of drugs and other invasive interventions during the whole process of labour, these risks can usually be kept to a minimum. Any disruption, through fear, use of drugs or inappropriate interventions, may cause excessive bleeding and otherwise avoidable interventions to become necessary.

In some cases, the third stage will be 'actively managed': as the planned approach; as a precaution if, for example, the woman is tense or has had drugs for pain relief or to stimulate contractions earlier in labour; or as a response to complications occurring. Part 2 of this briefing will focus on the active management of the third stage, and the pros and cons of different approaches.

Key points

- The third stage of labour is described as physiological when the normal stimulation of the nervous system and hormonal processes within the mother and baby result in the delivery of the placenta and membranes.
- Placental transfusion occurs following the birth of the baby when blood is redistributed between the placenta and the baby, giving the baby more blood which goes to fill the newly expanding bed of blood vessels around the baby's lungs.
- Fear, tension, immobility, lack of adequate hydration, nutrition and emotional support may all affect the ability of the uterus to contract adequately during labour, including during the third stage.
- Any interference which delays the oxytocin surge, the action of the living ligatures, or the activation of the maternal blood clotting system, may cause more bleeding. Major haemorrhage can be life threatening for the mother.
- A physiological delivery of the placenta is only considered appropriate following a physiological first and second stage, where there have been no medical interventions or disruptions to the normal processes of labour.

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