REVIEW ARTICLE

Optimal delivery for preterm breech fetuses: is there any consensus?

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The optimal route for delivery of preterm breech-presenting fetuses remains a clinical dilemma. Available data from the literature are largely based on retrospective cohort studies, and randomised controlled trials are considered impossible to conduct. Consistently however, large population-based surveys have shown that planned caesarean sections for these fetuses were associated with better neonatal outcomes compared with those following vaginal delivery. Nevertheless, the increased surgical risks for the mother having caesarean delivery of an early preterm breech fetus must be balanced with the probable neonatal survival benefits. Planned caesarean section should probably be limited to gestations with at least a fair chance of independent neonatal survival, where vaginal delivery is not imminent, and in the absence of other maternal risk factors. Vaginal delivery would probably include those fetuses that are of marginal viability, and that additional protection from abdominal delivery was unlikely to be beneficial to neonatal outcome.

Introduction

The optimal route for delivery for the breech-presenting fetus has always been controversial. For term singleton breech fetuses, the Term Breech Trial has shown that planned caesarean section decreases the risks of adverse perinatal outcomes due to the problems of labour and delivery as compared with those undergoing vaginal delivery.[1,2] For preterm breech delivery, the issue remains controversial, and this is particularly so for early preterm fetuses with gestations of around 32 weeks or earlier. Breech presentations are more common among preterm than term fetuses, being 21% at 25 to 26 weeks and only 3 to 4% at term.[3] Some observational studies have shown a lower neonatal mortality for planned caesarean delivery as compared with vaginal delivery for these preterm breech-presenting fetuses, while others showed no significant differences. In this article, the available evidence on this controversial clinical issue is reviewed.

Methods

A computer-based search of MEDLINE, PubMed, EMBASE, CINAHL, and Cochrane databases were carried out to identify randomised and non-randomised trials and observational cohorts on delivery outcomes for the preterm breech fetus. The key terms "preterm", "breech", "delivery", and their synonyms were used for the search. In this study, results were sorted for further analysis into retrospective, population-based surveys, and prospective trials. Case reports, small cohorts with fewer than 20 deliveries, those not distinguishing modes of presentation, and non-English papers were excluded. This review was not intended to be a comprehensive systematic review, rather a discussion paper on best available evidence.

Key words
Cesarean section; Obstetric labor, premature

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Retrospective studies supporting caesarean section

One of the earliest studies to suggest that caesarean section would benefit preterm fetuses was the classical study by Ingemarsson et al published in 1978.[4] In this study, 42 breech infants delivered by caesarean section before 37-week gestation were followed up prospectively, and the outcome was compared with 48 breech infants delivered vaginally before the introduction of routine caesarean section. The former group of infants had a significantly reduced frequency of severe prolonged asphyxia and low Apgar scores, and neonatal mortality was reduced from 14.6% to 4.8% after the introduction of caesarean section. At 12 months of age, 24% of those delivered vaginally had developmental or neurological abnormalities compared with 2.5% in the caesarean section group.

Another retrospective study on 136 infants in breech presentation weighing <1500 g showed that 27% were delivered vaginally while the remainder (73%) were

臀位早產胎兒最佳的分娩方法：是否達至共識？

臀位早產胎兒最佳的分娩方法在臨床上依然處於困境。文獻中有關的數據大多從回顧式隊列研究所得，而隨機對照實驗亦被認為是不可能進行的。以大型人口為基礎的調查顯示對於臀位分娩的早產胎兒來說，與陰道分娩比較，有計劃的剖腹產得到較佳新生兒分娩結果，但必須要平衡選擇剖腹產的產婦所承受的手術風險與新生兒的生存利益。有計劃的剖腹產應只限於新生兒有較大的存活機會，而陰道分娩並非迫在眉睫，而且要在沒有其他產婦風險因素的情況下進行。相反，如胎兒只有邊緣存活機會而剖腹產未能對新生兒增加有利的保護，則可考慮陰道分娩。

delivered by caesarean section. Perinatal mortality was higher in the former group (54% vs 37%) though the difference did not reach statistical significance. The authors pointed out the possible biases and limited scientific value of such retrospective cohorts.[5]

A small retrospective review of singleton breech deliveries at less than 26 weeks of gestation and with intact membranes included nine vaginal births after failed tocolysis and six caesarean deliveries.[6] The mean time interval between the first dose of antenatal corticosteroids was significantly greater in the vaginal than caesarean group (90 vs 22 hours); more of those in the vaginal group completed a course of steroids (89% vs 33%). Despite no significant differences in birth weight, the frequency of 5-minute Apgar scores of <7 was 55% in babies born vaginally and 22% in caesarean births, while neonatal mortality was 66% and 50% respectively. The small numbers precluded any statistically significant differences, but the authors concluded that vaginal and caesarean deliveries produced comparable results, and that vaginal birth could be effected in extremely preterm breech pregnancies with intact membranes by adopting the 'en caul' (ie with membranes around head) delivery.

In a cross-sectional study from Israel comparing 692 non-vertex preterm deliveries between 24 and 36 weeks of gestation with 4685 vertex preterm deliveries, it was shown that 73% of the malpresentations were breech.[7] While breech presentation itself was a very significant factor associated with intrapartum and neonatal death, caesarean section had a protective effect on neonatal mortality (odds ratio [OR]=0.31; 95% confidence interval [CI], 4.63-9.46).[7]

Studies not supporting caesarean section

In a comparison of the 2-year postnatal outcome of 147 infants born by early preterm (26-31 weeks of gestation) breech-presenting vaginal delivery or by caesarean section, the latter group received more mechanical ventilation and for longer.[8] However, there were no significant differences between the groups with respect to the frequency of cerebral haemorrhage or neonatal mortality. Moreover, logistic regression analysis revealed no significant difference in the chance of an infant surviving with a developmental handicap (OR=1.5; 95% CI, 0.6-3.9). By contrast, maternal morbidity was higher in those having caesarean sections. The authors concluded that operative delivery of a fetus in breech presentation in early preterm cases was not associated with increased survival without disability or handicap and that routine caesarean section is therefore not recommended.

An observational study on consecutive singletons with breech presentation and twins with the first fetus with breech presentation weighing between 500 and 1500 g carried out at the Chicago Lying-In Hospital from July 1980 to December 1987 was published in 1994.[9] It reported that of 262 fetuses, 60% were delivered vaginally and that on average they were smaller than those delivered abdominally by 300 g. Logistic regression analyses revealed that outcome differences between the two groups were primarily related to gestational age, fetal weight, and year of delivery. Rather than their breech presentation, the exceedingly poor perinatal outcomes of very-low-birth-weight breech infants were mainly related to antenatal deaths (22%), extremely low birth weights (44%), various congenital malformations, and premature labour. Evidently, the route of delivery did not significantly influence outcome among complete and frank breeches, while abdominal delivery might offer some benefit for footling breeches.

Similarly, in a French series of 169 preterm singleton breech deliveries, of which 84 were intended to be vaginal and 85 were to be caesarean, an intention-to-treat analysis showed the neonatal death rate to be similar in both groups (11% vs 7%, P=0.40).[10] Interestingly, in the intended vaginal delivery group, 22 of them had a caesarean section before onset of labour for an abnormal cardiotocographic tracing, and 17 had a caesarean section in labour for an abnormal cardiotocogram, chorioamnionitis, or protracted labour (total section rate, 46%). Moreover, five (6%) of the intended caesarean section group delivered vaginally, because labour progressed too rapidly.

Another small study examined the short-term maternal and neonatal outcomes of very-low-birth-weight breech singletons from 24 to 27 weeks of gestation between 2000 and 2008, and compared 26 vaginal and 39 caesarean deliveries.[11] Short-term neonatal outcomes did not differ between the groups. Of the caesarean deliveries, 27 involved classical uterine incisions with higher estimated blood loss (732 mL vs 362 mL on average) and postpartum infection rates (26% vs 4%).[11] Thus, caesarean section was apparently associated with higher maternal morbidity and no neonatal benefits.

Clearly, not all studies show survival benefits from caesarean section, although it is obvious that negative studies were far fewer than reports describing better perinatal benefits with caesarean delivery. Arguably, this could be a reflection of publication bias. However, many of the negative studies were of very small scale and involved single-centre cohorts that lacked the power to demonstrate a positive survival advantage with caesarean delivery.

Benefits of caesarean section according to categorisation by birth weight

Another approach to interpretation of the data is to categorise these breech deliveries by birth weight in order to assess whether caesarean section could be more beneficial for specific weight ranges.

A study published in 1994 evaluated the effects of abdominal versus vaginal delivery in 5012 singleton breech newborns with different birth weights in Slovenia.[12] It reported a significantly lower neonatal mortality and frequency of low 5-min Apgar scores in the 1000 to 1499 g birth weight neonates in the caesarean section group. In the higher birth weight groups (1500-2499 g), vaginal delivery was associated with a lower frequency of low Apgar scores, light or moderate hypoxia, and respiratory distress.

A very large United States cohort analysed 371 692 singleton live births with breech presentation for the years 1989 to 1991.[13] Differences in birth weight–specific mortality were compared, using a z-statistic for differences in proportions and by logistic regression. Compared with primary vaginal births, primary caesarean births had a significantly lower neonatal mortality for all birth weight groups. Difference in overall neonatal (<28 days) mortality ranged from a low of 1.6-fold in the 500-749 g group (P<0.001) to as high as about 3-fold in the 1250-1499 g group (P<0.001). It was concluded that very preterm up to term singleton live births with breech presentations delivered by caesarean had lower birth weight–specific neonatal mortality than those having vaginal births.

Another North American series based on 1995 to 1998 data demonstrated that breech neonates delivered by caesarean section had a significantly lower adjusted relative risk of death than those having vaginal delivery for all birth weight categories.[14] Moreover, the decrease in relative risk tended to be larger with each increase in birth weight category of up to 1500 g, whilst such a trend was not observed with vertex-presenting fetuses.

In another retrospective cohort study of 14 417 singleton, preterm (<37 weeks of gestation), low-birth-weight, non-anomalous breech newborns from California, 14% were delivered vaginally while 86% were delivered by caesarean section.[15] Vaginal breech delivery of these low-birth-weight newborns in nulliparous women was associated with an increased neonatal mortality of those weighing 500-1000 g (OR=11.7; 95% CI, 7.9-17.2), 1001-1500 g (OR=17.0; 95% CI, 6.8-42.7), 1501-2000 g (OR=7.2; 95% CI, 2.4-21.4), and 2001-2500 g (OR=6.6; 95% CI, 2.1-21.2) as compared with delivery by caesarean section. Birth trauma was also greater in the vaginal breech delivery group weighing 1500-2000 g (OR=3.8, 95% CI, 1.4-10.1) and 2001-2500 g (OR=4.5; 95% CI, 2.6-7.9) as compared with the caesarean group. In newborns weighing 2001-2500 g of nulliparous mothers, birth asphyxia was more common in those having breech rather than cephalic vaginal deliveries (OR=3.5; 95% CI, 2.2-5.6).

A more recent retrospective review from Turkey compared maternal and neonatal outcomes of vaginal delivery after stratifying singleton breech deliveries into birth weight categories of <1000 g, 1000-1500 g, 1501-2500 g, 2501-4000 g and >4000 g over a 6-year period.[16] Of the 1537 deliveries, 478 were vaginal and 1059 were by caesarean section. Neonatal complications did not differ in the two groups of women with term babies weighing <1000 g and >1500 g. However, breech presentation of preterm-delivery babies weighing 1000-1500 g appeared to be an independent risk factor of mortality (56.8% for vaginal and 30.2% for caesarean section, P=0.017) and the frequency of respiratory distress (67.6% vs 44.2%, P=0.036). Overall, there were fewer maternal complications in the vaginal than caesarean group. The authors concluded that for newborns weighing <1000 g, both vaginal delivery and caesarean section conferred high mortality, making the benefits of caesarean section scarcely detectable, but at higher birth weights (1000-1500 g), a survival benefit started to emerge.

Based on the above studies on actual (rather than estimated) birth weights, it was evident that those weighing 1000-1500 g benefited most consistently from caesarean delivery.

Population-based epidemiological surveys

A Swedish national health care centre study using the Swedish Medical Birth Register data from 1990 to 2002 showed that out of 2094 live births at gestational ages of 23-25 weeks and 26-27 weeks, the caesarean section rate was 38% and 66%, respectively.[17] The rate was 56% for preterm breech presentation alone. Moreover, preterm breech vaginal delivery of such fetuses was associated with a significantly increased risk of infant death, which was not observed in the preterm fetuses with vertex presentations.

Another Swedish study based on the same data set included 1975 caesarean and 699 vaginal deliveries with a diagnosis of preterm labour or preterm prelabour rupture of membranes, without significant

fetal compromise.[18] The rates of low Apgar scores and neonatal deaths were both lower after caesarean section (OR=0.4; 95% CI, 0.2-0.7 and OR=0.4; 95% CI, 0.3-0.7, respectively). The risk of respiratory distress syndrome was increased (OR=2.1; 95% CI, 1.4-3.2) but not associated with increased mortality (OR=0.8; 95% CI, 0.5-1.5). Nor was the frequency of intraventricular haemorrhage associated with the mode of delivery. The authors concluded that lower neonatal mortality after caesarean sections supports this mode of delivery for preterm breech presentations.

A retrospective survey, in which 3552 breech-presenting neonates at the time of delivery were admitted into 29 neonatal intensive care units of the Canadian Neonatal Network between 2003 and 2007, showed that 83% were delivered by caesarean section.[19] Multivariate regression analysis with adjustment for perinatal risk factors indicated that vaginal delivery was associated with an increased risk of death (OR=1.7; 95% CI, 1.3-2.3), chronic lung disease (OR=1.5; 95% CI, 1.1-1.9), and severe retinopathy of prematurity (OR=1.6; 95% CI, 1.1-2.3). It was concluded that vaginal as opposed to caesarean preterm breech delivery was possibly associated with a higher risk of neonatal mortality and morbidity.

A retrospective review based on the Consortium on Safe Labor data conducted by the National Institute of Child Health and Human Development of the United States on 228 668 deliveries from 2002 to 2008 was recently published.[20] Of 4352 singleton deliveries between 24 and 32 weeks of gestation, a subset of 2906 were deemed eligible for a trial of labour. Neonatal mortality in attempted vaginal delivery and planned caesarean delivery were compared (after stratification by presentation). For vertex presentations, 79% attempted vaginal delivery and 84% were successful, with no difference in neonatal morbidity. For breech presentations, at 24-28 weeks of gestation, 31.7% attempted vaginal delivery of which only 27.6% were successful. Neonatal morbidity was higher in those delivered vaginally (25.2% vs 13.2%, P=0.003). At 28 to 32 weeks of gestation, 30.5% attempted vaginal delivery but only 17.2% were successful. In those undergoing vaginal delivery, neonatal morbidity was also greater (6.0% vs 1.5%, P=0.016). It was concluded that attempted vaginal delivery for breech presentation was associated with higher neonatal mortality, unlike the situation for vertex presentations which yielded a higher success rate and no difference in mortality.[20] The strength of this study lies in the availability of case details on the attempted route of delivery in addition to the actual route of delivery. The data were convincing in that planned caesarean section was associated with lower neonatal mortality even after controlling for multiple maternal, demographic, and obstetric covariates.

Large epidemiological surveys quite consistently demonstrated a benefit to neonatal outcomes from caesarean delivery. While the large sizes of these studies were helpful in excluding random biases, unmeasured systemic confounders (such as selection and treatment biases) cannot be controlled for except in randomised controlled trials (RCTs). Moreover, data from most of these series did not offer the actual numbers of patients intended for vaginal delivery and only analysed outcomes of fetuses which had vaginal or caesarean delivery. The comparison of outcomes should probably have been between groups with the intention of undergoing vaginal or caesarean delivery, but apparently such data are lacking in the literature. In the few studies that did report the rate of successful vaginal delivery, the rates were apparently quite low, ranging from 27.6%[20] to 53.6%,[10] while in the only randomised trial that provided such data, the success rate was quoted as 5/7 (77%).[21]

Limitations of non-randomised data from retrospective cohorts

The above-mentioned studies were basically observational and retrospective, and were therefore prone to considerable bias. For instance, women who had very preterm infants vaginally tended to include more from persons presenting unexpectedly in advanced labour when maternal antenatal corticosteroids had little time to produce an affect/benefit.[21] The preterm breech infant born vaginally also tended to be lighter, of a lower gestational age, in a poorer condition, and attended by less-experienced staff.[22] Contrary biases may also ensue. For example, fetal distress during preterm labour with breech presentation might well lead to a caesarean section and also a poorer neonatal condition at birth.

In addition, in these retrospective cohorts, quite unlike RCTs, the decision on the mode of delivery was made by the obstetrician and would be influenced by clinical judgement. Those perceived to have worse outcome potential would have been more likely to be delivered vaginally, while those perceived to have more optimistic outcome would be selected for caesarean section. Such a bias may produce the false interpretation that caesarean section could be associated with better neonatal outcomes. Nevertheless, the consistency of the data across the many studies quoted in this review indicates that such biases are very unlikely to be the sole basis for such a conclusion.

Data available in the current literature certainly have crucial deficiencies. Most studies provide only limited data on longer-term neonatal outcomes, and detailed comparisons of neurological and physical disability data on infants born vaginally or by caesarean section are not available in the literature. Similarly, maternal data on the actual proportion of classical caesarean sections undertaken to

deliver very preterm breeches, and the subsequent obstetric performance of these women were seldom, if at all, reported. On the other hand, caesarean section should not be viewed as a tool to prevent subsequent cerebral palsy in preterm breech babies. In a retrospective analysis of 177 272 children born in Norway between 1996 and 1999, 245 were identified as having cerebral palsy.[23] Among breech births, the OR for cerebral palsy was 3.6 (95% CI, 2.4-5.3). This increased risk was reduced when adjusted for preterm birth, multiple pregnancies, and being small for gestational age. The OR for cerebral palsy in preterm breech infants born by caesarean section was 3.3 (95% CI, 1.6-6.7), and in those born vaginally it was 1.7 (95% CI, 0.5-5.4).[23]

Randomised control data on preterm breech delivery

The Cochrane meta-analysis reviewed six trials that attempted to randomise the mode of delivery for women in preterm labour progressing to delivery.[24] However, this meta-analysis included trials on all preterm presentations (cephalic and breech) and was not specifically structured to analyse preterm breech outcomes. Recruitment difficulties limited the total number of women in these trials to only 122. The difficulty in recruiting and randomising eligible patients was well demonstrated in one such trial carried out in 26 hospitals in England. After a period of 17 months, the trial recruited only 13 women and was forced to close.[21] In another trial, only two women were recruited after 5 months and was therefore terminated.[24] There were multiple reasons for these recruitment difficulties. First, preterm breech labour occurred only in around 1:200 pregnancies. Second, both mothers and obstetricians were unwilling to undergo randomisation despite the lack of clear evidence-based benefits of caesarean section. Moreover, when preterm breech labour did occur, it was not an opportune time to obtain informed consent. Of the six RCTs included in the meta-analysis, only four were specifically focused on preterm breech delivery. Notably, data from only three were used in the Cochrane meta-analysis, all of them recruited very small numbers[21,25,26] and lacked many clinical outcome parameters necessary for an appropriate analysis. The largest of these (the Iowa trial[26]) randomised only 38 patients.

The Cochrane review found no statistically significant differences in neonatal outcomes according to route of delivery, except for lower cord blood pH values for those delivered by caesarean section. However, the authors commented that the trials were definitely underpowered to show a significant difference in neonatal mortality. Indeed, it has been suggested that even with a pool of 60 000 deliveries per year, a RCT to examine the optimal mode of delivery for 24-to-28–week gestation breech presentation would not be feasible in a reasonable time span.[27] Attempts at meta-analysis of the data concluded that the studies were too small even to demonstrate large differences and there was insufficient evidence to evaluate a policy of planned caesarean delivery.[28,29] In addition, even with the Term Breech Trial, which included 2088 women from 121 centres in 26 countries, critics argue that the results should not be regarded as a satisfactory or definitive answer on the safest management for a breech-presenting baby at term.[30] Thus, obtaining such levels of evidence to answer this question for preterm breech deliveries would also appear not to be feasible.

Obstetricians' opinions and the authoritative guidelines

Despite the lack of randomised data to support the use of caesarean section, when 510 maternal-fetal medicine specialists were surveyed about breech fetuses at the threshold of viability (23-24 weeks or birth weight of 500 g), 70% opted for caesarean section.[31] The majority based their decision on 'published data' or 'expert opinion'; though 59% admitted that they felt current medical evidence was inadequate to support a recommendation, and around 53% stated that their recommendations were affected by medico-legal concerns.

There is a lack of support from authoritative guidelines to undertake preterm vaginal breech deliveries. The Royal College of Obstetricians and Gynaecologists Green-top guidelines on breech deliveries commented that routine caesarean section for the delivery of the preterm breech presentation should not be advised (Grade C evidence).[32] However, it went on to indicate that the mode of delivery of these babies should be discussed on an individual basis with the mother and her partner. It also stated that evidence from the Term Breech Trial cannot be extrapolated to preterm breech delivery, which remained "an area of clinical controversy". The Society of Obstetricians and Gynaecologists of Canada,[33] the American College of Obstetricians and Gynecologists,[34] and the National College of French Gynecologists[35] all suggested that vaginal breech delivery be limited to term fetuses, as all the studies quoted were based on clinical data of pregnancies at term. Apparently, none of the major colleges or societies has a separate guideline on preterm breech delivery.

Conclusion

Selecting the optimal mode of delivery for a preterm breech-presenting fetus remains a difficult clinical decision. The safety of preterm vaginal breech

delivery probably depends on a good protocol for case selection. However, a sound, evidence-based protocol does not currently exist. Most of the studies quoted in this review were retrospective, without a uniform protocol, and only examined the final results using very variable selection criteria. The few RCTs available did have a protocol, but the data they yielded were extremely limited.

Such decisions are even more difficult if the gestation is 32 weeks or earlier, given the high neonatal mortality and morbidity as well as the increased maternal risks associated with very preterm caesarean sections. The increased risks of surgery to the mother from caesarean delivery of an early preterm breech fetus include the need for a vertical uterine incision, increased risks of haemorrhage, bladder injury, and uterine tears. There are also increased risks in subsequent pregnancies, namely uterine rupture, placenta praevia, and placenta accreta.[36] In addition, the fading skills of vaginal breech delivery even among experienced obstetricians imply that many specialists are not comfortable with them and are more inclined to offer caesareans.

Given the biases in selecting the mode of delivery in current practice, it appears that the available evidence based on retrospective data generally favours planned caesarean section as offering better neonatal survival, while a significant proportion of planned vaginal deliveries still end up as emergency caesareans. Faced with this continued controversy, individualised management taking into account the woman's preferences appears indicated. Planned caesarean sections should probably be limited to gestations with at least a fair chance of neonatal intact survival, where vaginal delivery is not imminent, and in the absence of other maternal risk factors. By contrast, vaginal delivery might be favoured for fetuses that are of marginal viability, and where the additional protection of abdominal delivery was unlikely to benefit neonatal outcome. These facts should be utilised during counselling of patients, when arriving at a joint decision.

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