Mini Review Article

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Neonatal Mechanical Birth-Related Injury

Abstract

With improvements in prenatal diagnosis and care, the frequency of mechanical birth-related injuries to the newborn is decreasing. However, these injuries continue to be a significant cause of morbidity and mortality in the patient group that is impacted. According to estimates, 2.6% of births in the United States result in these injuries. Although more common when existing feto-maternal risk factors are taken into account, their incidence can still be unpredictable. Birth-related injuries can lead to functional and cosmetic consequences, disability, or even death, while they are frequently superficial and transient. Patient safety indicators have been produced by the Agency for Healthcare Research and Quality (AHRQ) in the USA by expert consensus and comprise seven different birth-related injuries, such as subdural and intracerebral haemorrhage, epicranial subaponeurotic hemorrhage.

Keywords: Prenatal diagnosis • Feto-maternal risk factors • Intra-cerebral haemorrhage • Epicranial Subaponeurotic Haemorrhage • Superficial • Transient

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Introduction

No matter if the birth is natural or assisted, it is always stressful for the baby. Mechanical and hypoxic-ischemic incidents both fall under the category of birth-related injuries. The mechanical trauma that the neonate experienced as a result of the pressures of labour and delivery is the main topic of this review. Neonatal birth-related hypoxic-ischemic injuries won't be covered separately in this review to keep it succinct. Neonatal organ systems may be impacted by birth-related trauma (ESM_1). It's possible that the true prevalence of mechanical trau- ma of delivery is understated. The prevalence has been calculated at 9.5 per 1000 live births, with an incidence of 0.82%. Birth-related trauma can happen even in the absence of known risk factors, but it tends to occur more frequently in the presence of predisposing feto-maternal risk factors. Maternal (diabetes, primiparity, small pelvis), foetal (macrosomia-birth weight > 4500 g, malpresentation or shoulder dystocia, defined as passage of more than 60 s between the delivery of the head and body, or obstetric (epidural analgesia, induced or instrumental delivery) risk factors can all affect the outcome of the pregnancy [1].

Extracranila injuries

Injury in scalp

Skin, subcutaneous connective tissue, galea aponeurotica, loose areolar connective tissue, and periosteum are the several layers of the scalp. Different layers of the scalp and meninges may have haemorrhages, subgaleal haemorrhage and cephalhematoma represent the three primary subtypes of scalp haemorrhages. Each of these traumatic extracranial lesions has a distinct clinical appearance and progression. Imaging frequently performs a supporting role to the clinical diagnosis. The majority of these haemorrhages settle spontaneously with no clinical impact. However, significant blood loss into the subgaleal region can occasionally happen, necessitating surgical removal of the hematoma and blood transfusion [2, 3].

Injury in skull

Multiple partially ossified bony and cartilaginous parts of the neonatal skull are divided by sutures, synchondroses, and fontanels. The foetal head undergoes "moulding" as it travels through the birth canal in accordance with the proportions of the mother's pelvis. The frontal and occipital bones are compressed when the head is the dominant body portion, causing the parietal bones to be moved outward. This causes a step-off between the coronal and lambdoid sutures and a minor expansion of the squamosal suture. However, the parietal bones are forced inward with the less frequent breech, brow, or face

presentations. In either case, the falx, tentorium, or bridging veins may tear, resulting in cerebral haemorrhages, if the deformation happens quickly or severely. Children occasionally develop leptomeningeal cysts or developing fractures, which are characterised by increasing fracture growth brought on by CSF pulsations from wounded leptomeninges trapped in the defect in the skull. The fracture's bony margins are scalloped or smooth. A scalp mass is valued clinically. The first imaging step can be high resolution head ultrasound, then CT or MRI [4].

Injuries in spinal cord and neck

Rare conditions such spinal cord injuries that can occur during labour and delivery that involve excessive traction, rotation, and hyperextension are shown in Figures 12a to 12c. Numerous reported cases have been determined to be caused by breech presentation compounded with an entrapped foetal head. Spinal dislocations or vertebral fractures may be related. It is necessary to get a lateral radiograph of the spine to show vertebral fracture or subluxation. The diagnosis can be helped by plain radiographs, ultrasonography, and MRI; the newborn may present with hypotonia, quadriplegia, or paraplegia. At the craniocervical junction, ligamentous injuries can occasionally be caused by the forceful hyperextension of the neck. Carotid dissection has been documented as a rare complication of dystocic labour the diagnosis may be made with MR, Doppler ultrasound, or CT scans. Colour Doppler of the carotid may indicate an intravascular flap suggesting dissection, while CT and MR of the brain may disclose indications of a stroke involving a carotid vascular region [5].

Peripheral nerve injury

Prepartum or intrapartum birth-related newborn brachial plexus injuries are possible. According to estimates, there are 1 to 1.5 cases of obstetric brachial plexus palsy for every 1000 live deliveries in the US. However, any maternofetal condition leading to foetal trau- ma, including maternal obesity, maternal diabetes, or instrumental delivery, can be implicated. The most common foetal risk factor is macrosomia. Clavicular fractures and brachial plexus injuries frequently coexist. Caesarean sections can be protective, but they do not rule out the possibility of brachial plexus damage. Erb's palsy and a lack of the Moro reflex are caused by C5/6 involvement, whereas Klumpke's palsy and a lack of the Moro and grab reflexes are caused by C7/T1 involvement. Additionally, Horner's syndrome can result from damage to T1 sympathetic fibres. Atonic limb and Horner's sign are the outcomes of complete plexus injury [6].

Also recently described was a tiny neuroma that affected the brachial plexus' upper trunk in a baby who had brachial plexus palsy. Progressive glenohumeral deformity may develop over time. About 25% of patients with newborn brachial plexus palsy had chronic abnormalities, according to a population-based study from Sweden. These anomalies include, among others, glenoid retroversion, posterior humeral head subluxation, dysplastic glenoid cavity, and dysmorphic and hypoplastic humeral head. Although ultrasound may be utilized for screening or for real-time evaluation of joint reduction, MRI is still the gold standard for glenohumeral joint evaluation [7, 8].

Visceral injury

Injuries to the liver, spleen, kidney, adrenals, and trachea are among the visceral organs impacted by trauma. Only 0.2% of newborns experience neonatal adrenal hemorrhage, which is uncommon but can be a significant indicator of birth-related mechanical stress. The position of a tracheal rupture can be anterior subglottic or distal tracheal. In newborns that experience subcutaneous emphysema or pneumomediastinum within a few days of birth, this uncommon and potentially lethal condition should be immediately suspected. In situations of distal tracheal rupture, bronchoscopy should be done right away, and if necessary, open surgical repair should be done [9, 10].

Conclusion

The neonate's many organ systems may be affected by mechanical trauma connected to birth. Traumatic experiences can result in cosmetic deformities, functional impairment, and in extreme cases, even death, despite the fact that they frequently have no clinical impact. For detection, prognostic significance assignment, and follow-up, imaging is crucial; hence radiologists should be knowledgeable about these entities' imaging manifestations and their aftereffects.

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