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Back to "once a caesarean: always a caesarean"? A trend analysis in Switzerland

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Abstract
Purpose Caesarean sections (CS) have significantly increased worldwide and a previous CS is nowadays an important and increasingly reported indication to perform a repeat CS. There is a paucity of information in Switzerland on the incidence of repeat CS after previous CS and relationship between the rates of vaginal birth after CS (VBAC). The aim of this study was to analyse the actual trend in VBAC in Switzerland.
Methods We performed a retrospective cohort study to analyse the proportion of VBAC among all pregnant women with previous sections which give birth during two time periods (group 1:1998/1999 vs. group 2:2004/2005) in our tertiary care referral hospital and in the annual statistics of Swiss Women's Hospitals (ASF-Statistics). In addition, the proportion of induction of labour after a previous caesarean and its success was analysed.
Results In both cohorts studied, we found a significant decrease of vaginal births ($p < 0.05$) and a significant increase of primary elective repeat caesarean section ($p < 0.05$) from the first to the second time period, while there was a decrease of secondary repeat caesarean sections. The prevalence of labour induction did not decrease.
Conclusion Our study shows that vaginal birth after a prior caesarean section has decreased over time in Switzerland. There was no significant change in labour induction during the study period. While this trend might reflect an increasing demand for safety in pregnancy and childbirth, it concomitantly increases maternal risks of further pregnancies, and women need to be appropriately informed about long-term risks.

Keywords Vaginal birth after caesarean section · Repeat caesarean section · Induction of labour · Maternal risk · Vaginal delivery

Abbreviations

CS	Caesarean section
VBAC	Vaginal birth after caesarean
AFS	Annual statistics of the Working Group of the Women's Hospital

Introduction

Caesarean delivery has largely increased worldwide over the last three decades [1–3]. After a previous CS, there was the dogma in the 1970s that in a next pregnancy there is a need for a repeat CS: "once a caesarean—always a caesarean". In later years, an effort was undertaken by some public health authorities, e.g., in the USA, as well as by obstetric societies to increase the number of vaginal birth after caesarean (VBAC). In the USA, this was followed by a sharp increase of VBAC with a peak in the late nineties, when VBAC prevalence increased to almost 30 % [4]. After large retrospective studies were published showing a significant although small increase of neonatal hypoxic-ischemic injury and perinatal death in VBAC as compared to repeat CS (mostly due to uterine rupture of the scarred

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uterus), this trend rapidly reversed between the years 1996 and 2004 [5]. Meanwhile there are less VBAC in the US than in the 1970s, actually below 10 % of all women with a previous CS.

Despite this trend, VBAC is believed to be safe for most women after an individual risk–benefit analysis, according to guidelines and recommendations. However, prospective randomized trials are lacking, and recommendations regarding individual criteria for risks and benefits of VBAC are largely based on retrospective studies and expert opinion. The optimal management of delivery after a history of a CS is therefore uncertain, and individual decisions together with the pregnant woman are being taken.

In general, the proportion of women attempting VBAC has decreased mainly because of concern about safety. The absolute and relative risks associated with a trial of labour in women after a prior caesarean section compared to a primary repeat CS are controversially discussed [6].

In the US and in western countries 18–20 % of the deliveries are induced [4, 7]. So far there is no common guideline to follow in women with prior CS with in induction of labour. The Royal College of Obstetricians and Gynaecologists and the American College of Obstetricians and Gynecologists disagree about the safety of induction of labour, in particular with the application of prostaglandins in women with prior CS [4–10]. There is still a lack of knowledge regarding whether certain forms of induction, certain management strategies or certain population of women are at higher risk.

The literature about VBAC reports average rates of successful vaginal deliveries around 75 % with a risk of a uterine rupture between 0.5 and 1 % [11, 12, 15]. Several factors influence the VBAC success rate such as fetal weight, maternal age and weight, previous vaginal delivery, indication for previous caesarean, and induction of labour. Other factors influence the uterine rupture risk, including inter-pregnancy interval, number of previous caesareans, maternal age, wound infection after the previous caesarean, method of labour induction, and thickness of lower uterine segment measured by ultrasound. This outweighing between success rate and risk is at the heart of counselling of pregnant women with a previous caesarean section, who consider VBAC. Importantly, besides different individual factors influencing success rate and uterine rupture risk, long-term consequences of repeat caesarean sections leading to increased maternal risks (specifically, placentation pathology) must be taken into account. Induction of labour in women after a previous caesarean has also been controversially discussed. The issue of inducing labour after a caesarean section became once more important with the steady increase of the rate of labour induction due to a higher risk of uterine rupture and a higher perinatal morbidity and mortality as well as higher maternal morbidity [7]. As mentioned above, multiple repeat caesarean sections are also associated with higher risks in the following pregnancies (e.g., placenta previa, placenta increta). None of the commonly used labour induction methods (prostaglandins, oxytocin or Foley-catheter) have been assessed in prospective randomised trials in the use of VBAC, and safety is still regarded as unclear.

Recently there has been a political debate in Switzerland over causes and consequences of rising caesarean section rates, leading to an official report from the health authorities. However, to date there are no published data available on the trend of VBAC or repetitive caesarean sections in Switzerland. As the decrease of VBAC is one of the most important factors contributing to the rise of caesarean section rates, the aim of this study was therefore to analyse VBAC and labour induction after previous caesarean over time in Switzerland. We chose the time period in which the fall of VBAC rate and its effect on rising caesarean section rate in the US was most significant.

Materials and methods

In this retrospective study, two time periods 6 years apart (1998/1999 and 2004/2005) were compared and analysed. The study utilized a computerized database containing details of deliveries collected prospectively by a Swiss obstetric study group (Arbeitsgemeinschaft Schweizerischer Frauenkliniken, Amlikon, Switzerland). The group collates and manages data from more than 100 obstetrics hospitals of various sizes and structures. All information related to patients identification is removed. Information on current and past pregnancy outcomes, neonatal outcome, intrapartum and postpartum complications was derived from the prenatal records, the delivery records, and the mother and infant's chart and available in the database. The quality of the data recorded is ensured by a two-steps control system. First, the completeness and exactness of all data is verified at each participating center at the time of woman discharge by a senior obstetrician; secondly, the plausibility of all data entered in the database is assessed by the data center quality control group. In case of data discrepancy the hospitals were asked to verify and eventually correct the information previously given. Moreover, the risk of data entry error is reduced to a minimum by the fact that all variables included in the database, with the exception of maternal age and weight, birth weight, and umbilical cord pH, are collected as categorical variables (e.g., second stage of labour longer than 2 h, maternal hemorrhage greater than 1000 mL).

All women with a history of prior caesarean section in the period of 1998/1999 and 2004/2005 were included. Women with successful VBAC were included in the

VBAC group. Women with unsuccessful trial of labour were included in the secondary caesarean section group. Unsuccessful delivery was defined as no vaginal delivery after spontaneous onset of labour or after induction of labour. All deliveries at our tertiary referral centre at University Hospital of Bern were included. Inclusion criteria as following: no more than one prior caesarean section, low transverse uterine incision, no previous additional intervention to the uterus (e.g., myomectomy), complete previous and current birth records, term delivery and cephalic presentation. Multiple pregnancies, breech presentation or severe fetal or maternal disease not suitable for vaginal delivery were excluded.

Gestational age at delivery, neonatal birth weight, spontaneous vaginal birth, primary repeat caesarean section, secondary caesarean section, number of successful and unsuccessful induction of labour and methods used for induction of labour were recorded.

All endpoints were also analysed in the annual statistics of the Working Group of the Swiss Women's Hospitals (ASF-statistics) for these periods. The ASF statistics covers roughly 40 % of all births in Switzerland, including public hospitals.

In 2006 the University Hospital of Bern, Switzerland, received exemption for permission for ethical approval from the local ethical committee in Bern for anonymous retrospective studies.

Statistical analysis was performed using statistical software SPSS (SPSS, Chigao, IL, USA). Numerical variables were analysed using the Student t test or ANOVA as appropriate and categorical parameters were analysed using the Fisher's exact test or Chi^2 test. Correlations were searched by means of a Spearman rank test to determine the significance of any difference between two continuous normally distributed variables. A p value < 0.05 was considered statistically significant.

Results

In the first period (1998/99) 113 and in the second period (2004/05) 164 women were suitable to be included in this retrospective trend analysis. The AFS Statistics provided data for the first period for 5751 and for the second period for 6760 patients respectively.

Table 1 shows that there was no difference in demographic parameters (gestational age at delivery and neonatal birth weight) in the different groups of University Hospital of Bern.

An increase of the number of birth with a history of prior caesarean section from the first to the second time period was seen. A significant decrease of vaginal birth and a concomitant significant increase of primary repeat caesarean section were evident. Additionally, the number of secondary repeat caesarean section decreased over time.

Table 1 Demographic parameters and mode of delivery, University Hospital of Bern for women with delivery after a history of caesarean section

Time period	1998/1999 $N = 113$	2004/2005 $N = 164$	p value (<0.05)**
Gestational age at delivery[a]	38 1/7 (±2.73)	38 4/7 (±2.82)	n.s.
Neonatal birth weight (g)[a]	3160 (±668)	3160 (±769)	n.s.
Vaginal birth (%)	46 (41.5 %)	57 (34.8 %)	<0.05
Trial of labour %	52 % (46/87)	63 % (57/91)	
I° repeated c-section (%)	25 (22.2 %)	73 (44.5 %)	<0.05
II° repeated c-section (%)	41 (36.3 %)	34 (20.7 %)	<0.05
Induction of labour (%)	15/113 (14.0 %)	26/164 (15.8 %)	n.s.
Uterine rupture (%)	1 (0.8 %)	2 (1.2 %)	n.s.

**t test

[a] Mean (Standard deviation)

Table 2 Mode of delivery, Working Group of the Swiss Women's Hospitals for gynaecology and obstetrics (ASF-statistics) for women with delivery after a history of caesarean section

Time period	1998/1999 $N = 5751$	2004/2005 N = 6760	p value (<0.05)*
Vaginal birth (%)	2400 (41.98 %)	2031 (30.10 %)	<0.05
Trial of labour	76.4 %	60.5 %	<0.0001
I° repeated c-section (%)	2016 (35.94 %)	2801 (42.31 %)	<0.05
II° repeated c-section (%)	740 (13.18 %)	1326 (19.88 %)	<0.05
Induction of labor (%)	872/5751 (15.16 %)	831/6760 (12.32 %)	n.s.

*t test

In the different groups of the ASF-Statistics (Table 2), there was also a significant increase of caesarean section in women after a history of a caesarean section from the first to the second period (+7 %) and a significant decrease of vaginal birth (−10 %). Compared to the group of the two time periods in Table 1, secondary repeat caesarean section did not decrease, but increased by 6 %. No postpartum hysterectomy was performed in either group. In the two periods in the first group, uterine rupture occurred in 0.8 and in 1.2 %, respectively. The second group (ASF Statistics) was not analysed for uterine rupture due to inconsistent definition and data acquisition.

We further analysed induction of labour after a prior caesarean section including success, risks and favourably methods applied. In both groups, there was no significant change in prevalence of induction of labour from the first to the second period (Tables 1, 2). Induction of labor in group 1 was performed almost uniformly with balloon catheter and/or oxytocin infusion. The success rate of labor induction with VBAC increased significantly from the first to the second time period when it was 61 %. No statistically correlation could be demonstrated between the indication of prior caesarean section and success rate of induction of labour. The methods applied for induction had neither influence on the success nor predicted failure. There were no correlation between reason of failure and method of induction.

Discussion

Our data for the first time prove a clear trend towards decrease of VBAC and increase of repeat caesarean sections. This doubtlessly contributed significantly to the rise in caesarean sections in Switzerland observed in the last 20 years.

Landon et al. [10] showed in a 4-year observational study an increased risk of adverse perinatal outcomes (hypoxic-ischemic encephalopathy and perinatal death) and higher rate of maternal adverse events, as compared with elective repeat caesarean delivery but the magnitude of those risks is small. Most other published data are derived from retrospective studies, while prospective randomized, controlled trials are absent. Meta-analyses of these data have been limited by the lack of comparability in women undergoing a trial of labour and primary repeated caesarean delivery [12, 13].

Rates of successful induction of labour with a history of a prior caesarean section are around 74 % [16, 17], which matches with the findings in this study considering the second period.

Sanchez-Ramos et al. concluded in a review regarding cervical ripening and induction after previous caesarean delivery that the use of PGE2 and oxytocin for those purposes is safe in women who are vaginal birth after caesarean delivery candidates [18].

Landon et al. show in their recently published analysis factors affecting the success of trial of labour after previous caesarean delivery as such as pervious vaginal birth, birth weight >4000 g, normal BMI of the mother, indication of the previous caesarean section and spontaneous start of the contractions [33]. Therefore before making a decision it is very important to focus on the factors Landon et al. pointed out.

A single method of induction could not have been elaborated but the focus is going on to the Foley-catheter used for ripening an unfavourable cervix prior use of oxytocin.

Kotaba achieved in 82.3 % a cervical ripening with a delivery rate of 78 % using the Atad catheter for induction of labour in women with an unfavourable cervix with a history of a prior caesarean section [20]. Miller and Davis reported a successful vaginal delivery with this method in 75 % [21] in comparison to Ben-Aroya et al. that found PGE2 to be superior to the Foley-catheter [22]. Buhimschi et al. described a softening effect on the old uterus scare therefore weakening of the uterus and less contractility [25]. According to latest guidelines misoprostol is strictly prohibited [24, 25].

The main concern in literature is the uterus rupture in induction of labour with a previous caesarean section. It is recognized as the most severe complication to be (2, 7 per 1000 induction of labour) [16, 17, 22, 32]. The number in this study is too little to get a respectful comparison. There are controversial discussions in literature about the incident of a uterus rupture in context with different methods of induction of labour and spontaneous onset of birth [14, 19, 25–29]. Delany et al. showed that there is no statistically significant increase in the rate of uterine rupture with induction of labour with oxytocin and other methods or PGE2 [16]. Former observation is in keeping with these results of Lydon-Rochelle et al. [28], Zelop et al. [26] and Ravasia et al. [27].

Even when the absolute risk is low the relative risk of uterine rupture and its associated maternal and neonatal morbidity with induction of labour after a history of a prior caesarean section is higher than a primary repeat caesarean section [21].

Secondary caesarean section goes along with higher maternal and neonatal risk such as infection, bleeding or intraoperative lesion of surrounding organs [13, 15].

Multiple caesarean deliveries are associated with more difficult surgery, increased intraoperative blood loss compared with a second planned caesarean delivery. The risk of major complications increases with caesarean delivery number [21].

Reproductive consequences of multiple caesarean sections should always be considered in making policy decisions regarding the risk–benefit ratio of vaginal birth after caesarean section [30, 31]. After a successful induction of

labour we see less thromb-embolic complications, less blood loss and most importantly less complications in following pregnancies associated with multiple caesarean sections [31].

This analysis shows that VBAC has decreased and primary repeat caesarean section have increased in Switzerland, while there was no change in induction of labour. Although this trend might reflect an increasing demand for safety in pregnancy and childbirth, it is not based on evidence from randomized controlled trials. Furthermore, the trend concomitantly increases maternal risks of further pregnancies, specifically placentation pathologies, and women need to be appropriately informed about these long-term risks, taking into account with family planning aspects. While the proportion of women undergoing a trial of VBAC is still considerably high as compared to the US, there might still be room for increasing VBAC and thus decreasing caesarean section rate in Switzerland.

Compliance with ethical standards

Conflict of interest statement We declare that we have no conflict of interest.

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Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal were involved in this study.

Informed consent Informed consent was obtained from all individual participants included in the study.

References

1. Hamilton BE, Martin JA, Sutton P (2003) Births: preliminary data 2002. Natl Vital Stat Rep 51:1–20
2. Müller M, Kolly L, Baumann M, Imboden S, Surbek D (2014) Analysis of caesarean section rates over time in a single Swiss centre using a ten-group classification system. Swiss Med Wkly 144:13921w
3. Bundesamt für Statistik, Schweiz, 2013: Kaiserschnittgeburten in der Schweiz. http://www.bag.admin.ch/themen/medizin/13641/index.html?lang=de
4. ACOG Committee Opinion (2002) No.271. Induction of labour for vaginal birth after caesarean delivery. Obstet Gynecol 99:679–680
5. Menacker F, Declercq E, Macdorman MF (2006) Cesarean delivery, background, trends, and epidemiology. Semin Perinatol 30:235–241
6. Greene MF (2004) Vaginal Birth after Cesarean Revisited. N Engl J Med 351:2647–2649
7. RCOG Clinical Effectiveness Support unit (2001) Induction of labour. RCOG Press, London, pp 1–78
8. Surbek D, Rath W (2006) Vaginal birth after previous caesarean section—a risk? Geburtsh Frauenheilk 66:1131–1133
9. Rath W, Surbek D (2006) Induction of labour after previous caesarean section. Geburtsh Frauenheilk 66:1143–1149
10. Safe prevention of the primary cesarean delivery. This document was developed jointly by the American College of Obstetricians and Gynecologists (the College) and the Society for Maternal and Fetal Medicine with the assistance of Aaron B. Caughey, MD, PhD; Alison G. Cahill, MD, MSCI; Jeanne-Marie Guise, MD, MPH; and Dwight J. Rouse, MD, MSPH
11. Landon M, Hauth J, Leveno K (2004) Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. N Engl J Med 351:2581–2589
12. Mozurkewich E, Hutton K (2000) Elective repeat caesarean delivery versus trial of labour: a meta-analysis of literature from 1989 to 1999. Am J Obstet Gynecol 183:1187–1197
13. Rageth J, Juzi C, Grossenbacher H (1999) Delivery after previous caesarean: a risk evaluation. Obstet Gynecol 93:332–337
14. Hendler I, Bujold E (2004) Effect of prior vaginal delivery or prior vaginal birth after cesarean delivery on obstetric outcomes in women undergoing trial of labour. ACOG 104:273–277
15. McMahon MJ, Luther ER, Bowes W Jr, Olshan A (1996) Comparison of a trial of labour with an elective second caesarean section. N Engl J Med 335:689–695
16. Delaney T, David C. Spontaneous versus induced labour after a previous caesarean delivery. ACOG 2003; 102 39–43
17. Guise JM (2004) McDonagh, Osterweil P, Nygren P, Chan B, Helfand M. Systematic review of the incidence and consequences of uterine rupture in women with previous caesarean section. BMJ 329:19–26
18. Sanchez-Ramos L, Gagudier FL, Kaunitz AM (2000) Cervical ripening and induction of labour after previous caesarean delivery. Clin Obstet Gynecol 43:513–523
19. Flamm BL, Anton D, Goings JR, Newman J (1997) Prostaglandine E2 for cervical ripening: a multicenter study of patients with prior caesarean delivery. Am J Perinatol 70(5):709–712
20. Kotaba S, Volfson M, Tarazova L et al (2001) Induction of labour in women with previous caesarean section using the double balloon device. Acta Obst Gynecol Scand 80:1041–1042
21. Miller T, Davis G. Use of the Atad catheter for the induction of labour in women who have had a previous caesarean section- a case series. ANZJOG 2005; 45 325–327
22. Ben-Aroya Z, Hallak M, Segal D, Friger M, Katz M, Mazor M (2002) Ripening of the uterine cervix in a post-caesarean parturient: prostaglandin E2 versus Foley catheter. J maternal-fetal and neonatal medicine 12:42–45
23. Smith G, Pell C, Cameron A, Dobbie R (2004) Factors predisposing to perinatal death related to uterine rupture during attempting vaginal birth after caesarean section: retrospective cohort study. BMJ 329:375
24. Society of Obstetricians and Gynaecologists of Canada, SOGC Clinical Practice Guidelines (2005) Guidelines for vaginal birth after previous caesarean birth. Number 155 (Replaces guideline Number 147), February 2005. Int J Gynaecol Obstet 89(3):319–331
25. Buhimschi C, Buhimschi I, Patel S (2005) Rupture of the uterine scar during term labour: contractilaty or biochemistry. BJOG 112:38–42
26. Zelop CM, Shipp TD, Repke J, Cohen A, Lieberman E (1999) Uterine rupture during induced or augmented labour in gravid women with prior caesarean delivery. Am J Obstet Gynecol 181:882–886
27. Ravasia DJ, Wood SL, Pollard JK (2000) Uterine rupture during induced trial of labour among women with previous delivery. Am J Obstet Gynecol 183:1176–1179
28. Lydon-Rochelle M, Holt VL, Easterling TR, Martin DP (2001) Risks of uterine rupture during labour among women with prior caesarean delivery. N Engl J Med 345:3–8
29. McDough, Osterweil P, Guise J. The benefits and risks of inducing labour in patients with prior caesarean delivery: a systematic review. BJOG 2005; 112:1007

30. Paré E, Quinones J, Macones G (2006) Vaginal birth after caesarean section versus elective repeat caesarean section: assessment of maternal downstream health outcomes. BJOG 113:75–85
31. Nisenblat V, Barak S (2006) Maternal complications associated with multiple caesarean deliveries. ACOG 108:21–26
32. Landon M, Spong C, Thom E, Hauth J et al (2006) Risk of uterine rupture with a trial of labour in women with multiple and single prior caesarean delivery. ACOG 108:12–19
33. Landon M, Leindecker S, Spong C, Hauth J et al (2005) The MFMU Caesarean Registry: factors affecting the success of trial of labour after previous caesarean delivery. Am J Obstet Gynecol 193:1016–1023