3.8.3. Birth Injuries

Unit 3 · Topic 8.3 Birth Injuries (Navajāta Janma-abhighāta)

Learning goals

By the end of this chapter you will be able to:

- define **birth injury** and explain its **rationale** in Kaumārabhṛtya and recent neonatology;
- list **risk factors**, **mechanisms**, and **patterns** of injury;
- identify **clinical features** and perform **focused examination**;
- outline **investigations**;
- write **step-wise management** for common injuries (scalp/cranial, fractures, nerve injuries, visceral);
- document **prevention and counselling** strategies.

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1) Definition, scope & Ayurvedic–recent correlation

Birth injury is structural or functional impairment in a newborn caused by **mechanical forces** during labour, delivery, or immediate post-delivery handling (including instrument use). It excludes purely hypoxic–ischaemic brain dysfunction unless accompanied by traumatic lesions.

Ayurvedic correlation: Under *abhighāta* (trauma) and *vrana/bhagna* (wounds/fractures), classical surgery texts emphasise protecting **vital points (marma)** and stabilising disturbed **vāta** in tender tissues of the neonate. The core safety principle is marma-rakṣaṇa:

> **"मांस-शिरा-स्नायु-अस्थि-सन्धीनां संयोगो मर्म।"** — *Suśruta Saṃhitā*, Śārīrasthāna **6/16**.
> *(Marma is the junction where muscle, vessels, ligaments, bone and joints meet; injury here endangers life.)*

This maps well to modern priorities: **gentle, skilled handling**, avoidance of excessive traction/pressure, and early recognition of bleeding or nerve compromise.

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2) Risk factors (know at least 8)

Maternal/ uterine: primigravida, prolonged/obstructed labour, hyperstimulation, cephalopelvic disproportion, diabetes, obesity, short stature.
Fetal: macrosomia, post-term, **prematurity** (fragile tissues), malpresentation (breech, face), **shoulder dystocia**.
Intrapartum/procedural: forceps/vacuum use (especially difficult extractions, cup detachment), precipitous delivery, prolonged second stage, lack of skilled help.
Others: coagulation disorders, vitamin-K deficiency, resuscitation with excessive pressures.

Mechanisms: compression, traction, torsion, shearing, instrument pressure, and postnatal mishandling.

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3) Classification overview

Group	Common entities	Usual timing	Typical clues
Scalp & cranial soft-tissue	**Caput succedaneum**, **cephalohematoma**, **subgaleal hemorrhage**	At birth/first hours	Scalp swelling characteristics, haemodynamic status

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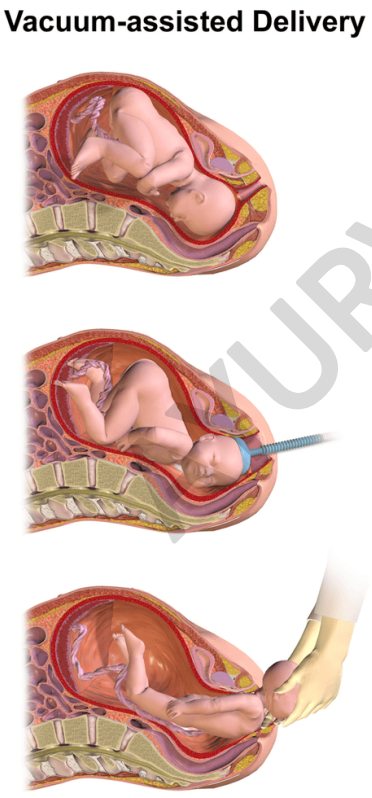
Group	Common entities	Usual timing	Typical clues
Skull & intracranial	Linear/depressed skull fracture; **intracranial hemorrhage** (subdural, subarachnoid, IVH esp. preterm)	Early hours–days	Apnoea, seizures, bulging fontanelle, anaemia
Peripheral nerve	**Brachial plexus palsy** (Erb–Duchenne C5–6; Klumpke C8–T1; total), **facial nerve palsy**, **phrenic nerve palsy**	At birth	Limb posture/asymmetry; facial asymmetry; respiratory distress (phrenic)
Skeletal fractures	**Clavicle** (commonest), humerus, femur	Birth–day 1	Tenderness, crepitus, pseudoparalysis, decreased Moro
Visceral/others	Liver/spleen rupture, adrenal hemorrhage, spinal cord injury (rare), sternomastoid tumour (fibromatosis colli)	Variable	Shock, abdominal distension; neck mass over weeks

4) Scalp & cranial soft-tissue

4.1 Caput succedaneum

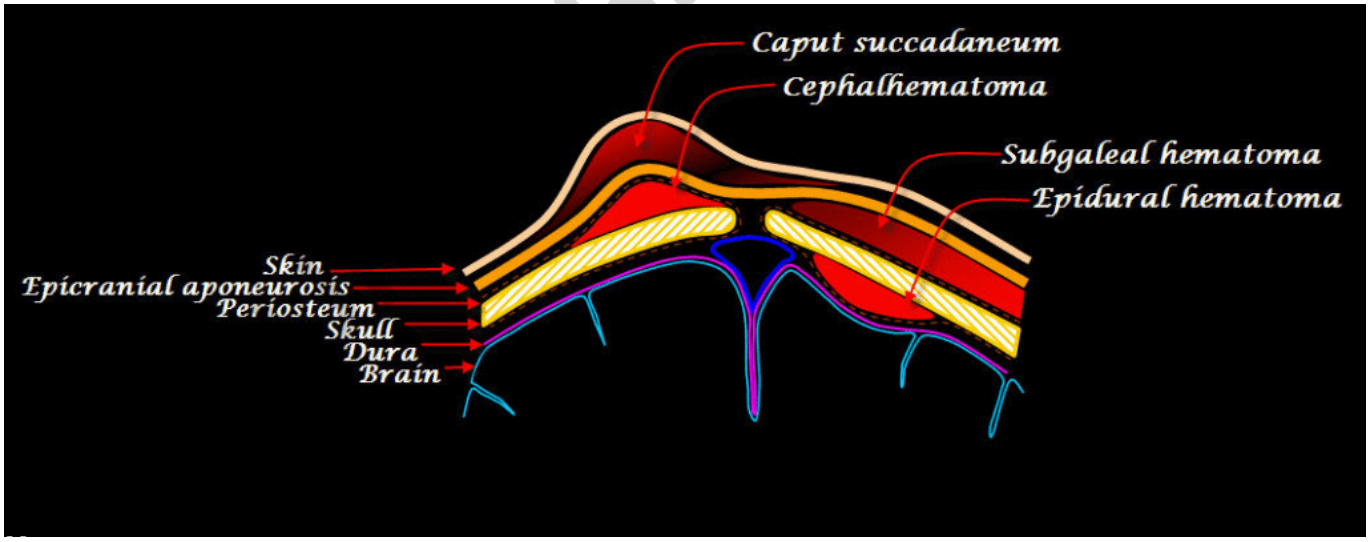
- **Subcutaneous oedema** crossing sutures; pitting; present at birth; resolves in 24–48 h.
- **Management:** reassurance, observation; avoid needle aspiration.

Caput succedaneum is a benign neonatal condition involving a serosanguinous (containing blood and serum), subcutaneous, extra-periosteal fluid collection with poorly defined margins caused by the pressure on the presenting part of the fetal scalp by the vaginal walls and uterus as the infant passes through a narrowed cervix during delivery.



Close-up of a newborn with *caput succedaneum*

Caput succedaneum typically presents as a soft, boggy, uneven mass that crosses cranial suture lines. The size of the caput is typically 1-2 cm deep with a varying circumference dependent on degree of injury. Petechiae, purpura, and ecchymoses (bruises) may also be present. Since the fluid collection is not bound by suture lines, the swelling will shift with gravity as the baby's head is repositioned.



Newborn Scalp bleeds

4.2 Cephalohematoma

- **Subperiosteal bleed**, **limited by sutures**; appears hours later; firm, non-pitting; may calcify; small risk of jaundice/anaemia.
- **Management:** observation, bilirubin monitoring; **no aspiration**; iron if significant anaemia.

4.3 Subgaleal hemorrhage (SGH) — life-threatening

- Bleeding in **subaponeurotic space**; **diffuse, fluctuant**, crosses sutures, may shift with gravity; **pallor, tachycardia, hypotension**; often after vacuum/traction.
- **Immediate actions:** ABC, large-bore access; **serial head circumference**, cardiorespiratory and **haemoglobin monitoring (4–8-hourly)**; correct **shock with fluids, blood/FFP**; Vitamin K; NICU care.

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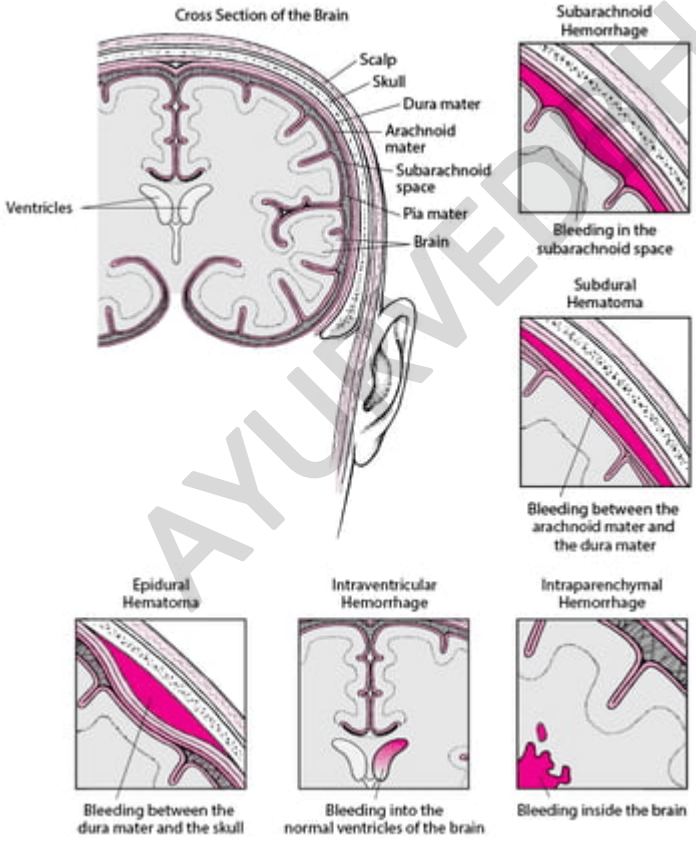
5) Skull & intracranial injuries

5.1 Skull fractures

- **Linear** (most): benign; treat with observation.
- **Depressed ("ping-pong")**: may need elevation if significant indentation or neurological signs; neurosurgery opinion.

5.2 Intracranial hemorrhage

- **Subdural** (instrumental/rapid delivery), **subarachnoid** (common, often benign), **intraventricular** (preterm).
- **Features:** seizures, lethargy, bulging fontanelle, anaemia, apnoea.
- **Work-up:** bedside ultrasound (preterm), CT/MRI if unstable/uncertain; labs (Hb, platelets, coag profile).
- **Management:** supportive (ventilation, fluids, anticonvulsants), treat coagulopathy, neurosurgical input when indicated.



Types of Intracranial Hemorrhage

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6) Peripheral nerve injuries

6.1 Brachial plexus birth palsy (NBPP)

- **Erb–Duchenne (C5–C6)**: “waiter’s tip” (adduction, internal rotation, elbow extension, forearm pronation).
- **Klumpke (C8–T1)**: intrinsic hand weakness ± Horner’s; rare.
- **Total plexus**: flail limb.
- **Risks:** shoulder dystocia, macrosomia, assisted delivery.
- **Initial management:** protect joint (avoid traction), **early physiotherapy/occupational therapy** to maintain range and prevent contractures; regular neuro follow-up. **Surgery** is considered for absent/poor recovery (typically by 3–6 months) or total palsy.

6.2 Facial nerve palsy (usually pressure/forceps)

- **Signs:** asymmetrical cry, mouth deviation, incomplete eye closure on affected side.
- **Care: eye protection** (lubricating drops/ointment, padding/taping technique), feeding support; most recover in **3–6 months**. Refer if persistent.

6.3 Phrenic nerve palsy

- **Clue:** paradoxical chest movement, unilateral diaphragm elevation on X-ray, respiratory distress (often with ipsilateral brachial plexus palsy).
- **Management:** respiratory support, consider noninvasive ventilation; rarely plication if prolonged failure.

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7) Skeletal fractures

7.1 Clavicle — the commonest

- **Presentation:** crepitus, tenderness, asymmetric Moro, pseudoparalysis; later **callus lump** (reassure parents).
- **Management:** analgesia; **gentle swaddling/sling** across chest for comfort; **no rigid splinting**; excellent healing. Provide anticipatory guidance about callus.

7.2 Humerus/Femur

- Rare; suspect with swelling/immobility; confirm by X-ray.
- **Management:** analgesia; soft splinting or Pavlik-like positioning as per orthopaedic advice; heal rapidly.

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8) Visceral & other injuries

- **Liver/spleen laceration**: pallor, abdominal distension, falling Hb → urgent imaging, resuscitation, surgery as needed.
- **Adrenal hemorrhage**: flank mass, anaemia/jaundice; ultrasound confirms; supportive care.
- **Spinal cord injury** (rare, breech traction): hypotonia/areflexia → MRI, neuro-critical care.
- **Sternomastoid tumour (fibromatosis colli)**: firm neck mass appearing at 2–4 weeks after difficult delivery; treat with physiotherapy and positioning.

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9) Examination & investigations (pointwise OSCE)

1. **Primary survey:** airway, breathing, circulation, temperature, glucose.
2. **Head-to-toe:** scalp swelling characteristics; skull step-offs; fontanelle; asymmetry of face/limbs; Moro/Grasp; tone; respiratory pattern.

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3. **Focused tests:**
    - **Serial head circumference** (SGH risk).
    - **Neurosonogram** (preterm/IVH concern).
    - **X-rays** for suspected fractures.
    - **Hb/platelets/coagulation** if bleeding is suspected; **bilirubin** if cephalohematoma.
    - **CXR/diaphragmatic elevation** for phrenic palsy.

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10) Management framework (delivery room → postnatal ward)

A. Delivery room principles (align with NRP; trauma-aware)

- Skilled team for difficult extraction/shoulder dystocia.
- **Avoid excessive traction** on the head/shoulders; follow standard dystocia manoeuvres.
- After delivery: **Warm–Dry–Position**, gentle handling, recognise abnormal swelling/asymmetry early.

B. Ward/NICU care (synthesise for each injury)

- **SGH**: NICU monitoring, labs, **resuscitate and transfuse early** as per guideline checklists; continuous cardiorespiratory monitoring.
- **Cephalohematoma/Caput**: observation and jaundice surveillance; no tapping.
- **Skull fracture/ICH**: neuro consult; imaging as indicated; manage seizures/coagulopathy.
- **NBPP**: early **physio/OT**, gentle positioning (avoid shoulder adduction-internal rotation posture), analgesia; planned follow-up; surgical referral if poor recovery trajectory.
- **Facial nerve**: **eye care first**, feeding support; reassure about prognosis.
- **Clavicle**: comfort sling/swaddle, analgesia; reassure about callus.

C. Kaumārabhṛtya-aligned supportive care (safety-first)

- **Marma-rakṣaṇa**: educate staff/parents to **avoid pressure** on neck/axillae and avoid **sudden traction** to limbs/head—consistent with *marma* protection (see śloka above).
- Start **KMC** and gentle **snehana (oiling)** only **after cardio-respiratory stability**; keep touch **light and warming**, never vigorous in injured neonates.
- **Stanya (human milk)** prioritised; correct mother's rest–diet; avoid overhandling.

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11) Differentials & red flags (don't miss)

- **Rapidly expanding scalp swelling + pallor/hypotension** → think **SGH** (not caput/cephalohematoma).
- **Asymmetric Moro** may be due to **clavicle fracture or Erb palsy**; check for crepitus vs persistent posture.
- **Persistent weak cry/hoarseness + asymmetric diaphragm** → consider **recurrent laryngeal/phrenic palsy**.
- **Bruising + bleeding at multiple sites** → evaluate coagulopathy (vitamin-K status).

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12) Prevention & counselling

Obstetric measures: appropriate decision for **operative vaginal vs caesarean**, correct instrument application, avoid repeated cup detachments, team readiness for **shoulder dystocia**, and judicious traction/rotational forces.

Neonatal handling: training in safe lifting, **no limb pulling**, avoid deep scalp needle sticks, avoid unnecessary suctioning; **vitamin K** prophylaxis.

Counselling pointers:

- Most injuries (caput, cephalohematoma, clavicle fracture, facial palsy, Erb palsy) have **excellent prognosis** with conservative care and physiotherapy; explain timelines.
- Teach **danger signs**: poor feeding, lethargy, pallor, increasing head swelling, breathing difficulty, seizures.
- Demonstrate **home positioning/ROM** exercises (for NBPP) and **eye protection** steps (for facial palsy).

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13) Case algorithms (copy into your notes)

A) Suspected SGH after vacuum extraction

- Diffuse, fluctuant scalp swelling ± pallor → **measure HC now and 2-hourly**, insert IV lines, bloods (CBC, coag, group & screen), **bolus crystalloids** if shock → **early O-negative blood + FFP** as per local protocol → NICU monitoring; treat jaundice later.

B) Weak right arm at birth (waiter's tip)

- Check clavicle for crepitus; if none, **Erb palsy** likely → **physio within days**, protective positioning; review recovery at 2, 6, 12 weeks; consider surgical referral if **no biceps recovery by ~3 months**.

C) Facial asymmetry with incomplete eye closure

- Start **lubricants + eye taping at sleep**, reassure on recovery (3–6 months common), arrange follow-up.

D) Clavicular crepitus after shoulder dystocia

- **Analgesia**, soft sling/swaddling; **no rigid immobilisation**; anticipate **callus lump** in 1–2 weeks and reassure.

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14) Quick revision tables

14.1 Scalp swellings compared

Feature	Caput succedaneum	Cephalohematoma	Subgaleal hemorrhage (SGH)
Compartment	Subcutaneous	Subperiosteal	Subaponeurotic
Crosses sutures?	**Yes**	**No**	**Yes (diffuse)**
Onset	At birth	Hours later	At birth/early
Systemic signs	None	Jaundice/anaemia sometimes	**Shock, anaemia**
Management	Observe	Observe; bilirubin	**Resuscitate, transfuse, ICU**

14.2 Brachial plexus patterns

Type	Roots	Posture	Reflex	Prognosis
Erb	C5–C6	Adducted, IR; elbow extended, pronated	↓ Moro on side	Good; physio early
Klumpke	C8–T1	Hand intrinsic weakness; claw	Grasp ↓	Variable; consider imaging
Total	C5–T1	Flail limb	Moro/Grasp absent	Early referral; may need surgery

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Self-assessment

MCQs (one best answer)

1. A diffuse, fluctuant scalp swelling that **crosses sutures** with falling Hb and tachycardia suggests:

A. Caput succedaneum B. Cephalohematoma C. **Subgaleal hemorrhage** D. Skull fracture

2. The **initial priority** in facial nerve palsy at birth is:
   A. Steroids B. Immediate surgery C. **Eye lubrication and protection** D. MRI brain
3. The **commonest** birth fracture is:
   A. Femur B. Humerus C. **Clavicle** D. Skull
4. "Waiter's tip" posture indicates palsy of:
   A. **C5–C6 roots (Erb)** B. C8–T1 C. C7 only D. Phrenic nerve
5. Which statement is **true** for clavicle fracture in the newborn?
   A. Needs rigid figure-of-eight splinting
   B. **Analgesia with gentle swaddling; excellent healing**
   C. Needs surgical plating
   D. Avoid breastfeeding for 2 weeks

Answer key: 1-C, 2-C, 3-C, 4-A, 5-B.

Short-answer (3–5 lines)

1. Differentiate caput, cephalohematoma and subgaleal hemorrhage.
2. Outline early physiotherapy goals in Erb palsy.
3. Enumerate three red flags in suspected intracranial bleed.
4. Write a counselling script for parents of a baby with clavicle fracture.
5. Explain how **marma-rakṣaṇa** guides safe newborn handling.

Long-answer (10–12 marks)

1. Discuss **Birth Injuries** under definition, risk factors, classification, clinical features, investigations, management and prevention; integrate *marma-rakṣaṇa* with modern delivery-room safety.
2. Write short notes on **(a) Subgaleal hemorrhage** and **(b) Brachial plexus birth palsy** with algorithms.

Modern & guideline sources

- Davis DJ. *Neonatal subgaleal hemorrhage: diagnosis and management.* **CMAJ** 2001. (classic clinical guidance).
- Child & Adolescent Health Service (WA). *Subgaleal Haemorrhage: Detection & Management in the Newborn* (2024).
- PIPER Neonatal (RCH Melbourne). *Management of Subgaleal Haemorrhage in Neonatal Transport* (2019).
- AAP publications: **NeoReviews** / **Pediatrics in Review** on **Neonatal Brachial Plexus Injury** (2019, 2007).
- Shah V, et al. *Evaluation and management of neonatal brachial plexus palsy.* **Paediatr Child Health** 2021.
- MedlinePlus / StatPearls: **Facial nerve palsy—birth trauma** (2024/2023).
- Stanford Newborn Nursery Photo Atlas—**Newborn clavicle fractures** (teaching guidance).
- Nationwide Children's; JPOSNA 2024 — **Neonatal clavicle fractures management (non-operative)**.
- Starship (NZ) **SGH guideline** (2024) and Nature 2025 review.

60-second recap

Birth injury = mechanical harm around delivery. Think **scalp/cranial**, **fractures**, **nerve palsies**, **visceral**. **SGH is the killer**—monitor HC/Hb and **resuscitate early**. **Clavicle fractures** heal with **comfort care**. **NBPP** needs **early physio** and outcome-based referral. Keep **marma-rakṣaṇa** in mind: gentle, skilled handling protects the newborn's life points—and your patient.