Vaginal birth after Caesarean section: a practical evidence-based approach

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Abstract

Around 10% of the obstetric population have experienced prior Caesarean delivery. This article provides a practical evidence-based approach to the antenatal and intrapartum management of such women. A gestation-specific strategy is suggested. Women with an uncomplicated pregnancy and single previous lower segment Caesarean delivery may be managed in shared community care following counselling by a consultant midwife. It is important to provide complete informed consent detailing the risks and benefits for the woman that are individualised to her circumstances. It is estimated that planned vaginal birth after Caesarean exposes the woman to an additional 0.25% risk (or 1 in 400) for experiencing an adverse perinatal outcome (antepartum stillbirth, delivery-related perinatal death or hypoxic ischaemic encephalopathy) compared with opting for elective repeat Caesarean section (ERCS). It is likely that this risk is significantly reduced for women who opt for ERCS at the start of the 39th week; however, direct evidence to support this is lacking.

Keywords Caesarean section; Caesarean section, repeat; placenta praevia; pregnancy outcome; uterine rupture; vaginal birth after Caesarean

Introduction

This article is based on, and updates, the evidence presented in the Royal College of Obstetricians and Gynaecologists (RCOG) Green-top Guideline 'Birth after previous Caesarean birth' (RCOG, February 2007). The definitions of terms used are detailed in Table 1.

Limitations of data

Presently, there are no published randomised controlled trials (RCTs) comparing planned vaginal birth after Caesarean section (VBAC) against planned elective repeat Caesarean section (ERCS), although an RCT has recently begun recruitment. Evidence for these interventions is obtained mainly from retrospective non-randomised studies making their conclusions less reliable. However, studies produced by the National Institute of Child Health and Human Development (NICHD) have overcome many of the shortcomings of previous studies through its analysis of a large multicentre prospective cohort of around 18,000 planned VBACs and 16,000 ERCSs with standardised inclusion criteria and outcomes.

Definitions used in article

Planned vaginal birth after Caesarean (VBAC)	Planned VBAC refers to any woman who has experienced a prior Caesarean birth who plans to deliver vaginally rather than by elective repeat Caesarean section (ERCS)
Successful and unsuccessful planned VBAC	A vaginal delivery (spontaneous or assisted) in a woman undergoing planned VBAC indicates a successful VBAC. Delivery by emergency Caesarean section during the labour indicates an unsuccessful VBAC
Uterine rupture	Disruption of the uterine muscle extending to and involving the uterine serosa or disruption of the uterine muscle with extension to the bladder or broad ligament
Uterine dehiscence	Disruption of the uterine muscle with intact uterine serosa
Term perinatal mortality	Combined number of stillbirths (antepartum and intrapartum) and neonatal deaths (death of a live born infant from birth to age 28 days) per 10,000 live births and stillbirths at or beyond 37 weeks gestation. Term perinatal mortality rates exclude deaths due to foetal malformation unless otherwise stated
Term delivery-related perinatal death	Combined number of intrapartum stillbirths and neonatal deaths per 10,000 live births and stillbirths at or beyond 37 weeks gestation. Delivery-related perinatal mortality rates exclude antepartum stillbirths and deaths due to foetal malformation unless otherwise stated
Neonatal respiratory morbidity	Combined rate of transient tachypnoea of the newborn (TTN) and respiratory distress syndrome (RDS)

Table 1

Prevalence of women with previous Caesarean birth

The overall Caesarean delivery rate in England for 2006–2007 was 24.3%; the majority were emergency (14.7%) rather than elective (9.5%) Caesarean births. Hence, around 10% of the obstetric population has experienced prior Caesarean delivery.

A national audit, conducted in England and Wales in 2000–2001, reported that the primary Caesarean section rate

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(rate for women who have not had a previous Caesarean section, regardless of parity) was 16.7%, whereas, the repeat Caesarean section rate (rate for women who have had at least one previous Caesarean delivery) was 67.2%.

Therefore, to reduce the overall Caesarean delivery rate, strategies are required that prevent the primary Caesarean delivery, improve uptake of VBAC and improve planned VBAC success. It has been estimated that increased uptake of planned VBAC could decrease the overall Caesarean delivery rate by around 5%. Recent data suggest that VBAC may not be as safe as originally thought. This coupled with the safety of ERCS at 39 weeks gestation, reduced hospital recovery time of ERCS (one-quarter spent 4 days or more recovering in hospital in 2006–2007, compared with just under one-third in 2005–2006) and current preference for lower parity, may encourage women with previous Caesarean birth to opt for ERCS rather than VBAC.

Management

Pregnant women who have previously undergone Caesarean delivery are considered high-risk pregnancies. Hence, their antenatal care should be consultant obstetrician-led and their intrapartum care be conducted in a suitably resourced obstetrician-led hospital labour ward.

- Antenatal care aims to determine the mode of delivery (either planned VBAC or ERCS) for such women and optimise their health in order to achieve best outcomes for mother and foetus.
- Intrapartum care varies for VBAC and ERCS modes of delivery and is individualised to the particular clinical circumstances of the mother and her pregnancy to ensure best outcomes for mother and foetus.

Overview of antenatal care

A suggested antenatal management plan, from initial booking of the pregnancy to delivery, is depicted in Figure 1. Essential elements of the plan include:

12–16 weeks	Provision of written patient information on delivery options (VBAC and ERCS) early on in the pregnancy
16–28 weeks	Consultant obstetrician or consultant midwife (in units where one is available)-led antenatal counselling appointment for women with uncomplicated singleton pregnancies and single previous lower segment Caesarean delivery. Documented counselling of risks and benefits of VBAC vs ERCS. A review of the previous Caesarean delivery, with access to the woman's previous obstetric medical record
32 weeks	Consultant obstetrician-led assessment of women with previous Caesarean delivery who are identified to have a low-lying placenta at 20-week and 32-week obstetric ultrasound. The aim is to provide adequate time for investigation and management of possible placenta accreta
36 weeks	Consultant obstetrician-led assessment to determine mode of delivery for women who: opted for ERCS; are undecided on mode of delivery; or have complicating obstetric and medical disorders (e.g. two previous Caesarean deliveries, multiple pregnancy etc.)
39 weeks	Perform ERCS. If ERCS is required prior to 39 weeks, consideration should be given to administering prophylactic antenatal corticosteroids
41 weeks	Consultant-led review for women who had opted for planned VBAC but have not gone into spontaneous labour. Options considered and documented are: expectant management, membrane sweep and induction of labour or ERCS.

Consultant midwife and consultant obstetrician review

Multiparous women with single previous lower segment Caesarean delivery, with or without a history of vaginal delivery,

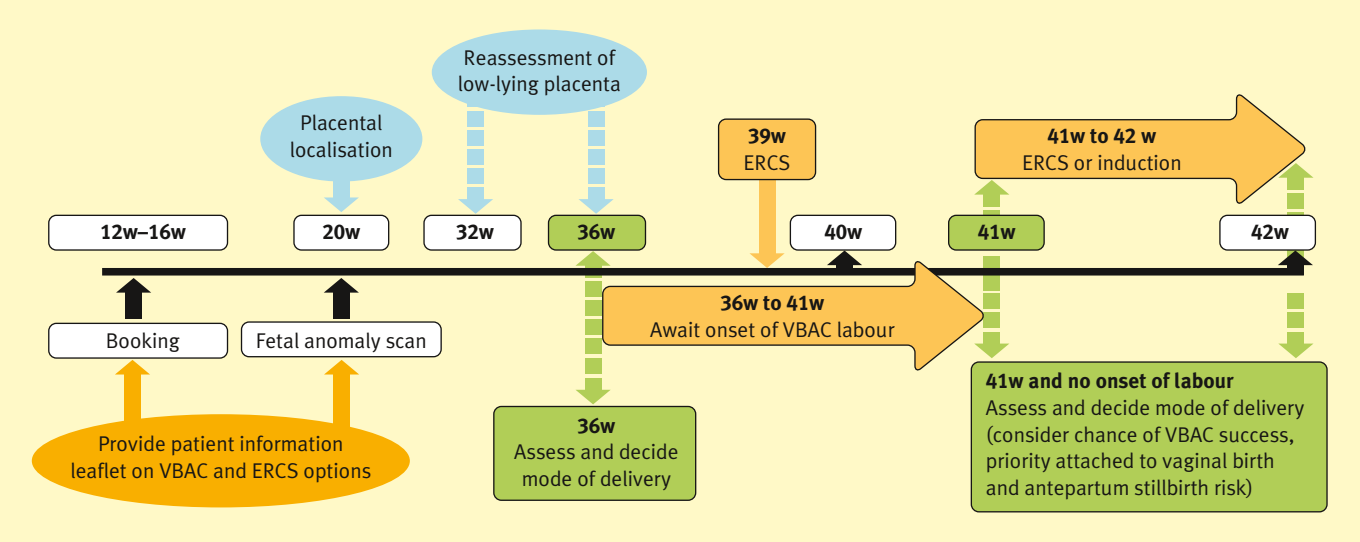

Figure 1 Plan of care for singleton uncomplicated pregnancy with previous Caesarean delivery. VBAC, vaginal birth after Caesarean; ERCS, elective repeat Caesarean section.

compose the vast majority of pregnant women referred to obstetricians due to their history of previous Caesarean delivery. Provided there are no other complicating factors in the current pregnancy (e.g. multiple pregnancy, uterine fibroids, and placenta not low-lying at midtrimester scan) or previous Caesarean delivery and the pregnancy is otherwise low-risk, such women may be counselled by consultant midwives and a preferred mode of delivery determined and documented. A suggested optimal time for this counselling review is 16–28 weeks gestation. This visit should incorporate an individualised risk benefit assessment of VBAC and ERCS, examination of the previous obstetric medical case record in relation to the Caesarean delivery and provision of a patient information leaflet (such as that produced by the RCOG – see additional resources). Assuming a decision for planned VBAC is confirmed at the consultant midwife review, antenatal care may continue in the usual manner for low-risk pregnancies (i.e. shared between general practitioner and midwife) and a consultant obstetrician review organised for 41 weeks.

For all other women, the final decision on mode of delivery should be established at a consultant-led review at 36 weeks. This group would include women who opted for ERCS or were undecided at the consultant midwife review, or who have complicating medical or obstetric risk factors that may preclude VBAC as a delivery option.

Items to be discussed during antenatal counselling

Decision-making for mode of delivery should be a shared process between the woman and her consultant midwife and/or consultant obstetrician. Qualitative studies have shown that women who have had a previous Caesarean section do not usually have firm ideas about mode of delivery. They look for targeted information and guidance from medical personnel based on their individual circumstances. Decision aids and specific patient information literature may facilitate this process (see DIAMOND trial, 2007). Items that should be assessed and discussed during the consultation are depicted in Table 2.

Review of the previous Caesarean delivery

In relation to the previous Caesarean delivery, it is important to identify the indication for Caesarean, the uterine incision used and any peri-operative complications. Ideally, there should be access to the woman's previous obstetric medical record to verify this information. A previous Caesarean delivery that was complicated by uterine incision extensions, endometritis, or wound infection, increases the likelihood of pelvic adhesions. Factors such as cephalopelvic disproportion or failure to progress in late first stage or second stage of labour may recur in a subsequent labour and decrease the likelihood of VBAC success.

Suitability for VBAC

Planned VBAC is appropriate and may be offered to the vast majority of multiparous women with a singleton pregnancy of cephalic presentation at ≥37 weeks, who have had a single previous lower segment Caesarean delivery, with or without a history of previous vaginal birth.

Evidence from several retrospective observational studies indicates that VBAC may be offered to women with: two previous low transverse Caesarean deliveries, previous unknown uterine scar, previous low vertical incision, previous uterine myomectomy, preterm birth, multiple pregnancy and diabetes. However, the supporting data is of limited quality and some studies suggest these pregnancies may be at increased risk of uterine scar rupture and unsuccessful VBAC. Hence, if extensive counselling is offered, planned VBAC is permissible in such women, provided no other factors prognostic of VBAC failure (e.g. induction, obesity, advanced maternal age, macrosomia, post dates) are also present.

Contraindications to VBAC may be considered in four main categories:

- *More than two previous Caesarean deliveries.* Studies have shown similar rates of VBAC success (62–75%) and uterine rupture rates (0.5–0.9%) in women with two previous Caesarean births compared with women with single prior Caesarean birth. However, the rates of hysterectomy and transfusion were increased in the former group
- *Previous uterine rupture*
- *Type of previous uterine incision.* The rate of uterine rupture depends on the type and location of the previous uterine incision. Women with previous classical, inverted T or J uterine incisions are at high risk of uterine rupture (4–9%), hence planned VBAC

Items to be discussed during antenatal counselling

	Items	Special considerations
1	Review of previous Caesarean delivery	Identify indication, uterine incision used and any peri-operative complications
2	Suitability for VBAC	Any contraindications to VBAC
3	The maternal and perinatal risks and benefits of VBAC compared with ERCS	Particularly the patient's attitude towards the risks of rare but serious adverse outcomes and how she values them
4	The likelihood of a successful VBAC	This should be individualised. For example, if patient has had a previous vaginal birth then VBAC is likely to be successful
5	Plans for future pregnancies	If a large family is desired, then achieving VBAC may have greater importance as subsequent births would avoid the risks associated with repeated Caesarean delivery
6	Personal preference for mode of delivery	This should be respected

VBAC, vaginal birth after Caesarean; ERCS, elective repeat Caesarean section.

Table 2

is contraindicated in these women. Similarly, women with previous myomectomy that has breached the intrauterine cavity are at an increased risk of uterine rupture (unable to quantify) and VBAC is contraindicated

- *Medical or obstetric complications that preclude vaginal delivery:* placenta praevia, cervical fibroid.

In extreme circumstances (such as miscarriage, intrauterine foetal death, extreme prematurity), for some women in the above groups, the vaginal route (although risky) may not necessarily be contraindicated.

Maternal and perinatal risks and benefits of VBAC compared with ERCS

The risks and benefits of VBAC and ERCS are summarised in Table 3. It is essential the following items are discussed and documented during counselling:

- *Planned VBAC adverse maternal outcome:* Maternal morbidity is increased in planned VBAC compared with ERCS. The NICHD study showed planned VBAC, compared with ERCS, increased the risk of: uterine rupture (0.5% vs 0%); blood transfusion (1.7% vs 1.0%); and endometritis (2.9% vs 1.8%). Unsuccessful VBAC resulting in emergency Caesarean delivery compared with successful VBAC increased the risk of: uterine rupture (2.3% vs 0.11%), uterine dehiscence (2.1% vs 0.15%); hysterectomy (0.5% vs 0.15%); transfusion (3.2% vs 1.2%); and endometritis (7.7% vs 1.2%)
- *Planned VBAC adverse perinatal outcomes:*
  - 10 per 10,000 (0.1%) risk of antepartum stillbirth beyond 39 weeks
  - 8 per 10,000 risk of hypoxic ischaemic encephalopathy (HIE; approximately half of the increased risk of HIE in planned VBAC arises due to the additional risk of HIE caused by uterine rupture, which is 4.6 per 10,000)
  - 4 per 10,000 risk of delivery- related perinatal death
- *Planned ERCS and adverse perinatal outcome:* ERCS compared with planned VBAC increased the risks of transient tachypnoea

Risks and benefits of planned VBAC vs ERCS

	Planned VBAC	ERCS at 39 weeks
Mother		
Benefits	• 72–76% chance of successful VBAC • If successful, shorter hospital stay and convalescence • Increases likelihood that future pregnancies may be delivered vaginally	• Able to plan to known delivery date • Lower risk of blood transfusion (1%) and endometritis (1.8%) • Essentially zero risk of uterine scar rupture (although published literature does not always distinguish between rupture and dehiscence, hence this estimate may be less reliable) • No risk of vaginal tears and no worsening of pelvic floor support or urinary and bowel continence mechanisms • Able to be surgically sterilised at the same time (but at possibly increased risk of sterilisation failure)
Risks	• 50 per 10,000 (0.5%) risk of uterine scar rupture - is associated with maternal morbidity and perinatal morbidity/mortality • 24–28% chance of emergency Caesarean • 10–15% chance of instrumental delivery and/or perineal tear requiring suturing • Higher risk of blood transfusion (1.7%) and endometritis (2.9%)	• 0.1–2% risk of serious surgical complications such as injury to bladder • Risk of surgical complications with subsequent Caesarean delivery due to increased risk of adhesions and placental praevia/accreta • Longer stay and convalescence • Future pregnancies would require Caesarean delivery
Infant		
Benefits	• Only 1% risk of transient respiratory morbidity	• Avoids the 10 per 10,000 prospective risk of antepartum stillbirth if delivery is undertaken at commencement of 39th week • 1 per 10,000 (0.01%) risk of delivery-related perinatal death or HIE at delivery - avoids intrapartum risks related to, and unrelated to, uterine rupture
Risks	• 10 per 10,000 (0.1%) prospective risk of antepartum stillbirth beyond 39 weeks whilst awaiting spontaneous labour • 4 per 10,000 (0.04%) risk of delivery-related perinatal death (intrapartum stillbirth and neonatal death) • 8 per 10,000 (0.08%) risk of HIE during labour	• 1–3% risk of transient respiratory morbidity • [6% risk if delivery performed at 38 instead of 39 weeks] • Need for antenatal corticosteroids if ERCS planned before 39 weeks

VBAC, vaginal birth after Caesarean; ERCS, elective repeat Caesarean section; HIE, hypoxic ischaemic encephalopathy.

Table 3

of the newborn (TTN) (5% vs 2%) and respiratory distress syndrome (RDS; 0.5% vs <0.05%).

The NICHD study showed there was around a three-fold increase (0.38% vs 0.13%; odds ratio 2.90 (95% confidence interval (CI) 1.74–4.81)) for one or more serious adverse perinatal outcomes (antepartum stillbirth, delivery-related perinatal death or HIE) for planned VBAC at term compared with ERCS. Hence, it is estimated that planned VBAC exposes the woman to an additional 0.25% risk (or 1 in 400) for experiencing an adverse perinatal outcome compared with opting for ERCS.

Variation in how health outcomes are valued when counselling on risk and benefits

The trade-off between risks and benefits for VBAC and ERCS is highly individualised because women value particular health outcomes differently. Understanding this helps the clinician and woman prioritise which outcomes matter most and, therefore, what represents the optimum mode of delivery for them. For example, some women may value their baby's health above all other outcomes. Such women would opt for ERCS and expose themselves to operative risk, rather than expose their baby to the rare adverse perinatal outcomes associated with VBAC. Conversely, some women may value their own health and achieving vaginal delivery above all other outcomes. Such women would attempt VBAC and accept the small degree of risk they are exposing themselves and their baby to during labour in preference to ERCS.

Her individualised likelihood of VBAC success

Studies report success rates of 72–76% for planned VBAC after a single previous Caesarean. Several pre-admission and admission-based multivariate models have recently been published to predict the likelihood of VBAC success. A summary of these prognostic factors is listed in Table 4. However, their usefulness in assisting health professionals or pregnant women in decision-making to minimise adverse outcome has not yet been established.

Previous vaginal delivery, particularly previous VBAC, is the single best predictor for successful VBAC and is associated with an approximately 85–90% planned VBAC success rate. Induced labour, no previous vaginal delivery, body mass index greater than 30 and previous Caesarean for failure to progress are associated with unsuccessful VBAC. If, all these factors are present, successful VBAC is achieved in only 40% of cases. A small observational study showed that if labour dystocia was diagnosed between 5 and 9 cm then subsequent VBAC was successful in around 70% of cases. However, if prior Caesarean delivery was performed during the second stage of labour, only 13% had successful VBAC.

The woman's future fertility wishes

The maternal morbidity risks for women with one previous Caesarean delivery are approximately similar whether they opt for VBAC or ERCS. However, women seeking future pregnancies should be counselled that opting for ERCS for their current pregnancy may expose themselves to greater surgical risks for future pregnancies. Studies have shown a linear relationship between the number of previous Caesarean deliveries and the risks of: placenta praevia; placenta accreta; injury to bladder, bowel or ureter; hysterectomy and blood transfusion. Women with a single prior Caesarean delivery have a four-fold increased risk of placenta praevia (relative risk (RR) 4.5, 95% CI 3.6–5.5) relative to women with an unscarred uterus.

Hence, women desiring large families may be more motivated to attempt VBAC in order to avoid the surgical risks inherent to multiple Caesarean deliveries.

There is no direct evidence to qualify what is a 'safe' maximal number of repeat Caesarean deliveries. In the NICHD study, placenta accreta was present in 0.24%, 0.31%, 0.57%, 2.13%, 2.33% and 6.74% of women undergoing their first, second, third, fourth, fifth and sixth or more Caesarean births, respectively. Hysterectomy was required in 0.65%, 0.42%, 0.90%, 2.41%, 3.49% and 8.99% of women undergoing their first, second, third, fourth, fifth and sixth or more Caesarean births, respectively.

The woman's preference for mode of delivery

The woman's preference for mode of delivery, and whether this has altered, should be duly respected and documented. The aim of antenatal counselling is to provide sufficient information to ensure she fully understands her delivery options so that an informed choice is made. As up to 10% of women scheduled for ERCS go into labour before the 39th week, it is good practice to

Risk factors prognostic of successful or unsuccessful VBAC

Successful VBAC	Unsuccessful VBAC
Previous vaginal delivery	No previous vaginal delivery
Spontaneous labour	Induced or augmented labour
Admission cervical dilatation >4 cm	Admission cervical dilatation <4 cm
Previous Caesarean delivery for foetal malpresentation or non-reassuring foetal well-being	Previous Caesarean delivery for cephalopelvic disproportion or failure to progress Previous preterm Caesarean delivery
>18 months from previous Caesarean delivery	<18 months from previous Caesarean delivery
BMI <30	BMI >30
Birthweight <4000 g	Birthweight >4000 g
	Second pregnancy birth weight exceeds the first by >500 g and the prior Caesarean indication was dystocia
	Post dates (at or after 41 weeks gestation)
Epidural analgesia	No epidural analgesia
Non-advanced maternal age (<40 years)	Advanced maternal age (>40 years)
Caucasian ethnicity	Non-Caucasian ethnicity
Maternal stature not short (>150 cm)	Short maternal stature (<150 cm)
Female infant	Male infant

VBAC, vaginal birth after Caesarean.

Table 4

discuss and document a plan for delivery if labour starts prior to the scheduled date.

Planning and conducting ERCS

Apart from standard peri-operative measures for conducting ERCS, there are specific issues that are pertinent to women with previous Caesarean delivery as detailed in the following sections.

Localisation of the placenta

Considering all pregnancies (both scarred and unscarred uteri), approximately 4% are low-lying at midtrimester (20–22 week) ultrasound and 10–25% of these cases remain low-lying (praevia) at repeat ultrasound at 36 weeks gestation. Overall, placenta praevia complicates 0.5–1% of deliveries and placenta accreta affects 10–25% of praevias.

Given the strong association between placenta praevia, placenta accreta and previous Caesarean delivery, then re-scan and placental localisation assessment should commence at 32 weeks (and be repeated at 36 weeks) for women with prior Caesarean delivery identified as having a low-lying placenta at midtrimester ultrasound. Furthermore, those women diagnosed as having placenta praevia (especially anterior and major praevias) after 36 weeks, should undergo additional imaging (such as power amplitude ultrasonic angiography, magnetic resonance imaging or colour flow Doppler) to establish the risk of accreta complicating the praevia.

Delivery at 39 weeks, otherwise administer antenatal corticosteroids if delivery is before 39 weeks

Women considering ERCS should be counselled that delaying delivery by 1 week from 38 to 39 weeks enables around a 5% reduction (6% vs 1%) in the incidence of respiratory morbidity (particularly reducing the incidence of TTN), however, this delay may be associated with a 5 per 10,000 increase in the risk of antepartum stillbirth. Should there be a need to perform ERCS prior to 39 weeks, then consideration should be given to administering prophylactic betamethasone at least 48 hours prior to delivery. An RCT (Stutchfield P et al, 2005) demonstrated a 50% reduction in respiratory morbidity by administering prophylactic betamethasone to women having elective Caesarean deliveries beyond 37 weeks (steroid vs control; 2.4% vs 5.1%; RR 0.46, 95% CI 0.23–0.93) and this treatment effect was still apparent at 39 weeks of gestation (steroid vs control; 0.6% vs 1.5%).

Preoperative considerations

For high-surgical risk cases (e.g. multiple previous Caesarean deliveries, placenta praevia with accreta, women who decline blood products) a multi-professional input is strongly recommended. Issues to consider are: preoperative haematological optimisation; preoperative discussion with the patient about the risks of transfusion and hysterectomy and leaving the placenta *in situ* (if accreta); preoperative insertion of uterine artery catheters by interventional radiologists; availability and use of cell salvage, cross-matched blood, recombinant factor VIIa; consideration of combined spinal-epidural regional analgesia; availability of a gynaecologist in case Caesarean hysterectomy is required. It is recommended practice in the UK that a consultant obstetrician and consultant anaesthetist be present for all placenta praevia Caesarean deliveries.

Planned VBAC beyond 41 weeks' gestation

The RCOG induction of labour guideline suggests that induction be offered from 41weeks as this reduces perinatal mortality without an increase in Caesarean section rates. There are no adequate data to recommend whether such an approach is equally valid in women with previous Caesarean delivery.

Studies of association between previous Caesarean and subsequent stillbirth risk are inconsistent. Nonetheless, analyses of large population datasets has shown that the risk of stillbirth at or after 39 weeks is between 1.5 and 2-fold higher in women with previous Caesarean delivery compared with women without prior Caesarean delivery (absolute risks: 11 per 10,000 vs 5 per 10,000). Hence, the reduction in risk of perinatal death that occurs by delivering from 41 weeks is likely to be greater among women with previous Caesarean. However, in such women, induction of labour compared with spontaneous labour is associated with increased risks of emergency Caesarean section (by 1.5-fold) and uterine scar rupture (by 2–3 fold).

A reasonable consensus approach would be for women who planned VBAC to have a consultant-led review at 41 weeks gestation and a plan for delivery agreed upon. The review would assess: likelihood of successful VBAC (e.g. favourable cervix, previous vaginal birth, absence of any obstetric or foetal complications); priority attached to achieving vaginal birth (such as plans for many future pregnancies); understanding of the increased maternal and perinatal risks if induction is chosen; preference for VBAC or ERCS. In practice, this may mean scheduling a 'provisional ERCS' at around 40 weeks +10 days and converting to induction of labour depending on the clinical review at that time. Furthermore, there is no evidence to indicate that a membrane sweep after 40 weeks is contraindicated in women with previous Caesarean delivery, and this may be offered to the woman at her 41-week review.

Intrapartum management of planned VBAC

Delivery setting

Planned VBAC should be conducted in a suitably staffed and equipped delivery suite capable of performing emergency operative (vaginal or Caesarean) delivery and maternal or neonatal resuscitation.

Monitoring

There should be continuous monitoring of the labour to ensure prompt identification of any: maternal or foetal compromise, labour dystocia, or uterine scar rupture (Table 5). Consequently, all women in established VBAC labour should receive:

- Supportive one-to-one care
- Intravenous access with full blood count and blood group and save
- Continuous electronic foetal monitoring
- Continuous monitoring of maternal symptoms and signs
- Regular (no less than 4-hourly) assessment of their cervicometric progress in labour.

Clinical features associated with uterine rupture in women with previous Caesarean delivery

Risk factors	Symptoms	Signs
Induction (prostaglandin, amniotomy, intracervical Foley catheter)	Severe abdominal pain, especially if persists in between uterine contractions	Abnormal CTG (decelerations, tachycardia, bradycardia)
Augmentation with oxytocin	Acute onset of lower abdominal pain	Loss of station of the presenting part
Abnormal labour progress (prolonged latent phase, dysfunctional or secondary arrest)	Cessation of previously efficient uterine activity	Acute onset scar or lower abdominal tenderness
More than one prior Caesarean delivery	Haematuria	Maternal tachycardia, hypotension, shock
Previous myomectomy	Abnormal excessive vaginal bleeding	
Multiparity*	Post-delivery maternal collapse	
Previous uterine perforation at surgery		
Short inter-delivery interval (<18 months) from previous Caesarean		

CTG, cardiotocograph.
*Multiparity is an independent risk factor for uterine rupture. However, prior vaginal delivery appears to be protective against uterine rupture in planned vaginal birth after Caesarean (VBAC). Hence, multiparity may or may not behave as a risk factor for uterine rupture during VBAC labour.

Table 5

Analgesia

Epidural analgesia does not mask the signs and symptoms associated with uterine rupture, and is not contraindicated in VBAC labour. In fact, epidural analgesia has been associated with improved rates of successful VBAC compared with those women not receiving epidural analgesia. However, epidural analgesia may increase the risk of second stage delay and operative vaginal delivery.

Induction and augmentation

Although augmentation and induction are not strictly contraindicated in women with prior Caesarean delivery, there remains considerable disagreement amongst clinicians on their use. Induction (particularly women with an unfavourable cervix or by prostaglandin method) or augmentation of VBAC labour are associated with a 2–3 fold increased risk of uterine rupture and around 1.5-fold increased risk of Caesarean section compared with spontaneous VBAC labour (Table 6). The decision to induce or augment should be determined following careful obstetric assessment and be consultant-led (Table 7). Women who are contemplating many future pregnancies may be prepared to accept the short-term additional risks associated with induction and/or augmentation in view of avoiding the long-term surgical risks associated with repeat Caesarean deliveries.

Prostaglandin (PG) induction vs non-PG induction

PG induction compared with non-PG induction (e.g. amniotomy or intracervical Foley catheter) is associated with a higher uterine rupture risk (87 per 10,000 vs 29 per 10,000) and a higher risk of perinatal death due to uterine rupture (11.2 per 10,000 vs 4.5 per 10,000) (Table 6). This compares with 6 per 10,000 risk of perinatal death in women with an unscarred uterus induced by prostaglandin. Hence, due consideration should be given to restricting

Outcome of planned VBAC labours from NICHD study

	Induced (n = 4708)	Augmented (n = 6009)	Spontaneous (n = 6685)	Overall all planned VBACs (n = 17,898)*
Uterine rupture	102 per 10,000 1.0% PG method only 140 per 10,000 1.4% Non-PG method only 89 per 10,000 0.9%	87 per 10,000 0.9%	36 per 10,000 0.4%	36 per 10,000 0.4%
Emergency Caesarean rate (%)	33	26	19	27
VBAC success rate (%)	67	74	81	73

VBAC, vaginal birth after Caesarean. NICHD, National Institute of Child Health and Human Development; PG, prostaglandin. (*n* = 17,898 planned VBACs).
*496 VBACs were not classified, hence total planned VBACs is 17,402 plus 496 = 17,898.

Table 6

Management of augmentation in established VBAC labour

	Clinical management issues
1	The decision for augmentation should follow careful obstetric assessment, maternal counselling and be consultant-led
2	If oxytocin is administered, augmentation should be titrated such that it should not exceed the maximum rate of contractions of 4 in 10 minutes. Particular caution is necessary when using high oxytocin augmentation doses, as there is a dose response for maximum oxytocin amount and uterine rupture
3	Careful serial cervical assessments, preferably by the same person, are necessary to show adequate cervicometric progress, thereby allowing augmentation to continue. These intervals should not exceed 4 hours
4	If there is less than 2 cm progress after 4 hours of oxytocin, then Caesarean section should be considered. A more conservative threshold of inadequate progress after 2 hours of augmentation for consideration for Caesarean section may be justified, depending on the patient's individual circumstances
5	If there is 2 cm or more progress, augmentation can be continued and vaginal examinations performed 4-hourly

VBAC, vaginal birth after Caesarean.

Table 7

the dose of total prostaglandin exposure and/or considering other methods of induction such as intracervical Foley catheter.

Augmentation and labour dystocia

There is no direct evidence to recommend what is acceptable or unacceptable cervicometric progress in women with spontaneous or augmented VBAC labour. Early recognition and intervention for labour dystocia (specifically not exceeding 2 hours of static cervicometric progress) could prevent a proportion of uterine ruptures among women attempting VBAC.

Awareness of the increased risk of uterine rupture in scarred uteri, particularly if there is labour dystocia, implies a more conservative threshold to the upper time limit (such as 2 hours instead of 4 hours) of oxytocin augmentation without progress (Table 7).

Recognition and management of uterine rupture

Uterine rupture in an unscarred uterus is extremely rare at 2 per 10,000 deliveries, and this risk is mainly confined to multiparous women in labour. Studies with differing methodological designs and definitions of scar rupture report uterine rupture rates in planned VBAC varying between 35 and 75 per 10,000. The NICHD study reported a 69 per 10,000 incidence (124 uterine ruptures in 17,898 planned VBACs; Table 6). Hence, 50 per 10,000 (0.5%) represents a reasonable estimate of the risk of uterine rupture that can be communicated to women.

Although a rare outcome, uterine rupture is associated with serious sequelae: perinatal death, foetal HIE and hysterectomy. Around one-third of delivery-related perinatal deaths (intrapartum stillbirths plus neonatal mortality) during VBAC labour are due to uterine rupture. A rate of 1.4 per 10,000 additional perinatal deaths occurs due to uterine rupture in planned VBAC. In addition, around one-third of delivery-related perinatal deaths during VBAC labour were due to intrapartum anoxia unrelated to uterine rupture (e.g. due to abruption, cord prolapse). In the NICHD study, HIE affected 8 per 10,000 planned VBACs, and of these, 60% of cases (7/12) were due to uterine rupture. Hysterectomy has been reported to be performed in 4–13% of uterine ruptures. It is likely that many of these adverse perinatal outcomes during labour, related to or unrelated to uterine rupture, would be prevented by ERCS.

Early diagnosis of uterine scar dehiscence or rupture followed by expeditious laparotomy and neonatal resuscitation are essential to reduce associated morbidity and mortality. There is no single pathognomic clinical feature indicating uterine rupture but the presence of any of the features indicated in Table 5 suggestive of this event. An abnormal cardiotocograph is the most consistent finding in uterine rupture and is present in 55–87% of these events. The diagnosis is ultimately confirmed at emergency Caesarean section or postpartum laparotomy. ◆

FURTHER READING

Royal College of Obstetricians and Gynaecologists. Guideline and Patient information leaflet. Birth after previous Caesarean birth. Green-top guideline No.45. London: RCOG, February 2007. Also available at: http://www.rcog.org.uk/womens-health/clinical-guidance/birth-after-previous-caesarean-birth-green-top-45 (accessed 19 Mar 2009).

Royal College of Obstetricians and Gynaecologists. Birth after previous Caesarean: information for you. London: RCOG, September 2008. Also available at: http://www.rcog.org.uk/womens-health/clinical-guidance/birth-after-previous-caesarean-information-you (accessed 19 Mar 2009).

Other resources

Hospital episode statistics online. Maternity statistics, England: 2006–2007. http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=1024.

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Montgomery AA, Emmett CL, Fahey T, et al. DiAMOND Study Group. Two decision aids for mode of delivery among women with previous Caesarean section: randomised controlled trial. *BMJ* 2007; **334:** 1305.

Moffat MA, Bell JS, Porter MA, et al. Decision making about mode of delivery among pregnant women who have previously had a Caesarean section: a qualitative study. *BJOG* 2007; **114:** 86–93.

Hoskins IA, Gomez JL. Correlation between maximum cervical dilation at caesarean delivery and subsequent vaginal birth after caesarean delivery. *Obstet Gynecol* 1997; **9:** 591–593.

On-going trial

Dodd JM, Crowther CA, Hiller JE, Haslam RR, Robinson JS. Birth after Caesarean study –planned vaginal birth or planned elective repeat Caesarean for women at term with a single previous Caesarean birth: protocol for a patient preference study and randomised trial. *BMC Pregnancy Childbirth* 2007; **7:** 17.

Practice points

- It is important to provide complete informed consent detailing the risks and benefits for the woman that are individualised to her circumstances. Documentation of counselling and provision of a patient information leaflet is highly recommended. Counselling should be unbiased. Women may then opt for either planned VBAC or ERCS and their preference should be respected.
- Planned VBAC compared with ERCS increases the risks of maternal morbidity, perinatal morbidity and perinatal mortality, particularly if the VBAC is unsuccessful. The principal risk associated with VBAC labour is uterine rupture.
- The NICHD study showed that the additional attributable risk for experiencing a serious adverse perinatal outcome at term for planned VBAC, compared with ERCS, appears to be approximately 1 in 400 (or 0.25%). It is likely that this risk is significantly reduced, or even eliminated, for women who opt for ERCS at the start of the 39th week.