Original Article

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Unusual obstetric trauma in newborn

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KEYWORDS

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ABSTRACT

Background: Birth injuries during delivery are rare but can be the most common cause of morbidity and mortality. All parts of the body can be damaged. The aim of this study is to determine the impact of these uncommon injuries on the newborn. This is a retrospective chart review of 11 newborn babies who had concurrent birth trauma. Pertinent data on the cause of injury treatment and the outcome were recorded.

Methods: It is a retrospective chart review of newborns who sustained a birth trauma during delivery. These patients presented to the Department of Pediatric Surgery, SETIF, Algeria from 2010 to 2020.

Results: A total of 11 cases with birth trauma occurred during delivery were managed during the study tenure. Of these 11, 9 were males and 2 females. Two cases sustained scalp laceration including one extensive laceration exposing the brain tissue with uncontrollable hemorrhage. One newborn sustained facial trauma secondary to the forceps delivery. One newborn who needed resuscitation and ventilation at birth developed bilateral pneumothorax secondary to the barotrauma. One patient sustained a femur fracture whereas another had a humerus fracture along with brachial plexus injury during delivery. Three cases had umbilical cord injury including two cases of clamped hernia of the umbilical cord resulting in neonatal intestinal obstruction. Two cases had scrotal trauma including one with testicular evisceration. Two cases were expired in this cohort.

Conclusion: We have presented a diversity of birth trauma in newborns and their management. Proper antenatal follow-up and better planning for the delivery can avoid such injuries in newborns which often require surgical interventions for the management and at times can lead to mortality as well.

INTRODUCTION

"A birth injury is described as an impairment of a newborn's body function or structure secondary to an adverse, often unexpected event during labor, delivery, or both."[1] Injuries at birth during delivery are rare and account today for 1% of all births in the world.[3] However, it can be the most common cause of morbidity and mortality. Most publications concerning neonatal injuries are mostly on the baby's head, neck, and shoulders injury. Although any other part of the body can be damaged, these areas of the body are more likely to be injured. The birth trauma can range from minor and self-limited problems to severe injuries that may result in significant neonatal morbidity or mortality.[2]

Various types of trauma are encountered, ranging from a minor laceration or ecchymosis to serious and potentially fatal injuries. Sometimes they lead to permanent disabilities or even loss of precious life. Here, we describe cases of newborns who sustained injuries at the time of delivery and require emergency care at our department.

METHODS

This is a retrospective chart review of 11 newborn babies who had concurrent birth trauma. Pertinent data on the cause of injury, treatment, and the outcome were recorded. Period of review covered 11 years between 2010 to 2020 at the Department of Pediatric Surgery, University Hospital Center of SETIF, Algeria. Criteria for patient inclusion were

iatrogenic injury during delivery, whatever the method, with unusual trauma injuries caused in newborns.

RESULTS

A total of 11 cases with birth trauma occurred during delivery were managed during the study tenure. Of these 11, 9 were males and 2 females. Table 1 summarizes the study population.

Figure 1: A) Showing ruptured cephalhematoma in the first patient. B) Extensive scalp laceration with visible brain tissue and massive hemorrhage in the second patient. C) Ecchymosis of the cheek in the third patient.

Head and neck trauma: Two cases sustained scalp laceration including one extensive laceration exposing the brain tissue with uncontrollable hemorrhage. Both newborns were male and delivered at term through forceps assisted vaginal delivery. Both the newborns had cephalic presentations. The first patient who was born at 40 weeks of gestation developed cephalhematoma during delivery and it was ruptured during maneuvering with forceps during delivery (Fig.1A). As the bleeding was not significant and there was a minor scalp breach therefore, this baby was settled with only observation and dressings.

In the second case, the patient had hydrocephalus, which was not identified antenatally. Following a dystocia delivery with instrument extractions, a severe scalp laceration extending up to the cranial cavity occurred. Examination in the delivery room revealed skin flap was avulsed posteriorly to the occiput exposing brain tissue and causing massive uncontrollable bleeding (Fig.1B). This newborn died immediately despite resuscitation measures.

Another male newborn, weighing 4 kg, born at term via forceps assisted vaginal delivery, sustained facial trauma. The newborn with cephalic presentation had labored delivery with forceps without any apparent incident, but after a few hours, bruising and facial hematoma became evident without any facial palsy (Fig.1C).

Barotrauma: A term male newborn, weighing 3.3kg, was born by cesarean section (C-section) delivery. Apgar score was 3/10 at 1 min which improved to 8/10 at 5 min after full resuscitation including lung inflation and ventilation. About 5 hours later, the baby developed respiratory distress and was transferred to NICU. An orogastric tube was passed and a chest radiograph requested which showed bilateral pneumothoraces but more significantly on the right side.

A barotrauma related injury was suspected and tube thoracostomy was done on the right hemithorax. We noted air bubbles in the underwater seal bottle, which quickly relieved the respiratory distress of the newborn. No intervention was required on the left side as subsequent chest x-ray showed resolution of pneumothoraces on both sides. CT scan chest performed ruled out any lung pathology contributing to the development of pneumothorax. The baby was discharged on the 10th day of life in good condition.

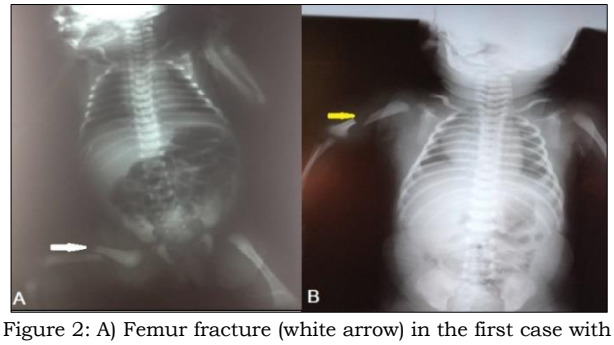

Figure 2: A) Femur fracture (white arrow) in the first case with skeleton injury. B) Humerus fracture (yellow arrow) in the second case of skeleton injury.

Skeleton trauma: A male term newborn weighing 3.8kg born by C-section due to failure of progression of the delivery. There were no reported difficulties in delivering the baby who cried immediately at birth with an Apgar score of 9. A few hours later, the baby developed irritability and inconsolable cry along with swelling of the right lower limb. Radiographic examination revealed a diaphyseal fracture of the right femur (Fig.2A). Immobilization of the limb with a bandage for 3 weeks was done and the baby discharged home. The follow-up showed a good outcome.

Another male newborn with the gestational age of 40 weeks, cephalic presentation, weighing 4 kg, was born by spontaneous vaginal delivery. This fetal macrosomia was complicated with brachial plexus injury, probably due to traction of the neck at birth. Radiographs of the shoulder and upper arm showed a fracture of the right humerus (Fig.2B). Both lesions were managed in our department immediately by immobilization by calf strip for 4 weeks, and the limb was held to the body by a scarf. One month later, rehabilitation was started. A good functional outcome was obtained after 6 months.

Umbilical cord trauma: Three cases had umbilical cord injury including two cases of clamped hernia

of the umbilical cord resulting in neonatal intestinal obstruction. The first case was a term female newborn, weighing 3.50 kg, and delivered through a normal vaginal route. We were called to the delivery room for trauma to the umbilical cord. On examination, a sectioned umbilical cord was found with bleeding through it. The rest of the examination was unremarkable, the mechanism of this trauma was not identified, but we supposed that the trauma was due to untimely traction on the umbilical cord. We proceeded to the ligature of the umbilical cord along with vitamin K administration. The newborn was discharged on the next day in good clinical condition.

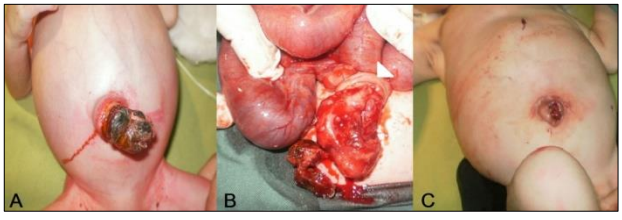

Figure 3: A) Crushed hernia of the umbilical cord. Clamp has been removed. B) Contents of the hernia of the umbilical cord. Arrowhead shows umbilical ring. C) Umbilicoplasty.

The second case was a term male newborn with a birth weight of 3.7 kg, born by normal vaginal delivery, presented with neonatal intestinal obstruction after 72 hours of the birth. Examination showed a clamped umbilical cord and meconium leakage through it (Fig.3A). The abdominal radiograph showed multiple air-fluid levels. A clamping hernia of the umbilical cord was suspected. The newborn underwent surgery immediately, under general anesthesia. Exploration of the abdomen was done by an incision on the periumbilical area. On the exploration, the ileum, cecum, and appendix were herniated into the umbilical cord, which was clamped (Fig.3B). The meconium was pouring out from the base of the appendix. A right hemicolectomy with end-to-end anastomosis of the ileum to the ascending colon was done. The rest of the abdominal viscera were fine; therefore, the abdominal wound was closed by umbilicoplasty (Fig.3C).

The third case was a female newborn (weight 2.7kg) with an antenatal diagnosis of umbilical cord cyst, born at term through C-section. The baby presented with signs of neonatal intestinal obstruction on the 4th day of life. Examination revealed a clamped hernia of the umbilical cord. X-ray abdomen showed multiple air-fluid levels (Fig.4A). Exploration through umbilicus found total sectioning of the ileal loop 4 cm from the cecum (Fig.4B,4C,4D). Right hemicolectomy with end-to-end anastomosis of the ileum to the ascending colon was done along with umbilicoplasty. Unfortunately, the newborn succumbed to the sepsis postoperatively.

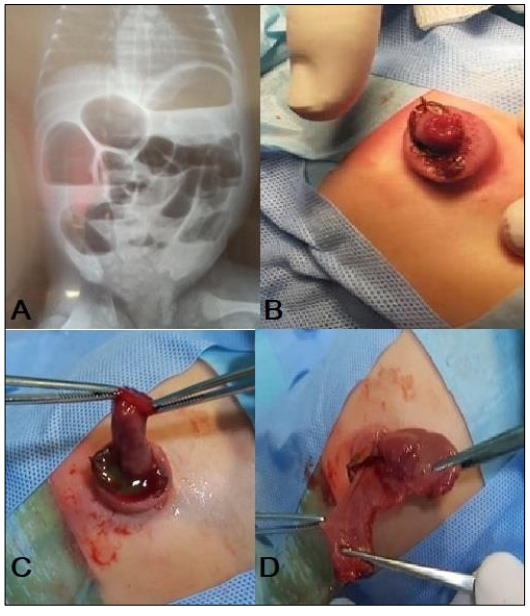

Figure 4: A) Abdominal x-ray showing multiple air-fluid levels. B, C) Transected terminal ileum herniating through the umbilical ring. D) Exploration identified it as terminal ileum.

Figure 5: Showing evisceration of the testis from the scrotal laceration.

Scrotal trauma: A term male newborn (3.4kg) with a breech presentation was born by vaginal delivery with an Apgar score of 9/10. During childbirth, an emergency episiotomy was required. During episiotomy, the scissors also cut the base of the scrotum which resulted in the evisceration of the testis and the spermatic cord (Fig.5). The injury was immediately recognized, and we were asked to repair this lesion. Exploration under general anesthesia revealed a wound in the right hemi-scrotum, approximately 2 cm in size, and exteriorization of the testicle with intact tunica vaginalis. On opening tunica, dark maroon to black testicle with a normal epididymis and spermatic cord was found. The testis and the spermatic cord were replaced in the scrotum. A second look scrotal exploration was done 48 hours later which revealed a viable testis. A Follow-up Doppler ultrasound was done at the age

of 6 months which showed a well-vascularized testis of adequate size.

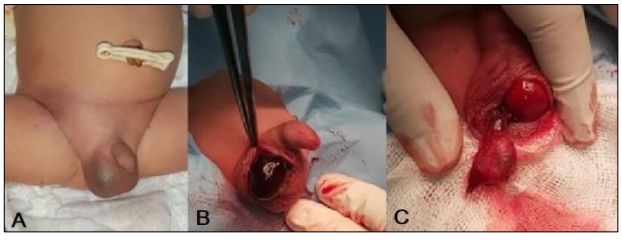

Figure 6: A) Showing inguinoscrotal swelling and ecchymosis. B) Operative picture showing hematocele and hematoma. C) After hematoma evacuation

Another male infant (3.5kg) of diabetic mother born at 39 weeks via spontaneous vaginal delivery. The baby needed resuscitation and ultimately labeled as neonatal asphyxia stage II. The next day the baby developed swelling and ecchymosis of the right inguinoscrotal region. Suspecting local trauma, the scrotum was explored which revealed right-sided hematocele with hematoma all along the spermatic cord to the deep inguinal orifice (Fig.6A,6B,6C). After the evacuation of hematoma, the testicle was found to be of good quality. The fixation of the testicle was done. Follow-up was done by Doppler ultrasound after 3 months, which was normal.

Table 1: Showing a summary of the study population

Patient	Diagnosed at	Sex	Birth trauma	Mechanism	Management	Outcome
1	Birth	Male	Small laceration of cephalhematoma	Forceps delivery	Conservative with dressings	Live
2	Birth	Male	Extensive laceration of hydrocephalic skull	Forceps delivery	Hemostasis attempted	Expired
3	Few hours of life	Male	Cheek ecchymosis and hematoma	Forceps delivery	Conservative	Live
4	5th hour of life	Male	Barotrauma to the lungs	Vigorous resuscitation	Tube thoracostomy	Live
5	Few hours of life	Male	Fracture of right femur	Unknown	Immobilization for 3 weeks	Live
6	Birth	Male	Right brachial plexus injury and right humerus fracture	Traction (fetal macrosomia)	Immobilization for 4 weeks, functional rehabilitation	Live
7	Birth	Female	Umbilical cord injury	Traction	Suture ligation	Live
8	3rd day of life	Male	Clamped terminal ileum, cecum, and transected appendix	Clamped hernia of umbilical cord	Exploration through a periumbilical incision and right limited hemicolectomy	Live
9	4th day of life	Female	Transection of the terminal ileum	Clamped hernia of umbilical cord	Trans-umbilical exploration and right limited hemicolectomy	Expired
10	Birth	Male	Laceration of right hemiscrotum with testicular evisceration	Cut by scissors during episiotomy	Replaced, re-exploration after 48 hours revealed viable testis	Live
11	1 day of life	Male	Right inguinoscrotal hematoma and right hematocele	Trauma during resuscitation	Scrotal exploration and evacuation of the hematoma	Live

DISCUSSION

"Birth trauma (BT) is defined as an injury sustained by the neonate during the process of labor and delivery as a result of mechanical factors".[4] Very few publications have covered this rare aspect of newborns and the majority of publications are limited to case reports or small case series. It is known that difficulty with delivery, birth weight of more than 4000 g, mechanical trauma, failure of progression of labor, or obstetric interventions may be responsible for the birth trauma. Birth trauma occurs in about 2.6-2.9% of live births in the United States, and approximately 3% of neonatal deaths are due to complications during the delivery.[5]

Concerning the head injuries, they can affect either intracranial or extracranial structures, which can be asymptomatic and some hours later may lead to significant morbidity.[1] Actually, we noted that these cranial birth injuries are decreased due to the declined use of potentially injurious instrumentation, such as forceps or vacuum delivery.[6] Newborns with obvious lesion require urgent intervention for decreasing morbidity and preventing mortality. Skull lacerations are the most frequent injuries for the head due to the cephalic presentation, instrumental delivery, or cesarean section.[7] These trauma skulls are ranging from the simple wound to the big lacerations of skin or collection of blood like cephalhematoma in which infection may occur in rare cases, but rupture was not reported.

Most injuries are a result of scalpel laceration during emergent cesarean delivery, which can be avoided by applying certain measures, such as

scoring the uterus with a scalpel followed by blunt entry into the uterine cavity using fingers, also paying attention to the uterine incision if the wall was not obvious. Shah et al. reported a 17cm clean laceration extending from 2cm poster lateral to the left auricle across the anterior scalp with avulsed skin posteriorly, following an emergent cesarean section, which was sutured in 2 planes.[8] One of our patients of scalp laceration associated with hydrocephalus is a unique case. The hydrocephalus, unfortunately, was not picked antenatally that led to iatrogenic extensive injury-not compatible with life.

About the facial injuries, the most are associated with forceps and dominated by facial nerve injury, nasal septal dislocation, and ocular injuries are very rare.[9] In our series, we, fortunately, have a localized cheek bruising and small hematoma which was managed without any further interventions.

In rare instances, air leaks can occur following preexisting malformations or due to several reasons such as intubation and mechanical ventilation. Spontaneous pneumothorax occurs in about 1–2% of all newborns.[7] Another entity of chest trauma in newborns can be neglected called obstetric phrenic nerve injury which is a relatively rare disorder that can cause life-threatening respiratory distress.[10]

In our current practice, we think that this kind of trauma may go unnoticed, such as the phrenic nerve injury, because we encounter eventration of the diaphragm, with which we cannot link the cause. Also, we must differentiate between iatrogenic phrenic nerve injury and occurring and obstetric phrenic nerve injury, which needs urgent decision to plicate a diaphragm because of severe respiratory distress. In our series, we did encounter a case of bilateral pneumothoraces secondary to barotrauma of vigorous resuscitation. The baby was managed with timely intervention.

The bony injury is rare; the clavicular fracture is the most common bony injury which has already been reported. However, there are few reports of long bone fractures that occurred during C-section delivery. In principle, a C-section is supposed to prevent long bone fractures, but this kind of complication cannot be inevitable. The first case of femur fracture in a newborn was described in 1922 by Ehrenfest.[11] A study from Israel showed that 12 femur fractures occurred in C-section versus 5 fractures during vaginal delivery.[12] Other fractures are occasionally reported such as fractures of the tibia, radius, and rarely the humerus.

Fracture of the humerus in a neonate born by C-section is extremely infrequent. John et al. reported a case of humerus fracture during the C-section, which is quite rare.[13] However, the fracture of the humerus can be concomitant with the brachial plexus injuries as encountered in one of our patients with skeleton injuries.[14,15] Dolivet et al. identified ten newborns with at least one fracture out of 7930 C-sections (1.26%); in two cases of these ten, there was a fracture of the humerus.[3] The femur fractures are usually caused by undue traction, poor delivery technique, small uterine incision, and inadequate relaxation especially in case of fetal macrosomia. Furthermore, these injuries can also happen when the breech is well engaged in the pelvis or when a footling has descended into the vagina.[16]

Another form of iatrogenic trauma unrelated to the risk of delivery methods is represented by umbilical cord injuries. Occasionally the newborns may have an abdominal wall defect such as omphalocele or a congenital hernia of the umbilical cord. Sometimes inexperienced midwives unrecognize these lesions and put a clamp on the base of the umbilical cord thus resulting in the crushing of contents of omphalocele or hernia of the umbilical cord. Such patients develop neonatal intestinal obstruction due to mechanical bowel obstruction, as experienced in two of our patients with umbilical cord trauma. For this reason, care must be taken in placing the umbilical cord clamp to avoid the herniated intestine. It is recommended to clamp the umbilical cord about 5cm away from the abdominal wall and a pediatric surgical opinion should be sought in case of an unusual umbilical cord thickening.[17] However, if iatrogenic bowel injury is present, the longitudinal incision is extended and the intestinal laceration is repaired along with layer by layer closure of the abdominal wound.[18] We employed a periumbilical and trans-umbilical approach in our patients with clamped umbilical cord hernia. The benefit of this approach is its closure as umbilicoplasty that can give a scar similar to the umbilicus.

The obstetrical genital trauma to the newborns is relatively infrequent and limited to mainly bruising. Breech delivery and the associated fetal manipulation have been associated with genital injuries.[19,20] In a French study of 45 children with testicular trauma, only one case was related to obstetric trauma.[21] An interesting but unfortunate case has been reported of a newborn who accidentally got castration at birth; this baby had a breech presentation that required episiotomy. During the procedure, two pink spherical structures fell out of the vagina into the obstetrician's hand. On examination, severe laceration of the scrotum of the newborn was found which was bleeding profusely, and it was soon realized that the two testicles were cut during the episiotomy. General surgeons were urgently called for, but nothing could

be done except to stop the bleeding and stitch back the scrotum. No legal action was taken by the parents.[22] This is similar to our case in which the midwife performed an episiotomy without realizing that the scrotum of the newborn was just hanging below; fortunately, the lesion was managed without a testicular loss.

Intra-abdominal birth injuries are rare and include rupture or subcapsular hemorrhage into the liver, spleen, or adrenal gland. Liver injury is the most common of these injuries. A greater birth weight occasionally has been a factor.[1,9,10,23] But in our series, we had no intra-abdominal trauma.

CONCLUSION

Birth trauma in developing countries is not negligible. In the current study, we have shown various types of uncommon types of birth trauma, identified risk factors, and assessed the effects of trauma on neonatal short-term morbidity. Instrumental delivery appears to be responsible for most cases of neonatal birth trauma, especially when performed by less experienced medical staff, as reflected by the higher rate of birth trauma on night hours and weekends because of less vigilance and fatigue. Previously we thought that cesarean delivery reduces the risk of injury to the newborn compared to vaginal delivery, but its risk cannot be eliminated. Additional research is necessary to identify measures to reduce birth trauma and subsequent neonatal morbidity. This report hopefully will encourage others to publish similar work from other countries and help to adopt better strategies for the prevention and management of these devastating injuries.

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Author Contributions: Author(s) declared to fulfil authorship criteria as devised by ICMJE and approved the final version.

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