

Case report

Frontal obstetrical head trauma in a newborn: Clinical case report and literature review

Abstract

Obstetrical cranial trauma can be responsible for extra cranial haematomas, cranial fractures and intracranial haematomas. It is diagnosed early, either after a normal vaginal or instrumental delivery and rarely during Caesarean deliveries. It results from the association between the force of uterine contractions, manual uterine trans-abdominal compression, presentation and abrupt passage into the bony pelvis. In most cases it resolves spontaneously. Neurosurgical treatment is rare. We present the clinical case of a 1-day-old girl, presenting with a significant depression of the left frontal bone with a very large central fracture, who was operated on, with a good surgical outcome. Head trauma can occur at birth, and can be described in normal childbirth. Resorption is generally spontaneous, but rare cases are surgical.

Key words: Obstetrical head trauma, New born

Introduction

During birth the infant's head is exposed to contractions of the uterine muscles and to intra-abdominal pressure, and must cross a bony pelvic, These mechanical influences are the cause of transient physiological or enduring pathological changes to the skull. The skull deformities different according to the size of the pelvic opening (1); thus the modelling of the head allows a non-traumatic passage in the bony pelvis, however, in spite of this modelling of the head, the instrumental childbirth, the speed of descent of the baby in the pelvis, the abnormal cephalic performances (cephalic facial, seat) can cause cranial traumatism during childbirth, these traumatism can interest either: extracranial structures, the skull or intracranial structures (2). The mechanisms that can cause birth trauma are mechanical (compressive and traction forces) or hypoxic ischemic. The most important risk factors for birth trauma include: instrument delivery (e.g. midfaces or vacuum extraction), primiparity, cephalopelvic disproportion, birth weight more than 4 kg or less than 2.5 kg, oligohydramnios, prolonged delivery, prolonged or unusually rapid labor, maternal pelvic anomalies, fetal malformations, abnormal presentations such as breech presentation, and prematurity(1);we present a clinical case of frontal embarrural fracture after vaginal delivery in term pregnancy with normal birth weight.

Case presentation

BB X, 1 day old, was seen in consultation for a depression of the frontal cranial vault observed at birth without any notion of a fall or trauma described. She was the 3rd of 3 siblings born vaginally in cephalic presentation, from a full term pregnancy of 39 weeks, well monitored with obstetric ultrasound (fig1) showing no cranial anomaly. The mother declared that labour and expulsion of the baby had lasted approximately 5 hours, that manual abdominal pressure had been applied by the midwife at the last minute of expulsion of the baby, Apgar 10/10, birth weight 3250g, born, no notion of the colour of the monial fluid or of the position at delivery.

On physical examination, the child was conscious and tonic, with a left frontal depression and archaic reflexes. A cerebral CT scan (fig2) with a bone window showed a depression of the left frontal bone with a continuity gap in its centre, suggesting an obstetric traumatic pot-bearing fracture.

The child underwent surgery on Day 7 to remove the embrasure, with an intraoperative incident marked by a wound in the frontal sagittal sinus, which was corrected, followed by a good post-operative course and a small healing defect (fig3). The follow-up CT scan showed good correction of the embrasure fracture (fig4).

The notion of obstetrical cranial trauma goes back to antiquity. In fact, Hippocrates (460-377 B.C.), Shakespeare (1564-1616), Little (1819-1894) and Gowers (1888) described that certain cerebral pathologies of infancy, such as epilepsy, infantile convulsions, cerebral palsy and diplegia, were closely related to dystocia(1). Salomonsen (1928) emphasized that even a normal, delivery represents a trauma to the infant: 'The traumatic effects of labor upon the brain give rise to demonstrable lesions in such a large proportion of cases that it attains the character of a physical law (1,3), It was not until the beginning of the 19th century that attention was drawn to the fact that there might be a connection between head injuries occurring during delivery and pathological conditions of infancy.

Discussion

Birth injury is defined as a condition that affects neonate's structure and function caused by an adverse event at birth. It is often used interchangeably with 'birth trauma'.(3), this birth trauma can involve several organs: the clavicle, humerus, skull, femur and ribs. The incidence of birth injury is known to be about 2% for, normal vaginal delivery and 1% for cesarean delivery. Since the head is the first part to enter the birth canal during delivery, it is one of the most vulnerable area to birth injury (2,4, 5). In the work of Andreas Rehm et al, it is the third most common obstetric trauma after that of the clavicle and humerus(6).

The mechanism of fractures: When the pregnancy reaches term, the foetus passes into the maternal pelvis in vertex presentation, the head is flexed with the chin resting on the chest, allowing for the smallest diameter under the occipito-bregma. As the foetal head descends into

the pelvic cavity, the shape of the head changes to facilitate the relationship between the size of the foetal head and the diameters of the pelvis. This shaping is achieved by overlapping the sutures, giving a trapezoidal shape that allows passage through the birth canal. No force is exerted on the sagittal sinus or cortical bridging veins, so in a normal delivery, the force of uterine contraction exerts pressure on the foetus as it passes through the bony pelvis without any trauma. Thus Skull of the newborn can be moulded during delivery and is resistant to fracture because it is separated into several bones (2, 7). However, although it is rare, skull fracture could occur at birth if there are difficulties during delivery. The overall fracture incidence was 2-3.7 per 100000 live births (8,9). Some insist on that this data is underestimated because of undetected clinically silent simple linear fractures (2).

Difficulties leading to trauma may arise:

- In poor cephalic presentations occur when there is deviation of the foetal head, resulting in facial presentations (frontal, chin). The presentation is determined by the contractile force of the uterus, and this can lead to craniofacial trauma during delivery.
- In the powerful force of close contraction of the uterus, the effect of excessive moulding can cause the parietal bone to impact on the pelvis, resulting in trauma to this bone by sinking, the degree of sinking depending on the force of contraction of the uterine muscles. This depression may be accompanied by a fracture. The presence of the left frontal depression in our patient is due to poor presentation. Should deformation occur abruptly and be severe, intracranial bleeding may result from tearing of the falx cerebri and the tentorium cerebelli, or tearing of the bridging veins draining the cortical surface into the venous sinus (Figure 2). An excessive moulding effect may cause scalloping of the parietal bones, contributing to the traumatic mechanism to the fetal head. Infants with dolichocephaly suffer an especially severe configuration. In such cases, the changes in sutures and fontanelles are more distinct. It has been suggested that during breech delivery, occipitalosteodiasis, a separation of the squamous and lateral portions of the developing occipital bone, is caused by pressure from the pubic symphysis against the suboccipital region; however, this may also occur during forcible engagement of the head (2,8,10, 4,11).
- In cephalopelvic disproportion, the power of uterine contraction, as well as uterine Trans abdominal manual pressure manoeuvres can lead to rapid expulsion of the foetus with head trauma in cephalic presentation(1,3)

in short, the delivery process is a combination of compression, contraction and traction forces, when the size of the foetus, its presentation and neurological immaturity complicate the event. cases, it may take several weeks(19). In those cases, calcification may also occur from collected blood. If disfigurement is severe, surgical treatment could be considered (2, 20 ,21).

Rarely, cephalhematoma becomes infected even without laceration or abrasion (2,22) the major causative organism is Escherichia coli, It could be accompanied by osteomyelitis, meningitis, or

sepsis. When infected cephalhematoma is suspected, diagnostic aspiration should be performed (2,23).

The Fracture SKULL traitement: the Linear fractures are of no clinical importance and therapy is indicated unless any of the above-mentioned associated lesions are present. Follow up is necessary when the skull fracture present with diastasis between its edges.

We must be cognizant of growing skull fractures. Even in the cases of depressed skull fracture, most of them can be resolved spontaneously; Spontaneous elevation has usually corrected the depressed bone by the three-month follow-up. Usually, there is no need for surgery or any other form of therapy. There have been reports of elevation by vacuum extractor, breast pump, and digital pressure. Surgical reduction could be considered depending on its severity. When neurosurgical expertise is available and digital compression or breast pumping has been unsuccessful, operative elevation should be undertaken (1,2). Some authors recommend making a 1 cm incision to lift the embarrment; in the case of our patient, the depression was significant, the 1 cm incision did not allow the embarrment to be lifted, we had to enlarge the frontal incision to lift the embarrment fracture. Intracranial hemorrhages treatment: with the obstetrical epidural hemorrhage and subdural hemorrhage, the less invasive treatment is the most advisable, in the less abundant bleeding without mass effect, the monitoring and compliance is the therapeutic choice, the recourse to surgical treatment is indicated only in the hematomas exerting a mass effect on the cerebral structures, with an abnormal clinical examination, in the subarachnoid hemorrhage, the Complications of primary subarachnoid hemorrhage in the newborn are difficult to identify, except for hydrocephalus. Adhesions around the cisterna magna and the fourth ventricle may result in an obstruction to CSF circulation; the occurrence of hydrocephalus requires surgical treatment, the same is true for intraventricular hemorrhages where the only occurrence of hydrocephalus requires neurosurgical treatment. As for intracerebellar hemorrhage, cerebral contusion, monitoring and sequelae occurred such as epilepsy, delayed psychomotor development are taken care of medically or in rehabilitation, the surgical indication arises only in the very rare cases of occurrence of associated hydrocephalus.

Conclusion:

Obstetric head trauma, or birth trauma are diagnosed very early from birth, they are described in vaginal deliveries, with or without instruments, very rare cases have been described in cesarean deliveries they are rare and generally have a good prognosis. The injuries are mostly minor and

resolve spontaneously, surgical treatment is exceptional and reserved for symptomatic cases and more severe cases.



Fig 1 A et B : échographie prénatale

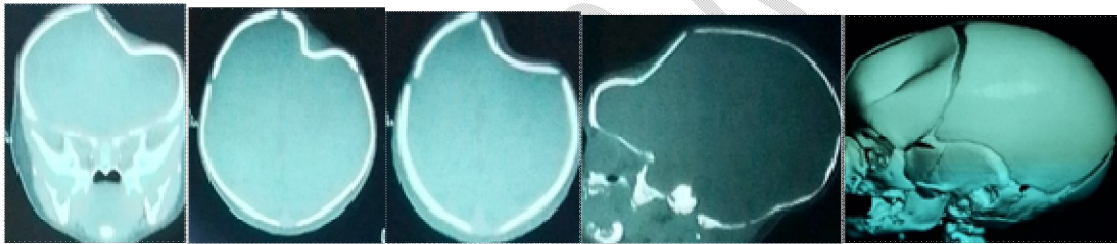


FIG 2 : Scanner pré opératoire en fenêtre osseuse A coupe coronale ,B et C coupe axiale, D coupe sagittale , E recontruiction3D



FIG 3 : cicatrice post opératoire



Fig4 : scanner de contrôle post opératoire
: A coupe coronale, B coupe axiale, C reconstitution 3

References

- 1) Nicollas Nunes Rabelo, Hamilton Matushita, Daniel Dante Cardeal Nunes Rabelo, Hamilton Matushita, Daniel Dante Cardeal , Traumatic brain lesions in newborns. *ArqNeuropsiquiatr* 2017;75(3):180-188
- 2) Sangjoon Chong, Head Injury during Childbirth, Review Article, *J Korean Neurosurg Soc* 65 (3) : 342-347, 2022, <https://doi.org/10.3340/jkns.2022.0045> pISSN 2005-3711 eISSN 1598-7876
- 3) Moloy HC. Studies on head molding during labor. *Amer J Obstet Gynec.* 1942;44(5):762-82. [https://doi.org/10.1016/S0002-9378\(15\)30603-7](https://doi.org/10.1016/S0002-9378(15)30603-7)
- 4) Davis DJ : Neonatal subgaleal hemorrhage: diagnosis and management. *CMAJ* 164 : 1452-1453, 2001
- 5) Alexander JM, Leveno KJ, Hauth J, Landon MB, Thom E, Spong CY, et al. : Fetal injury associated with cesarean delivery. *ObstetGynecol* 90 :885-890, 2006
- 6) Andreas Rehm , Prakash Promod , Amanda Ogilvy-Stuart, Original Articles Neonatal birth fractures: a retrospective tertiary maternity hospital review, *J ObstetGynaecol.*, mai2020 ; 40(4):485-490. DOI : 10.1080/01443615.2019.1631770. Epub 3 septembre 2019
- 7) Merhar SL, Kline-Fath BM, Nathan AT, Melton KR, Bierbrauer KS : Identification and management of neonatal skull fractures. *J Perinatol* 36 :640-642, 2016.
- 8) Högberg U, Fellman V, Thiblin I, Karlsson R, Wester K : Difficult birth is the main contributor to birth-related fracture and accidents to other neonatal fractures. *Acta Paediatr* 109 : 2040-2048, 2020
- 9) Dupuis O, Silveira R, Dupont C, Mottolese C, Kahn P, Dittmar A, et al. : Comparison of "instrument-associated" and "spontaneous" obstetric depressed skull fractures in a cohort of 68 neonates. *Am J ObstetGynecol* 192 : 165-170, 2005
- 10) Cieplinski JAM, Bhutani VK : Lactational and neonatal morbidities associated with operative vaginal deliveries. 1191. *Pediatric Research* 39 :201, 1996
- 11) Demissie K, Rhoads GG, Smulian JC, Balasubramanian BA, Gandhi K, Joseph KS, et al. : Operative vaginal delivery and neonatal and infant adverse outcomes: population based retrospective analysis. *BMJ* 329 :24-29, 2004
- 12) Zalatimo O, Ranasinghe M, Dias M, Iantosca M. Treatment of depressed skull fractures in neonates using percutaneous microscrew elevation. *J NeurosurgPediatr.* 2012;9(6):676-9. <https://doi.org/10.3171/2012.2.PEDS11304>
- 13) Weiner EJ, McIntosh MS, Joseph MM, Maraga N, Davis PG. Neonatal scalp abscess: is it a benign disease? *J Emerg Med.* 2011;40(5):e97-101. <https://doi.org/10.1016/j.jemermed.2009.08.019>

- 14) Nechama Linder,IdoLinder,ElenaFridman,FrankKouadio,DanielLubin,PaulMerlob Birth trauma – risk factors and short-term neonatal outcome Research article The Journal of Maternal-Fetal and Neonatal Medicine Issue 15,Volume 26, 2013 –
- 15) Martin A, Paddock M, Johns CS, Smith J, Raghavan A, Connolly DJA, et al. : Avoiding skull radiographs in infants with suspected inflicted injury who also undergo head CT: “a no-brainer?” EurRadiol30 : 1480- 1487, 2020
- 16) Mr. Zerah, obstetric head trauma, Extract from the Neurosurgery Campus
<http://campus.neurochirurgie.fr/spip.php?article421>, January 2009.
- 17) Orman G, Wagner MW, Seeburg D, Zamora CA, Oshmyansky A, Tekes A, et al. : Pediatric skull fracture diagnosis: should 3D CT reconstructions be added as routine imaging? J NeurosurgPediatr16 : 426-431, 2015.
- 18) Amar AP, Aryan HE, Meltzer HS, Levy ML : Neonatal subgalealhematoma causing brain compression: report of two cases and review of the literature. Neurosurgery 4 : 1470-1474, 2003
- 19) Mangurten H, Puppala B : Birth injuries. Fanaroff and Martin’s Neonatal Perinatal Medicine- Diseases of the Fetus and Newborn, ed 8. Philadelphia: Mosby Elsevier, 2006, pp.529-559.
- 20) Ulma RM, Sacks G, Rodoni BM, Duncan A, Buchman AT, Buchman BC,et al. : Management of calcified cephalohematoma of infancy: the University of Michigan 25-year experience. PlastReconstr Surg 148 :409-417, 2021
- 21) Wong CH, Foo CL, Seow WT : Calcified cephalohematoma: classification,indications for surgery and techniques. J Craniofac Surg 17 :970-979, 2006.
- 22) Chang HY, Chiu NC, Huang FY, Kao HA, Hsu CH, Hung HY : Infected cephalohematoma of newborns: experience in a medical center in Taiwan. Pediatr Int 47 : 274-277, 2005
- 23) LeBlanc CM, Allen UD, VentureyraE : Cephalhematomas revisited. When should a diagnostic tap be performed? Clin Pediatr (Phila) 34 : 86-89, 1995