NEONATAL BRACHIAL PLEXUS INJURY PATHWAY

TARGET AUDIENCE	Neonatal health care team, Midwifery teams, Children's community physiotherapy team
PATIENT GROUP	All neonates with brachial plexus injury after birth

Clinical Guidelines Summary

- Obstetric/neonatal brachial plexus injury happens around the time of birth and is usually the result of a neuromotor stretch injury to the brachial plexus
- This will present as flaccid paralysis of part of, or all of the upper limb affected
- Although the majority improve with conservative management, there is a risk of long-term impairment
- Brachial plexus injury warrants Neonatal Medical Review and referral to Paediatric Physiotherapy for early intervention and support
- In severe cases, early referral to the Scottish National Brachial Plexus Injury Service is warranted
- Follow-up for neonates born in NHS Lanarkshire is summarised on page 6

Obstetric/Neonatal Brachial Plexus Injury

Injury to the brachial plexus happens at the time of birth and is reported in up to 8 per 1000 livebirths worldwide (Van der Looven et al., 2020). It is the result of neuromotor injury of the brachial plexus, mostly around the time of birth, causing flaccid paralysis. Obstetric brachial plexus injury (OBPI) can result in neurological deficit of the shoulder, arm, hand and fingers. The extent and length of recovery time is variable. Residual deficit has been reported in 20-30% of patients (Smith et al., 2018), and so timely assessment and supervised intervention is important. Surgical intervention may be required if there is no improvement at 3-6 months of age. Long-term, there may be bone growth issues, joint issues, psychomotor challenges and can impact quality of life (Van der Looven et al., 2020).

Brachial Plexus Anatomy

The brachial plexus is in the neck, extending to the axilla, posterior to the clavicle. It is a network of nerves, formed by lower cervical and upper thoracic ventral nerve roots (C5-T1 nerve roots) supplying the upper limb and extending to the scapular region (Knipe et al., 2013; Polcaro et al., 2023).

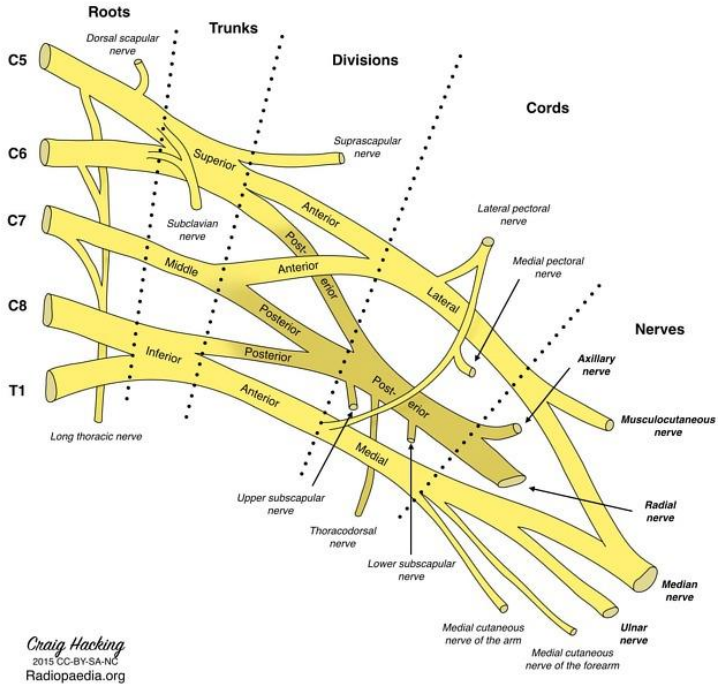

Figure 1. Brachial plexus anatomy (Knipe et al., 2013)

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Risk Factors

These include:

- Shoulder dystocia
- Macrosomia (birthweight >4kg)
- Maternal diabetes
- Instrumental delivery
- Breech delivery
- Clavicle fracture
- Prolonged labour
- Maternal obesity

Types of Injury

This depends on the degree of injury to the nerves (Abid, 2016; Scottish National Brachial Plexus Injury Service, n.d.).

1. **Neuropraxia** – elongation/stretching and bruising of the nerve fibres, with recovery over a few days or weeks
2. **Axonotmesis** – partial nerve rupture, but nerve sheath remains intact, with recovery over months
3. **Neurotmesis** – complete nerve rupture and neuroma formation, making full recovery difficult
4. **Avulsion** – complete rupture of nerves from the spinal cord, with no chance of nerve recovery

Presentation

This depends on the nerve root or roots injured, as detailed below (Abid, 2016; Shah et al., 2021).

Injury involving C5/C6 (+/- C7) roots: Erb's Palsy

- The arm lies with the elbow straight, the wrist bent and the hand pointing backwards
- The infant is unable to abduct the arm from the shoulder
- The infant is unable to rotate the arm externally from the shoulder
- The infant is unable to supinate the forearm
- If C7 is involved, the wrist is affected, making it 'drop' (extended Erb's palsy)
- This results with a 'waiter's tip' appearance

Injury involving C8/T1 roots: Klumpke's palsy

- Rare
- Flaccid paralysis of the hand, with an active arm
- Claw appearance of the hand
- Wrist hyperextended due to unopposed wrist extensors

Injury involving C5-T1 roots: Total brachial plexus palsy

- Complete flaccid paralysis of the arm, wrist and hand

Injury involving C5-T1 and sympathetic chain fibres: OBPI with Horner's syndrome

- Results from damage to the sympathetic chain nerve fibres and may suggest an avulsion injury
- Evident from a constricted pupil, and weak, droopy eyelid and decreased sweating on the affected side
- Consider chest x-ray to assess for diaphragmatic paralysis on the ipsilateral side, because of phrenic nerve injury (C3-5 origins)

Evaluation of the Neonate

Clinical suspicion of a brachial plexus injury should prompt referral to the Neonatal Medical Team for clinical assessment.

A history of the labour and birth, including presentation and type of birth should be taken, taking into account risk factors for OBPI.

Clinical assessment should include the following assessment of **active movement**, **power** and **tone** at **shoulder**, **elbow**, **wrist** and **finger** levels.

Shoulder (C5) – can the baby move their arm above the head (i.e. abduct the shoulder)?

Elbow (C5/C6) – can the baby bring their arm to their mouth/midline (i.e. active flexion)?

Wrist (C7) – can the baby bend their wrist back when grasping (i.e. active wrist extension)?

Fingers (C8, T1) – can the baby grasp and make a fist (i.e. active flexion)?

Moro reflex – is this symmetrical?

Presence of Horner's syndrome – is the baby's pupil constricted, with a weak, droopy eyelid on the affected side?

Presence of breathing abnormality – is the baby showing an abnormal breathing pattern which may suggest phrenic nerve injury? Consider a chest x-ray in this instance.

Presence of fractures – is there evidence of a clavicle or humeral fracture? A chest x-ray may be considered to assess for this if there is a strong clinical suspicion.

These history and clinical findings should be documented clearly within the Badger Maternity baby case notes. All neonates with brachial plexus injury should also be assessed by a tier 2 or tier 3 clinician. All babies should be referred for paediatric physiotherapy assessment and management. If there are severe findings including complete paralysis of the arm and/or Horner's syndrome, or there is persistence of symptoms at 2 months of age, the baby also needs urgent referral to the Scottish National Brachial Plexus Injury Service. Follow-up for these patients is summarised on the next page.

Follow-up Pathway University Hospital Wishaw

Primary Medical Assessment

Examination and documentation of findings by Tier 1 and Tier 2 clinicians in Maternity Badger on Baby section

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Referral

If diagnosis confirmed by Tier 2 or Consultant, e-mail referral with history and findings to Community Paediatric Physiotherapy Team at: childphysio.lanarkshire@lanarkshire.scot.nhs.uk

Copy in named Consultant to e-mail. Neonatal consultant clinic follow-up is not routine unless there is evidence of Horner's syndrome, diaphragmatic involvement or is requested by the named consultant

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Primary Physiotherapy Assessment

During hours 0830-1200 Monday-Friday, contact Maternity Ward Physiotherapist on extension 5830 for initial physiotherapy assessment

If patient is discharged prior to first assessment e.g. Friday PM-Sunday, the initial assessment will be with the Community Paediatric Physiotherapist

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Subsequent follow-up based on individual patient and family needs, arranged Community Paediatric Physiotherapy Team

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Community Physiotherapist to contact the "Named Neonatal Consultant" through e-mail or by contacting neonatal secretaries on 01698 366 206 in case of any concern regarding a baby

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Community Physiotherapist to discharge when deemed fit or onward referral to SNBPIS

For significant findings, including complete paralysis of the upper arm and Horner's syndrome, immediate tertiary referral to be performed by Community Paediatric Physiotherapy Team

SNBPIS: Scottish National Brachial Plexus Injury Service

E-mail: brachial.plexus@ggc.scot.nhs.uk

Telephone: 0141 347 8916

Scottish Neonatal Brachial Plexus Injury Service

The Children's Brachial Plexus Injury Service is a designated national service for Scotland. Outpatients are reviewed at the Royal Hospital for Children Glasgow. Treatment is provided by the multi-disciplinary team, including occupational therapy, physiotherapy, nerve repair and shoulder repair surgery.

Full details of the service, referral forms and information for parents/carers are found at: https://www.brachialplexus.scot.nhs.uk/childguidelines

Further information for parents is available at: www.erbspalsygroup.co.uk

Further Reading

Abid's (2016) article has several useful images for reference, demonstrating brachial plexus injury, which can be found through: https://pubmed.ncbi.nlm.nih.gov/26774906/

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Appendices

1. Governance information for Guidance document

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		e.g. Review, revise and update of policy in line with contemporary professional structures and practice	1
			2
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