

# Labour and Childbirth After Previous Caesarean Section

## Recommendations of the Austrian Society of Obstetrics and Gynaecology (OEGGG)

### Geburt nach vorausgegangenem Kaiserschnitt

### Empfehlung der Österreichischen Gesellschaft für Gynäkologie und Geburtshilfe (OEGGG)

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- Management
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#### Abstract

The new expert recommendation from the Austrian Society of Obstetrics and Gynaecology (OEGGG) comprises an interpretation and summary of guidelines from the leading specialist organisations worldwide (RCOG, ACOG, SOGC, CNGOF, WHO, NIH, NICE, UpToDate). In essence it outlines alternatives to the direct pathway to elective repeat caesarean section (ERCS). In so doing it aligns with international trends, according to which a differentiated, individualised clinical approach is recommended that considers benefits and risks to both mother and child, provides detailed counselling and takes the patient's wishes into account. In view of good success rates (60–85%) for vaginal birth after caesarean section (VBAC) the consideration of predictive factors during antenatal birth planning has become increasingly important. This publication provides a compact management recommendation for the majority of standard clinical situations. However it cannot and does not claim to cover all possible scenarios. The consideration of all relevant factors in each individual case, and thus the ultimate decision on mode of delivery, remains the discretion and responsibility of the treating obstetrician.

#### Summary of Recommendations for Women with Previous Caesarean Section

1. The vast majority of affected pregnant women fulfil conditions for an attempted vaginal birth after caesarean section (VBAC) and should be counselled accordingly (ACOG – Level 1). This is particularly true after *one* previous caesarean and for singleton pregnancies with cephalic lie and gestational age beyond 37 completed weeks (RCOG – Grade B).
2. Women should be informed that the success rate for VBAC is between 60–85% (SOGC, ACOG, RCOG – Grade C).
3. Women should be informed that a successful vaginal birth is associated with the lowest complication rate (RCOG-Grade B).
4. Women should be informed that occasionally, in the event of unsuccessful vaginal delivery, an urgent caesarean section is necessary and this is associated with an increased complication rate (RCOG – Grade B).

#### Zusammenfassung

Die neue Expertenempfehlung der Österreichischen Gesellschaft für Gynäkologie und Geburtshilfe (OEGGG) stellt eine Zusammenfassung und Interpretation der Guidelines der weltweit führenden Fachgesellschaften und Organisationen (RCOG, ACOG, SOGC, CNGOF, WHO, NIH, NICE, UpToDate) dar. In ihrer Kernaussage zeigt die Empfehlung Alternativen zum direkten Weg zur geplanten Re-Sectio auf. Sie folgt damit dem internationalen Trend, der stattdessen ein differenziertes, individualisiertes klinisches Management unter Abwägen mütterlicher und kindlicher Vorteile und Risiken sowie eine detaillierte Aufklärung und Miteinbeziehung der Wünsche der Schwangeren empfiehlt. Angesichts guter Erfolgsraten für eine vaginale Geburt nach Kaiserschnitt von 60–85% gewinnt das Einbeziehen von prädiktiven Faktoren in die antenatale Geburtsplanung zunehmend an Wichtigkeit. Die Empfehlung versteht sich als kompakte Handlungsempfehlung für die meisten klinischen Standardsituationen, kann jedoch niemals alle potenziellen Einzelsituationen abdecken. Das individuelle Bewerten aller Faktoren und damit die Entscheidung über den tatsächlichen Entbindungsmodus bleibt letztendlich im Ermessen des behandelnden Facharzts/der behandelnden Fachärztin.

5. Women should be informed that there is an approx. 0.5% (1 in 200) risk of uterine rupture during VBAC (RCOG – Grade B).
6. Women should be informed that the risk of delivery-associated perinatal fetal/neonatal death is extremely low for VBAC – risk comparable with that for vaginal birth in primiparous women (RCOG – Grade C). Maternal mortality is not measurable (only sporadic individual reports from industrialised countries).
7. The perinatal mortality risk is extremely low for elective repeat caesarean section (ERCS). Neonatal respiratory morbidity is slightly increased especially if birth is before 39 completed weeks (RCOG – Grade C).
8. Women should be informed that every repeat caesarean further increases the risk of abnormal placentation in future pregnancies and that adhesions, which may complicate future abdominal surgery, can result (RCOG – Grade C).
9. ERCS should ideally be performed after 39 completed weeks of pregnancy (RCOG – Grade A).
10. Birth should take place in a hospital. The hospital should have suitably skilled staff and facilities necessary for the immediate management of potential complications (all guidelines).
11. There should be continuous fetal monitoring (CTG) as soon as regular contractions are established (all guidelines).
12. There are no restrictions to peripartum analgesia (ACOG – Level 1).
13. A medical indication is required for induction of labour (all guidelines).
14. Women should be informed that induction of labour carries a 2- to 3-fold increased risk of uterine rupture (approx. 1–1.5%) and a 1.5-fold increased chance of caesarean delivery (RCOG – Grade D).
15. A specialist obstetrician must be involved in the decision to induce labour and the choice of induction method (RCOG).
16. Beyond term (post-dates) when no signs of spontaneous labour are present, an obstetric assessment to estimate the likelihood of successful vaginal birth should be performed at the latest after 41 completed weeks. Ideally the date for induction of labour or ERCS should be set at 41 + 3 weeks of gestation at the latest (RCOG).
17. Oxytocin is not contraindicated for augmentation of labour after previous caesarean (SOGC – Grade B – Level 2a).
18. Amniotomy and oxytocin for labour induction is a low-risk method when the cervix is ripe (Bishop score  $\geq 6$ ) (UpToDate – Level 2, SOGC, ACOG).
19. Mechanical methods of labour induction (transcervical balloon catheter, amniotomy) are associated with lower risk than medical methods (prostaglandins, oxytocin) (RCOG – Grade D).
20. Misoprostol should not be used for induction of labour or cervical ripening in the third trimester after previous caesarean (ACOG – Level 1, SOGC – Grade B – Level 3).

### Aim of this Recommendation

▼ This expert recommendation provides an overview and interpretation of the recommendations of the leading specialist organisations worldwide. It should be seen as a compact management guideline for the majority of standard clinical situations, however it cannot, and does not claim to cover all potential individual sce-

narios. The consideration of all relevant factors mentioned in this publication and thus the ultimate decision on mode of delivery in each individual case, remains the discretion and responsibility of the treating specialist.

For the sake of readability detailed listing of the primary literature and comprehensive study data has mostly been avoided. Instead, the relevant guideline is mentioned in each case, and where available the level of evidence/grade of recommendation stated.

### Level of Evidence and Grading of Recommendations



#### Level of evidence

**Level 1a:** Meta-analyses or systematic reviews based on high-quality randomised, controlled trials; numerous high-quality randomised, controlled trials with very low risk of bias.

**Level 1b:** At least one high-quality RCT of sufficient size with low risk of bias.

**Level 2a:** Systematic reviews of non-randomised trials; at least one high-quality, non-randomised trial with a low risk of bias.

**Level 2b:** At least one high-quality study of a different type, such as a comparative study, correlation study or case-control trial.

**Level 3:** Non-analytical studies, e.g. case reports, case series.

**Level 4:** Opinions and convictions of respected authorities (expert opinion); consensus opinions of expert commissions.

#### Grade of recommendation

**Grade A recommendation:** Based on at least one randomised controlled trial, systematic review or meta-analysis of good quality and consistency overall that is not extrapolated from, but applies directly to the recommendation in question (evidence level 1a and 1b).

**Grade B recommendation:** Based on well constructed, non-randomised clinical studies directly applicable to the recommendation (evidence level 2a) or extrapolated from level 1 evidence if not directly applicable to the specific situation.

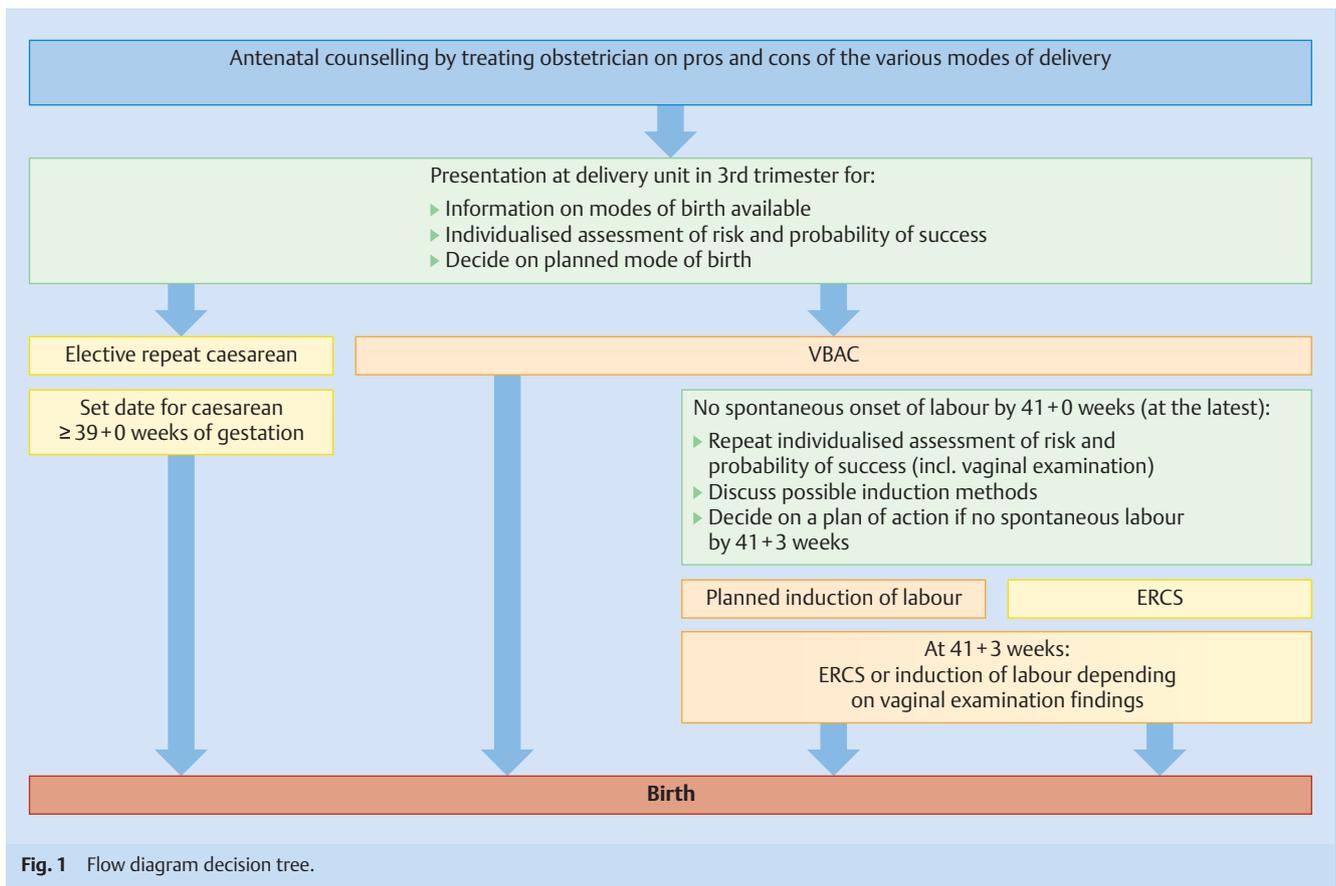
**Grade C recommendation:** Based on well constructed, non-randomised clinical studies directly applicable to the recommendation (evidence level 2b) or extrapolated from level 2a evidence if not directly applicable to the specific situation.

**Grade D recommendation:** Reports from expert groups or expert opinions and/or clinical experience of recognised authorities (evidence level 4), as well as findings directly from level 3, or extrapolation from level 2b, or level 3 evidence when no directly relevant good quality clinical studies are available.

### Guidelines



This expert recommendation is based on the guidelines of the leading specialist organisations worldwide, including the Royal College of Obstetricians & Gynaecologists (RCOG), the American College of Obstetricians & Gynecologists (ACOG), the Society of Obstetricians and Gynaecologists of Canada (SOGC), the French College of Gynecologists and Obstetricians (CNGOF), and the recommendations of the British National Institute for Health and Care Excellence (NICE), the American National Institutes of Health (NIH) and the World Health Organisation (WHO). In addition, the very current and topic-specific recommendations of [www.uptodate.com](http://www.uptodate.com) were drawn on.



These guidelines include:

- ▶ NICE Guideline. Inducing labour – Quality standard. 2014 [1]
- ▶ NICE Guideline. Induction of labour. 2008 [1]
- ▶ RCOG Greentop Guideline No 45. Birth after previous Caesarean Birth. 2015 [2]
- ▶ ACOG Practice Bulletin no. 115. Vaginal birth after caesarean delivery. 2010 [3]
- ▶ ACOG Practice Bulletin no. 107. Induction of Labor. 2009 [4]
- ▶ SOGC clinical practice guideline no. 155. Guidelines for vaginal birth after previous caesarean birth. 2005 [5]
- ▶ SOGC clinical practice guideline no. 296. Induction of Labour: Review. 2015 [6]
- ▶ Delivery for women with a previous caesarean: guidelines for clinical practice from the French College of Gynecologists and Obstetricians. 2013 [7]
- ▶ NIH Consensus Development Conference Statement: Vaginal Birth After Caesarean: New Insights. 2010 [8]
- ▶ WHO recommendations for Induction of labour. 2011 [9]
- ▶ UpToDate. Choosing the route of delivery after caesarean birth. 2015 [10]
- ▶ UpToDate. Cervical ripening and induction of labor in women with a prior caesarean delivery. 2015 [11]
- ▶ UpToDate. Use of calculators for predicting successful trial of labor after caesarean delivery. 2015 [12]

The equivalent guidelines in German are currently being revised and a validated version is not available.

## Introduction and Background



The assumption “once a caesarean, always a caesarean”, which prevailed in the early decades of the 20th century, has long lost its validity. Instead, a differentiated management approach has arisen that aims to assess the chances of successful vaginal birth on an individualised basis taking the risks to both mother and child into consideration. With this approach, detailed counselling and the incorporation of the pregnant patient’s wishes play an ever greater roll. This paradigm shift in planning the mode of delivery after previous caesarean section has now been ratified and accepted by all relevant specialist societies and organisations and has led to the revision of their respective guidelines.

And so it is that obstetricians and midwives face an ever increasing number of situations in which birth planning after previous caesarean and decisions surrounding possible labour induction and induction methods are required. Decisions should always be made on an individual basis; the management recommendations presented here provide general orientation and counselling support. Guidelines are currently not able to make a valid, general recommendation for any option over another. Nevertheless an attempt has been made to provide an overview of the pros and cons of each individual method and to define factors likely to be predictive of successful vaginal birth thus making induction of labour both sensible and safe.

## Predictors of Successful VBAC



The success rate of vaginal birth after previous caesarean section is uniformly stated as 60–85% (SOGC, ACOG, RCOG). The indications for previous caesareans are useful as predictive factors: abnormal fetal lie such as breech presentation (OR 1.9; 95% CI: 1.0–3.7) [13] and pregnancy induced hypertension (OR 2.3; 95% CI: 1.0–5.8) [13] can be regarded as favourable predictors, likewise previous normal vaginal births (OR 1.8; 95% CI: 1.1–3.1) [13], which are associated with a success rate of 82% [14]. Opinion is divided on the prognosis following previous caesarean due to uterine dystonia, labour arrest/obstructed labour or cephalopelvic disproportion, some studies showing significantly reduced success rates.

The success rate of a VBAC falls with increasing **maternal age**. Available data are insufficient to define an age limit. Subsequent family planning should be incorporated into decision-making around mode of birth (CNGOF) in this context.

Higher multiparity increases the chances of successful vaginal birth and is associated with reduced risk of uterine rupture. Attempted VBAC can therefore be advised preferentially to **higher-parity multipara** (CNGOF).

Preexisting **diabetes** lowers the chances of successful VBAC. In the absence of fetal macrosomia, gestational diabetes that is well controlled with dietary measures does not lower the chances of successful VBAC. Diabetes is not a risk factor for uterine rupture. Attempted VBAC is possible with all forms of diabetes (CNGOF, SOGC).

**Maternal obesity** (BMI > 40) lowers the chances of successful VBAC without influencing the risk of uterine rupture (CNGOF – Level 3). ERCS is recommended at a BMI > 50 (CNGOF-Grade C) in view of low success rates (13%) for VBAC (CNGOF-Grade C) and difficulty in emergency situations.

The risk of uterine rupture rises for **shorter intervals between current pregnancy and previous caesarean section**. Uterine rupture rates of up to 2.65% (95% CI: 1.08–6.46) [15] are quoted for intervals < 24 months. Nevertheless, where obstetric conditions are favourable, a trial of labour (VBAC) is possible for intervals of > 6 months (CNGOF – Grade C). Women with intervals of 18–24 months should be informed explicitly about the increased risk of uterine rupture (SOGC – Grade B – Level 2b).

The success rate of **external cephalic version** does not seem to be influenced by previous caesarean section (CNGOF – Level 3, ACOG – Level 2) and it does not seem to affect the rate of uterine rupture (CNGOF – Level 4, ACOG). External cephalic version can thus be offered to patients with previous caesarean section (CNGOF – Grade C, SOGC).

**Twin pregnancies** have similar rates of successful VBAC (CNGOF – Level 3) and uterine rupture (CNGOF – Level 3) compared to singleton pregnancies. VBAC can be offered to women with twin pregnancies without increasing maternal or fetal mortality or morbidity (CNGOF – Grade C, ACOG – Level 2) and has a success rate of 69–84% (SOGC).

**Fetal macrosomia** (birth weight > 4000 g) lowers the success rate of VBAC (ACOG). While the French and American guidelines assume the risk of uterine rupture is doubled (CNGOF-Level 3, ACOG), the Canadian guideline quotes a study by Zelop et al. [16] that found no increased rupture risk. With a remaining success rate of > 60% and an acceptably low risk of uterine rupture, a trial of labour is possible up to an estimated birth weight of 4500 g (CNGOF – Level 3). ERCS should be performed when estimated birth weight is > 4500 g (CNGOF – Grade C).

The success rate of VBAC **before 37 completed weeks of gestation** is comparable to that at term. The risk of uterine rupture is lower (CNGOF – Level 3). Neonatal outcome before 37 completed weeks is not different for ERCS compared to VBAC (CNGOF – Level 3). Therefore, when delivery is necessary before 37 weeks gestation the patient should be offered a trial of labour (in the absence of other contraindications) (CNGOF – Grade C).

**Beyond term (post-dates)** the success rate of VBAC is decreased (ACOG) without an influence on uterine rupture rate (CNGOF – Level 3). VBAC is possible beyond term (CNGOF – Grade C, SOGC – Grade B – Level 2b).

There are no clinically established **scoring systems** that predict successful VBAC (ACOG, CNGOF, NIH, RCOG). Nevertheless use of a prognosis calculator can be considered when planning mode of birth (UpToDate), e.g. as available on the Maternal-Fetal Medicine Units (MFMU) Network homepage (<https://mfmunetwork.bsc.gwu.edu/PublicBSC/MFMU/VGBirthCalc/vagbirth.html>).

## Informed Consent



The treating physician has a substantial influence on a pregnant woman's decision whether or not to attempt a vaginal delivery after previous caesarean section (SOGC [17, 18]). The practice obstetrician therefore has the task of providing accurate, non-directive counselling early in pregnancy on the pros and cons of the various modes of birth. An unconsidered decision for ERCS early on in the pregnancy using the often quoted phrase “once a caesarean, always a caesarean” should be avoided.

Building on this counselling and based on an individualised risk assessment the safest mode of birth available at the birthing facility, with the greatest chances of success, that is also concordant with the patient's wishes can be chosen (• Fig. 1). A specialist obstetrician must always be involved in the final decision on mode of birth in patients with previous caesarean section.

## Timing

Since potential risk factors for VBAC are usually known early on, specific counselling can be provided from an early stage of pregnancy (ACOG). A concluding discussion should take place at the delivery unit closer to the time of birth, early enough however, to allow for gathering potentially outstanding information and results. ERCS should ideally be performed after 39 completed weeks of gestation (RCOG – Level 1).

When labour is induced, depending on the chosen induction method, patients should be informed about possible **off-label use** of certain drugs or mechanical methods and all discussions should be documented in writing.

## Risks

Patient counselling should include an individualised evaluation of the advantages and risks of both ERCS and VBAC. Adequate time should be available for the analysis of each individual clinical history, taking known predictors of success and failure of VBAC into account. It is particularly important to discuss maternal short- and long-term morbidity when considering ERCS. Data on possibly increased long-term child morbidity are currently inconclusive. The increased risk of uterine rupture should be mentioned when a vaginal birth is attempted; patients should be informed that the risk is slightly increased with spontaneous labour and in some cases significantly increased with induction of labour, dependant on method of induction. Counselling should

include information on the potential associated consequences of uterine rupture for both mother and child.

### Documentation

Counselling about maternal (especially uterine rupture) and fetal risks should be documented (ACOG – Level 3). To ensure the best possible counselling, decision-making and documentation the use of a checklist or standardised counselling form is recommended (RCOG – Grade B).

Documentation should include information on the previous caesarean section (especially indication and incision type). In some centres the “conjugata vera” measured at previous caesarean is taken into account when planning the birth.

When the previous caesarean section surgical report is not available and the type of uterine incision is unknown a lower segment transverse incision can be assumed when there is no information to the contrary. The lack of a surgical report is not a contraindication to a trial of labour (CNGOF, SOGC – Grade B – Level 2b, ACOG – Level 2). Nevertheless the birthing assistant/midwife should be aware of this, as a previous longitudinal incision involving the uterine corpus cannot be definitely excluded.

### Analgesia

The patient should be informed that there are no restrictions to analgesia options (ACOG–Level 1). Available data do not suggest that epidural anaesthesia (PDA) has a negative affect on the success rate of VBAC. Since the most common signs of uterine rupture are CTG changes, there is no reason to fear masking of possible rupture by PDA (ACOG). A sudden requirement for analgesia should however increase vigilance for possible uterine rupture (RCOG – Grade D).

### Plan for spontaneous onset of labour before scheduled ERCS

When ERCS has been chosen as the preferred mode of delivery the possibility of spontaneous onset of labour (contractions, spontaneous rupture of membranes) before the scheduled caesarean date should be discussed. A plan of action for this eventuality should be made and documented in the patient notes (RCOG).

In the event of an unexpectedly early onset of labour, or in the absence of prenatal counselling/documentated plan of action the decision on mode of birth should be made by an experienced obstetrician (RCOG).

### Structural Requirements and Management

Patients with previous caesarean section should give birth in a hospital (SOGC – Grade B – Level 2a). The obstetric department should be staffed appropriately and have suitable equipment to perform an emergency caesarean and manage any possible complications (SOGC – Grade B – Level 2a, CNGOF). The Canadian guideline recommends a maximum decision-to-delivery time of 30 minutes (SOGC – Grade C – Level 3); the equivalent American organisation posits that the appropriate personnel must be “immediately available” (ACOG – Level 3). The French guideline further stipulates that an obstetrician with sufficient operative expertise for emergency haemostasis be available (CNGOF). In German-speaking countries the maximum decision-to-delivery time is legally set at 20 minutes.

Patients should be informed beforehand if the necessary personnel are usually not on site 24 hours a day (ACOG).

A standard operating procedure (SOP) should be available for the management of potential emergencies (SOGC – Grade C – Level 2).

Continuous CTG monitoring is recommended when regular contractions are established (SOGC – Grade B – Level 2a, CNGOF, ACOG) since changes in fetal heart rate are unanimously recognised as the first sign of possible uterine rupture (SOGC, CNGOF, ACOG).

The progress of labour should be monitored regularly since prolonged labour or ineffective contractions increase the risk of uterine rupture (SOGC, CNGOF) and may themselves be important signs of actual uterine rupture.

Routine postpartum digital exploration of the uterine cavity and the previous caesarean section scar is not beneficial (CNGOF, SOGC, ACOG).

Imaging (ultrasound) to determine the thickness of the lower uterine segment may help in defining increased risk of uterine rupture; as yet, however, this is not established as a standard procedure. Threshold measurements have not been defined (SOGC, UpToDate [19,20]).

### Risks and Benefits, VBAC vs. ERCS

#### Maternal risks and benefits

All the guidelines reviewed confirm that successful VBAC carries the lowest, and secondary caesarean section after an unsuccessful attempted VBAC the highest **maternal mortality**. Data on maternal mortality are however inconsistent. Whereas the Canadian guidelines report increased maternal mortality for VBAC (OR 1.71 95% CI: 1.28–2.28) [21], the NIH guideline quotes a **mortality rate** of 1.9/100 000 for attempted vaginal birth vs. 9.6/100 000 for ERCS.

The **risk of uterine rupture** for attempted VBAC is slightly increased and for previous low transverse incision caesarean is quoted at 0.1 to 1.6% (CNGOF, SOGC, NIH, ACOG). A previous vaginal birth constitutes a protective factor, reducing the chances of uterine rupture irrespective of whether it occurred before or after the previous caesarean. Thus the risk of uterine rupture falls with increasing number of VBACs from 1.6% (first VBAC) to 0.2% after two successful VBACs (SOGC [22]). The sometimes widely varying alleged incidence of uterine rupture can generally be explained by the fact that there has been hardly any meaningful stratification of cases into either asymptomatic wound dehiscence or life-threatening, complete rupture (ACOG).

In comparison the uterine rupture rate for ERCS is quoted at 0.03% (NIH) to 0.19% (SOGC [23]). Hysterectomy is required in 14–33% of cases when uterine rupture occurs (NIH).

Evidence of a possibly increased **hysterectomy rate** for attempted VBAC is variable. The reviewed guidelines range from quoting a similar risk to that for ERCS (NIH), to maintaining a doubled rate of severe complications (1.6% vs. 0.8; OR: 1.8; 95% CI: 1.1–3.0; SOGC) although this same guideline quotes a study by Rageth et al. [24] that reports a reduced hysterectomy rate for VBAC (relative risk 0.36; 95% CI: 0.23–0.56).

There are no conclusive data on the surgical method of **closure of the uterine incision** (continuous vs. interrupted sutures, “locked” or “unlocked” etc.) with respect to uterine rupture risk in future pregnancies (CNGOF, SOGC).

Guidelines are unanimous in the view that successful VBAC is associated with **less febrile morbidity, fewer thromboembolic complications, shorter hospital stay and quicker recovery** (SOGC, CNGOF, NIH).

Previous caesarean section is associated with an increased incidence of **placenta praevia** (RR 3.89) and **placental abruption** (RR 2.41) (SOGC [25]). The incidence of placenta praevia increases further to 1.7% after a repeat caesarean section and to 3% after a third (NIH). Even with a normally localised placenta the risk of **placenta accreta, increta or percreta** increases from 0.3% after one caesarean to 2.4% after three or more.

It is particularly important to consider the **potential morbidity** associated with repeated caesarean sections when discussing mode of birth options with a patient who is planning further pregnancies (SOGC, CNGOF, NIH, ACOG). This morbidity includes **disorders of placentation**, increased **likelihood hysterectomy**, increased risk of **infection, bowel and bladder injury** and need for **blood transfusion** (ACOG).

### Paediatric risks and benefits

Whereas extensive data is mostly available on the maternal pros and cons of the various modes of birth, there is limited evidence on neonatal outcome.

In all the reviewed guidelines **perinatal mortality** (from 20 completed weeks of gestation up to 28 days after birth) and **neonatal mortality** (within the first 28 days after birth) are quoted as low, but higher for VBAC than for ERCS. Thus perinatal mortality is estimated at 0.13 vs. 0.05% respectively (NIH), with an odds ratio of 1.71 (95% CI: 1.28–2.28) (SOGC [21]), and neonatal mortality at 0.11 vs. 0.05% (NIH, CNGOF – Level 2). The Canadian guideline explicitly points out that this increased perinatal morbidity and mortality can be regarded as directly related to the occurrence of uterine rupture (SOGC).

The incidence of **hypoxic ischemic encephalopathy** is generally low but occurs significantly more often with VBAC. Prevalence rates of 0.5–2.3/1000 vs. 0–1.1/1000 are quoted (CNGOF – Level 2).

The risk of **neonatal sepsis** is higher for VBAC (2 vs. 0%; CNGOF – Level 2) and mostly seems to affect cases where attempted vaginal birth is unsuccessful and secondary caesarean is required (OR 4.8; 95% CI: 3.6–9.0; SOGC [26]). According to the NIH, however, data on neonatal sepsis are insufficient.

Neonatal **respiratory problems** (transient tachypnoe of the newborn) seem to occur more often after ERCS compared to successful VBAC (6 vs. 3%, OR: 2.3 95% CI: 1.4–3.8; CNGOF, SOGC, ACOG), although here too the NIH guideline regards the evidence level as insufficient.

The risk of **fetal hyperbilirubinemia** is significantly increased after ERCS compared to VBAC (5.8 vs. 2.2%, ACOG).

The **long-term consequences** of caesarean section for the child have not yet been adequately researched.

### Contraindications to VBAC

Recommendations regarding **type of previous uterine incision** are not uniform. While the Canadian (SOGC) and French (CNGOF) specialist bodies regard all uterine scars other than the lower segment transverse incision as contraindications to a trial of vaginal birth, according to the ACOG a lower segment vertical incision is not necessarily a contraindication. All specialist organisations

however do regard previous classical caesarean (sharp dissection of all layers) or T-incision as contraindications.

ERCS is generally recommended after a **previous uterine rupture** (SOGC, CNGOF, ACOG). The risk of repeated rupture is quoted at 6–32%.

ERCS should also be the aim when **contraindications to labour** (e.g. placenta praevia, anomalous presentation incompatible with vaginal birth) are present (SOGC, ACOG – Level 2).

When a patient does not consent to VBAC and has a **clear desire to have an elective repeat caesarean**, this wish should be met (SOGC).

**Three or more (≥ 3) previous caesarean sections** is uniformly regarded as a contraindication to VBAC. The risk of uterine rupture is thought to be increased already after 2 previous caesareans (CNGOF – Level 3), although there are some data that suggest risk is not significantly increased [27]. The risk is quoted at up to 3.7% (SOGC). VBAC can be considered in individual cases following detailed counselling when obstetric conditions are favourable (CNGOF – Grade D). Success rates are between 62–89% (SOGC), the largest study by Miller et al. [28] showing a success rate of 75% and a uterine rupture rate of 1.7 vs. 0.6% for ERCS. In line with this result the American guideline states a moderate increase in morbidity of 3.2% vs. 2.1% for VBAC after two vs. one previous caesarean. The possibility of VBAC for these patients is acknowledged (ACOG – Level 2). The decision for VBAC after two previous caesareans must be made on a case-by-case basis and should only go ahead after extensive counselling by an experienced obstetrician (RCOG – Grade C).

### Methods of Labour Induction

#### ▼ Wait and watch

The NICE guidelines make a general recommendation to induce labour at 41 + 0 completed weeks of gestation, however it is not clear whether this can simply be applied to the previous caesarean section population. On the one hand, after previous caesarean section there is a 1.5- to 2-fold increased risk (0.11 vs. 0.05%) [29] of intrauterine death after 39 completed weeks. This must be weighed up against a 1.5-fold increased risk of emergency caesarean and a 2- to 3-fold higher risk of uterine rupture during induction of labour, both factors which themselves influence perinatal morbidity and mortality.

Taking these data into consideration the RCOG in England recommends the following: when a pregnant woman with previous caesarean section is beyond term (post-dates) and no signs of spontaneous labour are present she should be examined at 41 + 0 weeks of gestation by a senior obstetrician. Apart from assessing fetal wellbeing, a vaginal examination should be performed and the chances of successful VBAC estimated taking all possible factors into account. Furthermore, the patient's preferences and options (VBAC vs. ERCS) as well as possible induction methods should be discussed with her again. Induction or ERCS should be planned for 41 + 3 weeks at the latest, though a change of plan (from repeat caesarean to induction) may be offered if the cervix becomes favourable.

#### Oxytocin

Oxytocin can be used for induction of labour in hospitalised patients when the cervix is ripe (SOGC – Grade B – Level 3, CNGOF – Grade C). The risk of uterine rupture is regarded as minimal to moderate (CNGOF – Level 2). In a study of 142 075 attempted

VBACs where oxytocin was used in 43% of cases the uterine rupture rate was 0.62% [30]. A slightly increased rupture risk is reported for the use of oxytocin for induction compared to augmentation of labour (1.1 vs. 0.8%) (ACOG [31]). An unripe cervix (Bishop score < 6) significantly increases the rupture risk (ACOG). Pregnant women with a previous vaginal birth have a significantly lower rupture risk (1.5 vs. 0.8%) (ACOG, RCOG [32]). There is a dose–risk correlation, though a maximum oxytocin dose has not been defined (ACOG [32]). The use of prostaglandins before oxytocin administration is associated with a higher rupture risk (1.4–2.24%) than oxytocin alone (ACOG [31, 33]).

### Prostaglandin E2

Data on the use of prostaglandin E2 is inconsistent and recommendations are contradictory. In America, for instance, the ACOG recommends prostaglandin E2 only for women with good chances of successful VBAC, however the guideline quotes studies that report no increased uterine rupture risk [31] and studies that report uterine rupture risk is increased [33]; studies are also quoted that show increased rupture risk only associated with subsequent oxytocin use [34]. The French guideline is in agreement, recommending cautious use of prostaglandin E2 after careful consideration of the chances of success and taking all relevant obstetric and maternal factors into account.

In direct contrast to this, the Canadian guideline does not allow for the use of prostaglandin E2 for induction of labour except in special individual cases and after explicit counselling (SOGC – Grade B – Level 2). The risk of uterine rupture is described as significantly higher than for amniotomy/oxytocin/Foley catheter [35]. In England, while the 2008 NICE guideline still allowed for the rather liberal use of prostaglandin E2, the current RCOG Green-top guideline advises cautious use with a recommendation to and limit the total prostaglandin exposure. In this regard the NICHD study [31] is referred to, which states lower risk with amniotomy/Foley catheter, however a recent Cochrane review [36] is also quoted, which states that there is insufficient evidence to define the induction method with lowest risk. When using prostaglandin E2 for women with previous caesarean section explicit reference should be made to its off-label use in this context.

### Misoprostol

Even though current knowledge and experience with misoprostol is based on small case numbers almost all specialist organisations advise against its use after previous caesarean section. The RCOG makes no recommendation with respect to misoprostol. It is also unlikely there will be new data from large studies in future in view of reported rupture rates of up to 18.8% [37]; prospective, comparative trials have been discontinued [38] due to unacceptably high rupture rates. It is also difficult to predict whether, and to what extent, the study of different dosage schemes or alternative application methods (oral) will change the available evidence.

### Transcervical balloon catheter

The WHO recommends preferential use of induction methods associated with lower risk of uterine hyperstimulation, explicitly mentioning the balloon catheter (WHO). A more comprehensive appraisal of the subject is planned for future WHO guidelines. The Canadian guideline considers the use of Foley catheters acceptable and safe (SOGC-Grade A – Level 2) and mentions the double-balloon catheter as a second-line alternative (SOGC-

Grade B – Level 2b). The use of Foley catheters does not appear to be associated with an increased rate of uterine rupture (SOGC [39]).

The American guideline states the rupture risk is comparable with that of spontaneous labour and recommends the Foley catheter as beneficial (ACOG).

A low-lying placenta should be regarded as an absolute contraindication to the use of transcervical balloon catheter systems. This deserves particular attention and increased vigilance since disorders of placentation (e.g. placenta praevia) occur more frequently following caesarean section (SOGC).

In Austria only the double-balloon induction catheter (Cook Med Inc, Bloomington, IN, USA) is licensed for induction of labour. Licensing studies did not include women with previous caesarean section so that this is formally a contraindication to its use. The Foley catheter is not licensed for labour induction in Austria at all and explicit reference to its off-label use must be made.

### Conflict of Interest



The authors report no conflict of interest.

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