



Spatulas for entrapment of the after-coming head during vaginal breech delivery

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Received: 5 January 2019 / Accepted: 4 March 2019 / Published online: 9 March 2019
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Abstract

Purpose To evaluate spatulas for entrapment of the after-coming head (EAH) during vaginal breech delivery, in the setting of failed usual manoeuvres (Bracht or Mauriceau).

Methods We led a retrospective cohort study in two tertiary referral hospital in France. From 2003 to 2018, we included all deliveries of live children requiring the use of spatulas (Thierry's and Teissier's) for EAH during vaginal breech delivery.

Results Over the period, 59 breech deliveries with spatulas for EAH were enrolled (prevalence 2.3%). No vaginal delivery failures were found. The average term was 36 weeks of gestation. Mean maternal age was 29.4 years and median parity was 1. 50.8% of the foetuses presented as complete breech, 40.7% as frank breech, and 8.5% as footling breech. Maternal morbidity was low: no obstetrical lesions of the anal sphincter, 28% episiotomy (performed before application of instruments in most cases). There was no evidence of foetal over-morbidity. The average weight of the foetuses was 2635g. There was no serious trauma associated with the use of spatulas: only one case of skin lesion and a case of non-severe cephalhematoma could be attributed to the instrument. Mean arterial pH was 7.19, the median 5-min Apgar score was 10.

Conclusion In compliance with obstetrical mechanics, spatulas should be considered as an effective instrument during EAH with maternal and foetal safety. This is the first cohort describing the use of an instrument to manage EAH during vaginal breech delivery, while knowledge and mastery of this technique are essential to manage this situation.

Keywords Vaginal breech delivery · Spatulas · After-coming head · Head entrapment · Birth injury

Introduction

Breech delivery is the second most frequent presentation at term after cephalic presentation (3–4%) [1].

The delivery route of a breech presentation has long been a controversial topic, particularly after Hannah's TBT study [2] in 2000. Nowadays, the vaginal delivery is generally proposed when both foetal and maternal parameters allow it [3–4].

Entrapment of the after-coming head (EAH) is a rare but potentially serious dystocia complication during vaginal breech delivery [5–7].

According to Broche and al [5], it could be related to a misjudged foetal-pelvic disproportion, an unknown pelvic narrowing or a foetal head deflexion related to a backward rotation of the back. During entrapment in pelvic excavation, the main anomalies are soft-tissue dystocia (rapid delivery and hypertonia of the anus lifters) or, more rarely, narrow midpelvis. On the other hand, preterm foetuses whom head-to-pelvis ratios are higher could pass through an incompletely dilated cervix, while the cervix later retains the head.

Risk factors for EAH include: foetal macrosomia or macrocephaly, extended foetal neck, reduced maternal pelvic diameters, prolonged second stage of labour, and incompletely dilated cervix at the time of deliver or rapid descent of the foetus in preterm delivery.

Since EAH portends an increased risk of neonatal morbidity, its management should be prompt and accurate. Caregivers need to maintain competence in management of

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EAH, because they may always encounter it unexpectedly, particularly when women present in advanced labour with the breech already delivering.

Bracht and Mauriceau manoeuvres are commonly performed to overcome EAH [5]. In case of failure, several guidelines (CNGOF [8–9], SOGC [10], RCOG [3], ACOG [11]) recommend the use of instrumental assistance (Piper forceps or spatulas). However, only few data focusing on instrumental management of EAH are available and none has specifically addressed the feasibility of spatulas in this indication.

Spatulas do display several strengths to support their use in EAH. Indeed, their design allows foetal propulsion and orientation within the maternal genital tract with reduced traction [9]. Furthermore, many studies have demonstrated their safety on the foetal head, including premature babies [12–14]. Therefore, spatulas seem to be a preferred instrument in EAH, unlike forceps, which require gripping force and support.

We thus aimed to evaluate spatulas for the management of EAH during vaginal breech delivery, in the setting of failed usual first line manoeuvres (Bracht or Mauriceau).

Study design

All cases of EAH during vaginal breech delivery, requiring instrumental assistance by Thierry's or Tessier's spatulas were enrolled in this retrospective study from 2003 to 2018 in two tertiary maternity hospitals (Toulouse University Hospital and Besançon University Hospital).

Mode of delivery for term breech was planned according to the HAS French Guidelines. Exclusion criterions for vaginal breech delivery were similar in both hospitals: hyperextended neck on ultrasound, high estimated foetal weight (> 3800 g). External cephalic version (ECV) was proposed to all these patients in both maternities. Computerized tomography was performed to study maternal pelvimetry if ECV failed in case of primiparous or history of childbirth < 3800 g.

Spatulas were the only instrument used for EAH after failure of the usual manoeuvres (Bracht or Mauriceau) in both departments.

The exclusion criteria comprised EAH of children born by caesarean section for breech presentation, breech deliveries during stillbirth, and Medical Termination of pregnancy.

Patient records containing the code "spatulas" and "breech delivery" were identified. The various qualitative and quantitative data from patients and new borns were collected anonymously on obstetrical and paediatric records.

Our primary endpoint was the existence of a neonatal trauma that could be attributed to instrumental assistance, also named "Neonatal birth injuries" [15]. It included

cutaneous lesion (petechiae, ecchymosis, hematoma, and wound), extra-cranial lesion (cephalohaematoma and serosanguineous hump), orthopaedic lesion (fractures and embarrassments), neurological lesion (brachial plexus and facial paralysis), and cerebral lesion (hematoma under-dural, extradural, intraventricular haemorrhage, and intra-parenchymatous haemorrhage). Secondary endpoints included foetal morbidity parameters (arterial pH, venous pH, cord lactate, APGAR scores, and neonatal care unit admission), maternal perineal state (episiotomy and severe perineal tears corresponding to third and four degree lacerations, involving anal sphincter or rectum mucosa injuries [16]). The vaginal delivery success rate was also collected.

We performed a sub-group analysis for preterm babies before 29 weeks of gestation (WG) and new borns of < 2000 g. Actually, the incidence of EAH in preterm does not appear to be higher in this sub-population [17]. Neonatal morbidity also did not appear to be increased [6, 16].

This study received agreement from the national Research Ethics Committee on Gynaecology and Obstetrics (CEROG 2018-OBS-1024).

The results are presented as averages, medians, deviations, and percentages.

Results

Between January 2003 and July 2018, 94,459 childbirth occurred in participating centers. Among them, we observed 2572 vaginal breech deliveries (2.7% of deliveries) and 59 cases of instrumental extraction by Thierry's or Tessier's spatulas for EAH during a vaginal breech delivery have been recorded. Hence, the prevalence of EAH requiring second line management was 2.3%. In all cases, spatulas application permitted vaginal delivery.

The maternal demographic characteristics are summarized in Table 1. An attempt of an external cephalic version was made in 23 cases (38.9%).

Table 1 Maternal demographic characteristics

	<i>n</i> = 59
Maternal age (year)	29.4 (15–41)
Gestational age (WG)	36
Primiparous	14 (23%)
Median parity (RDI)	1 (1–2)
Scar uterus	2 (3.4%)
Maternal height (cm)	164 (152–178)
BMI (kg/m ²)	23.3

Continuous variables are presented as mean ± SD and categorical variables as *n* (%)

WG weeks of gestation, BMI body mass index

The prenatal workup to allow a vaginal delivery comprised ultrasound examination for head deflexion in 53 cases (89.9%) and pelvimetry in 23 cases (39%). Regarding pelvimetry, mean measurement of antero-posterior diameter was 124.8 cm (range 113–141cm), mean inlet transverse diameter was 128.3 cm (range 113–147 cm), and mean pelvis transverse diameter was 113 cm (range 95–138 cm). Pelvimetry was not performed in 61% of cases ($n = 36$) due to prematurity (i.e., gestational age ≤ 37 WG, $n = 26$), history of vaginal delivery of a child weighing > 3800 g ($n = 10$), and diagnosis of breech presentation during labour ($n = 3$).

The average term of delivery was 36 WG. Labour was spontaneous in 91.5% of cases ($n = 54$) and induced in 8.5% ($n = 5$) of cases. 50.8% ($n = 30$) of the fetuses presented as complete breech, 40.7% as frank breech, and 8.5% as footling breech. The characteristics of the first stage of labour are summarized in Table 2.

The presentation station before starting active second phase of labour was midpelvic (10%, $n = 6$), low pelvic (71.7%, $n = 43$), and outlet (13.3%, $n = 8$). There was 5% ($n = 3$) of cord prolapse before or at the beginning of expulsive efforts. The average duration of expulsive efforts was 14 min (1–43 min).

The reduction of EAH by spatulas was preceded in 79.7% by the usual manoeuvres (in 41 cases Mauriceau's alone, in 2 cases Bracht's alone, and in 12 cases both manoeuvres combined). Nitrates were administered in 28.8% ($n = 17$). A complementary cervical incision was performed in eight cases (13.8%).

The analysis of neonatal characteristics (Table 3) did not reveal any case of neonatal birth trauma or severe Neonatal Birth Injury due to spatula use. There were one case of superficial skin and one case of non-severe cephalohematoma. No orthopaedic, extra-cranial, or neurological lesions were observed.

The median arterial pH was 7.19, and the median 5-min Apgar score was 10. A transfer to neonatal intensive care unit (NICU) occurred in 27 neonates (45.8%), related

Table 2 Labour characteristics

Type of labour	
Spontaneous labour	54 (91.5%)
Induced labour	6 (8.5%)
Foetal presentation	
Complete breech	30 (50.8%)
Frank breech	24 (40.7%)
Footling breech	5 (8.5%)
Duration of labour	04h15
No analgesia	4 (6.77%)
Oxytocin use	48 (81.3%)

Continuous variables are presented as mean \pm SD and categorical variables as n (%)

Table 3 Neonatal characteristics ($n = 59$)

	n (%)
Term distribution (WG)	
25–27+6	3 (5)
28–32+6	7 (10)
33–36+6	15 (27)
> 37	34 (58)
Weight (g)	
< 2000 g	11 (18.6%)
2000–3000 g	25 (42.3%)
3000–4000 g	22 (37.2%)
> 4000 g	1 (1.7%)
Average weight (g)	2635
IQR	2109–3250
Apgar score 5 min median	10
Apgar 5 min < 7	12 (20.3%)
Apgar5 min > 7	47 (79.7%)
Apgar score 10 min	9
Arterial pH	7.19
pH Arterial < 7.00	3 (5%)
Venous pH	7.3
Cord lactates	5.5
NICU transfer	27 (45.8%)

Continuous variables are presented as mean \pm SD and categorical variables as n (%)

to prematurity. The mean length of hospitalization was 6.4 days.

The average arterial pH for new-born weighing less than 2000g ($n = 11$) was 7.24. The median 5-min Apgar score was 7. For premature children born before 29 WG ($n = 6$), the mean arterial pH was 7.29. The corresponding median 5-min and 10-min Apgar score before 29 WG was 2.5 and 5, respectively. All these new-borns (< 2000 g and < 29 WG) have been transferred to NICU. Two of them died at D28 of life (< 2000 g and < 29 WG) due to complications related to prematurity.

Regarding maternal morbidity, we did not observe any case of severe perineal laceration. The episiotomy rate was 28.3% ($n = 17$).

Discussion

Our results highlight the efficacy and safety of spatulas in the management of EAH during vaginal breech delivery. Indeed, their use systematically led to vaginal delivery and was not associated with significant maternal and foetal morbidity. The prevalence of EAH requiring second line management (spatula-assisted delivery) was 2.3%.

To our knowledge, this is the first cohort describing the use of an instrument in case of EAH during vaginal breech delivery. It was carried out in two tertiary maternity hospitals delivering more than 3500 and 5000 babies per year with elective use of spatulas in this special indication, due to their supposed safety on the foetal head.

According to the French HAS guidelines in 2012 [4] on planned caesarean sections, criteria for vaginal breech delivery agreement are based on the favourable confrontation between pelvimetry and foetal biometry, the absence of hyperextended neck on ultrasound. In our study, despite different medical protocols in our centres (about the limits of maternal pelvic dimensions), vaginal birth agreements respected these recommendations (89.9%, $n = 53$). Foetal measurements were not standardized in our two maternity hospitals, which explains the high rate of absence of ultrasound data [76.3% ($n = 45$)].

National guidelines for vaginal breech delivery (CNGOF [8–9] SOGC [10], RCOG [3], and ACOG [11]) describe the possibility of performing manoeuvres (Mauriceau's and Bracht's, supra-pubic fist) to ensure the foetal head flexion and thus its engagement during EAH. Assisted delivery (forceps or spatulas) is also possible in case of failure of these manoeuvres. Forceps is a birth aid instrument historically described in 1924 by Edmund Piper [18] during EAH. Focusing on obstetrical mechanics, using forceps in this indication seems inappropriate because of the strength gripping (the blades are articulated), the support on the foetal occiput (which is an area of fragility) and the chin-occipital traction axis used. There are a few quotes of forceps in scientific literature for EAH in vaginal breech delivery [19–22], most of them older, without any evaluation of maternal and foetal morbidity. After failure of these above manoeuvres, emergency caesarean sections after reintroduction of the foetal mobile (on head deflexion) had also been described [23]. Finally, Zavanelli's manoeuvre or symphysiotomy had also been cited in the literature [24].

Many studies have demonstrated the low neonatal morbidity associated with spatulas-assisted deliveries [12–14]. Indeed, spatulas are often considered as an instrument protecting foetal head due to its mechanistic based on propulsion rather than traction and without gripping effect. Hence, there are commonly used in premature deliveries.

This technique requires two operators. An assistant holds the foetal body, extremities and umbilical cord with two hands and raises these structures slightly to create space to inserting the spatulas. The operator places the two blades on either side of the foetal head. The two blades are not articulated, so there is no gripping effect. Spatulas supports are the foetal malar bones (protection of the skull) and the maternal pelvic walls (Fig. 1). The traction in the umbilical–coccygeal axis will allow a flexion of the head and thus a reduction of the largest diameter of the presentation.

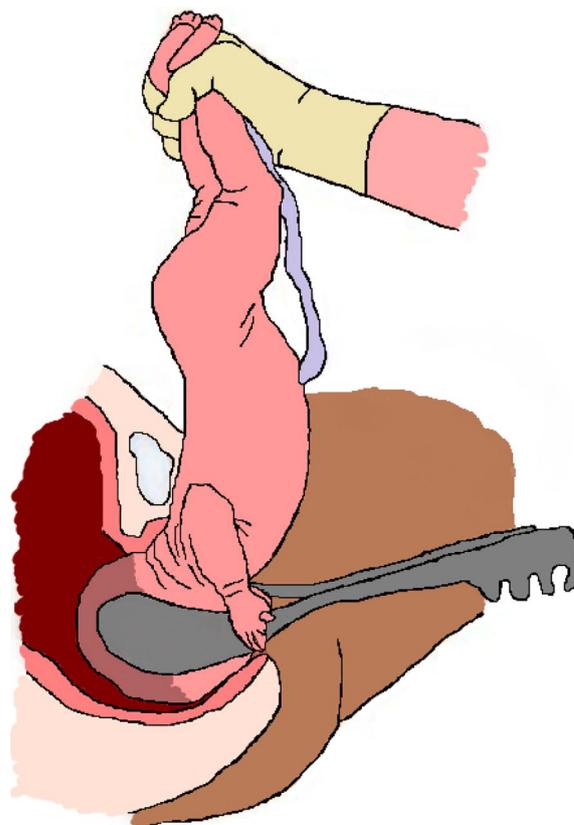


Fig. 1 Spatulas during entrapment of after-coming head

Our data, although retrospective, tend to support their safety as well in the setting of EAH. Indeed, no neonatal lesion attributable to instrumental extraction nor severe "Neonatal birth injuries" [15] were observed. However, there is no comparison to a reference control group in the literature. Moreover, our study is descriptive and we were not able to carry out a comparative analysis, particularly on the use of forceps versus spatulas in this situation.

The supra-cervical EAH rate appears to be low in our study due to missing data. The rate of nitrate use or cervical incision rate does not allow us to conclude on the supra-cervical retention rate. It would seem appropriate to consider this infrequent type of EAH as potentially more serious, with a worse foetal prognosis, although this is not described in the literature and causes significant mechanical problems with a quasi-impossible instrumental assistance.

There are no data available to predict EAH prevalence during a vaginal breech delivery > 37 WG. However, neonatal mortality due to this event ranges from 1.7 to 13.3% in preterm populations (26–29 WG) [6–7]. In our study, no case of neonatal injury due to spatulas or "Neonatal birth injuries" was found in this category. However, neonatal morbidity according to other outcomes (5- and 10-min APGAR score, NICU transfer) was higher in this population. This

is related to prematurity itself more than to the situation of EAH. It is important to note that two of these children died on D28 due to prematurity-related complications. The study of this subgroup highlights the possibility of using spatulas also in cases of preterms or low birth weight.

In our study, no vaginal failure has been reported. This cohort study confirms this clinical impression and emphasizes the interest of spatulas in these high-risk obstetrical situations. Including centres that recommend caesarean section delivery for breech presentation, healthcare professionals need to maintain competence in management of EAH, because they may always encounter it unexpectedly, particularly when women present in advanced labour with the breech already delivering or even during caesarean section.

Conclusion

In compliance with obstetrical mechanics, spatulas are an efficient instrument to manage EAH in vaginal breech delivery with maternal and foetal safety. Therefore, mastering this technique seems essential and indicated for any obstetrician without increasing the neonatal risk during EAH in vaginal breech delivery.

Author contributions YO and PG had the idea for the original cohort study and, with FV, OP, DR carried out the design of the study. YO and NM collected the data, YO, FV and PG analysed/interpreted the data and produced the first draft. PG and YO carried out statistical analysis. All authors read, revised and approved the submitted version of the manuscript.

Funding None.

Compliance with ethical standards

Conflict of interest The author declares that they have no conflict of interest.

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. This study received agreement from the national Research Ethics Committee on Gynaecology and Obstetrics (CEROG 2018-OBS-1024).

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

References

- Hickok DE, Gordon DC, Milberg JA, Williams MA, Daling JR (1992) The frequency of breech presentation by gestational age at birth: a large population-based study. *Am J Obstet Gynecol* 166(3):851–852
- Hannah ME, Hannah WJ, Hewson SA, Hodnett ED, Saigal S, Willan AR (2000) Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomised multicentre trial. Term Breech Trial Collaborative Group. *Lancet* 356(9239):1375–1383
- Management of Breech Presentation (2017) Green-top Guideline No. 20b. *BJOG* 124(7):e151–e177. <https://doi.org/10.1111/1471-0528.14465>. Epub 2017 Mar 16. Erratum in: *BJOG*. 2017 Sep;124(10):e279
- Haute Autorité de Santé (HAS) (2012) Indication de la césarienne programmée. https://www.has-sante.fr/portail/jcms/c_1070417/fr/indications-de-la-cesarienne-programmee-a-terme
- Broche D-E, Maillet R, Curie V, Ramanah R, Schaal J-P, Riethmuller D (2008) Accouchement en présentation du siège. *EMC Obstétrique* Janv 3(2):1–19
- Kayem G, Combaud V, Lorthe E, Haddad B, Descamps P, Marpeau L, Goffinet F, Sentilhes L (2015) Mortality and morbidity in early preterm breech singletons: impact of a policy of planned vaginal delivery. *Eur J Obstet Gynecol Reprod Biol* 192:61–65
- Kayem G, Baumann R, Goffinet F, El Abiad S, Ville Y, Cabrol D, Haddad B (2008) Early preterm breech delivery: is a policy of planned vaginal delivery associated with increased risk of neonatal death? *Am J Obstet Gynecol* 198(3): 289.e1–289.e6
- Vayssière C, Beucher G, Dupuis O, Feraud O, Simon-Toulza C, Sentilhes L, Meunier E, Parant O, Schmitz T, Riethmuller D, Baud O, Galley-Raulin F, Diemunsch P, Pierre F, Schaal JP, Fournié A, Oury JF, French College of Gynaecologists and Obstetricians (2011) Instrumental delivery: clinical practice guidelines from the French College of Gynaecologists and Obstetricians. *Eur J Obstet Gynecol Reprod Biol* 159(1):43–48
- Simon-Toulza C, Parant O (2008) Spatulas: description, obstetrical mechanics, indications and contra-indications. *J Gynecol Obstet Biol Reprod (Paris)* 37(Suppl 8):S222–S230
- Kotaska A, Menticoglou S, Gagnon R, Farine D, Basso M, Bos H, Delisle MF, Grabowska K, Hudon L, Mundle W, Murphy-Kaulbeck L, Ouellet A, Pressey T, Roggensack A, Society of Obstetricians and Gynaecologists of Canada (2009) SOGC clinical practice guideline: vaginal delivery of breech presentation. *Int J Gynaecol Obstet* 107(2):169–176
- CACOG Committee Opinion No. 745 (2018) Mode of term singleton breech delivery. *Obstet Gynecol* 132(2):e60–e63
- Khallouk B, Mottet N, Goujon E, Ramanah R, Riethmuller D (2016) Evaluation of Teissier's spatulas during preterm fetal vaginal delivery. *J Gynecol Obstet Biol Reprod (Paris)* 45(6):592–598
- Maisonnette-Escot Y, Riethmuller D, Chevreière S, Becher P, Floret N, Zurlinden B, Teissier G, Maillet R, Schaal JP (2005) Thierry's spatula instrumental extraction: a study of foetal-maternal morbidity. *Gynecol Obstet Fertil* 33(4):208–212
- Tsoyem Mouafou AC, Morel O, Lamy C, Monceau E, Judlin P, Muhlstein J (2014) Materno-fetal morbidity of instrumental deliveries: forceps versus spatulas. About a series of 77 cases. *Gynecol Obstet Fertil* 42(3):144–148
- Akangire G, Carter B (2016) Birth injuries in neonates. *Pediatr Rev* 37(11):451–462
- Harvey MA, Pierce M, Alter JE, Chou Q, Diamond P, Epp A, Geoffrion R, Harvey MA, Larochelle A, Maslow K, Neustaedter G, Pascali D, Pierce M, Schulz J, Wilkie D, Sultan A, Thakar R, Society of Obstetricians and Gynaecologists of Canada (2015) Obstetrical anal sphincter injuries (OASIS): prevention, recognition, and repair. *J Obstet Gynaecol Can* 37(12):1131–1148
- Robertson PA, Foran CM, Croughan-Minihane MS, Kilpatrick SJ (1995) Head entrapment and neonatal outcome by mode of delivery in breech deliveries from twenty-four to twenty-seven weeks of gestation. *Am J Obstet Gynecol* 173(4):1171–1176
- Ghosh MK (2005) Breech presentation: evolution of management. *J Reprod Med* 50(2):108–116

19. Lork EC (1964) Forceps for the after-coming head in control of perinatal mortality. *Z Arztl Fortbild (Jena)* 58:1032
20. Antos J, Rezacova Z (1961) Forceps delivery in breech presentation in the past 20 years in the Gynecological Clinic in Hradec Kralove. *Sb Ved Pr Lek Fak Karlovy Unive Hradci Kralove* 4:657–660
21. Mahon R (1952) Betous forceps for breech presentation. *Rev Fr Gynecol Obstet* 47(11–12):384–386
22. May DP (1974) Letter: forceps for breech delivery. *Lancet* 1(7850):218
23. Iffy L, Apuzzio JJ, Cohen-Addad N, Zwolska-Demczuk B, Francis-Lane M, Olenczak J (1986) Abdominal rescue after entrapment of the aftercoming head. *Am J Obstet Gynecol* 154(3):623–634
24. Spencer JA (1987) Symphysiotomy for vaginal breech delivery: two case reports. *Br J Obstet Gynaecol* 94(7):716–718

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