Birth Injuries to the Baby

The passage of a baby from the safety of the uterus to the outside world is made hazardous by the following:

- The skull has to mould to facilitate passage through the pelvis and there may be cephalopelvic disproportion (CPD) - a mismatch between the size of the fetal head and the capacity of the maternal pelvis. It may represent a large head in a normal pelvis or a normal head in a restricted pelvis.
- Malposition increases risk, whilst malpresentation necessitates caesarean section.
- Contractions tax the reserve of the placenta.
- The lungs and circulation undergo great changes.

Difficulties in delivery may compound the situation. Delivery may need to be expedited because of fetal distress. This may present as fetal hypoxia (shown on electronic fetal monitoring) and as acidosis on fetal blood sampling.

Injuries may be caused by a combination of mechanical trauma and hypoxia. Birth injuries may be minor and transient but they can produce serious, permanent effects, including perinatal and neonatal death. [1] Previously it was assumed that most cases of cerebral palsy were due to obstetric mismanagement; however, it is now understood that in the majority of cases the cause occurs prior to labour and, in those cases associated with hypoxia at birth, this is often secondary to pre-existing pathology, including genetic mutations. [2]

Epidemiology

Figures for major (but not fatal) birth trauma in the UK are not routinely collected. For fatal outcomes there is a UK-wide survey which has shown a gradual reduction in stillbirth and perinatal death since 2003: the lighter the baby and the earlier the gestational age, the greater the risk of stillbirth or neonatal death. [1]

A Canadian study found that fetal trauma occurred in 2% of deliveries. [3] An analysis based on published studies estimated the risk of brachial plexus injury to be between 0.5 to 2.0 per 1,000 live vaginal births. [4]

Risk factors

Risk factors for birth trauma include:

- A large infant: especially if weighing more than 4500 g.
- CPD.
- Instrumental delivery, especially mid-cavity forceps or ventouse delivery for deep transverse arrest.
- Breach delivery: vaginal delivery and emergency caesarean section during labour are both associated with small but significant risk of short-term increase in morbidity and mortality. [5]
- Prematurity: small head and incompletely formed skull - precipitate delivery can cause 'champagne cork popping’, risking intracranial haemorrhage.
- Shoulder dystocia: the risk is reduced when delivery is by a skilled midwife or obstetrician. [6, 7]

Other risk factors include:

- Primagravida (untried pelvis).
- Very short labour, which may represent precipitate delivery of a premature baby.
- Very long labour, which may indicate CPD.
- Oligohydramnios.
- Congenital abnormalities, especially if there is enlarged head (macrosomia).
Skull injuries

Cephalohaematoma

*Synonym: cephalhaematoma*

- Bleeding between the periosteum and skull causes a haematoma, usually in the parietal region and sometimes the occipital region. Spread is restricted by suture lines that are adherent so it is limited to the surface of one cranial bone. Blood loss can cause anaemia and even hypotension.
- As the haematoma resolves, breakdown of haemoglobin can cause hyperbilirubinaemia that may need treatment.
- An underlying skull fracture may also be present. If it is suspected and thought to be depressed, CT or MRI scanning is required and surgery may be indicated.
- Spontaneous remission may take weeks and there is sometimes residual calcification. Rarely this may require surgical removal for cosmetic reasons.
- A haematoma may (rarely) become infected.

Subgaleal haematoma

- Bleeding between the periosteum and scalp is usually associated with use of ventouse extraction but has been reported to occur spontaneously.
- Incidence of 40-60 per 10,000 deliveries, reducing to 4 per 10,000 in spontaneous vaginal deliveries; the mortality is as high as 12-25%.[8]
  - 77% follow instrumental delivery.[9]
- It usually appears within 12-72 hours of birth as a soft, fluctuant mass within the scalp, especially over the back of the head.
- The spread is not restricted by suture lines.
- It can spread slowly and be unnoticed and present as hypovolaemic shock.
- Management is conservative but should be considered in any neonate with unexplained collapse.
- Consider the possibility of a coagulation defect.

Caput succedaneum

- This is a poorly defined, subcutaneous collection of serosanguinous fluid that spreads over suture lines and the midline.
- It is very common after prolonged labour.
- It does not cause significant problems.

Cuts and abrasions

- These may result from operative delivery, including cutting the baby with the scalpel blade at caesarean section. Great care is needed in cutting the last layer of the uterus, even in an emergency.
- Cuts need closing and dressing.

Subcutaneous fat necrosis

- This is not usually apparent at birth.
- Some time later, irregular, hard, subcutaneous plaques appear with overlying dusky red-purple discolouration.
- They occur on the extremities, face, trunk or buttocks, having been caused by pressure during delivery.
- There is no treatment and they should resolve but sometimes there is calcification.

Brachial plexus injury

This occurs in about 2 per 1,000 births.[10] The majority are Erb’s palsy involving the upper part of the brachial plexus. The underlying problem is usually injudicious traction when the anterior shoulder is trapped (shoulder dystocia).[11]
Associated injuries include:

- Fractured clavicle.
- Fractured humerus.
- Subluxation of cervical spine.
- Cervical cord injury.
- Facial palsy.
- Occasionally, phrenic nerve paresis.

**Erb’s palsy**
- There is damage to the C5, C6 segments of the brachial plexus.
- It produces loss of motion of the shoulder with a limp arm, adducted and internally rotated. The elbow is pronated and extended with wrist flexed.
- The grasp reflex is normally maintained but Moro, biceps and radial reflexes are lost.

See also separate Erb’s Palsy article.

The position of the hand is said to be reminiscent of a porter who is turning away but is holding out his hand behind him for a tip.

**Klumpke’s paralysis**
In infants, this is much less common than Erb’s palsy.

- It is due to damage of the nerves of segmental origin C7, C8, T1 in the brachial plexus.
- It causes paralysis with weakness of the hand and loss of grasp reflex.
- Horner’s syndrome may be seen if there is T1 damage.

**Management**
- Most cases of brachial plexus injury resolve spontaneously within four months but it can take up to two years.
- X-rays to exclude fractures and examination for phrenic nerve paresis are required. Further investigations include MRI scan, electromyography, nerve conduction studies and CT myography.
- To prevent contractures, immobilise the arm across the upper abdomen for seven days then start physiotherapy using wrist splints.
- Neurosurgical nerve repair should be considered if movement is not returning after three months and electrophysiology results suggest a poor prognosis.\(^{[12]}\)
- It may be possible to identify neonates with the worst prognosis at 1 month.\(^{[13]}\)

**Cranial nerve injury**
Cranial nerve and spinal cord injuries result from hyperextension, traction and overstretching with simultaneous rotation. Neurapraxia will resolve swiftly but complete nerve or cord transection is much more serious.

- Central damage to the facial and vagus nerves causes an asymmetrical face on crying, with swelling and smoothness of the affected side and drooping of the side of the mouth.
- Peripheral damage causes paralysis to the eye, forehead or mouth only.
- Most cases soon start to recover but full recovery may take months.
- The eye must be protected with the use of synthetic tears and a covering.
- If there is no improvement after 7-10 days, investigation is required.
- Phrenic nerve damage can cause paralysis of half of the diaphragm, leading to breathing difficulties with significant mortality. It can occur in isolation or in combination with a brachial plexus injury. Ultrasound or X-ray shows an elevated hemidiaphragm but this may be absent in the early stages. Screening may show immobility.
Laryngeal nerve injury
- Unilateral paralysis often presents with a hoarse cry or stridor and may affect swallowing.
- Bilateral damage causes severe respiratory problems.
- Diagnosis is by laryngoscopy to exclude other causes of the symptoms.
- Recovery usually occurs after 4-6 weeks but can take up to a year.

Spinal cord injury
- Damage to the spinal cord often results in stillbirth or babies who die soon after delivery, due to an inability to breathe.
- Ventilation may be life-saving. If the lesion is not a temporary neuropraxia, this will be lifelong.
- Those who survive are weak and often develop spasticity.
- Diagnosis is by MRI or CT myelography.
- Treatment is supportive.

Fractures

Clavicle
- Fractured clavicle is common and presents with apparent paralysis.
- Palpation may show crepitus, uneven bone and muscle spasm.
- It heals within 7-10 days with the arm immobilised.
- Confirm the diagnosis by X-ray.
- Look for other damage.

Arm and leg bones
- Fracture may be heard during delivery.
- It presents with absence of normal movement of the limb, with swelling becoming apparent later.
- Confirm with X-ray.
- Treat with 8-10 days of splinting or reduction and casting if displaced.
- Check for radial nerve damage in arm fractures.

Abdominal bleeding
- This presents with shock, pallor and a distended abdomen, possibly bluish in colour.
- Check for anaemia.
- Diagnose with paracentesis.
- Causes include hepatic laceration and rupture of spleen.

Hypoxia
Factors within labour are complex; however, processes such as uteroplacental vascular disease, reduced uterine perfusion, fetal sepsis, reduced fetal reserves and cord compression can be involved alone or in combination producing fetal distress. Gestational and antepartum factors modify the fetal response to these processes.

Even though cerebral palsy is strongly associated with a low Apgar score five minutes after birth, the majority of babies with low scores do not develop cerebral palsy. The majority of cases are now thought to be a consequence of antepartum insults to the fetus. Only 13% of babies with neonatal encephalopathy are later diagnosed with cerebral palsy.
Prevention
Good maternity care will reduce the risk of an adverse outcome to both mother and child.

Caesarean section
Fear of fetal damage and the vast cost of litigation have led to an increasing rate of caesarean section that is now between 20% and 25% in the UK as a whole, with significant geographical variation. In some parts of the world the figure is higher.

There is debate regarding the current rising rate of caesarean section. The World Health Organization has suggested that, in developed countries, the figure should not be above 15%. Skills in the use of Kielland’s forceps and assisted breech delivery are being lost as caesarean section is more readily undertaken.

Prematurity
A major contributor to perinatal mortality and morbidity is prematurity. One of the most important risk factors for premature labour is maternal socio-economic deprivation and the associated behaviours and lifestyle. The fetuses at greatest risk from prematurity are those of lowest weight for gestational age due to fetal growth restriction.

Further reading & references

1. Perinatal Mortality Surveillance Report UK Perinatal Deaths for births from January to December 2013; MBRRACE-UK, 10 June 2015
16. Caesarean section; NICE Clinical Guideline (November 2011)
17. The Investigation and Management of the Small-for-Gestational-Age Fetus; Royal College of Obstetricians and Gynaecologists Green-top guideline (Mar 2013)

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Author: Dr Jacqueline Payne
Peer Reviewer: Dr John Cox

Next Review: 11/11/2020

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