The second stage of labour

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Obstetric intervention in the second stage of labour is frequently indicated. An appreciation of the physiology of the second stage and an awareness of the range of interventions with their appropriate selection and application will contribute towards ensuring a safe delivery.

Labour begins with the onset of regular uterine contractions leading to progressive dilatation of the cervix. The second stage of labour describes progress from full dilatation of the cervix until delivery of the infant.

Despite the publicity given to elective abdominal delivery in the absence of an obstetric indication, most women, midwives and obstetricians consider spontaneous labour leading to a vaginal birth the preferred mode of delivery.

Difficulties during the second stage of labour are common and often require obstetric intervention. This review describes the physiology of the second stage of labour and the evidence base for appropriate medical intervention and management as it applies to the singleton vertex presentation.

THE 'NORMAL' SECOND STAGE

In the physiological second stage of labour there is progressive descent of the fetal head through the maternal pelvis. This is accompanied by internal rotation and flexion of the fetal head as it reaches the maternal pelvic floor. With the onset of the maternal urge to bear down and push, the passive phase of the second stage is succeeded by the active phase.

On grounds of increasing risk of fetal hypoxia and morbidity to the maternal pelvic floor, first time labourers are traditionally limited to 1 hour and parous women 45 minutes in the active second stage of labour. On exceeding these limits assisted delivery is often recommended, although assisted delivery is associated with both maternal and fetal trauma. Among 1200 labouring women achieving a vaginal delivery, Janni et al (2002) found no evidence that a second stage longer than 2 hours disadvantaged the fetus provided adequate monitoring was available. Provided there is progress of labour and maternal and fetal monitoring is satisfactory, assisted delivery on grounds of duration of second stage is not indicated (Enkin et al, 2000).

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MATERNAL POSITION DURING LABOUR AND DELIVERY

Most women of Western societies adopt the supine position for labour and delivery. Removed from such conventions, the position naturally adopted is upright or squatting. Mobility during labour and the avoidance of recumbency are important for optimal uterine perfusion and descent of the fetal head (Gardosi et al, 1989; De Jong et al, 1997).

The hands and knees position is helpful in promoting rotation of the fetal head from occipito-posterior or transverse positions (Hofmeyer, 1998; Gupta and Nikoderm, 2000). The upright position is associated with a slightly reduced duration of second stage, a reduction in assisted deliveries and episiotomies and fewer abnormal fetal heart rate patterns; these benefits must be balanced against an increased risk of estimated blood loss greater than 500 ml and increase in second degree perineal tears (Gupta and Nikoderm, 2000).

EPISIOTOMY

Episiotomy is a common intervention during the second stage of labour, often performed in the belief that delivery is expedited together with maternal benefits such as reduction of third degree tears and preservation of pelvic floor function. Complications of episiotomy include vaginal haematoma, increased blood loss, abscess formation, chronic perineal pain and subsequent sexual dysfunction.

When the liberal use of episiotomy is compared with a more restrictive policy, liberal use has a higher risk of posterior perineal trauma but reduced anterior vaginal and labial trauma; there are no differences in pain, dyspareunia, urinary incontinence or chronic pain (Carrole et al, 1998). In addition, there was no evidence that routine episiotomy prevents neonatal intracranial haemorrhage or birth asphyxia. Therefore, there is little evidence supporting routine use of epi-

siotomy in the normal second stage, although it should be considered a component of most operative vaginal deliveries.

FETAL MONITORING IN THE SECOND STAGE

Fetal acid–base status can change quickly during the second stage of labour, particularly in the active phase. The use of fetal heart rate monitoring during labour has been reviewed and guidelines for management published (Royal College of Obstetricians and Gynaecologists, 2001). For low-risk pregnancies in the second stage, intermittent auscultation of the fetal heart after a contraction, for a minimum of 1 minute every 5 minutes, is appropriate.

Continuous electronic fetal heart rate monitoring (EFHRM) is recommended in pregnancies with a prior risk factor for intrapartum hypoxia or if intermittent auscultation detects a change in baseline heart rate or decelerations.

THE INFLUENCE OF EPIDURAL ANALGESIA

Anticipation of pain is a large component of any woman's approach to labour and delivery. Epidural analgesia is very effective in reducing the pain of labour and is associated with high maternal satisfaction. Published studies have demonstrated an increased instrumental delivery rate and higher rate of malpositions in the second stage (Howell, 2000) although this is not a universal finding (Yancey et al, 2001; Zhang et al, 2001).

In an effort to reduce the possible adverse effects of epidural analgesia on the second stage of labour, which are presumed to relate to the poor motor function of traditional epidurals, new techniques have been developed which aim to preserve motor function. The COMET study (Comparative Obstetric Mobile Epidural Trial Study Group UK, 2001) is a randomized controlled trial comparing low-dose combined spinal epidural analgesia and low-dose infusion epidural analgesia with traditional epidural analgesia; the normal delivery rate was higher with the low-dose techniques (42.7%) than with traditional epidural analgesia (35.1%) as a result of a reduction in instrumental delivery rate. Less promising findings were the more frequent Apgar scores of 7 or less at 5 minutes and more frequent need for neonatal resuscitation with low-dose techniques.

THE 'ABNORMAL' SECOND STAGE

Despite the best efforts of labouring women and their carers, problems frequently occur, often requiring obstetric intervention. Areas of concern principally involve delay in the second stage and/or fetal compromise.

Inadequate progress in the second stage

There are three factors affecting descent of the fetal head and progress in the second stage of labour. First, the 'power' of the uterine contractions may be inadequate to effect descent and delivery. Under normal circumstances maternal oxytocin levels increase in the second stage although this rise is not observed in women with epidural analgesia. Oxytocin infusions may improve the efficiency of contractions in the second stage. A randomized double-blind controlled trial (Saunders et al, 1989) compared the use of oxytocin with placebo infusion at full dilatation in 226 primigravidae with epidural analgesia. Oxytocin infusion was associated with a shorter second stage, more spontaneous deliveries (50% compared with 40%), fewer non-rotational instrumental deliveries (31% compared with 47%) and less perineal trauma (66% compared with 79%) but was not associated with any reduction in the number of rotational forceps deliveries performed for malposition of the occiput.

Second, the 'passenger' may be unable or slow to descend because of malposition. Occipitoposterior and occipitotransverse positions result in a larger presenting diameter than the more favourable occipitoanterior positions, causing a degree of relative cephalopelvic disproportion. During labour, 65% rotate to the occipitoanterior position for delivery, 20% rotate to the occipitotransverse position and then arrest (deep transverse arrest) and 15% deliver in the persistent occipitoposterior position. Even at this late stage in the labour, epidural analgesia should be considered to allow time for head descent by blocking the premature urge to push, and can be particularly useful if operative delivery is anticipated. Altering the maternal position may assist rotation of the fetal head (Hofmeyer, 1998). In cases of slow progress because of malposition, maternal exhaustion may occur before delivery thus requiring operative delivery.

Third, the 'passages' of the maternal pelvis may be of insufficient dimension to allow a normally positioned fetal head to descend. In this uncommon situation of true second stage cephalopelvic disproportion, safe delivery will be achieved by caesarean section.

Fetal compromise

Interpretation of EFHRM is often difficult during the second stage of labour since physiological fetal heart rate changes often occur and can be

misinterpreted as suspicious. Early decelerations are a consequence of fetal head compression and do not require intervention. Signs of hypoxia are a reduction in baseline variability, late decelerations, tachycardia or failure of the heart rate to return to the baseline after a contraction. Late decelerations, bradycardia <70 beats per minute and an abnormal fetal heart rate in the first stage of labour are associated with neonatal acidosis (pH<7.2, base deficit >12 mmol/litre) (Sheiner et al, 2001). In cases of doubt about abnormalities of the second stage trace and in the absence of another indication for operative delivery, fetal scalp blood sampling is justified and may allow labour to progress to spontaneous delivery without further intervention.

OPERATIVE VAGINAL DELIVERY

Operative vaginal delivery rates account for approximately 20% of all deliveries in the UK. Instruments used fall into two categories: vacuum extractor and obstetric forceps. Both types of instruments are used for non-rotational and rotational types of deliveries. The instruments and techniques of assisted vaginal delivery are described in detail elsewhere (Chamberlain, 1995).

The commonest indications for operative delivery are slow progress, maternal exhaustion and fetal compromise. Contraindications to operative vaginal delivery include operator inexperience, delivery before full dilatation, head not fully engaged in the pelvis, and in the case of the vacuum extractor, face presentation or gestation <36 weeks (Royal College of Obstetricians and Gynaecologists, 2000).

The choice of instrument is influenced by operator preference and expertise. Individual circumstances may dictate the need for a particular instrument and so operators should be skilled in application of both forceps and the vacuum extractor.

In cases of suspected fetal compromise, the instrument of choice remains obstetric forceps. A prospective analysis of 225 women having an assisted vaginal delivery demonstrated a shorter decision-to-delivery interval with forceps compared to vacuum extraction (23.3 minutes *vs* 29.2 minutes) (Okunwobi-Smith et al, 2000). In addition, forceps are indicated in situations where maternal effort is limited (e.g. exhaustion) or contraindicated (e.g. cardiac disease).

When compared to obstetric forceps, the vacuum extractor is associated with less maternal trauma (odds ratio (OR) = 0.41), less perineal pain at 24 hours (OR = 0.54) and less general and regional anaesthesia (OR = 0.6) (Johanson and Menon, 1999). Vacuum extraction is more likely to fail than attempted forceps deliveries (OR = 1.7) and is more likely to be associated with fetal trauma, e.g. cephalhaematoma (OR = 2.4) and retinal haemorrhage (OR = 2.0) (Johanson and Menon, 1999). No significant differences between forceps and vacuum extraction were found in caesarean section rates, low Apgar scores at 5 minutes or long-term follow-up of mothers and children. Therefore, use of the vacuum extractor appears to reduce maternal morbidity compared to forceps, but is associated with higher rate of fetal trauma and instrument failure. Although the choice of instruments is somewhat subjective, the most appropriate instrument for the individual circumstances should be used (Royal College of Obstetricians and Gynaecologists, 2000).

There is no reported randomized trial of operative vaginal delivery *vs* second stage caesarean section but observational comparisons are available. Among women undergoing second stage operative delivery in theatre, those who had a caesarean section were more likely to have a blood loss >1 litre (OR = 2.8) and hospital stay >6 days (OR = 3.5); babies delivered by caesarean section were more likely to require intensive care admission (OR = 2.6) but less likely to experience trauma compared to those delivered by forceps (OR = 0.4) (Murphy et al, 2001). Vaginal delivery should remain the aim of overcoming difficulties in the second stage of labour.

When there is uncertainty concerning the ability to safely complete a vaginal delivery then a trial of instrumental delivery in theatre is appropriate with early recourse to caesarean section if appropriate. Provided abdominal delivery is within 10 minutes of abandoning the attempt at vaginal delivery there is no difference in neonatal outcome (Revah et al, 1997).

Following delivery of the fetal head the obstetrician must be alert to the possibility of shoulder dystocia and postpartum haemorrhage, both emergency situations necessitating prompt and appropriate actions. Detailed reviews of these conditions and their management are available (Owen and Bain, 1998; Scottish Obstetric Guidelines and Audit Project, 2002).

CONCLUSIONS

There is no substitute for experience and expertise among midwives and obstetricians for the safe conduct of the second stage of labour. Close communication with the mother and her partner are essential. When obstetric intervention is required, operative vaginal delivery is indicated provided the fetal position and station in the pelvis are favourable. HM

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Carrole G, Belizan J, Stamp G (1998) Episiotomy policies in vaginal births (Cochrane Review). Issue 3. The Cochrane Library, Oxford

Chamberlain GC (1995) Operative vaginal delivery. In: Chamberlain GC, ed. *Turnbull's Obstetrics*. Churchill Livingstone, Edinburgh: 695–715

Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK (2001) Effect of low-dose mobile versus traditional epidural techniques on mode of delivery: a randomised controlled trial. *Lancet* **358:** 19–23

De Jong PR, Johanson RB, Baxen P et al (1997) Randomised trial comparing the upright and supine positions for the second stage of labour. *Br J Obstet Gynaecol* **104:** 567–71

Enkin M, Keirse MJNC, Neilson C et al (2000) *A Guide to Effective Care in Pregnancy and Childbirth.* 3rd edn. Oxford University Press, Oxford

Gardosi J, Sylvester S, B-Lynch C (1989) Alternative positions in the second stage of labor: a randomised controlled trial. *Br J Obstet Gynaecol* **96:** 1290–6

Gupta JK, Nikoderm VC (2000) Women's position during second stage of labour (Cochrane Review). Issue 4. The Cochrane Library, Oxford

Hofmeyer GJ (1998) Hands/knees posture in late pregnancy or labour for malposition (lateral or posterior) of the presenting part (Cochrane Review). Issue 3. The Cochrane Library, Oxford

Howell CJ (2000) Epidural vs non-epidural analgesia for pain relief in labour. Cochrane Database Syst Rev 2: CD000331

Janni W, Schiessl B, Peschers U et al (2002) The prognostic impact of a prolonged second stage of labour on maternal and fetal outcome. *Acta Obstet Gynecol Scand* **81**(3): 214–21

Johanson RB, Menon BK (1999) Vacuum extraction vs forceps delivery. (Cochrane Review). Issue 4. The Cochrane Library, Oxford

Murphy DJ, Liebling RE, Verity L (2001) Early maternal and neonatal morbidity associated with operative delivery in second stage of labour: a cohort study. *Lancet* **358**: 1203–7

Okunwobi-Smith Y, Cooke I, MacKenzie IZ (2000) Decision to delivery intervals for assisted vaginal vertex delivery. *Br J Obstet Gynaecol* **107:** 467–71

Owen P, Bain C (1998) Shoulder dystocia. *Hosp Med* **59**(9): 698–703

Revah A, Ezra D, Farine D, Ritchie K (1997) Failed trial of vacuum or forceps: maternal and fetal outcome. *Am J Obstet Gynecol* **176:** 200–4

Royal College of Obstetricians and Gynaecologists (2000) *Instrumental Vaginal Delivery. Clinical Green Top Guideline 26.* Royal College of Obstetricians and Gynaecologists, London (http://www.rcog.org.uk)

Royal College of Obstetricians and Gynaecologists (2001) *National Evidence-Based Clinical Guideline: The Use of Electronic Fetal Monitoring.* Royal College of Obstetricians and Gynaecologists, London (http://www.rcog.org.uk)

Saunders NJ, Spiby H, Gilbert L et al (1989) Oxytocin infusion during second stage of labour in primiparous women using epidural analgesia: a randomised double blind placebo controlled trial. *BMJ* **299**: 1423–6

Scottish Obstetric Guidelines and Audit Project (2002) *The management of postpartum haemorrhage.* Scottish Obstetric Guidelines and Audit Project, Aberdeen (www.show.scot.nhs.uk/spcerh)

Sheiner E, Hadar A, Hallak M et al (2001) Clinical significance of the fetal heart rate tracings during the second stage of labour. *Obstet Gynecol* **97**(5 pt 1): 747–52

Yancey MK, Zhang J, Schweitzer DL et al (2001) Epidural analgesia and fetal head malposition at vaginal delivery. *Obstet Gynaecol* **97:** 608–12

Zhang J, Yancey MK, Klebanoff MA et al (2001) Does epidural analgesia prolong labour and increase risk of Caesarean delivery? A natural experiment. *Am J Obstet Gynecol* **185:** 128–34

KEY POINTS

- In the absence of recognized risk factors for intrapartum hypoxia there is no demonstrable maternal or fetal benefit in applying continuous electronic fetal heart rate monitoring compared with intermittent auscultation.
- Epidural analgesia is associated with a higher incidence of operative vaginal delivery. Oxytocin infusion is associated with a higher incidence of spontaneous vaginal delivery.
- Obstetricians should gain experience and become competent in the use of both ventouse extraction and obstetric forceps. Ventouse delivery is associated with a lower incidence of maternal trauma but a higher incidence of failure and neonatal trauma compared to forceps delivery.