Neonatal Cranial Injuries

NATALIA CALDERON, MD, MPH

Extracranial Injuries

Extracranial – Caput Succedaneum

Edematous swelling of the scalp **above the periosteum**.

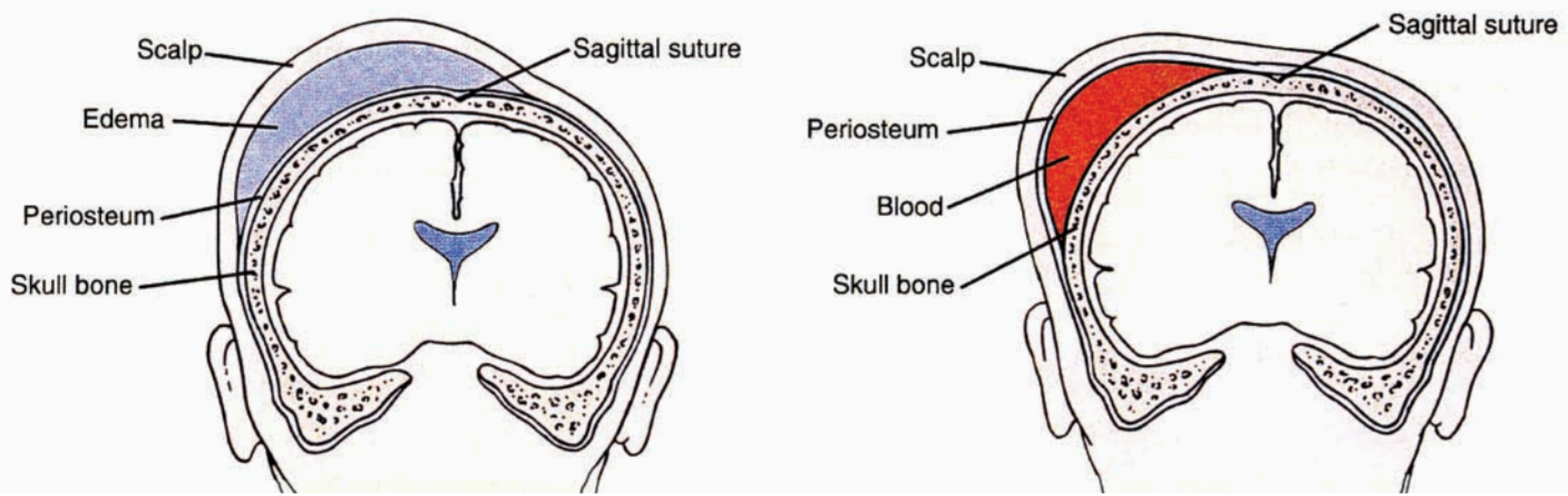
- Presents at birth after prolonged engagement of the fetal head in the birth canal or after vacuum extraction
- It **extends across** suture lines (unlike cephalohematoma)
- Generally benign and will resolve within a few days, requiring no treatment
- Complications: necrotic lesions resulting in long-term scarring and alopecia and rarely systemic infection

Stanford University, Newborn Nursery. https://med.stanford.edu/newborns/professional-education/photo-gallery/head.html#caput_succedaneum

Extracranial – Cephalohematoma

A subperiosteal collection of **blood** caused by rupture of vessels **beneath the periosteum** (usually over the parietal or occipital bone)

- A swelling that **does not cross suture lines** (unlike a caput succedaneum)
- May or may not be accompanied by discoloration
- rarely expands after and delivery and does not cause significant blood loss
- More common when forceps or vacuum delivery is performed
- Majority resolve spontaneously over a few weeks, however calcification of the hematoma can occur with following bony swelling that can persist for months



Understanding the Differences

Caput Succedaneum

- Condition marked by localized soft tissue edema with poorly defined outline
- Caused by pressure of the fetal head against the cervix during labor, which decreases blood flow to the area and results in edema
- Present at birth; does not increase in size
- Swelling crosses suture lines
- Disappears after birth within a few hours to several days
- Complications are rare

Cephalhematoma

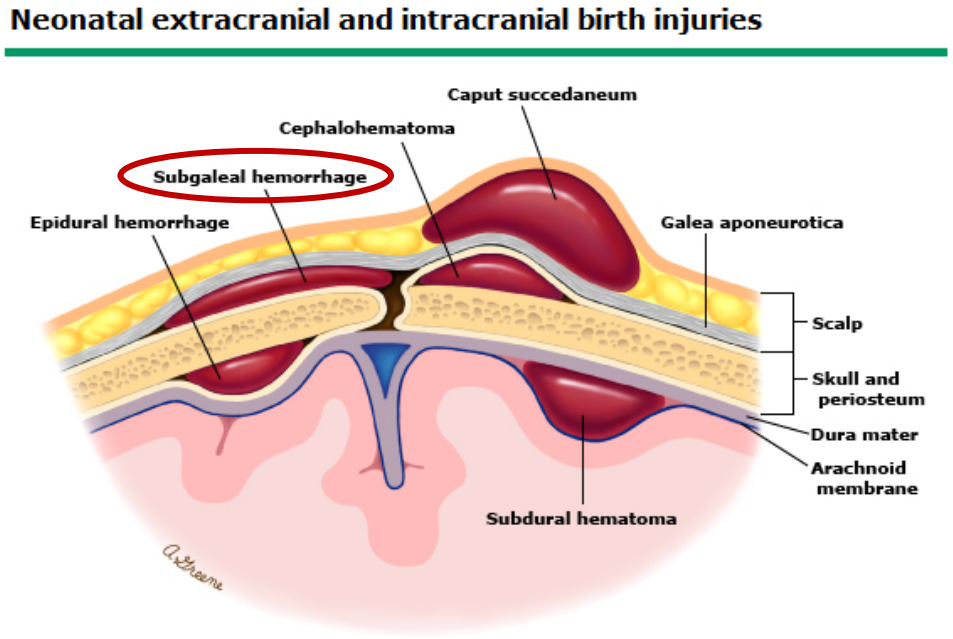
- Condition marked by soft, fluctuant, localized swelling with well-defined outline
- Caused by subperiosteal hemorrhage
- Appears after birth; increases in size for 2–3 days
- Swelling does not cross suture lines
- Disappears from several weeks to even months after birth
- Complications include defective blood clotting, underlying skull fracture or intracranial bleeding, and jaundice

From: Nichols, F. H., & Zwelling, E. (1997). *Maternal-newborn nursing theory and practice* (p. 1105). Philladelphia: WB Saunders. Reprinted by permission.

Extracranial - Subgaleal Hemorrhage

Develops when **blood** accumulates in the loose areolar tissue in the space between the periosteum of the skull and the aponeurosis.

- Potential for massive blood loss (20-40% of the neonate's blood volume) into the subgaleal space, which contributes to the high mortality rate
- Mortality rate is approximately 12-14%
- Presents as a diffuse, fluctuant swelling that can shift with movement. Expansion of the swelling can occur hours to days after delivery
- Early recognition is crucial and management includes frequent vital signs, serial measurements of hematocrits and occipital frontal circumference and head imaging. Volume resuscitation if needed

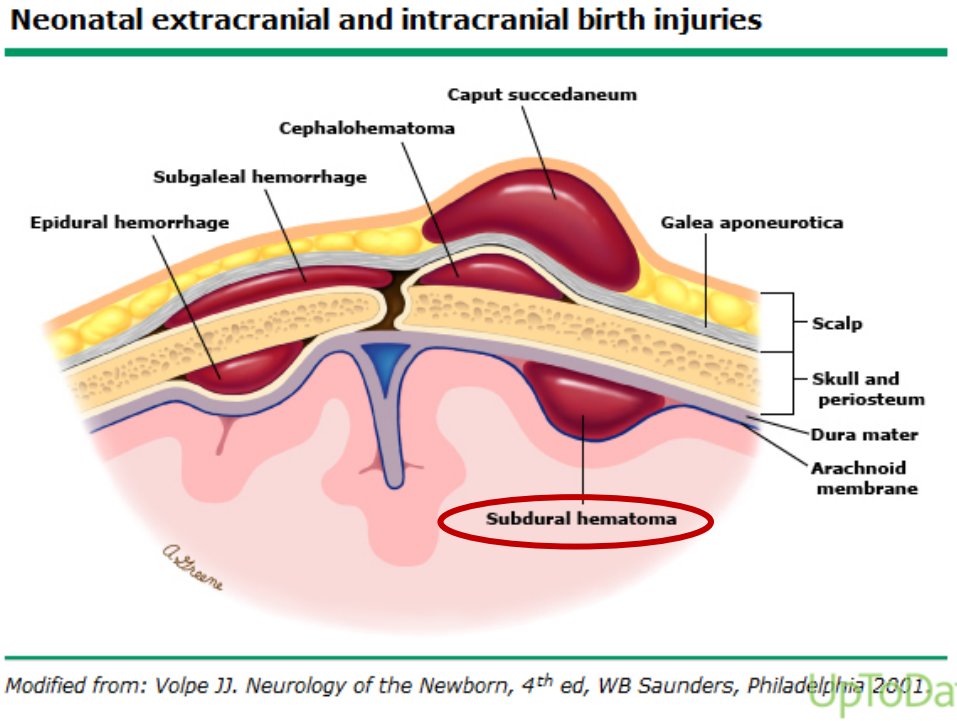


Intracranial Injuries

Intracranial – Subdural Hemorrhage

Although overall incidence is rare, SDH or hematoma, is the **most common type** of intracranial hemorrhage noted in neonates

- Rate higher among infants delivered by vacuum extraction, forceps
- Symptomatic infants present within the first 24-48 hours of life with any of the following: seizures, respiratory depression, apnea, irritability, altered tone/level of consciousness
- Most managed with conservative therapy without surgical intervention. The neonatal skull is very plastic and allows for some degree of expansion without increased ICP



Intracranial - Subarachnoid Hemorrhage

It is the **second most commonly** detected neonatal intracranial hemorrhage. Most often cause by **rupture of bridging veins** in the subarachnoid space

- Can occur with normal spontaneous vaginal deliveries, but the risk increases with operative vaginal deliveries (vacuum-assisted or forceps-assisted)
- As with subdural hemorrhage, newborns most often present at 24 to 48 hours of life with any of the following: seizures, respiratory depression, apnea, irritability, altered tone/level of consciousness
- Imaging via CT of head or MRI of head (in non-emergent situations)
- Treatment is typically conservative

Intracranial - Epidural Hemorrhage

Very rare in neonates and found between the dura and inner table of the skull. Usually caused by **injury to the middle meningeal artery**. Rare in neonates because there is no middle meningeal artery groove in the neonatal cranial bone structure, thus making it more difficult to injure the artery

- Such like the aforementioned injuries, it is associated with operative deliveries
- Can coexist with a cephalohematoma when accompanied by an underlying skull fracture due to the communication
- Neonates present with nonspecific neurological symptoms such as seizures and hypotonia
- Increased ICP can occur, seen as a bulging fontanelle, VS changes and decreased LOC
- Diagnosis make by CT or MRI head which differentiates it from a subdural hemorrhage
- If small lesion and clinically stable, supportive management is sufficient. Surgical evacuation for increased ICP and/or the EDH is large

Intracranial – Intraventricular Hemorrhage

Typically associated with **preterm delivery**, but has been reported as a consequence of birth injury in term infants

- Risk of IVH increases with operative deliveries
- If there is no concern for clotting disorder or history of severe asphyxia, most IVH in term infants will resolve spontaneously with no long-term sequela (unlike preterm infants, which is whole different story!)
- Close monitoring still required due to the risk of extension into the surrounding parenchyma and the the development of post-hemorrhagic hydrocephalus

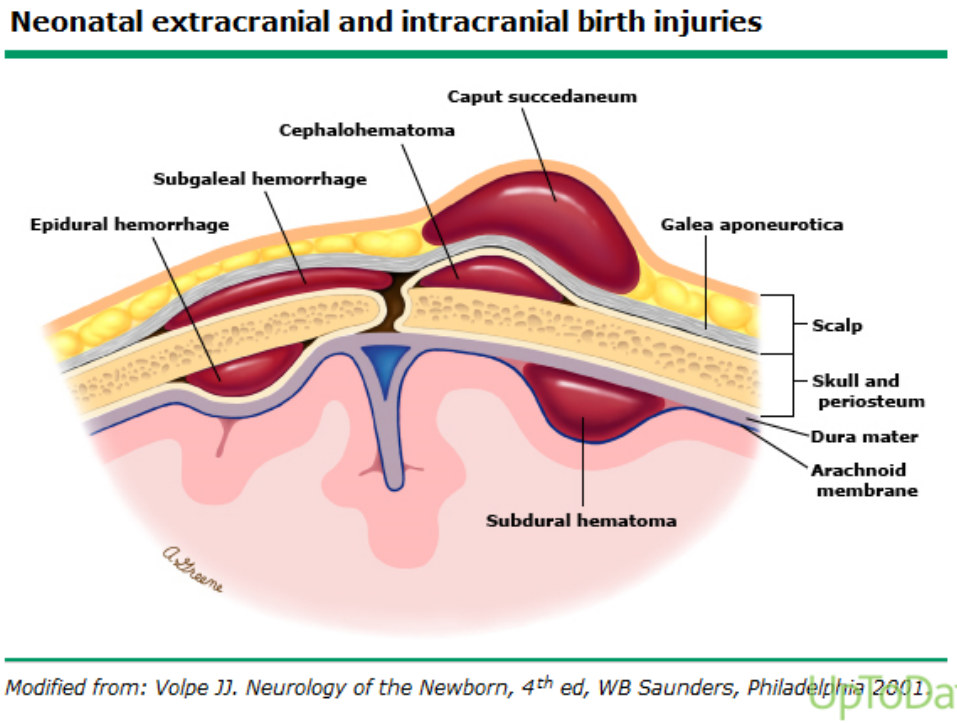
Summary

Extracranial

- Caput Succedaneum
- Cephalohematoma
- Subgaleal Hemorrhage

Intracranial

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



Sources

- McKee-Garrett, T., Weisman, L., Phillips, W., Patterson, M., Kim, M. *Neonatal Birth Injuries*. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA. (Accessed on April 3, 2020.)
- Nicholson, L. *Caput Succedaneum and Cephalohematoma: The Cs that Leave Bumps*. Neonatal Network, *Vol. 26, No. 5.* September/October 2007.
- Gangaram, A., Carter, B. Birth Injuries in Neonates. Pediatrics in Review Nov 2016, 37 (11) 451 462; DOI: 10.1542/pir.2015-0125