

# Factors Influencing the Choice of Mode of Delivery in Women with Repeat Pregnancies after Cesarean Delivery

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## Abstract

The increasing rate of cesarean delivery has become a widespread concern worldwide, nearly half of which is due to previous cesarean deliveries, and elective repeat cesarean delivery (ERCD), which is the main option for women who have a second pregnancy after cesarean section, is a major factor in this increase. The trial of labor after cesarean section (TOLAC) is considered to be the best method, and the safety and feasibility of TOLAC have been confirmed by numerous studies, but in clinical practice, there are many factors that make TOLAC unsuccessful. This article reviews the factors that influence the choice of delivery method after cesarean section as follows.

## Keywords

Trial of Labor after Cesarean Section, Elective Repeat Cesarean Delivery, Influence Factor

## 1. Backgrounds

The original intention of cesarean section is to solve the difficult labor and is a delivery method to terminate high-risk pregnancy, which may cause unavoidable near- and long-term complications for both mother and child, so clinically, efforts are made to advocate vaginal delivery. However, for a long time, due to various reasons, the cesarean section rate has shown a rising trend. After the full implementation of China's two-child policy in 2016, with the increase in the number of pregnant women who were re-pregnant after cesarean section, the rate of cesarean section in China increased again, and in 2018, Zhang's research on the status of cesarean section in China's mainland region showed that [1], among the 112,138 cases of maternity, the number of cesarean section accounted for 54.5% of the

total number of deliveries, which is much higher than the ideal level of 10% - 15% generally recognized internationally. As the rate of cesarean section increases, the consequent rate of maternal and pediatric complications also increases accordingly. Since the 1980s, due to the accumulation of evidence-based medicine, the view of “once a cesarean section, always a cesarean section” has been gradually discarded by obstetricians, and the safety and feasibility of trial of labor after cesarean section have been affirmed with the deepening of research. Many countries have gradually developed the practice of trial of labor after cesarean section according to their own actual situation and relevant guidelines, and have strictly formulated corresponding policies and procedures for evaluation and monitoring of the progress of labor to ensure the safety of both mother and child. In order to effectively reduce the cesarean delivery rate, many hospitals in China have gradually carried out TOLAC in recent years, and several aspects of TOLAC that have been generally concerned are summarized as follows.

## **2. Current Status of TOLAC at Home and Abroad**

Globally, the rate of cesarean delivery is continuing to rise, which has caused widespread concern in the international obstetrics community, and nearly half of the growing cesarean deliveries are due to previous cesarean deliveries. With the opening of China’s two-child and three-child policies, there has been a large increase in the number of women who are re-pregnant after cesarean delivery, and elective repeat cesarean delivery (ERCD) has become the main choice of delivery method for the majority of scarred uterus women who are re-pregnant. Thus, the promotion of vaginal delivery after cesarean section has become the best method to reduce repeat cesarean delivery. Since the concept of trial of labor after cesarean section (TOLAC) was proposed in the United States, the international obstetrics and gynecology community has started to try the trial of labor after cesarean section since the end of the 1970s, and a large number of studies at home and abroad have proved that trial of labor after cesarean section is a safe and feasible mode of delivery. In order to further promote the development of TOLAC in various countries, the American College of Obstetricians and Gynecologists, the Society of Obstetricians and Gynecologists of Canada, the Royal College of Obstetricians and Gynecologists of the United Kingdom, and the Royal Australasian Society of Obstetricians and Gynecologists of Australia and New Zealand have issued guidelines on vaginal delivery after cesarean section to provide guidance on the mode of delivery for pregnant women with a history of cesarean section who are pregnant again, and at the same time, to provide evidence-based medicine for the relevant prenatal and intrapartum consultations. However, this has not had a substantial effect on increasing TOLAC rates.

The rates of trial of labor after cesarean section (TOLAC) and vaginal birth after cesarean section (VBAC) rates vary widely across the globe. A survey of 1086 pregnant women with a history of previous cesarean delivery showed that 735 were eligible to undergo a TOLAC, of which 64.1% opted for a TOLAC, and the success

rate of TOLAC was 91.3% [2]. In 2019, a survey from Norway, regarding 24,645 pregnant women with low-risk pregnancies who had a history of one previous cesarean section, showed that the TOLAC rate was 74.9%, the failure rate of TOLAC was 16.2%, and the rate of normal delivery was 62.8% [3]. VBAC rates have been reported to be 36% in Ireland, Italy and Germany, 45% - 55% in Finland, Sweden and the Netherlands, 14% in Australia and 13.3% in the USA [4] [5]. The rate of pregnant women with a history of previous cesarean section choosing TOLAC in China is 13.0% - 29.3% [6] [7], and the results of a study of 871,636 pregnant women with keloid uterus who had a history of one previous cesarean section in China in 2018 showed that only 82,778 cases (9.6%) completed VBAC [8].

### 3. Indications and Contraindications of TOLAC

The indications and contraindications for TOLAC are summarized as follows, according to the guidelines related to vaginal trial of labor for second pregnancy after cesarean section in foreign countries and the consensus of experts in China [9]-[14]:

#### 3.1. Indications for TOLAC

- 1) Pregnant women and their families are willing to try a vaginal delivery.
- 2) The medical institution has the conditions for rescuing the complications of vaginal delivery in a second pregnancy after cesarean delivery.
- 3) There is a history of one previous cesarean section with a transverse incision of the lower uterine segment, and the previous cesarean section went well, with no prolonged fracture of the incision, recovered as expected, and without postpartum hemorrhage or puerperal infection; there is no scar on the fibrous layer of the uterus except for the scar of the previous cesarean section.
- 4) Fetal position is cephalic.
- 5) There is no indication of previous cesarean section, and no new indication for cesarean section has emerged.
- 6) The interval between pregnancies is  $\geq 24$  months.
- 7) Continuous myometrium in the lower uterine segment on ultrasound examination.
- 8) Estimated fetal body mass less than 4000 g.

#### 3.2. Contraindications to TOLAC

- 1) The medical unit is not equipped to perform a contraindicated cesarean section.
- 2) History of two or more uterine surgeries.
- 3) The previous cesarean section was a classical cesarean section with a T-shaped incision.
- 4) Indication of previous cesarean delivery.
- 5) History of uterine rupture or removal of fibroids that penetrated the uterine cavity.

- 6) Complications of uterine incision from previous cesarean delivery.
- 7) Ultrasound evidence of placental attachment to the uterine scar, placenta previa, or placental malformation.
- 8) Medical or surgical complications or obstetric complications that make vaginal delivery inappropriate.
- 9) Refusal of the pregnant woman and her family to have a trial of vaginal delivery.

## **4. Comparison of TOLAC and ERCD**

### **4.1. Advantages and Disadvantages of TOLAC**

Successful TOLAC has many short- and long-term benefits, including reductions in perinatal complications, hemorrhage and thrombosis and infections, as well as chronic pain and bowel obstruction in later life [15]-[18]. Compared with elective repeat cesarean section, women who successfully have a trial of vaginal birth have higher satisfaction with labor, faster recovery times, lower costs, and associated maternal morbidity and mortality are also low, and women who deliver vaginally have less depression [19]. In neonates, vaginal births are associated with lower rates of respiratory and neurological disorders, such as neonatal wet lung and neonatal convulsions [20].

The most serious consequence of TOLAC is uterine rupture. Uterine rupture, if not treated promptly and effectively, can lead to serious adverse pregnancy outcomes with a very poor prognosis for both mother and child. However, the risk of uterine rupture remains low overall. Studies have shown that the probability of uterine rupture in pregnant women with a history of one cesarean section is about 0.2% - 0.7% [21] [22]. The higher the number of cesarean sections, the higher the risk of uterine rupture, and the probability of uterine rupture in pregnant women with two cesarean sections can increase to 0.9% - 1.8% [23] [24]. The incidence of TOLAC stillbirths, neonatal 5-minute Apgar scores less than 7, and neonatal deaths prior to discharge are significantly higher compared to elective cesarean deliveries [8] [25].

### **4.2. Advantages and Disadvantages of ERCD**

Compared to a TOLAC, elective cesarean section is a shorter process, a controlled delivery, and a less painful delivery that avoids uterine rupture during the trial of labor.

However, elective cesarean sections, especially repeat cesarean sections, carry potentially significant risks to the mother and child. Both mother and child are at increased risk compared to TOLAC. Risks to the mother: increased probability of placenta previa and placenta implantation in a second pregnancy, increased risk of hemorrhage and transfusion-related risks, and in severe cases, even hysterectomy, with the higher number of surgeries being associated with the higher probability of the above complications [26] [27]. Risks to neonates: mainly in neonatal respiratory abnormalities, the incidence of respiratory diseases in neonates born

by cesarean section before labor is higher than that in neonates born by other means [28]. A foreign survey showed that, compared with vaginal delivery, children born by cesarean section had a higher prevalence of asthma and allergic rhinitis in childhood, and newborns born by cesarean section were less likely to be exclusively breastfed in the first four months of life, while children exclusively formula-fed had a significantly higher risk of childhood asthma, allergic rhinitis, or both than exclusively breastfed children [29]. Other relevant studies abroad have shown that children born via cesarean section are at increased risk of developing high body weight and behavioral abnormalities in childhood [30]-[32], and newborns are more likely to be admitted to neonatal units [25].

## **5. Factors Associated with the Choice of TOLAC for Pregnant Women**

Over the course of a century, an increasing number of cesarean deliveries have exceeded medical indications and needs, and a variety of factors have contributed to elevated cesarean rates. Increasing maternal age, increasing rates of obesity, and an increasing proportion of women with multiple pregnancies or reproduction after cesarean section have been shown to be factors in the increased cesarean section rate; however, these factors alone do not explain the entire phenomenon. In the absence of a medical indication, the reasons for a pregnant woman's preference for the mode of delivery are many and varied, with fear of childbirth, social and cultural factors, and the attitudes of medical personnel towards caesarean sections all likely to be involved.

### **5.1. Age**

With the increase of age, maternal physical and psychological changes are taking place. A number of studies at home and abroad have shown that the age of a pregnant woman affects her choice of delivery method. The choice of vaginal trial of labor and the success rate of vaginal trial of labor for older pregnant women is smaller than that of young women. A foreign multicenter retrospective cohort study of 167 adolescent pregnant women  $\leq 21$  years old with no previous history of vaginal delivery but a history of one cesarean section who delivered at two tertiary care centers during 2007-2019 showed that 117 (70%) young pregnant women opted for TOLAC, and 97 of these 117 pregnant women underwent a successful TOLAC and the success rate of TOLAC was 83% [33]. In addition, a study on 335 pregnant women of advanced age with no previous history of vaginal delivery and a history of one cesarean section showed that 61 pregnant women (18.2%) opted for TOLAC and 38 of them experienced successful TOLAC [34]. Sjur Lehmann et al. also showed that low maternal age was significantly correlated with a high rate of TOLAC and a low rate of TOLAC failure rates were significantly associated [3].

### **5.2. Family Income**

In addition to age, family income may also affect pregnant women's choice of

delivery method, studies have shown that women with high family income have a low acceptance of TOLAC [35] [36], analyzing the reason, it may be that women with high family income do not have to consider the cost while worrying about the complications of TOLAC, and they are more inclined to cesarean delivery.

### 5.3. Educational Level

For the education level, there is inconsistency in the research results. A domestic study [36] concluded that the level of education was not an influential factor in the choice of delivery method for pregnant women who had a second pregnancy after cesarean section, but the findings of another study [37] concluded that pregnant women with education of bachelor's degree and above were more inclined to choose TOLAC, which was consistent with the findings of Lehmann's. It was noted in Lehmann's study that there was no significant correlation between the number of years of education and the number of years of education with the number of years of education being between 11 and (15.3%) and more than 14 years (16.2%), women with less than 11 years of education (17.0%) had a higher risk of TOLAC failure, and the association between short-term education and TOLAC failure was stronger [3]. The reasons for this may be related to the fact that as education increases, women have a greater ability to receive and understand knowledge related to childbirth.

In addition, indication of previous cesarean delivery is a pregnant woman's request reduces women's acceptance of TOLAC, and the difference between races is also one of the factors affecting pregnant women's choice of delivery method.

## 6. Knowledge of TOLAC Delivery Method

Although trial of labor after cesarean section (TOLAC) has been recognized as a safe way to terminate a pregnancy, the majority of eligible women still do not undergo trial of labor after cesarean section (TOLAC), which is closely related to the lack of knowledge related to TOLAC. A prospective, observational study from 2020 in Japan showed that women tended to choose TOLAC as the ideal mode of delivery if they received adequate education and support about the mode of delivery [2]. A domestic study on the knowledge of pregnant women who had a recurrent pregnancy after cesarean delivery and the factors influencing their choice of mode of delivery pointed out that 53.9% of pregnant women who had a recurrent pregnancy after cesarean delivery did not know that a recurrent pregnancy after cesarean delivery could be delivered vaginally, and that about 45% of the pregnant women knew that there was a risk of uterine rupture in the course of performing a TOLAC, but more than 80% of the pregnant women were not aware of the fact that the risk of uterine rupture during a TOLAC ranged only from 1% to 1.5%, and 78.5% of pregnant women were unaware that the success rate of VBAC was 60% - 80% [38]. Results of a 2017 study from Kenya showed that only 32.2% of women were aware that the chances of success of TOLAC could be up to 60% - 80%, and 48% were unaware of the chances of success of TOLAC; more than half

of women (53.9%) were unaware of the previous delivery risk of uterine rupture after the previous delivery, and only a few women (31.7%) were aware of the low risk of uterine rupture with TOLAC (<1%) [39]. It is clear that pregnant women, both at home and abroad, have little knowledge about the mode of delivery, and we need to strengthen the knowledge and take effective measures to improve the understanding of women and their families about the mode of termination of pregnancy and its advantages and disadvantages, to assist them in deciding on a reasonable mode of termination of pregnancy.

## 7. Determinants of Delivery

It can be concluded from the results of the above studies that the choice of delivery method for pregnant women who are pregnant again after cesarean section is influenced by a number of factors. However, in clinical practice, the delivery advice of medical personnel is often the determining factor for the mode of delivery for pregnant women who have had a second pregnancy after cesarean delivery. Han's study [37] showed that 89.6% of 1010 pregnant women who had a second pregnancy after cesarean section preferred the delivery method recommended by medical personnel, and 80.0% of them were influenced by their family's choice of delivery method. A study from Kenya showed that the mode of delivery of pregnant women was significantly associated with the preference of consulting physicians and their qualifications. This shows that the advice of medical staff is crucial in influencing the mode of delivery of pregnant women [39].

## 8. Factors Influencing Medical Staff's Attitude towards TOLAC

The recommendation of medical staff on the mode of termination of pregnancy plays a crucial role in the decision of pregnant women's willingness to deliver, and the recommendation of medical staff may enhance the rate of TOLAC. However, in practice, some medical personnel are reluctant to recommend TOLAC to pregnant women, which may be related to the lack of understanding of TOLAC by pregnant women and their families, poor compliance, and concerns about medical disputes arising from TOLAC complications. In a cross-sectional study of obstetricians' perceptions of TOLAC under China's two-child policy in 2021 [40], 426 obstetricians were surveyed to determine their attitudes toward TOLAC, and the results showed that 31.0% of obstetricians had no intention of recommending TOLAC to pregnant women with a history of CS. The reasons affecting their recommendation of TOLAC were as follows: the lack of confidence of pregnant women and their families in undergoing TOLAC; uncertainty about the safety of TOLAC, and concerns about medical litigation arising from adverse birth outcomes. The study showed that the main challenges they perceived in performing TOLAC were the lack of clear guidelines for predicting or avoiding the risks associated with TOLAC (83.4%); obstetricians' uncertainty about the safety of TOLAC in pregnant women with a history of cesarean section (81.2%), pregnant women's unwillingness to accept the risks associated with TOLAC (81.0%) or the need for

ERCS (80.7%), and the lack of confidence of pregnant women and their families in performing TOLAC and lack of confidence (77.5%) or understanding (69.7%) of pregnant women and their families to perform TOLAC.

## 9. Conclusion

With the increase in cesarean section rate globally and the increasing maternal and pediatric complications associated with cesarean section, especially repeat cesarean section, there is an urgent need to effectively reduce the cesarean section rate, and the promotion of vaginal birth for pregnant women with suitable conditions is an effective and optimal way to reduce the cesarean section rate. Despite this conclusion, the obstetrics community has made continuous efforts to improve TOLAC and VBAC rates, which are still poor worldwide. Several studies have shown that a variety of factors influence a pregnant woman's preference for her mode of delivery. Lack of education about TOLAC is often associated with elective cesarean section, and due to a lack of knowledge about the mode of delivery, most women are unable to make informed choices about the mode of delivery, and are more likely to be influenced by their healthcare providers and others around them. Some healthcare professionals are reluctant to recommend TOLAC due to concerns about the risks associated with it, and deciding on the mode of delivery becomes one of the most challenging decisions for the expectant mother and the healthcare team. Relevant medical departments and clinicians should provide more in-depth information about TOLAC, enhance the knowledge and acceptance of pregnant women and their family members about the mode of delivery through multi-channel education, make adequate assessment before delivery, strictly grasp the indications, strengthen the management of labor and delivery, and be alert to the occurrence of complications and be prepared for the emergency measures, so as to guarantee the safety of mothers and infants in TOLAC and to promote the development of TOLAC.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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