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Review Article

Birth Trauma

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Abstract

To know the risk factors of Birth injuries, the most common types of injuries, the causes, clinical presentations, helpful investigations and lines of treatment of these injuries.

Birth injuries still remain more than 1% in live birth. The majority of birth injuries are minor and often unreported. Birth injuries may be so severe as to be fatal or leave the child with a permanent disability.

Keywords: Birth injury, Birth trauma, Prematurity, CT scan; Sinus

Introduction

Risk factors for birth injuries

- Deficient medical skills or attention
- Instrumental delivery
- Breech and other abnormal presentations
- Prolonged second stage of labour
- Precipitous delivery
- Macrosomia
- Prematurity
- Cephalopelvic disproportion
- Organomegaly and mass lesions in the abdomen
- Coagulopathy

Types of Birth Injuries

Head injuries (Extracranial, Cranial, Interacranial)

Extracranial

Caput succedaneum: Cause: Caput succedaneum caused by rupture of blood vessels within the dense connective tissue underneath the skin due to birth trauma or due to vacuum or forceps delivery.

Presentation: Purpura and ecchymosis of the overlying skin, and the suture lines do not restrict the swelling.

Fate and management: The bleeding is usually minimal due to the tamponading effect of the dense connective tissue. Hematomas resolve spontaneously within a few days.

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Subgaleal haemorrhage: Cause: Subgaleal haemorrhage is secondary to rupture of emissary veins within the loose connective tissue between the galeaaponeurotica and the periosteum. Bleeding can also sometimes result from a bone fracture.

Presentation: It presents as a firm or fluctuant mass that crosses the suture lines. It is estimated that each 1 cm increase in the head circumference correlates to 38 ml of blood loss. Bilirubin levels may increase due to reabsorption of large haematomas in neonates.

Fate and management: Monitoring and fluid replacement. CBC and blood tests are necessary to establish the extent of blood loss and a coagulation screen. Surgery may be required in severe cases to cauterize the bleeding vessels.

Cephalhaematoma: Cause: Most common extracranial haematoma and is due to the rupture of blood vessels beneath the periosteum. It is seen in approximately 2.5% of newborns and is associated with forceps and breech deliveries.

Presentation: Firm swelling does not cross the suture lines due to the periosteal attachments to the bone (Figure 1).

Association with bony fractures about 5%. Rapid expansion and excessive blood loss are rare.

Fate and management: X-ray head to exclude fractures and Mostly resolves over a few weeks. If rapid expansion with signs fractures, aspiration of fluid for diagnosis and treatment is necessary.

Cranial injuries

Types: Linear fractures of parietal bones, Depressed fractures ('ping-pong ball' type that is due to inward buckling).

Treatment: Conservative management in the absence of neurological deficits or signs of raised intracranial pressure. Neurosurgical intervention may be necessary to evacuate any hematoma and to elevate the fractured segment or bony fragments removal.

Interacranial

Epidural haemorrhage: Causes: It is usually due to a direct injury to the middle meningeal artery.

Presentation: Epidural haemorrhage is usually associated with cephal haematoma or skull fracture. Skull X-rays and CT scan are useful in the diagnosis of this injury (Figure 2A).

Treatment: Aspiration of the hematoma, reported to be successful in the treatment of epidural haemorrhage. The 2-Open surgery may be required if aspiration failed.

Subdural hemorrhage

Causes: Tearing of the tentorial, interhemisphericveins or dural sinuses.

Presentation: The clinical signs of raised intracranial pressure, which includes bulging anterior fontanelle, vomiting, irritability, seizures and pallor. Focal neurological deficit, hemiparesis, unequal pupils, or deviation of the eyes. Cranial US, CT scan and MRI are required to confirm the diagnosis (Figure 2B).

Treatment: Asymptomatic could be treated conservatively. Repeated tap of the subdural space by using a size 20G needle. Progressive hydrocephalus is a well-known complication of subdural haemorrhage and follow up is a must.

Subarachnoid hemorrhage:

Causes: Rupture of the bridging veins of the subarachnoid space in preterm infants.

Presentation: Symptoms are that of raised intracranial pressure in an infant seen within the first 1-2 days of life. Cranial ultrasound, CT scan and CSF sampling may all help in the diagnosis.

Treatment: Asymptomatic could be treated conservatively, surgical intervention, progressive hydrocephalus is should be monitored during follow up [1].

Intracerebral hemorrhage: Intracerebral hemorrhage is the least common intracranial trauma. The clinical presentation is that of increased intracranial pressure. Serial cranial US, CT, and MRI are needed to monitor the regression. Treatment mainly supportive but surgical aspiration indicated if the bleeding increasing.

Peripheral nerves injuries (Brachial plexus, Facial nerve, phrenic nerve)

These injuries are usually caused by excessive traction or direct compression of nerves during the delivery.

Types of nerve injury were classified by Sunderland into five categories (Table 1).

Brachial plexus injury (Erb's palsy, Klumpke's palsy and Injury to the entire plexus)

The most common injury and is reported in 0.1% to 0.3% of all live births. It occurs due to excessive downward traction on the head so as to dislodge an impacted shoulder [2].

Figure 1: Large Cephalhaematoma.

Figure 2A: CT of Epidural hemorrhage with cephalhematoma.

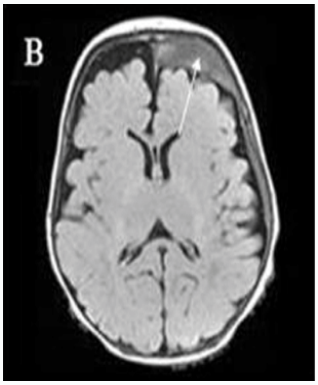

Figure 2B: MRI of Subdural hemorrhage.

Erb's palsy: The injury is to the C5-C6 nerve roots. The most common type (90%) of birth related peripheral nerve injury.

Presentation: The affected arm hanging limply adducted and internally rotated at the shoulder, and extended and pronated at the elbow with flexed wrist and fingers in the typical 'waiter's tip' posture (Figure 2A). Muscles paralysis is a paralysis of the deltoid, supra-spinatus, infra-spinatus, brachioradialis and supinator brevis muscles. Reflexes is On the affected side the Moro, biceps and radial reflexes are absent. While the grasp reflex is preserved. Associated phrenic nerve injury should be excluded. MRI, EMG is helpful for confirmation.

Management: Initial conservative treatment includes immobilization of the affected arm underneath the sleeve for 1 week. After 1 week of rest, the arm is put through passive range of motion exercises at the shoulder, elbow and wrist to prevent contractures. If by 3 months no movements are documented within these muscle

Table 1: Types of nerve injury.

First degree injury or neuropraxia	Complete recovery is normal and takes up to 12 weeks.
Second degree injury or axonotmesis, the endoneurial tubes are intact	The recovery is complete, with axonal regeneration occurring at a rate of 1 mm per day.
Third-degree injury, disruption to the endoneurialtubes	The regeneration is complete, but the regenerating axons may not reinnervate their original motor and sensory targets
Fourth-degree injury, larger area of axon is damaged	Axons couldn't advanced is tally during regeneration. Surgery is necessary to restore neural continuity
Fifth-degree injury, complete transaction of the nerve	Surgery is necessary for recovery of function. (end to end anastomosis, grafting or microsurgery)

groups, neurosurgical intervention should be done.

Klumpke's paralysis: Injury to lower plexus including C8-T1 nerve roots. This lower plexus injury is uncommon.

Presentation: Paralysis of the intrinsic muscles of the hand and flexors of the wrist and fingers (Claw hand) (Figure 2B). Reflexes - the grasp reflex is absent. Presence of Horner's syndrome due to injury of the cervical sympathetic fibers. MRI, EMG is helpful for confirmation.

Management: Initial conservative treatment includes immobilization of the affected arm underneath the sleeve for 1 week. Followed up closely with both active and passive exercises. If by 3 months no movements are documented within these muscle groups, neurosurgical intervention should be done [3,4].

Injury to the entire brachial plexus: Injury to the entire brachial plexus leads to flaccid arm with absence of sweating, sensation, and deep tendon reflexes. X-ray of the upper arm and shoulder should be performed to exclude the possibility of bony injuries. Children with injury to the entire brachial plexus have severe nerve disruption and get worse on conservative management. Early neurosurgical interference and surgical exploration should be considered (Figure 3) [5].

Facial nerve injury

Cause: Facial nerve injury is usually unilateral and is secondary to compression of the nerve against stylomastoid foramen or the ramus of the mandible. Compression could be either with forceps or against the sacral promontory. Most injuries are simple swelling of the axons secondary to the compression, and disruption of the axons is rarely seen.

Presentation: The affected side of the face would have absent or decreased forehead wrinkling, a persistently open eye, a decreased nasolabial fold and flattening of the corner of the mouth.

Fate and management: Spontaneous complete recovery within a month is seen in >90% of infants. The initial treatment consists of protecting the affected eye from drying out with application of artificial tears, until full recovery is documented. Surgery should only be considered for those with no signs of recovery after 1 year [6].

Phrenic nerve injury

Cause: Phrenic nerve injury arises from C3-C5 nerve roots and is the motor supply to the ipsilateral diaphragm. Injury to this nerve usually results from excessive traction of the neck muscles. Most of these injuries (up to75%) occur together with brachial plexus injury, or fracture of the clavicle.

Presentation: The infant may show respiratory distress and decreased air-entry on the affected side. Chest X-ray will show a raised hemidiaphragm with mediastinal shift to the opposite side. Atelectasis of the lower lobe of lung on the affected side with pneumonia may be present. Ultrasound confirms paralysis by demonstrating paradoxical movement of the affected hemidiaphragm.

Treatment: Conservative with oxygen, physiotherapy and antibiotics when indicated. If the respiratory distress is significant, continuous positive airway pressure ventilation should be considered. Surgery is indicated when no improvement is seen after 2 weeks of mechanical ventilation or 3 months of conservative treatment. Surgical options include plication of the diaphragm or, rarely, excision and artificial patch repair of the diaphragm as employed in the repair of large congenital diaphragmatic hernias.

Spinal cord injury

Causes: Damage to the upper cervical cord is common and is associated with rotation of the head during vertex delivery with forceps. Lower cord injury occurs during breech delivery, when the head is trapped secondary to cephalopelvic disproportion.

Presentation: Injury above the level of C4will results in paralysis of the diaphragm due to phrenic nerve injury and cause apnoea. When the injury is below the level of C4:

- Absent spontaneous movement.
- Absent tendon reflexes and lack of response to painful stimuli below the level of the injury.
- The bladder will be atonic and distended while
- The anal sphincter will be atonic and patulent.
- The outcome, in general, is very poor for these infants.
- Ultrasonography and MRI scan will reveal the extent of injury and may help in determining the prognosis.

Treatment: Early management should consist of strict immobilization of the head, neck and spine. Supportive including ventilation and passive range of movements to prevent pressure ulcers and pain relief. The overall outcome in this group of children is poor resulting in early death, severe disability and ventilator dependency.

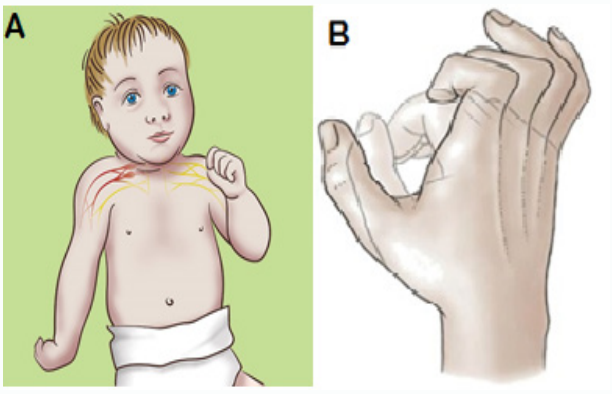

Figure 3: (A) Erbs paralysis; (B) Klumbekspralysis.

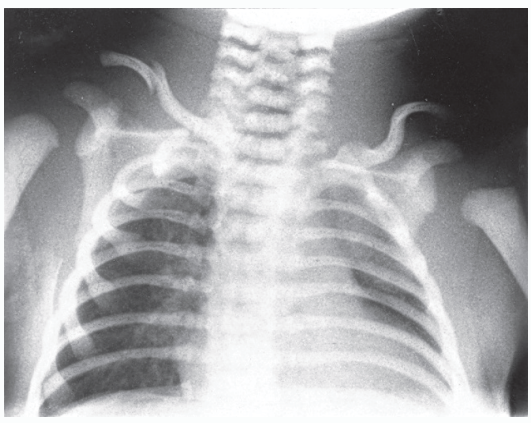

Figure 4: Fracture right clavicle.

Abdominal organ injuries

Causes: Direct trauma by the rib cage secondary to thoracic wall compression. Thoracic wall compression causing a pulling effect on the ligamentous attachments to the liver and spleen with consequent tearing of the parenchyma. Trauma secondary to instrumental compression of the organs. The liver is the most common organ involved.

Presentation: Clinical signs and symptoms of an intra-abdominal bleeding with pallor, shock, abdominal distension and abdominal wall discoloration. Adrenal haemorrhage may present as a flank mass at 4th day of life, fever and jaundice. The presence of a tumor should be ruled out, especially when the adrenal gland is involved. Blood tests CBC, coagulation screen and cross match are helpful. Abdominal ultrasound, CT and abdominal paracentesis could all help in the diagnosis.

Treatment: Resuscitation and supportive with fluid replacement and/or transfusion as indicated by the severity of the blood loss. Explorative laparotomy if failure of conservative treatment.

Fractures

Most fractures following birth trauma heal spontaneously. Nonunion is almost unknown. The most common bones involved are the (clavicle, femur, humerus, and skull). A majority of these fractures are of the greenstick type are not even recognized at the time of discharge of the infant. Calcification of these fractures started by the second week of life.

Clavicle

The clavicle is the most common fracture in the newborn (Figure 3). Caused by shoulder dystocia. The fracture is noticed only when callous formation begins. It is usually a green stick fracture and occasionally is associated with brachial plexus injury. Treatment is usually conservative for incomplete fractures. When complete fracture is noted, the arm should be immobilized.

Long bones

The femur may be involved during a difficult breech delivery when traction is applied to extract the fetus; 8 usually the mid-shaft is involved. Fracture femur is treated by skin traction or splinting with Spica cast. Fracture of the humerus is encountered during a difficult delivery of the shoulder in a vertex presentation. Humeral fractures may be associated with Erb's or radial nerve palsy. Fracture humerus treated by restricting the baby's movements by bandaging the arm to the chest for 1 to 3 weeks (Figure 4).

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