



## Mode of delivery of twin pregnancies with the first twin in breech position after the introduction of a policy of planned caesarean delivery for nulliparous women



Marion Pascalet\*, Marianne Fourel, Aude Bourtembourg, Claire Toubin, Camille Coppola, Patrick Becher, Rajeev Ramanah, Didier Riethmuller, Nicolas Mottet

Besançon University Medical Center, Department of Obstetrics and Gynaecology, Alexander Fleming Boulevard, 25000 Besançon, France

### ARTICLE INFO

#### Article history:

Received 9 September 2018  
Received in revised form 26 November 2018  
Accepted 27 November 2018

#### Keywords:

Twin pregnancies  
Delivery  
First twin  
Breech position  
Nulliparity

### ABSTRACT

**Introduction:** To evaluate the impact of the mode of delivery of twin pregnancies with the first twin in breech position for all parities combined after introduction of a policy of planned caesarean section in 38 weeks' gestation in nulliparas.

**Material and methods:** A retrospective study of the mode of delivery of twin pregnancies with the first twin in breech position was conducted from January 2007 to December 2015 after the implementation of a planned caesarean section in 38 weeks' gestation in nulliparas. Maternal and neonatal outcomes were compared according to the decision of attempted vaginal or planned caesarean delivery.

**Results:** Among the 134 women included, an attempted vaginal delivery was decided for 30.6% women (n=41), with 95% (n=39) who delivered vaginally and 5% (n=2) by caesarean section during labour. Among the 69.4% women (n=93) with a planned caesarean section, 64.5% (n=60) and 11.8% (n=11) delivered by caesarean before labour and during labour, respectively, and 23.7% (n=22) delivered vaginally. The overall vaginal delivery rate was 45.5%, and the overall rate of caesarean section was 54.5% for all parities combined. In nulliparous women, the rate of caesarean section during labour was 33%. There were no significant differences in maternal mortality or morbidity between the two groups.

**Conclusion:** A selective policy of attempted vaginal delivery based on parity for twin pregnancies with the first twin in breech position can lead to a reduction in the overall rate of caesarean section in this population.

© 2018 Elsevier B.V. All rights reserved.

### Introduction

The first twin in breech position represents 20% of twins pregnancies [1,2]. Currently, there is no consensus among different countries regarding the mode of delivery of twin pregnancies with first twin in breech position. The French National College of Gynaecologists and Obstetricians does not recommend one mode of delivery over another [3], and the Royal College of Obstetricians and Gynaecologists advocates a planned caesarean section (PCS) but adds that caesarean section during labour after spontaneous labour is not recommended. The American College of Obstetricians and Gynaecologists encourages vaginal delivery but points out that the optimal mode of delivery depends on chorionicity, foetal presentations, gestational age,

and the experience of the obstetrician [3,4]. The rate of caesarean section of twin pregnancies varies according to the country, with 74.8% occurring in the United States in 2013 [6] and 54% occurring in France in 2016 [7]. Although attempted vaginal delivery (AVD) is a reasonable option when the first twin is in cephalic position, the rate of caesarean section when the first twin is in a breech position can reach 73% among pregnant French women [2] or 92% among pregnant women in the United States [6]. Due to lack of training in obstetric manoeuvres, some teams PCS systematically and abandoned AVD [8]. However, the increase in neonatal morbidity and mortality associated with the PCS, found recently in the JUMODA prospective study [10], should encourage teams to control this procedure [9,5].

Parity remains an important factor in the decision for an AVD when the first twin is in breech position [11]. The aim of this study was to evaluate the mode of delivery of twin pregnancies, with the first twin in breech position, of all parities combined after the implementation of a policy of PCS after 38 weeks' gestation, only for nulliparous women.

\* Corresponding author.

E-mail addresses: [marionpascalet@aol.fr](mailto:marionpascalet@aol.fr) (M. Pascalet), [n1mottet@chu-besancon.fr](mailto:n1mottet@chu-besancon.fr) (N. Mottet).

## Material and methods

We conducted a retrospective study at our level III university maternity ward, including all deliveries of twin pregnancies, with the first twin in breech position from January 2007 to December 2015. The introduction of this policy of PCS after 38 weeks' gestation in nulliparas started in January 2007 after a first analysis of our clinical practices concerning mode of delivery of twin pregnancies [11]. Indeed, we found a rate of caesarean section during labour at 68% in nulliparas from January 1995 to December 2006.

Only twin pregnancies with the following characteristics were included:  $\geq 26$  weeks' gestation, the first twin in breech position, all parities combined, and two living twins at the beginning of labour. Pregnancies characterised by foetal deaths before labour of one or both twins and by deliveries before 26 weeks' gestation were excluded.

The decision regarding the mode of delivery was different before and after 2007. Before 2007, there was no selection of AVD based on parity, and it was the obstetrician responsible for the pregnancy who decided the mode of delivery. If caesarean section was decided, it was planned at 37 weeks' gestation or was performed before that date if the women entered labour spontaneously. The rate of caesarean section during labour was 18% in all parities combined and reached 68% in nulliparous women with an AVD. Given this high rate of caesarean section during labour, a new reflection about our clinical practices has been proposed, especially for nulliparous women. After 2007, a selection of AVD by parity was introduced. Thus, the decision for the mode of delivery of twin pregnancies was addressed in a collegiate manner during daily meetings of the medical team between 36–37 weeks' gestation.

Whatever the parity of the parturient, the chorionicity, the type of breech position or the presentation of the second twin did not interfere in the decision for mode of delivery. Respecting the recommendations of the French National College of Gynecologists and Obstetricians, the delivery of these twin pregnancies was planned from 38 weeks' gestation, without exceeding 39 weeks' gestation for the uncomplicated monochorionic diamniotic or dichorionic diamniotic twin pregnancies. We did not perform radiopelvimetry for twin pregnancy, whatever the presentation of the first twin. For nulliparous women, a caesarean section was planned after 38 weeks' gestation. However, if women entered labour spontaneously prior to this date, an attempted vaginal delivery was accepted. Considering that the maternal and neonatal comorbidities of a caesarean during labour were more important than a PCS [11], a caesarean section from the outset was no longer justified. For multiparous women, caesarean section before labour was only justified for maternal or foetal indications; otherwise, a vaginal delivery was attempted. The labour was induced at 39 weeks' gestation in the absence of spontaneous labour. Prostaglandins were not used.

Classical and systematic manoeuvres were performed during delivery of the first twin: Lovset or Suzor's manoeuvres for shoulders and Mauriceau's manoeuvre for head delivery. The intertwin interval was reduced by an actively managed second-twin delivery. In the case of a non-cephalic presentation of the second twin, immediate total breech extraction after the internal version was practised. In the case of cephalic presentation at or below 0 station, the management of the second twin delivery consisted of the association of maternal pushing efforts, oxytocin infusion and artificial rupture of the membranes. All the obstetrical manoeuvres were performed with intent with intact membranes. Cord blood analysis was performed in all cases.

We divided women into two groups according to prenatal decisions regarding the mode of delivery: PCS and AVD. In each

group, we reported the actual mode of delivery (caesarean before labour, caesarean during labour and vaginal delivery). The maternal and neonatal outcomes were studied according to the planned mode of delivery:

- The baseline characteristics included maternal age at delivery, previous caesarean, parity, gestational age at delivery (weeks), second twin's position (cephalic, breech or transverse), mode of onset of labour (spontaneous, induction with oxytocin and amniotomy or caesarean before labour), mode of delivery.
- Maternal outcomes: maternal morbidity during the first six weeks postpartum included one or more the following: postpartum haemorrhage of more than 500 ml, anaemia (defined as maternal haemoglobin of  $<10$  g/dl), deep vein thrombophlebitis or pulmonary embolism (diagnoses respectively using bilateral leg Doppler ultrasound and ventilation-perfusion lung scanning), maternal death.
- Neonatal characteristics and outcome of first twin: neonatal birthweight (g), Apgar score at one and five min, admission to the neonatal unit, admission to the neonatal intensive care unit. We defined a combined neonatal mortality and severe morbidity by one or more of the following data: death before discharge, admission to the neonatal intensive care unit, five min Apgar score  $<7$ , cord blood pH  $<7.10$ , or birth trauma.

All data were retrospectively collected from birth records, caesarean section reports, service activity reports, and computerized obstetric records.

### Statistical analyses

Data analysis used  $\chi^2$  or Fisher's exact test, as appropriate for categorical variables and the Student test for continuous variables with SAS 9.3 software. A  $p$  value of  $B/0.05$  was considered statistically significant.

### Ethical approval

Under French regulations, this study is exempt from institutional review board review because it is an observational investigation using anonymized data from medical records. In our centre, women are systematically informed that obstetrical and neonatal data can be used for the evaluation of medical practices and are explicitly informed that they can sign an opposition form.

## Results

During the study period, 639 women gave birth to twins, and 134 gave birth to a first twin in breech position, representing 0.6% of all deliveries (Fig. 1). Table 1 presents the characteristics of the study population, with all parities combined, according to the planned mode of delivery. The two groups did not differ significantly for maternal and gestational ages at delivery, the number of previous caesarean sections and the type of second twin's presentation.

Among the 134 women included, an AVD was decided for 30.6% women ( $n=41$ ) with 95% ( $n=39$ ) who delivered vaginally and 5% ( $n=2$ ) by caesarean section during labour. Among the 69.4% women ( $n=93$ ) with a PCS, 64.5% ( $n=60$ ) and 11.8% ( $n=11$ ) delivered by caesarean before labour and during labour, respectively, and 23.7% ( $n=22$ ) delivered vaginally. The overall vaginal delivery rate was 45.5%, and the overall rate of caesarean section was 54.5%, with all parities combined. In nulliparas, the rate of caesarean section during labour was 33%.

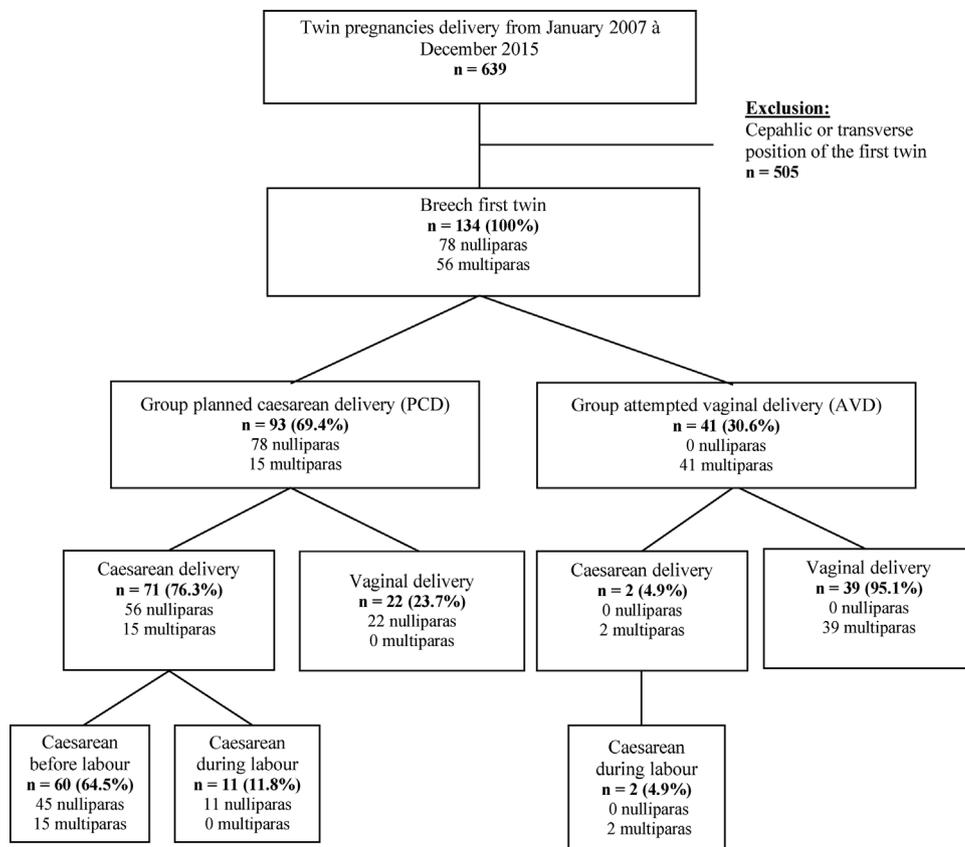


Fig. 1. Flow chart.

Indications for caesarean before labour were the breech position for the first twin in the nulliparas after 38 weeks' gestation (n=20), postterm pregnancy and unfavourable cervix in the multiparas (n=6), a previous caesarean (n=2), preeclampsia (n=12), an intrauterine growth restriction (n=6), abnormal foetal heart rate (n=6), bleeding of placenta previa (n=3), intrahepatic cholestasis of pregnancy (n=2), a thrombocytopenia (n=1), a specific maternal disease as a multiple sclerosis (n=1), a Twin Oligo-Polyhydramnios Sequence (n=1). The indications for caesarean during labour were a non-progressive labour (n=8),

abnormal foetal heart rate (n=2), and umbilical cord prolapse (n=1). No caesarean section was performed on the second twin.

Of 41 candidates for vaginal delivery, 95.1% (n=39) delivered vaginally, and 4.9% (n=2) delivered by caesarean section during labour, one for a nonprogressive labour and one for an abnormal foetal heart rate. After 2007, 54.5% women (n=73) delivered by caesarean section and 45.5% (n=61) delivered vaginally.

Neonatal and maternal outcomes are presented in Table 2. Three neonatal deaths occurred during the study, two in the AVD group and one in the PCS group. Two children were born before 28

Table 1

Baseline characteristics of the study population all parities combined according to prenatal decision regarding mode of delivery.

	Attempted vaginal delivery		Planned caesarean delivery		P
	n	%	n	%	
All women	41	30.6	93	69.4	
Maternal age at delivery (years) <sup>a</sup>	32 ± 3.9		31 ± 4		
<25	2	4.9	7	7.5	0.98
25–35	30	73.2	66	71	
35–40	7	17	16	17.2	
>40	2	4.9	4	4.3	
Nulliparity	0		78	83.9	<0.05
Gestational age at delivery (weeks)	34.3 ± 2.7		35.1 ± 2.7		
>37 weeks' gestation	16	39	36	38.7	0.97
Previous caesarean	3	7.3	7	7.5	0.97
Type of second twin's presentation					
Cephalic	16	39	46	49.5	0.54
Breech	18	43.9	34	36.5	
Transverse	7	17.1	13	14	
Mode of onset of labour					
Spontaneous	28	68.3	33	35.5	<0.05
Induction	13	31.7	0	0	
Caesarean before labour	0	0	60	64.5	

<sup>a</sup> Plus-minus values are means ± SD.

**Table 2**

Neonatal outcome for first twin and maternal morbidity according to prenatal decision regarding mode of delivery.

	Attempted vaginal delivery		Planned caesarean delivery		P
	n	%	n	%	
All women	41	30.6	93	69.4	
Neonatal morbidity					
Neonatal birthweight (g) <sup>a</sup>	2175 ± 504		2090 ± 482		0.41
Apgar score ≤ 7 at 1 min	9	21.9	32	34.4	0.14
Apgar score ≤ 7 at 5 min	2	4.9	2	2.1	0.58
Admission to neonatal unit	11	26.8	31	33.3	0.45
Admission to neonatal intensive care unit	14	34.1	22	23.6	0.21
Neonatal death	2	4.9	1	1.1	0.22
Combined negative outcome	15	36.6	25	26.9	0.25
Maternal morbidity					
Postpartum haemorrhage > 500 ml	5	12.2	42	45.2	<0.055
Anaemia	14	31.1	39	41.9	0.39
Deep vein thrombophlebitis or pulmonary embolism	0		0		
Maternal death	0		0		

<sup>a</sup> Plus-minus values are means ± SD.

weeks' gestation and died of complications due to extreme prematurity with severe sepsis and multiple organ failure. The third child had bilateral renal agenesis and a tetralogy of Fallot. No maternal deaths occurred in either group.

## Discussion

The vaginal delivery of twins in a pregnancy with the first twin in breech position is possible and represents a safe option in a selected population. The introduction of a selective policy of attempted vaginal delivery based on parity for twin pregnancies, with the first twin in breech position, can lead to an overall rate of vaginal delivery of 45.5% in an obstetrical team trained in obstetrical manoeuvres.

Recent data in the literature reminds us of the benefit of vaginal delivery for twins compared to caesarean delivery. As described in the study by Goossens et al. [6], the national prospective study JUMODA by Schmitz et al. [7] reported an excess risk of neonatal morbidity and mortality, especially before 37 weeks' gestation, in the PCS group compared to the AVD group. There are a few data concerning the mode of delivery of twin pregnancies with the first twin in breech position. In the survey by Vendittelli et al. on French obstetrical practices, the rates of caesarean section before labour can reach 72% when the first or the second twin is in breech position [2]. However, these maternity wards also practise a large number of planned caesarean sections on singletons with a breech position. In the meta-analysis of Hogle et al. [8], a low Apgar score at five min was less common in the PCS group than in the attempted vaginal delivery group (OR = 0.33, 95% CI; 0.17 to 0.65) in twins with the first twin in breech position. Moreover, there was no difference in perinatal and neonatal mortality between the two groups (OR = 1.14, 95% CI; 0.12–11.02). Other Swedish studies found no increased risk of neonatal mortality in vaginal delivery compared to caesarean section [9] or difference in the occurrence of an Apgar score <7 at five min or the occurrence of a neonatal death for the first twins. Nevertheless, these studies were only based on administrative data and should be interpreted with caution [10]. Haest et al. [11] also found no significant difference in terms of neonatal morbidity and mortality, regardless of the mode of delivery and the presentation of twins whose term was greater than 32 weeks' gestation. In their study of 969 twin pregnancies, Sentilhes et al. did not show any significant differences in the neonatal outcomes between the AVD and the PCS in cases in which the first twin was in breech position [12].

It is difficult to compare our results with those available in the literature because of practice biases explained by different levels of

training of obstetrical teams in obstetrical manoeuvres for breech extraction. In our study, we report a rate of vaginal delivery of 45.5%, 9.7% caesarean section during labour and 44.8% PCS, with an overall rate of caesarean section for all parities of 54.5%. Blickstein et al. [13], in a retrospective multicentre study of 613 cases, found 39% vaginal delivery, 22% caesarean during labour and 39% PCS, corresponding to an overall rate of caesarean section of 61%. These statistics are comparable to those of Bats et al. [14], who found, respectively, 27.7% vaginal delivery, 39.2% caesarean during labour and 33.1% PCS, corresponding to an overall rate of caesarean section of 72.3% for 166 twins pregnancies. The same observations can be made in the study by Grisaru et al., in which the overall caesarean section rate was close to 74.6%, with 53.5% of the PCS in the group with the first twin in a non-cephalic position [15]. Thus, despite our higher PCS rate, our vaginal delivery rate is higher, with a decrease in caesarean section rate during labour. Indeed, we accepted an AVD when the women entered labour spontaneously, as there was no longer any benefit from a caesarean section during labour compared to a PCS. In the previously cited studies, women who begin spontaneous labour before the date of the planned caesarean section had a caesarean during labour, potentiating maternal and neonatal morbidity and mortality. The increase in neonatal morbidity and mortality associated with caesarean section during labour is well described in the literature, with an increase in the number of admissions to the neonatal unit care and a higher number of Apgar scores <7 at five minute [16]. More postpartum haemorrhage, more intensive care hospitalizations and more transfusions are also reported with caesarean section during labour [17–19].

Considering that multiparity and spontaneous labour are predictors of successful AVD [20,21], we decided after 2007 to select our AVD based on the criterion of parity planning a caesarean section at 38 weeks' gestation [22,23]. Before the change in our practices in 2007 [11], 79% of women delivered by caesarean section and 21% delivered vaginally. Among women with an AVD, 54% delivered vaginally and 46% delivered by caesarean section during labour. The caesarean section was planned at 37 weeks' gestation for 61% of women with a rate of caesarean section of 78.8% and a rate of vaginal delivery of 21%. Thus, after changes in our clinical practices, the overall rate of caesarean section among all parities combined decreased to 24% after 2007. One interesting result concerned the evolution of the mode of delivery in nulliparous women. In this specific population, 90.3% had a caesarean section before 2007, compared to 71.8% after 2007 with an increase in vaginal deliveries (28.2% vs 9.7% in 2007). The rate of caesarean during labour in nulliparas was 68% before 2007, and it

was 33.3% in our study. Two reasons concerning increase of the vaginal delivery rate for nulliparous women could be discussed. The first explanation is the period of PCS. Indeed, comparing the two periods, caesarean section was planned one week later, allowing more women to enter labour spontaneously. The second explanation concerned the training of the obstetrical team. Since 2007, training sessions on simulators and video teachings are regularly dispensed in our maternity ward for obstetricians.

In addition, the presentation of the second twin did not affect the decision on the mode of delivery. The dystocic complications of these pregnancies, such as collision, compaction, impaction and the interlocking twins, even if very serious, are very rare [24]. Nissen et al. estimated the incidence of these complications to be one case out of 9000 deliveries or one twin delivery out of 1000, and these results could not justify a systematic PCS in case the first twin was in breech position and the second twin was in cephalic presentation. As demonstrated in the study of Easter et al. [25], non-cephalic presentations were not associated with lower rates of successful AVD in the case of the first twin being in breech position. The authors reiterated that the initial presentation of the second twin could change after the birth of the first twin. Similarly, Schmitz et al. found no difference in the neonatal morbidity and mortality of the second twin, according to its presentation [26].

## Conclusion

Vaginal delivery can be a reasonable option when the first twin is in breech position and the obstetrical team is trained in obstetrical manoeuvres, as long as the acceptance criteria are respected [27,28]. The spontaneous onset of labour and the experience of the obstetrician plays an important role in the success rate of vaginal deliveries, even in nulliparous women [29]. Through a critical analysis of our practices, we were able to reduce the overall rate of caesarean section in this population. The first twin being in breech position is not a sufficient condition for the systematic recommendation of caesarean section, especially after spontaneous labour.

## Author's contributions

Pascalet Marion, Fourel Marianne, Becher Patrick and Nicolas Mottet designed the study, collected data, performed the analysis and wrote the manuscript. Toubin Claire, Coppola Camille, Ramanah Rajeev, Riethmuller Didier and Mottet Nicolas helped to draft manuscript. All authors read and approved final version of the manuscript.

## References

- Prunet C, Goffinet F, Blondel B. Prise en charge et santé périnatale en cas de grossesse gémellaire : situation en 2010 et évolution récente en France. [Medical care and perinatal health in twin pregnancies: situation in 2010 and recent trends in France.] (in French). *J Gynecol Obstet Biol Reprod (Paris)* 2015;44:184–93.
- Vendittelli F, Rivière O, Pons J-C, Lémyer D, Berrebi A, Mamelle N, et al. Accouchement des grossesses gémellaires : enquête sur les politiques des maternités françaises. [Twin delivery: a survey of French obstetrical policies] (in French). *Gynecol Obstet Fertil* 2006;34:19–26.
- American College of Obstetricians and Gynecologists Committee on Practice Bulletins-Obstetrics, Society for Maternal-Fetal Medicine, ACOG Joint Editorial Committee. ACOG practice bulletin #56: multiple gestation: complicated twin, triplet, and high-order multifetal pregnancy. *Obstet Gynecol* 2004;104:869–83.
- American College of Obstetricians and Gynecologists (College), Society for Maternal-Fetal Medicine, Caughey AB, Cahill AG, Guise J-M, Rouse DJ. Safe prevention of the primary cesarean delivery. *Am J Obstet Gynecol* 2014;210:179–93.
- Sénat M-V, Sentilhes L, Battut A, Benhamou D, Bydlowski S, Chantray A, et al. Post-partum: recommandations pour la pratique clinique—texte court. [Post-partum: guidelines for clinical practice—short text] (in French). *J Gynecol Obstet Biol Reprod (Paris)* 2015;44:1157–66.
- Goossens SMTA, Ensing S, van der Hoeven MAHBM, Roumen FJME, Nijhuis JG, Mol BW. Comparison of planned caesarean delivery and planned vaginal delivery in women with a twin pregnancy: a nation wide cohort study. *Eur J Obstet Gynecol Reprod Biol* 2018;221:97–104.
- Schmitz T, Prunet C, Azria E, Bohec C, Bongain A, Chabanier P, et al. Association between planned cesarean delivery and neonatal mortality and morbidity in twin pregnancies. *Obstet Gynecol* 2017;129:986–95.
- Hogle KL, Hutton EK, McBrien KA, Barrett JFR, Hannah ME. Cesarean delivery for twins: a systematic review and meta-analysis. *Am J Obstet Gynecol* 2003;188:220–7.
- Rydholm H. Should all twins be delivered by caesarean section? A preliminary report. *Twin Res* 2001;4:156–8.
- Vendittelli F, Accoceberry M, Savary D, et al. Quelle voie d'accouchement pour les jumeaux? [What type of delivery for twins?]. *J Gynecol Obstet Biol Reprod (Paris)* 2009;38:5104–113.
- Haest KMJ, Roumen FJME, Nijhuis JG. Neonatal and maternal outcomes in twin gestations & or =32 weeks according to the planned mode of delivery. *Eur J Obstet Gynecol Reprod Biol* 2005;123:17–21.
- Sentilhes L, Goffinet F, Talbot A, Diguët A, Verspyck E, Cabrol D, et al. Attempted vaginal versus planned cesarean delivery in 195 breech first twin pregnancies. *Acta Obstet Gynecol Scand* 2007;86:55–60.
- Blickstein I, Goldman RD, Kupferminc M. Delivery of breech first twins: a multicenter retrospective study. *Obstet Gynecol* 2000;95:37–42.
- Bats A-S, Marie V, Sentilhes L, Cabrol D, Goffinet F. Grossesse gémellaire et siège premier à terme : peut-on encore accepter un accouchement par les voies naturelles? [First breech twin pregnancy: can we still accept a vaginal delivery? Comparative study of perinatal outcome with attempt of vaginal delivery versus planned cesarean: 166 cases] (in French). *J Gynecol Obstet Biol Reprod (Paris)* 2006;35:584–93.
- Grisaru D, Fuchs S, Kupferminc MJ, Har-Toov J, Niv J, Lessing JB. Outcome of 306 twin deliveries according to first twin presentation and method of delivery. *Am J Perinatol* 2000;17:303–7.
- Ascioglu O, Güngördük K, Yildirim G, et al. Second-stage vs first-stage caesarean delivery: comparison of maternal and perinatal outcomes. *J Obstet Gynaecol* 2014;34:598–604.
- Lurie S, Raz N, Boaz M, Sadan O, Golan A. Comparison of maternal outcomes from primary cesarean section during the second compared with first stage of labor by indication for the operation. *Eur J Obstet Gynecol Reprod Biol* 2014;182:43–7.
- Sucak A, Celen S, Akbaba E, Soysal S, Moraloglu O, Danişman N. Comparison of nulliparas undergoing cesarean section in first and second stages of labour: a prospective study in a tertiary teaching hospital. *Obstet Gynecol Int* 2011;2011:986506.
- Alexander JM, Leveno KJ, Rouse DJ, Landon MB, Gilbert S, Spong CY, et al. Comparison of maternal and infant outcomes from primary cesarean delivery during the second compared with first stage of labor. *Obstet Gynecol* 2007;109:917–21.
- Breathnach FM, McAuliffe FM, Geary M, Daly S, Higgins JR, Dornan J, et al. Prediction of safe and successful vaginal twin birth. *Am J Obstet Gynecol* 2011;205:237.e1-7.
- Jonsson M. Induction of twin pregnancy and the risk of caesarean delivery: a cohort study. *BMC Pregnancy Childbirth* 2015;15:136.
- Fox NS, Gupta S, Melka S, Silverstein M, Bender S, Saltzman DH, et al. Risk factors for cesarean delivery in twin pregnancies attempting vaginal delivery. *Am J Obstet Gynecol* 2015;212:106.e1-5.
- Shachter-Safrai N, Karavani G, Haj-Yahya R, Ofek Shlomo N, Porat S. Risk factors for cesarean delivery and adverse neonatal outcome in twin pregnancies attempting vaginal delivery. *Acta Obstet Gynecol Scand* 2018;97:845–51.
- Nissen ED. Twins: collision, impaction, compaction, and interlocking. *Obstet Gynecol* 1958;11:514–26.
- Easter SR, Lieberman E, Carusi D. Fetal presentation and successful twin vaginal delivery. *Am J Obstet Gynecol* 2016;214:116.e1–116.e10.
- Schmitz T, Carnavalet C de C, Azria E, Lopez E, Cabrol D, Goffinet F. Neonatal outcomes of twin pregnancy according to the planned mode of delivery. *Obstet Gynecol* 2008;111:695–703.
- Boukerroum M, Robillard P-Y, Gérairdin P, Heisert M, Kauffmann E, Laffitte A, et al. Présentations et modes d'accouchements de 371 grossesses gémellaires. [Modes of deliveries of twins as a function of their presentation. A study of 371 pregnancies] (in French). *Gynecol Obstet Fertil* 2011;39:76–80.
- Sibony O, Touitou S, Luton D, Oury J-F, Blot P. Modes of delivery of first and second twins as a function of their presentation. Study of 614 consecutive patients from 1992 to 2000. *Eur J Obstet Gynecol Reprod Biol* 2006;126:180–5.
- Steins Bisschop CN, Vogelvang TE, May AM, Schuitemaker NWE. Mode of delivery in non-cephalic presenting twins: a systematic review. *Arch Gynecol Obstet* 2012;286:237–47.