Ministry of Education and Science of Ukraine
V. N. Karazin Kharkiv National University

Birth trauma. Etiology. Pathogenesis. Classification. Clinical manifestations. Diagnostics. Differential diagnostics. Treatment. Preventive measures. Prognosis

Methodical recommendations
for students of 5th course of medical faculty

Kharkiv – 2018

УДК 616-001.8-036.88
В 64

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Methodical recommendations is worked out on the basis of the Program of discipline of «Pediatrics and pediatrics infections» for students of higher medical educational institutions of III–IV levels of accreditation, authorized by Ministry of Health of Ukraine. This recommendation is intended for the 5th years English speaking medical students.

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CONTENTS

LIST OF ACRONYMS

EMG – Electromyography
EEG – Electroencephalography
IVH – Intraventricular hemorrhage
CNS – Central nervous system
CT – Computer tomography
MRI – Magnetic resonance imaging
SAH – Subarachnoid hemorrhage
SDH – Subdural hemorrhage

1. Theme. Birth trauma. Etiology. Pathogenesis. Classification. Clinical manifestations. Diagnostics. Differential diagnostics. Treatment. Preventive measures. Prognosis.

2. Lesson duration: 4 hours

3. Concrete tasks:

- to identify the different types of birth traumas;
- to diagnosis and provide emergency assistance in emergency conditions caused by birth trauma in newborn;
- to determine patient management with most common birth traumas;
- examination of a sick newborn to plan and interpret the results of analysis of patients with birth traumas;
- to make differential diagnosis and identify clinical diagnosis of most common birth traumas.

4. Basic knowledge:

1. Anatomy 2. Histology 3. Physiology 4. Pathological anatomy 5. Pathological physiology 6. Pediatrics 7. Pharmacology 8. Neonatology. To know the anatomical and physiological peculiarities of child organism. To understand the physiological basic of organs and systems function in pediatrics. To perform the special modes in patient care for newborns. To know the main groups and pediatrics doses of medications.

5. Contain.

ACTUALITY

Injuries to the infant that result from mechanical forces (ie, compression, traction) during the birth process are categorized as birth trauma. Significant birth injury accounts for fewer than 2 % of neonatal deaths and stillbirths in the United States; it still occurs occasionally and unavoidably, with an average of 6–8 injuries per 1000 live births. In general, larger infants are more susceptible to birth trauma. Higher rates are reported for infants who weigh more than 4500g. Most birth traumas are self-limiting and have a favorable outcome. Nearly one half are potentially avoidable with recognition and anticipation of obstetric risk factors. Infant outcome is the product of multiple factors.

CAUSES OF BIRTH TRAUMA

The birth process is a blend of compression, contractions, torques, and traction. When fetal size, presentation, or neurologic immaturity complicates this event, such intrapartum forces may lead to tissue damage, edema, hemorrhage, or fracture in the neonate. The use of obstetric instrumentation may further amplify the effects of such forces or may induce injury alone. Under certain conditions, cesarean delivery can be an acceptable alternative but does not guarantee an injury-free birth. Factors predisposing to injury include the following:

- Prima gravida
- Cephalopelvic disproportion, small maternal stature, maternal pelvic anomalies
- Prolonged or rapid labor
- Deep, transverse arrest of descent of presenting part of the fetus
- Oligohydramnios
- Abnormal presentation (breech)
- Use of midcavity forceps or vacuum extraction
- Versions and extractions
- Very low-birth-weight infant or extreme prematurity
- Fetal macrosomia
- Large fetal head
- Fetal anomalies

CLASSIFICATION OF BIRTH TRAUMA

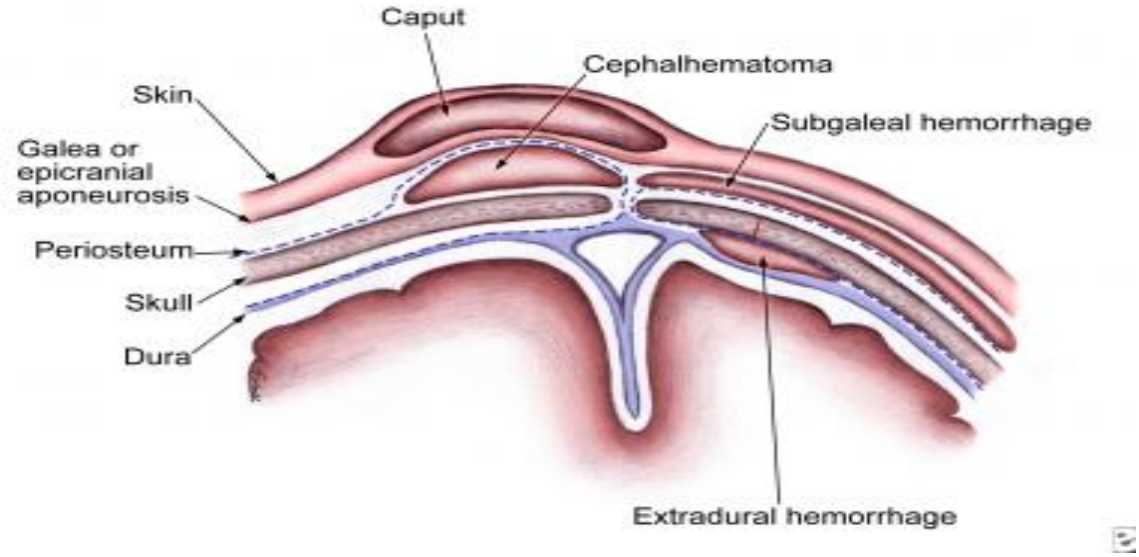
1. Soft tissue injuries:

- Abrasions
- Erythema petechia

- Ecchymosis
- Lacerations
- Subcutaneous fat necrosis

2. Skull injuries:

- Caput succedaneum
- Cephalhematoma
- Subgaleal hematoma



Location of injury in soft tissue planes
on the scalp and head

3. Musculoskeletal injuries:

- Clavicular fractures
- Fractures of long bones

4. Intra-abdominal injuries:

- Liver hematoma
- Splenic hematoma

5. Peripheral nerve injuries:

- Brachial Plexus Injury
- Phrenic Nerve Injury
- Laryngeal Nerve Injury
- Facial nerve injury
- Diaphragmatic paralysis

6. Intracranial Injuries

- Subdural Hemorrhage
- Epidural Hematoma
- Subarachnoid Hemorrhage
- Intraventricular Hemorrhage

7. Spinal Cord Injury

SOFT TISSUE INJURIES

Erythema. These injuries occur when there is dystocia (abnormal fetal size or position resulting in a difficult delivery) of the presenting part during labor. When forceps are applied, these injuries are linear at the site of forceps application. Any soft-tissue area affected by birth injury should be managed hygienically to minimize secondary infections. Most injuries are self-limited and usually do not require treatment unless complications occur.

Petechiae. Petechiae are observed when there is a tight nuchal cord, a precipitous delivery, or a breech presentation. Tightening of a nuchal cord causes a sudden increase in venous pressure that can lead to pinpoint capillary rupture in affected areas. With the release of such pressure, typically no further petechiae develop unless there is thrombocytopenia after delivery. A detailed family history and history of birth injury in any prior pregnancies is important. During physical examination, the clinician should pay specific attention to the location and distribution of the petechiae and any sites of active bleeding. Localized petechiae are usually associated with birth injuries, as is active bleeding. No specific treatment is necessary for traumatic petechiae; they usually disappear within the first few days after birth.

Ecchymosis and Bruising. Ecchymoses and bruising occur more with traumatic and breech deliveries. There is an increased risk of hyperbilirubinemia with these injuries. The incidence of ecchymoses and bruising is greater in preterm than term infants. Ecchymoses may reflect blood loss when extensive and should prompt a search for occult sites of internal bleeding. Jaundice occurs over the 3 to 5 days after birth as the extravasated blood is degraded and its byproducts cleared. Most ecchymoses due to birth injury resolve spontaneously within 1 week.

Abrasions and lacerations. Abrasions and lacerations sometimes may occur as scalpel cuts during cesarean delivery or during instrumental delivery (ie, vacuum, forceps). Infection remains a risk, but most of these lesions uneventfully heal. Lacerations usually occur from scalpel use during vaginal or cesarean deliveries. The most common sites are the scalp, the gluteal region, and the thigh. Following an operative delivery with superficial lacerations, adhesive tape across the laceration is usually sufficient to initiate the process of healing and control bleeding. Deep lacerations require suturing. Rarely, a skull fracture may underlie the laceration and can cause excessive bleeding, leading to an emergency. Management consists of careful cleaning, application of antibiotic ointment, and observation.

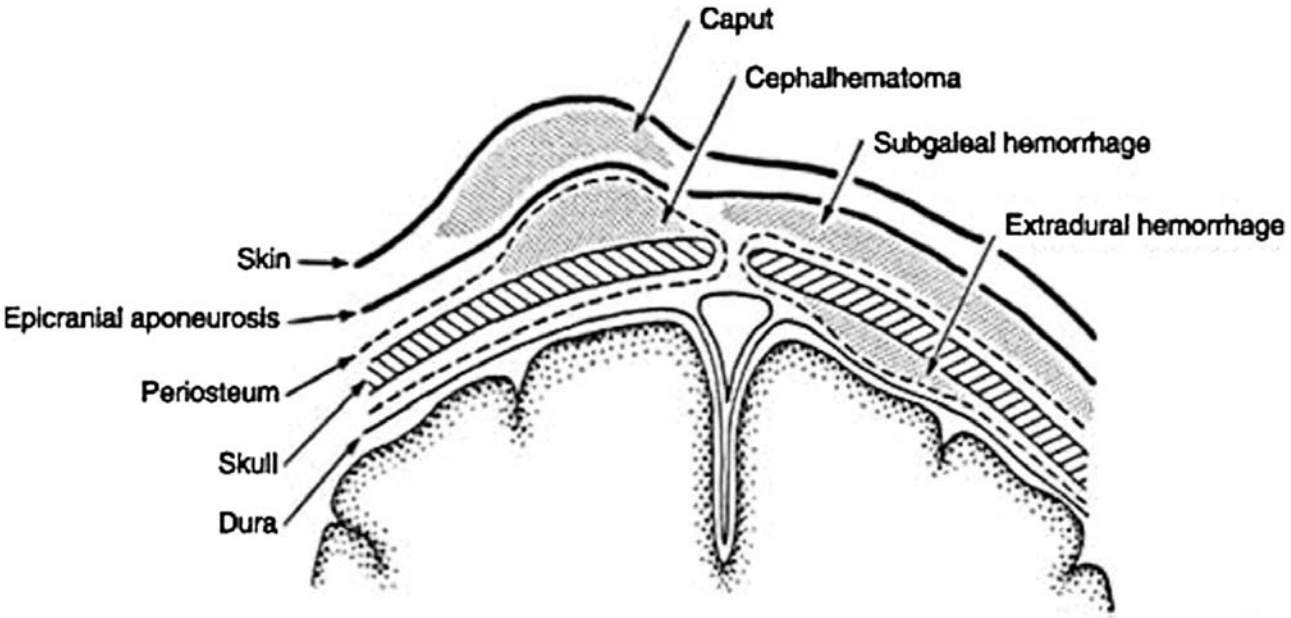
Subcutaneous fat necrosis. Subcutaneous fat necrosis is not usually detected at birth. Irregular, hard, nonpitting, subcutaneous plaques with

overlying dusky, red-purple discoloration on the extremities, face, trunk, or buttocks may be caused by pressure during delivery. No treatment is necessary. Subcutaneous fat necrosis sometimes calcifies.

SKULL INJURIES

Caput succedaneum. Caput succedaneum is a serosanguineous, subcutaneous, extraperiosteal fluid collection with poorly defined margins; it is caused by the pressure of the presenting part against the dilating cervix. Caput succedaneum extends across the midline and over suture lines and is associated with head molding. Caput succedaneum does not usually cause complications and usually resolves over the first few days. Management consists of observation only. Caput succedaneum can be difficult to differentiate when it is bilateral. Careful examination and palpation to discern if the bleeding is external to the periosteum is necessary to differentiate caput succedaneum from cephalohematoma.

Cephalhematoma. Cephalhematoma is a subperiosteal collection of blood secondary to rupture of blood vessels between the skull and the periosteum; suture lines delineate its extent. Most commonly parietal, cephalhematoma may occasionally be observed over the occipital bone. The extent of hemorrhage may be severe enough to cause anemia and hypotension, although this is uncommon. The resolving hematoma predisposes to hyperbilirubinemia. Rarely, cephalhematoma may be a focus of infection that leads to meningitis or osteomyelitis. Linear skull fractures may underlie a cephalhematoma (5–20 % of cephalhematomas). Resolution occurs over weeks, occasionally with residual calcification.



Different types of scull injuries

Subgaleal hematoma. Subgaleal hematoma is bleeding in the potential space between the skull periosteum and the scalp galea aponeurosis. Ninety percent of cases result from a vacuum applied to the head at delivery. Subgaleal hematoma has a high frequency of occurrence of associated head trauma (40 %), such as intracranial hemorrhage or skull fracture. The occurrence of these features does not significantly correlate with the severity of subgaleal hemorrhage. The diagnosis is generally a clinical one, with a fluctuant, boggy mass developing over the scalp (especially over the occiput). The swelling develops gradually 12–72 hours after delivery, although it may be noted immediately after delivery in severe cases. The hematoma spreads across the whole calvaria; its growth is insidious, and subgaleal hematoma may not be recognized for hours. Patients with subgaleal hematoma may present with hemorrhagic shock. The swelling may obscure the fontanelle and cross suture lines (distinguishing it from cephalhematoma). Watch for significant hyperbilirubinemia. In the absence of shock or intracranial injury, the long-term prognosis is generally good. Laboratory studies consist of a hematocrit evaluation. Management consists of vigilant observation over days to detect progression and provide therapy for such problems as shock and anemia. Transfusion and phototherapy may be necessary. Investigation for coagulopathy may be indicated.

MUSCULOSKELETAL INJURIES

Clavicular fractures. This is the most common fracture in newborns, with an incidence of approximately 1 % to 1.5 % from birth trauma. The risk factors for clavicle fracture are use of vacuum and forceps, shoulder dystocia, higher birthweight, and increased maternal age. The diagnosis is based on a displaced fracture in the newborn period; it is often associated with tactile crepitus or petechiae over the affected side. If the fracture is nondisplaced, the diagnosis may be made weeks later by the discovery of a palpable callus. No specific treatment is necessary. Infants may experience increased pain on the affected side for 5 to 7 days. In order to decrease pain, arm motion may be limited by pinning the infant's sleeve to the shirt. This pain is usually amenable to oral or rectal acetaminophen. Once the callus forms (usually by 7 to 10 days), the pain subsides. Prognosis is excellent without any long-term sequelae.

Fractures of long bones. Loss of spontaneous arm or leg movement is an early sign of long bone fracture, followed by swelling and pain on passive movement. The obstetrician may feel or hear a snap at the time of delivery. Radiographic studies of the limb confirm the diagnosis and

distinguish this condition from septic arthritis. Femoral and humeral shaft fractures are treated with splinting. Closed reduction and casting is necessary only when displaced. Watch for evidence of radial nerve injury with humeral fracture. Callus formation occurs, and complete recovery is expected in 2–4 weeks. In 8–10 days, the callus formation is sufficient to discontinue immobilization. Orthopedic consultation is recommended.

INTRA-ABDOMINAL INJURIES

Intra-abdominal injury is relatively uncommon and can sometimes be overlooked as a cause of death in the newborn. Hemorrhage is the most serious acute complication, and the liver is the most commonly damaged internal organ. Bleeding may be fulminant or insidious, but patients ultimately present with circulatory collapse. Intra-abdominal bleeding should be considered for every infant who presents with shock, pallor, unexplained anemia, and abdominal distension. Overlying abdominal skin may have a bluish discoloration. Radiographic findings are not diagnostic but may suggest free peritoneal fluid. Paracentesis is the procedure of choice.

Liver hematoma. The most common lesion is subcapsular hematoma, which increases to 4–5 cm before rupturing. Symptoms of shock may be delayed. Lacerations are less common; they are often caused by an abnormal pull on the peritoneal support ligaments or by the effect of excessive pressure by the costal margin. Infants with hepatomegaly may be at higher risk. Other predisposing factors include prematurity, postmaturity, coagulation disorders, and asphyxia. In cases associated with asphyxia, a vigorous resuscitative effort (often by unusual methods) is the culprit.

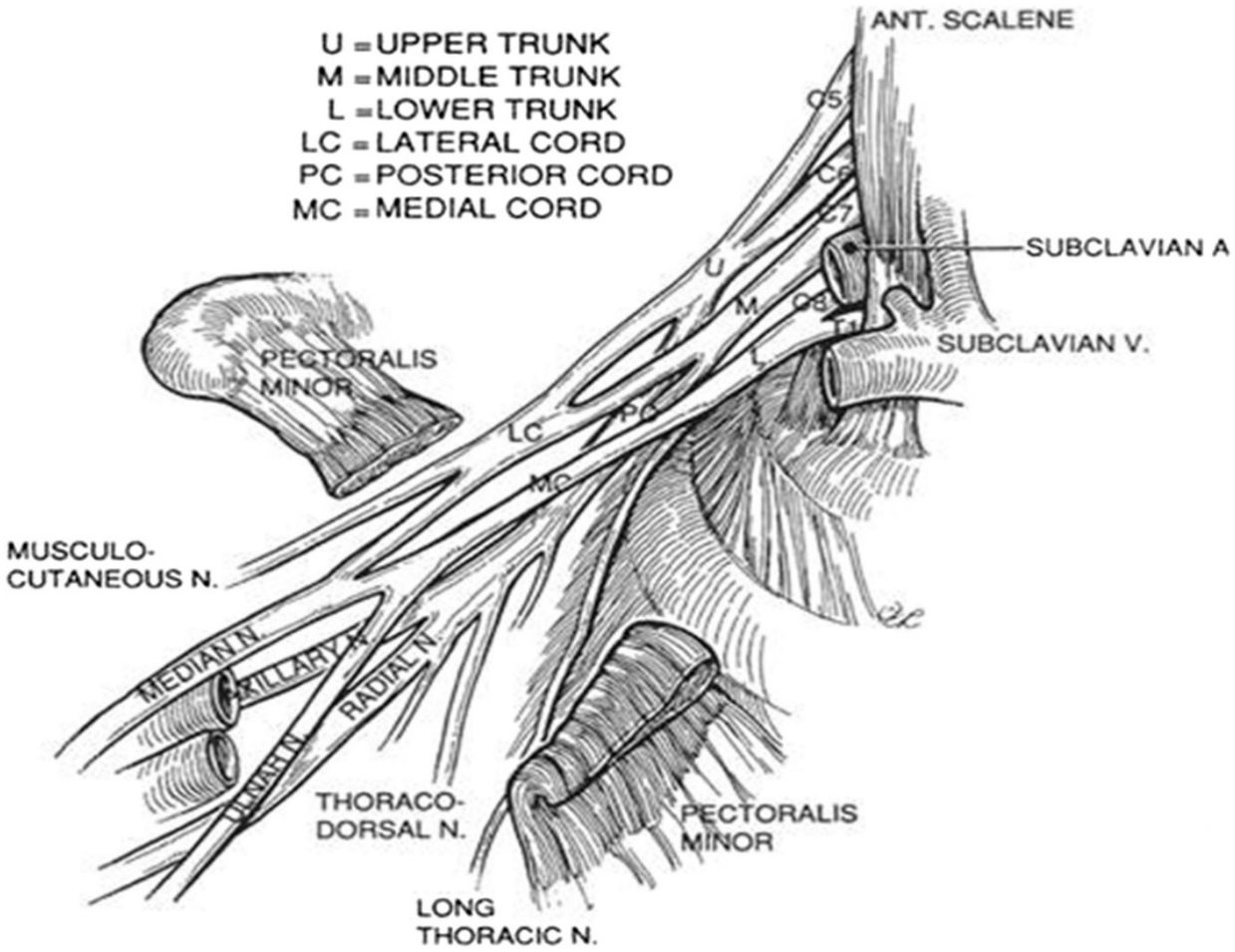
Splenic hematoma is at least a fifth as common as liver laceration. Predisposing factors and mechanisms of injury are similar. Rapid identification and stabilization of the infant are the keys to management, along with assessment of coagulation defect. Blood transfusion is the most urgent initial step. Persistent coagulopathy may be treated with fresh frozen plasma, the transfusion of platelets, and other measures.

PERIPHERAL NERVE INJURIES

Brachial Plexus Injury. The incidence of brachial plexus injuries is 0.5 to 2.5 per 1,000 live births. Brachial plexus injury involves paralysis of upper arm muscles following trauma to spinal roots C5 to T1. Risk factors for this type of injury include shoulder dystocia, macrosomia

(birthweight >4,500 g), difficult delivery, breech presentation, and instrumented deliveries. There are 4 forms of brachial plexus injury:

- Erb-Duchenne palsy: injury to C5–6, most common form of brachial plexus palsy
- Klumpke palsy: injury to C8 to T1
- Total arm paralysis: if all nerve roots are involved
- Horner syndrome: miosis, ptosis, and enophthalmos; damage to sympathetic outflow via nerve root T1



Brachial plexus anatomy. From Sutcliffe TL.
Brachial plexus injury in the newborn. NeoReviews. 2007;8(6):e239–e246

Peripheral nerve damage in the form of brachial plexus injury occurs most commonly in large babies, frequently with shoulder dystocia or breech delivery. Incidence for brachial plexus injury is 0.5–2 per 1000 live births. Most cases are Erb palsy; entire brachial plexus involvement occurs in 10 % of cases.

Traumatic lesions associated with brachial plexus injury include the following:

- Fractured clavicle (10 %)

- Fractured humerus (10 %)
- Subluxation of cervical spine (5 %)
- Cervical cord injury (5–10 %)
- Facial palsy (10–20 %)

Erb palsy (C5–C6) is most common and is associated with lack of shoulder motion. The involved extremity lies adducted, prone, and internally rotated. Moro, biceps, and radial reflexes are absent on the affected side. The grasp reflex is usually present. Five percent of patients have an accompanying (ipsilateral) phrenic nerve paresis.

Klumpke paralysis (C7–8, T1) is rare and results in weakness of the intrinsic muscles of the hand; the grasp reflex is absent. If cervical sympathetic fibers of the first thoracic spinal nerve are involved, Horner syndrome is present.

Prognosis. According to the collaborative perinatal study (59 infants), 88 % of cases resolved in the first 4 months, 92 % resolved by 12 months, and 93 % resolved by 48 months. In another study, which examined 28 patients with upper plexus involvement and 38 with total plexus palsy, 92 % spontaneously recovered. Residual long-term deficits may include progressive bony deformities, muscle atrophy, joint contractures, possible impaired growth of the limb, weakness of the shoulder girdle, and/or Erb engram flexion of the elbow accompanied by adduction of shoulder. Workup consists of radiographic studies of the shoulder and upper arm to rule out bony injury. The chest should be examined to rule out associated phrenic nerve injury. Electromyography (EMG) and nerve conduction studies are occasionally useful. Fast spin-echo magnetic resonance imaging (MRI) can be used to evaluate plexus injuries noninvasively in a relatively short time, minimizing the need for general anesthesia. MRI can define meningoceles and may distinguish between intact nerve roots and pseudomeningoceles (indicative of complete avulsion). Carefully performed, intrathecally enhanced CT myelography may show preganglionic disruption, pseudomeningoceles, and partial

Newborn with classic left-sided upper brachial plexus lesion examination findings. From Sutliffe TL. Brachial plexus injury in the newborn. NeoReviews 2007;8(6):e239–e246

nerve root avulsion. CT myelography is more invasive and offers few advantages over MRI.

Management consists of prevention of contractures. Immobilize the limb gently across the abdomen for the first week and then start passive range-of-motion exercises at all joints of the limb. Use supportive wrist splints. The best results from surgical repair appear to be obtained in the first year of life. Several investigators have recommended surgical exploration and grafting if no function is present in the upper roots at age 3 months, although the recommendation for early explorations is far from universal.

Phrenic Nerve Injury. Phrenic nerve injury can be associated with brachial plexus injury. It occurs most often with breech delivery and lateral extension of the neck, with avulsion of C3 through C5 nerve roots. Clinical signs include recurrent episodes of cyanosis followed by respiratory distress. Phrenic nerve injury impairs diaphragmatic excursion on the involved side, resulting in ineffective respiration. Bulging of the abdomen does not occur with inspiration. Diagnosis is made by a chest radiograph showing elevation of the diaphragm in an infant who has an associated brachial plexus injury. A dynamic ultrasonographic study of diaphragmatic excursion may also be helpful. Treatment is close observation in hopes of recovery for 30 days, after which surgical plication or diaphragmatic pacing may be pursued.

Laryngeal Nerve Injury. Disturbance of laryngeal nerve function may affect swallowing and breathing. Laryngeal nerve injury appears to result from an intrauterine posture in which the head is rotated and flexed laterally. During delivery, similar head movement (when marked) may injure the laryngeal nerve, accounting for approximately 10 % of cases of vocal cord paralysis attributed to birth trauma. The infant presents with a hoarse cry or respiratory stridor, caused most often by unilateral laryngeal nerve paralysis. Swallowing may be affected if the superior branch is involved. Bilateral paralysis may be caused by trauma to both laryngeal nerves or, more commonly, by a central nervous system (CNS) injury, such as hypoxia or hemorrhage, that involves the brain stem. Patients with bilateral paralysis often present with severe respiratory distress or asphyxia. Direct laryngoscopic examination is necessary to make the diagnosis and to distinguish vocal cord paralysis from other causes of respiratory distress and stridor in the newborn. Differentiate from other rare etiologies such as cardiovascular or CNS malformations or a mediastinal tumor. Paralysis often resolves in 4–6 weeks, although recovery may take as long as 6–12 months in severe cases. Treatment is symptomatic. Once the neonate is stable, providing small, frequent feeds

minimizes the risk of aspiration. Infants with bilateral involvement may require gavage feeding and tracheotomy.

Facial nerve injury. Compression by the forceps blade has been implicated in some facial nerve injury, but most facial nerve palsy is unrelated to trauma from obstetric instrumentation (eg, forceps). The compression appears to occur as the head passes by the sacrum. Physical findings for central nerve injuries are asymmetrical facies with crying. The mouth is drawn towards the normal side, wrinkles are deeper on the normal side, and movement of the forehead and eyelid is unaffected. The paralyzed side is smooth with a swollen appearance, the nasolabial fold is absent, and the corner of the mouth droops. No evidence of trauma is present on the face.

Physical findings for peripheral nerve injuries are asymmetrical facies with crying. Sometimes evidence of forceps marks is present. With peripheral nerve branch injury, the paralysis is limited to the forehead, eye, or mouth. The differential diagnosis includes nuclear genesis (Möbius syndrome), congenital absence of the facial muscles, unilateral absence of the orbicularis oris muscle, and intracranial hemorrhage.

Facial nerve injury. This newborn was delivered by forceps-assisted vaginal delivery. Although not visible in the photo, there were small abrasions present on the left lateral eyelid and anterior to the right ear. The right facial nerve is affected. In an infant who is crying, the entire lower lip should be pulled down by the action of the facial nerve, but in this infant, the lip is pulled down only on the left and an asymmetry results. Spontaneous resolution is expected. Courtesy of Janelle Aby, MD, Lucille Packard Children's Hospital at Stanford

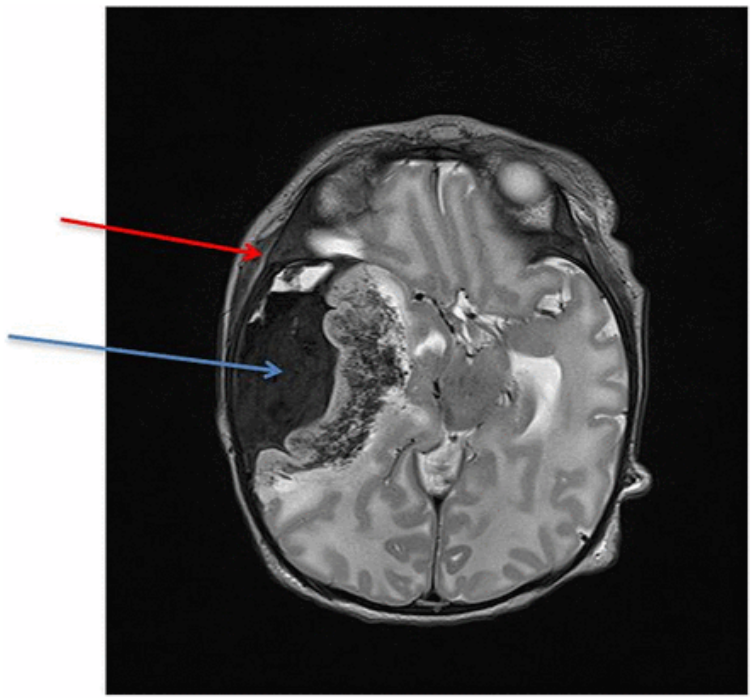
Management and recovery. Most infants begin to recover in the first week, but full resolution may take several months. Palsy that is due to trauma usually resolves or improves, whereas palsy that persists is often due to absence of the nerve. Management consists of protecting the open eye with patches and synthetic tears (methylcellulose drops) every 4 hours. Consultation with a neurologist and a surgeon should be sought if no improvement is observed in 7–10 days.

Diaphragmatic paralysis. Diaphragmatic paralysis secondary to traumatic injury to the cervical nerve roots that supply the phrenic nerve can occur as an isolated finding or in association with brachial plexus injury. The clinical syndrome is variable. The course is biphasic; initially the infant experiences respiratory distress with tachypnea and blood gases suggestive of hypoventilation (ie, hypoxemia, hypercapnia, acidosis). Over the next several days, the infant may improve with oxygen and varying degrees of ventilatory support. Elevated hemidiaphragm may not be observed in the early stages. Approximately 80 % of lesions involve the right side and about 10 % are bilateral. The diagnosis is established by ultrasonography or fluoroscopy of the chest, which reveals the elevated hemidiaphragm with paradoxic movement of the affected side with breathing. Most patients recover in the first 6–12 months. An outcome for bilateral lesions is poorer. Management consists of careful surveillance of respiratory status, and intervention, when appropriate, is critical.

INTRACRANIAL INJURIES

Subdural Hemorrhage. The incidence of subdural hemorrhage (SDH) is 2.9 per 100,000 spontaneous deliveries. It doubles with vacuum or forceps use and is 10 times higher if both vacuum and forceps are used in delivery assistance. If cesarean delivery is performed, the incidence is higher if the procedure is undertaken after a trial of labor compared to no labor and cesarean delivery. SDH describes bleeding between the dura mater and the arachnoid layer of brain. It is caused by rupture of bridging veins and is the most common intracranial hemorrhage in term newborns. The most common location for SDH is interhemispheric or tentorial. Affected infants may become symptomatic in the first 24 to 48 hours after birth. Presenting findings generally include respiratory depression, apnea, and/or seizures. In addition, there may be signs of neurologic dysfunction such as irritability and an altered level of consciousness. The management of SDH depends upon the location and extent of the bleeding. Most infants can be closely observed without surgical intervention. This is possibly due

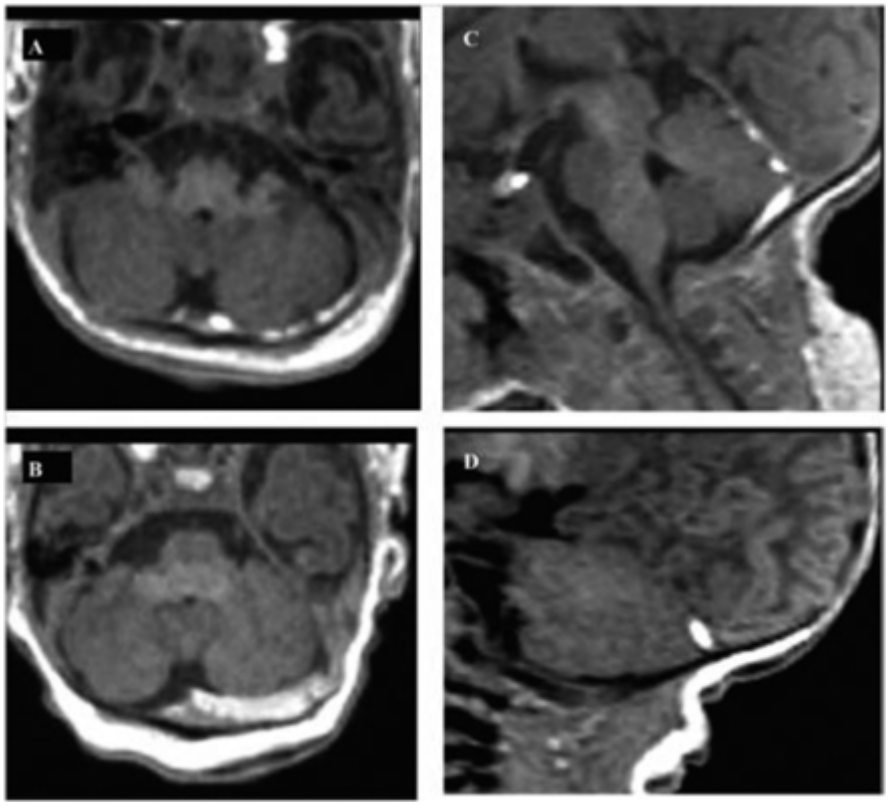
to the plasticity of the neonatal skull, which allows for some degree of expansion without development of increased intracranial pressure. Surgical evacuation is necessary for infants with SDH who exhibit signs of increased intracranial pressure.



Magnetic resonance imaging of term infant with right-side subdural hemorrhage (blue arrow) who presented with seizures requiring surgical decompression within 24 hours after birth due to midline shift and extent of hemorrhage. The dural layer is indicated with the red arrow. Courtesy of Children's Mercy Hospital, Kansas City

Posterior fossa SDH in neonates is relatively rare. Substantial SDH in the posterior fossa, however, may result in death due to compression of the respiratory centers in the brainstem. Excessive fetal head molding during the birthing process can be an important clue to diagnosing posterior SDH.

Head ultrasonography is a safe and readily available bedside tool that is often performed before definitive studies (eg, CT scan, MRI) because recent safety trends encourage reduced radiation exposure by using fewer CT scans. In the hands of an experienced sonographer or radiologist, a high-quality image can detect significant intracranial hemorrhage and facilitate management, if needed. Treatment is generally supportive, including correction of any coagulopathy and cardiopulmonary support. Neurosurgical consultation may be prudent if there is severe hemorrhage, brainstem dysfunction, or hydrocephalus.



Posterior fossa subdural hemorrhage (SDH) on T1-weighted magnetic resonance scans in 4 different patients. A. Axial small SDH left cerebellar convexity. B. Axial larger SDH left cerebellar convexity. C. Sagittal small SDH below tent and posterior to cerebellum. D. Sagittal small SDH below tent, off midline. Reprinted from Kelly P, Hayman R, Shekerdemian LS, et al. Subdural hemorrhage and hypoxia in infants with congenital heart disease. Pediatrics. 2014;134(3):e773–e781

Epidural Hematoma. Epidural hematoma is very rare in neonates and is caused by injury to the middle meningeal artery. Most cases also involve a corresponding linear skull fracture. Presenting signs include hypotonia, seizures, bulging fontanelles, and a change in the neonate's level of consciousness. Diagnosis is usually made by head CT scan. Close observation may be all that is necessary, specifically monitoring for signs of herniation. If such signs are found, surgical evacuation is necessary.

Subarachnoid Hemorrhage. This is the second most common intracranial hemorrhage in neonates. According to reports, many newborns acquire a subarachnoid hemorrhage (SAH) during the birth process but remain asymptomatic, with eventual resolution after several days. SAH is caused by rupture of bridging veins in the subarachnoid space. Symptoms appear at 24 to 48 hours after birth and may include apnea or seizures. If the cause of apnea or seizures is not obvious and if determination of cause is difficult, SAH should be suspected and a CT scan of the brain

pursued. Close monitoring may be all that is necessary, but if signs of herniation are encountered, surgical evacuation is warranted.

Intraventricular Hemorrhage. Although intraventricular hemorrhage (IVH) is usually associated with preterm delivery, IVH is also reported as a consequence of birth injury in term infants. In a study of 505 healthy asymptomatic term infants who underwent head ultrasonography within 72 hours of birth, the incidence of IVH was 4 %. All of the hemorrhages were subependymal (grade 1 IVH). The risk of IVH increases with operative deliveries, with reported incidences per 10,000 deliveries of 1.1, 1.5, 2.6, and 3.7 for spontaneous, vacuum-assisted, forcepsassisted, and combined vacuum- and forceps-assisted deliveries, respectively.

SPINAL CORD INJURY

Spinal cord injury incurred during delivery results from excessive traction or rotation. Traction is more important in breech deliveries (the minority of cases), and torsion is more significant in vertex deliveries. The true incidence of spinal cord injuries is difficult to determine. The lower cervical and upper thoracic region for breech delivery and the upper and midcervical region for vertex delivery are the major sites of injury. Major neuropathologic changes consist of acute lesions, which are hemorrhages, especially epidural lesions, intraspinal lesions, and edema. Hemorrhagic lesions are associated with varying degrees of stretching, laceration, and disruption or total transaction. Occasionally, the dura may be torn, and rarely, vertebral fractures or dislocations may be observed. The clinical presentation is stillbirth or rapid neonatal death with failure to establish adequate respiratory function, especially in cases involving the upper cervical cord or lower brainstem. Severe respiratory failure may be obscured by mechanical ventilation and may cause ethical issues later. The infant may survive with weakness and hypotonia, and the true etiology may not be recognized. A neuromuscular disorder or transient hypoxic ischemic encephalopathy may be considered. Most infants later develop spasticity that may be mistaken for cerebral palsy. The diagnosis is made using MRI or CT myelography. Little evidence indicates that laminectomy or decompression has anything to offer. A potential role for methylprednisolone is recognized. Supportive therapy is important.

Prevention is the most important aspect of medical care. Obstetric management of breech deliveries, instrumental deliveries, and pharmacologic augmentation of labor must be appropriate. Occasionally, injury may be sustained in utero.

CONCLUSION

The incidence of birth injuries has dramatically decreased in the last 2 decades. Macrosomia and instrumental deliveries are major risk factors for birth injuries. Subgaleal hemorrhage is an emergency, and close monitoring and aggressive resuscitation are key to management. Forceps use is the most common cause of facial nerve injury and is usually self-limited. Erb palsy is the most common brachial plexus injury, and management should include close follow-up evaluation and physical therapy until 3 to 4 months of age. Shoulder dystocia is a major risk factor for brachial plexus injury. Management of clavicle and most skull, humerus, and femur fractures is nonoperative if there is monitoring and timely follow-up. Planned cesarean delivery for breech presentation decreases mortality and morbidity. Posterior fossa hematoma can cause brain stem compression, leading to respiratory compromise, and requires close monitoring. Careful documenttation and cooperation between the obstetric and pediatric clinicians in explaining birth injury to parents may minimize litigation.

THE LIST OF THEORETICAL QUESTIONS TO THE TOPIC TO BE LEARNED

1. Birth trauma. Etiology. Pathogenesis. Classification. Clinical manifestations. Diagnostics. Differential diagnostics. Treatment. Preventive measures. Prognosis.
2. Soft tissue injuries: Abrasions, Erythema petechial, Ecchymosis, Lacerations, Subcutaneous fat necrosis.
3. Skull injuries: Caput succedaneum, Cephalhematoma, Subgaleal hematoma.
4. Musculoskeletal injuries: Clavicular fractures, Fractures of long bones.
5. Intra-abdominal injuries: Liver hematoma, Splenic hematoma.
6. Peripheral nerve injuries: Brachial Plexus Injury, Phrenic Nerve Injury, Laryngeal Nerve Injury, Facial nerve injury, Diaphragmatic paralysis.
7. Intracranial Injuries: Subdural Hemorrhage, Epidural Hematoma, Subarachnoid Hemorrhage, Intraventricular Hemorrhage.
8. Spinal Cord Injury.

THE LIST OF PRACTICAL KNOWLEDGE

1. Physical examination of newborn.
2. Identifying the different clinical variants of most common birth traumas.
3. Diagnosis and providing emergency assistance in emergency conditions caused by birth traumas.
4. To determine patient management with most common birth traumas.
5. Examination of a sick newborn to plan and interpret the results of analysis of patients with birth traumas.
6. To make differential diagnosis and identify clinical diagnosis of most common birth traumas.

THE TESTS OF SELF-CONTROL AND SELF-CORRECTION OF INITIAL LEVEL

1. Factors predisposing to injury include the following:
A. Fetal macrosomia
B. Small maternal stature, maternal pelvic anomalies
C. Prolonged or rapid labor
D. Abnormal presentation (breech)
E. All listed
2. Soft tissue injuries include exept:
A. Abrasions
B. Ecchymosis
C. Facial paralysis
D. Lacerations
E. Subcutaneous fat necrosis
3. Intracranial Injuries include except:
A. Subdural Hemorrhage
B. Epidural Hematoma
C. Subarachnoid Hemorrhage
D. Intraventricular Hemorrhage
E. Spinal Cord Injury
4. Brachial plexus injury include except:
A. Erb-Duchenne palsy
B. Laryngeal Nerve Injury
C. Klumpke palsy
D. Horner syndrome
E. Total arm paralysis

5. Horner syndrome includes except:

A. Miosis
B. Ptosis
C. Enophthalmos
D. Mydriasis
E. Damage to sympathetic outflow via nerve root T1

Standards of answers to tasks:

1 – E; 2 – C; 3 – E; 4 – B; 5 – D.

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For notes

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