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VAGINAL BIRTH AFTER CESAREAN SECTION

Shahrazad Kamil Habeeb and Raya Issa Rezqallah

Ministry of Health, Baghdad, Iraq.

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***Corresponding Author**
Shahrazad Kamil Habeeb
Ministry of Health, Baghdad, Iraq.

ABSTRACT

Cesarean section (CS) has evolved from a procedure with considerable morbidity and mortality risks into one that is safe enough to be considered as a matter of maternal choice in high resource countries. Improvements in operative techniques, anesthesia, intensive care, blood transfusion services and availability of antibiotics have all contributed to improved safety of the procedure for pregnant women. Rates of CS are rising all over the world and so are the rates of vaginal birth after cesarean (VBAC). Attempting a VBAC is a safe and appropriate choice that must be offered to most women who have had a prior cesarean delivery. Approximately 70e75% of women who attempt VBAC will have a successful vaginal delivery. However, VBAC is associated with risks for both the mother and the baby. The possibility of uterine rupture in labor ranges from 3 to 7 per 1000 pregnancies while the risk of perinatal death or severe morbidity should a uterine rupture occur is higher with the trial of vaginal delivery than with repeat cesarean delivery.

KEYWORDS: Vaginal birth, cesarean section.

INTRODUCTION

The trend of increasing cesarean section (CS) rates had evoked worldwide attention for both healthcare workers and the general population. Many articles revealed the trend of a steady rise of C States globally in the past 2 decades.[1] According to the World Health Organization (WHO) recommendation, CSS should be performed only when medically necessary.[2] Unfortunately, this recommendation fails to reverse the increasing trend of CS rates.[3] Among the group of cesarean deliveries, repeated CS due to priorities account for a remarkable proportion[4]. Vaginal birth after cesarean section (VBAC) is an alternative to repeated CSs. It peaked during the mid-1990s along with a lower total CS rate. A dramatic drop in the percentage of VBAC since that point of time accompanied by a steady increase in

CS rates was explored until the present time.[4] Several national medical associations have provided practice guidelines for VBAC. However, the evidence is inconsistent and the effect on VBAC rates is unclear.[5] The rates of successful VBAC in the United States are between 38.5% and 69.8%, as revealed by a 10-year survey.[6]

Vaginal birth after cesarean (VBAC) delivery remains a controversial topic and one for which there is a lack of robust data to guide clinicians and parturients regarding their best option for mode of delivery in a subsequent pregnancy. The optimum mode of delivery for the woman who has had one previous cesarean section remains a controversial topic in obstetric practice and is a subject for which clinical practice varies somewhat worldwide. Vaginal birth after cesarean section (VBAC) rates vary significantly from one country to another, ranging from 9.6% - 52.2%[7] in the developed world. In an era when general cesarean section (CS) rates are deemed to be disproportionately high at 25 – 50% in many countries[8], and rising, it must be borne in mind that one of the largest contributions to such rates in a population arises from the cohort of women who have had one previous cesarean section. In approximately 28% of cesarean deliveries in the UK[10], and in 30-50% in the USA[9], a previous cesarean section has been cited as the primary indication. For the parturient who has had one previous cesarean delivery, there are basically two options, VBAC or elective repeat cesarean section (ERCS).

In different ways, both of these confer a degree of additional maternal and perinatal morbidity, and rarely mortality. The risks of VBAC include increased risk to the mother of emergency cesarean section (failed VBAC), hemorrhage, transfusion, uterine rupture, and endometritis, and to the infant an increased risk of asphyxia or perinatal death.[10]

The risks are lowest with successful VBAC but unfortunately, none of the existing VBAC screening tools provide consistent ability to identify women who may achieve this. The risks of ERCS include surgical complications, placenta praevia, placenta accreta, risks associated with multiple caesareans and increased risk of hysterectomy.[11] For the infant neonatal respiratory morbidity, and putative long-term childhood risks are associated with such delivery.[12]

One of the more consistent findings in relation to VBAC in recent decades is that of a declining rate in many countries, with a concomitant rise in the rates of ERCS.[13] In the absence of reliable data from randomized trials, it is difficult to make sensible conclusions

regarding the benefits, or otherwise, of these changes, but the resulting increased cesarean section rates have raised many concerns.[14]

The exact reasons for these recent trends are unclear, but multiple factors have contributed such as clinician views, patient preference, institutional protocols, national guidelines, litigation and the lack of good quality evidence to counsel patients reliably.[15]

BACKGROUND

Definitions and Methodology VBAC Attempt Rate

VBAC attempt rates may also be described as VBAC uptake rates or trial of labor after cesarean section (TOLAC) rates. VBAC Success Rate: An attempt at VBAC may result in either a "successful" VBAC or a "failed" trial of labor resulting in a repeat cesarean delivery. This statistic (Table I) describes the proportion (%) of all women undergoing a trial of labor after a previous cesarean section (VBAC attempt) who achieve a successful vaginal delivery.

VBAC Rate

The VBAC rate is the proportion (%) of women with successful VBAC from the total denominator of all women who entered the antenatal system having had one previous cesarean section. The accepted VBAC rate, as defined by the National Centre for Health Statistics, and endorsed by The American College of Obstetricians and Gynecologists Committee on Obstetric Practice, is the number of VBACs divided by the number of women with previous cesarean delivery multiplied by 100.[16]

VBAC Attempt Rates

The VBAC attempt rate for GUH for the 25-year period from 1990 – 2015 is demonstrated graphically in Figure II. There was a decline in the VBAC attempt rate from 69% in 1990 to 51.8% in 2015.

VBAC Success Rate

The VBAC success rates for GUH from 1990 to 2015 are similarly demonstrated in Figure III. The rates varied from 80.5% in 1995 to 63.7% in 2015 (P<-0.001). VBAC success rates vary in the literature but are generally quoted as somewhere between 54-75%, with the highest rates in those with a history of previous vaginal delivery.[17] In the US VBAC success rates peaked at 69.8% in 2000 but decreased to a low of 38.5% in 2008. UK figures for VBAC success rates vary from to 63.4% to 72-75%.

VBAC Rate

There is significant variation in VBAC rates worldwide and this finding is controversial in itself. Rates vary from as low as 11.9% in the US to 29-36% in Ireland, Italy, and Germany, and increase too much higher rates of 45-55% in Finland, Sweden, and the Netherlands.

The VBAC rates for GUH are shown in Figure IV for the time period 1990 – 2015. The VBAC rate peaked in 1996 at 64.9% and was followed by a consistent decline to 33% in 2015. ($P<0.001$). This trend has been noted in other studies. A 2016 study found that since 1990, the CS rate in Dublin obstetric hospitals has steadily increased associated with a significant fall in the VBAC rate, from a VBAC rate of over 60% in 1990 to just over 30% in 2014.[18]

These trends in increasing CS rates secondary to decreasing VBAC rates are mirrored internationally. In the US, the VBAC rates peaked at 28.3% in 1996[19] but they began to decline after this time and reached their lowest rate of 8.3% in 2007. In 2010, in response to the declining rates, the National Institute of Health released a practice bulletin concluding that VBAC remains a reasonable birth option for women with a previous CS.[20] From 2010 there has been a slight increase in the VBAC rates in the US with a rate of 11.9% reported in 2015.[20]

Risks associated with planned VBAC

The most important risk associated with a planned VBAC is uterine rupture (0.5%) and the associated maternal morbidity and fetal morbidity/mortality. Other significant risks associated with planned VBAC include e operative injury at emergency CS, increased risk of blood transfusion and endometritis, 10e15% chance of instrumental delivery associated with perineal tear/episiotomy, the risk of antepartum stillbirth beyond 39 weeks (0.1%) while awaiting the onset of labor.[21]

Uterine dehiscence and rupture

Uterine dehiscence is defined as a disruption of the uterine muscle with intact uterine serosa. Uterine rupture is defined as a 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. The risk of uterine rupture with VBAC is about 0.3e0.7% as compared to nearly zero with elective repeat CS. However, it has been estimated that in order to avoid one symptomatic uterine rupture, 370 elective CS deliveries would have to be performed.[22]

Although a rare outcome, uterine rupture is associated with significant maternal and perinatal morbidity and perinatal mortality. The chance for a poor infant outcome depends on a number of factors including the extent of rupture and umbilical cord compression, whether the placenta and/or fetus had extruded into the maternal abdomen and the time from diagnosis to delivery. Approximately 6% of uterine ruptures will result in perinatal death and estimates for the risk of HIE with long-term disability range from 0.5 to 19%. Generally, with lower uterine transverse scare scar dehiscence, rather than rupture, is more likely.[23]

The risk of uterine rupture is lower in women who have had a prior vaginal delivery as compared to those who have not had one. There is limited evidence that women who had experienced both intrapartum and postpartum fever in their prior cesarean birth are at increased risk of uterine rupture in their subsequent planned VBAC labor. There is conflicting evidence on whether single layer compared with double-layer uterine closure at CS may increase the risk of uterine rupture in subsequent planned VBAC. The current recommended practice is a two-layer closure of the uterine incision.[24]

Signs of uterine scar rupture

Although the majority of cases of uterine rupture occur during labor, women with a classic uterine scar are at risk of uterine rupture prior to the onset of labor.

Benefits and risks associated with planned vaginal birth after caesarean (VBAC) vs. planned elective repeat caesarean section (ERCS)

VBAC	ERCS
Benefits • Avoidance of major abdominal surgery • Short hospital stay • Increased likelihood of future vaginal birth • Reduced (1%) risk of transient respiratory morbidity • Reduced risks in future pregnancies resulting from multiple caesarean deliveries such as morbidly adherent placenta, bladder/bowel injury and hysterectomy • Reduced maternal mortality	Benefits • Able to plan to known delivery date • Less risk of blood transfusion (1%) & endometritis (1.8%) • Extremely low risk of uterine scar rupture (<0.02%) • Protects pelvic floor, reduction of urinary incontinence • Option for sterilization if fertility complete • Avoids 10 per 10,000 risk of stillbirth beyond 39 weeks
Risks • Uterine rupture (0.5%) • 24—28% chance of emergency caesarean • Operative injury at emergency CS • Increased risk of blood transfusion and endometritis • 10—15% chance of instrumental delivery & perineal tear/episiotomy • Higher risk of blood transfusion (1.7%) and endometritis (2.9%) • 10 per 10,000 prospective risk of antepartum stillbirth beyond 39 weeks whilst awaiting spontaneous labour • 8 per 10,000 (0.08%) risk of hypoxic ischaemic encephalopathy (HIE) • 4 per 10,000 (0.04%) risk of delivery-related perinatal death	Risks • 0.1—2% risk of surgical complications • Longer recovery • Future pregnancies: likely to require caesarean delivery, • Increased risk of placenta praevia/accreta and adhesions with successive caesarean deliveries • Infections, ileus, need for postoperative ventilation, intensive care unit admission, venous thromboembolism, significant peri-operative haemorrhage and anaesthetic complications • Increased risk of maternal death (13 per 100,000 vs. 4 per 100,000) compared with planned VBAC • Higher incidence of neonatal respiratory morbidity (2—3% with planned VBAC and 3—4% with ERCS)

Factors determining the likelihood of successful VBAC

Prospects for successful VBAC with lower segment transverse uterine scar depend on a number of factors which can be ascertained on taking a thorough clinical history and

performing the relevant examination for the woman. Making the right choice of cases will ensure that 65e75% of women attempting VBAC will achieve a successful vaginal delivery.[25]

Factors associated with a decreased probability of success are

1. Increased maternal age,
2. Short stature,
3. Obesity,
4. Gestational age more than 41 weeks,
5. Recurrent indication for initial cesarean delivery,
6. Inter-delivery interval less than 24 months,
7. Need for labor augmentation or induction,
8. Non-white ethnicity
9. No epidural anesthesia,
10. Estimated fetal weight more than 4 kg,
11. Previous preterm cesarean birth,
12. Cervical dilatation at admission less than 4 cm, and
13. Male infant.

Factors associated with an increased probability of success include

1. Prior to vaginal delivery,
2. Prior to successful VBAC,
3. Non-recurring indication for prior CS and
4. 4 cm or greater cervical dilatation at admission or rupture of membranes,
5. In addition, spontaneous onset of labor, vertex position, fetal head engagement, and higher admission Bishop score also increases the likelihood of successful VBAC.

Best prospects for vaginal delivery after CS are in women who had their previous CS for non-recurrent indications such as malpresentation, suspected fetal compromise in labor and placenta praevia especially if there has been a previous successful vaginal delivery either before or since the CS. Previous CS for suspected cephalopelvic disproportion (CPD), dystocia or failure to progress in labor is associated with a lower chance of subsequent successful VBAC.

However, it is important to remember that the diagnosis of CPD is often subjective and dependent on the size of the baby in relation to the pelvis. So also, failure to progress, following induced labor could have been a result of induction with an unfavorable cervix.[26]

Both these indications for previous CS should therefore not be used to deny a VBAC to any woman. Estimating fetal weight and imaging of the pelvis do not reliably predict the success of VBAC. Most clinicians have a low threshold to offer CS rather than a VBAC to a woman with a large baby with a previous CS. This is due to concerns about intrapartum uterine rupture, failure to progress in labor, difficult delivery, shoulder dystocia, postpartum hemorrhage, and major perineal trauma.

A review of four retrospective studies and the NICHD study has reported a significantly decreased likelihood of successful trial of VBAC for pregnancies with infants weighing 4000 g or more (55e67%) compared with smaller infants (75e83%). The risk of uterine rupture was reported in one of the retrospective studies to be only increased in those who did not have a previous vaginal birth (relative risk (RR), 2.3; $p < 0.001$).[27]

Unfortunately, clinical or ultrasound assessment of fetal size/weight is inaccurate, especially above 4 kg, and this should be acknowledged during the process of deciding the mode of delivery. Three observational studies have shown a 2e3 fold increased the risk of uterine rupture for women with a short inter-delivery interval (below 24 months) from their previous CS.[28]

In the NICHD study, women undergoing planned VBAC whose previous cesarean birth was within 2 years of their labor had an increased risk of cesarean birth compared with women whose labor was more than 2 years from their previous cesarean (32% versus 25% respectively). This information should be highlighted to women after their delivery (CS or VBAC) so that they are able to plan their preferred spacing intervals for subsequent pregnancies.[29]

If the previous CS was carried out selectively or in the early latent phase of labor, the pattern of uterine activity in the subsequent labor is likely to be of the nulliparous type requiring strong and possibly prolonged, uterine activity to efface and dilate the nulliparous cervix. In contrast, those who had previous CS in active labor are more likely to show a multiparous pattern in the subsequent labor, with less uterine work and less strain on the uterine scar.

Previous postpartum endomyometritis may interfere with adequate healing of the uterine scar and increase the subsequent risk of rupture in labor, however not all postpartum fever is due to endomyometritis, therefore, it is important to establish that the sepsis was intrauterine and it may be prudent to avoid labor in this situation in a subsequent pregnancy.[30]

Measurement of the lower uterine segment (LUS) thickness

Sonography permits accurate assessment of the LUS thickness in women with previous cesarean section and therefore can potentially be used to predict the risk of uterine rupture during a trial of vaginal birth. Studies have used ultrasound to measure the thickness of the LUS in the third trimester of pregnancy and suggested that those with a very thin lower uterine segment may have increased risk of scar rupture or alternatively, a thick LUS is more likely to indicate a higher chance of successful VBAC. The clinical applicability of this approach is being assessed in prospective studies as there is a need for more standardized measurement techniques in order to recommend cut-off values on sonographic examination.[31]

Maternal considerations

Women considering their options for birth after a single previous cesarean should be informed that, overall, the chances of successful planned VBAC are 72e76%. Previous vaginal birth, particularly previous VBAC, is the single best predictor for successful VBAC and is associated with an approximately 87e90% planned VBAC success rate. Women considering the option of VBAC should be informed that planned VBAC carries a risk of uterine rupture of 2.2e7.4/1000. There is virtually no risk of uterine rupture in women undergoing ERCS.[32]

Uterine rupture in an unscarred uterus is extremely rare at 0.5e2.0/10,000 deliveries; this risk is mainly confined to multiparous women in labor. A planned VBAC compared with ERCS also carries around 1% additional risk of either blood transfusion or endometritis. The increased risk of morbidity overall among women attempting VBAC is due to higher rates among women who attempt VBAC and are unsuccessful. The NICHD study showed that unsuccessful planned VBAC compared with successful VBAC is associated with an increased risk of uterine rupture (231/10,000 versus 11/10,000), uterine dehiscence (210/10,000 versus 14.5/10,000), hysterectomy (46/10,000 versus 14.5/ 10,000), transfusion (319/10,000 versus 116/10,000) and endometritis (767/10,000 versus 116/10,000).[33]

Fetal and neonatal considerations

Women considering planned VBAC should be informed that this decision carries a 2e3/10,000 additional risk of birth-related perinatal death when compared with ERCS. The absolute risk of such birth-related perinatal loss is comparable to the risk for women having their first birth. Overall perinatal mortalities for planned VBAC versus ERCS, respectively, were 32/10,000 versus 13/10,000 (RR 2.40, 95% CI 1.43e4.01) and perinatal mortalities after excluding fetal malformation were 24/10,000 versus 9.3/ 10,000 (RR 2.52, 95% CI 1.37e4.62).[34]

The increased risk of perinatal mortality is largely attributable to the statistically significantly increased risk of antepartum stillbirth beyond 37 weeks of gestation in planned VBAC compared with ERCS (19.6/ 10,000 versus 8.0/10,000; RR 2.45, 95% CI 1.27e4.72) in infants without fetal malformation. Approximately 43% of such stillbirths in planned VBAC were at or after 39 weeks of gestation (approximately 9/10,000 women delivering at or after 39 weeks) and may have been prevented by ERCS at 39 weeks of gestation. In the NICHD study, rates of delivery-related perinatal death were 4/10,000 for planned VBAC and 1.4/10,000 for ERCS. Women considering the options for birth after a previous cesarean should be informed that planned VBAC carries an 8/ 10,000 risk of the infant developing HIE. The effect on the long-term outcome of the infant upon experiencing HIE is unknown.[35]

The incidence of intrapartum-related HIE at term is significantly greater in planned VBAC (7.8/10,000) compared with ERCS (zero rates). Approximately 50% of the increased risk in planned VBAC arises from the additional risk of HIE caused by uterine rupture (4.6/10,000). It has been estimated that a planned VBAC exposes the woman to a very low additional 0.25% risk (or 1 in 400) for experiencing an adverse perinatal outcome compared to opting for ERCS at 39 weeks gestation.[36]

Women considering the options for birth after a previous cesarean should also be informed that attempting VBAC probably reduces the risk that their baby will have respiratory problems after birth: rates are 2e3% with planned VBAC and 3e4% with ERCS. These risks and benefits should be discussed in the context of the woman's individual circumstances, including her personal motivation and preferences to achieve vaginal birth or ERCS, her attitudes towards the risk of rare but serious adverse outcomes, her plans for future

pregnancies and her chance of a successful VBAC (principally whether she has previously had a vaginal birth).[37]

In addition, where possible, there should be a review of the operative notes of the previous cesarean to identify the indication, type of uterine incision and any peri-operative complications. It should be recognized that the emotional trauma of the first vaginal delivery/labor experience may scare some women and make them less motivated towards second vaginal delivery. Such women will often demand a cesarean section. When discussing VBAC in such situations e a time limit agreed prior to the onset of labor (short trial) and avoidance of induction of labor may be helpful in allaying anxiety. While counseling for VBAC, women views as regards future family size should be taken into consideration.[38]

If more than one pregnancy is planned in the future, VBAC carries a lower risk of subsequent per partum hysterectomy. Knowledge of the woman's intended number of future pregnancies may be an important factor to consider during the decision-making process for either planned VBAC or ERCS. Women who are contemplating future pregnancies may accept the additional risks associated with VBAC in view of the reduced risk of serious complications in future pregnancies if they have a successful VBAC. When discussing fetal risks, although the absolute risk to the baby from uterine rupture is considered low, it may be unacceptable to the individual woman, particularly since the outcome can be lethal and uncontrollable.[39]

VBAC and induction of labor (IOL)

The risk of stillbirth at or after 39 weeks is between 1.5 and 2 fold higher in women with previous cesarean delivery compared to women without prior cesarean delivery (absolute risks e 11 per 10,000 vs. 5 per 10,000). The reduction in risk of perinatal death that occurs by delivering from 41 weeks is likely to be greater among women with a previous cesarean. However, both induction and augmentation of VBAC labor are associated with a 2e3 fold increased risk of uterine rupture and around 1.5-fold increased risk of CS compared to spontaneous VBAC labor.[40]

A consultant-led review should, therefore, be planned for women at 41 weeks who wish to have VBAC and in whom the spontaneous onset of labor has not ensued. Based on large studies the risk of uterine rupture appears to be 3e5 per 1000 in spontaneous labor, 8 per 1000 in oxytocin augmented or induced labor and still higher (about 25 per 1000) when prostaglandins are used.

In the NICHD study, the rates of cesarean section in women undergoing planned VBAC were 33%, 26% and 19% for induced, augmented and spontaneous labor groups respectively. Induction of labor for VBAC should only be considered when the indication is compelling. If the cervix is favorable, amniotomy is the method of choice and adds no extra risk to spontaneous labor.

If amniotomy fails to induce labor, oxytocin may be cautiously used with a slight increase in the risk of uterine rupture. Mechanical methods of induction such as trans cervical Foley's catheter are preferable to other methods of induction of labor as they are less likely to cause uterine hyperstimulation. Given the risks associated with induction of labor in a woman attempting VBAC, it is important not to exceed the safe recommended limit for prostaglandin priming in women with a prior cesarean birth. Due consideration should be given to restricting the dose and adopting a lower threshold of total prostaglandin dose exposure.[41]

CONCLUSION

Rates of CS and VBAC are on the rise across the world. Both repeat CS and VBAC have inherent risks for the mother and the baby. The primary task, therefore, should be to reduce primary CS delivery rates. In a woman with previous CS, risk factors should be properly evaluated before offering VBAC. Antenatal counseling and appropriate consent are crucial. Counseling should incorporate an individualized assessment of the risks and benefits of ERCS and planned VBAC modes of delivery. Induction of labor should be best avoided. Close surveillance in labor and ready recourse to CS should minimize morbidity in those who attempt VBAC. Planned VBAC is associated with slightly increased perinatal risk than planned ERCS, although absolute risks are low for both modes of delivery. Planned VBAC, therefore, is appropriate and may be offered to the vast majority of multiparous women with a singleton pregnancy of cephalic presentation at term with a single previous lower segment cesarean delivery. From a material point of view, the safest outcome is spontaneous labor and spontaneous vaginal delivery while the outcome associated with the greatest morbidity is a failed VBAC resulting in cesarean section. Careful clinical appraisal, discussion of risks vs benefits, individualized assessment and taking on board maternal choice should aid in decision making for selection of VBAC or elective CS as a mode of delivery and improve clinical outcomes.

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