

Isolated radial nerve injury in newborns: Highlights on diagnosis

Isolated radial nerve palsy is rare and must be differentiated from obstetric brachial plexus palsy to ensure the correct course of action. The authors present a case of isolated radial nerve palsy in a female neonate, with subsequent treatment and recovery, and a literature review.

Moustafa Eldalal

Paediatric Senior Clinical Fellow
moustafa_badreldin@outlook.com
or moustafa.eldalal@nhs.net

Michael Gunn

Paediatric Junior Clinical Fellow

Siddhartha Paliwal

Paediatric Consultant and Neonatal Lead

Queen Elizabeth Hospital, Lewisham and
Greenwich NHS Trust

Background

Neonatal nerve injuries of the upper limb may have different causes. The most common cause is obstetric brachial plexus palsy (OBPP) in which Erb's palsy is more common than Klumpke's palsy. However, radial nerve palsy is very rare with only a small number of cases reported. Hence, it is likely to be misdiagnosed as OBPP. In carrying out our literature review, we have found 84 cases previously reported.

As radial nerve palsy is uncommon, paediatricians need to be aware of the condition in order to identify it, to provide appropriate management and to plan the necessary follow-up appointments. Although radial nerve palsy has varying causes, isolated radial nerve palsy is most commonly associated with a difficult delivery¹ and has an excellent prognosis. Therefore, accurate diagnosis will enable paediatricians to reassure parents and provide an accurate prognosis.

Case presentation

We present a case of isolated radial nerve palsy in a female neonate, born to a primigravida mother at term (40 weeks of gestation) weighing 3.7kg at birth. She was born by forceps delivery due to failure to progress to the second stage of labour. The baby required drying, stimulation and one set of inflation breaths at birth. Her Apgar score was 6, 9 and 10 at one, five and 10 minutes respectively.

On routine NIPE examination (newborn and infant physical examination) the following day, the baby had left wrist and finger drop (FIGURE 1). She had a full active range of movement of the right upper limb at all joints. She also had a full active range of movement on the left shoulder and arm against gravity. There was marked left wrist



FIGURE 1 Left wrist and finger drop with inability to extend wrist, metacarpophalangeal or interphalangeal joints. Normal wrist and fingers extension of the right hand.



FIGURE 2 Red area at the posterolateral aspect of the left arm, indicative of fat necrosis.

drop and finger drop with no active movement of wrist extension, even with stimulation. Furthermore, there was no active finger extension, but a minimal flicker of finger extension on stimulation. Passive movement of left wrist and fingers

Keywords

obstetric brachial plexus palsy; isolated radial nerve palsy; Erb's palsy; Klumpke's palsy; Horner syndrome

Key points

Eldalal M., Gunn M., Paliwal S. Isolated radial nerve injury in newborns: Highlights on diagnosis. *Infant* 2024; 20(4): 116-19.

1. Radial nerve palsy is rare; however, it can be misdiagnosed as obstetric brachial plexus palsy. Hence, differentiating between them is important.
2. Radial nerve palsy presents with wrist and fingers drop; however, arm and shoulder movements are normal. Palmar grasp reflex is preserved. Prognosis is usually excellent with full recovery.
3. Erb's palsy can be excluded if Moro reflex is normal.
4. Klumpke's palsy can be excluded if palmar grasp reflex is present.

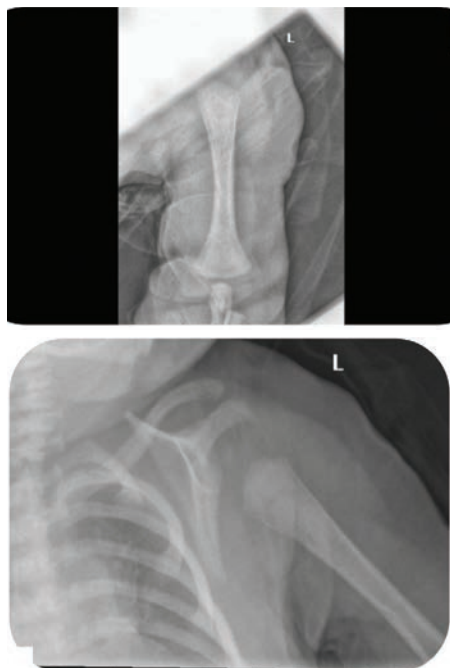


FIGURE 3 Normal x-ray of the humerus.

were normal with full range of movement. The baby had Moro reflex and palmar grasp reflex bilaterally. Therefore, it was clear that it was a distal injury not involving the shoulder or arm of the left upper limb.

On inspection of the left arm, there was an area of redness at posterolateral aspect. It was a firm non-pitting nodule in the subcutaneous tissue, which is consistent with fat necrosis (**FIGURE 2**).

Investigations

The baby had x-rays to exclude humerus fracture, which came back normal (**FIGURE 3**). At six weeks of age, nerve conduction studies and electromyography suggested mild radial nerve affection with good recovery. This was expected due to the time lag between when the injury was sustained and when the investigations were carried out.

Differential diagnosis

Other pathologies can be associated with radial nerve injury in neonates such as humerus fracture⁵ and infantile cortical hyperostosis,²⁰ which can be easily excluded by an x-ray of the arm. Other causes that are described in the literature include angioleiomyoma,²¹⁻²² amniotic constriction band,²³ intrauterine stab injury,²⁴ septic shoulder²⁵ and use of the blood pressure cuff in premature infants.²⁶

The management in these cases is dependent upon the cause. In some case, surgical intervention may be necessary.

Authors	No. of cases	Side	Skin lesion	Complicated birth	Full recovery
Kehrer 1918 ^(in ref 5)	1	Bilateral	Yes	Not documented	*Not documented
Abelson et al 1936 ^(in ref 4)	1	Unilateral	No	Yes	2 weeks
Hauch & Ottsen 1939 ^(in ref 5)	3	2 unilateral, 1 bilateral	Yes (3/3)	Yes (3/3)	*Not documented
Morgan 1948 ⁵	2	1 bilateral, 1 unilateral	Yes (2/2)	Yes (2/2)	3 weeks - 3 months
Lightwood 1951 ⁶	2	Unilateral	Yes (2/2)	(1/2)	3 weeks - 2 months
Feldman 1957 ⁷	8	6 unilateral, 2 bilateral	(7/8)	(7/8)	3 weeks - 3 months
Browne 1958 ^(in ref 4)	1	Bilateral	Yes	Yes	6 weeks
Craig et al 1958 ^(in ref 4)	10	5 bilateral, 5 unilateral	(5/10)	Yes (10/10)	2 weeks - 3.5 months
Coppotelli et al 1979 ⁸	1	Unilateral	Yes	Yes	3 weeks
Ross et al 1983 ⁹	2	Unilateral	Yes	(1/2)	6 weeks - 4 months
Lenn et al 1983 ¹⁰	1	Unilateral	No	No	1 month
Hayman et al 1999 ¹¹	4	Unilateral	(3/4)	(3/4)	4 months
Deshmukh et al 2002 ¹²	2	Unilateral	No	(1/2)	1-3 weeks
Monica et al 2008 ¹³	4	Unilateral	Yes	Yes	*Full recovery
Lundy et al 2009 ¹⁴	1	Bilateral	Yes	Yes	2 weeks
Alsubhi et al 2011 ³	25	Unilateral	(17/25)	(24/25)	1 week - 6 months
Haider 2012 ¹⁵	1	Unilateral	Yes	Yes	6 weeks
Ghinescu et al 2012 ¹⁶	1	Unilateral	Yes	No	2 months
Siqueira et al 2014 ¹⁷	1	Bilateral	-	-	3 months
Carsi et al 2015 ⁴	8	6 unilateral 2 bilateral	(7/8)	Yes (8/8)	3 weeks - 6 months
Böhringer 2014 ¹⁸	1	Bilateral	No	No	10 months
Malik et al 2014 ¹	2	Unilateral	-	Yes	*Full recovery
Vazquez Do Campo 2017 ¹⁹	1	Bilateral	Yes	Yes	*Full recovery
Carrato et al 2020 ²	1	Unilateral	Yes	No	5 weeks
Our case	1	Unilateral	Yes	Yes	6 months
Total cases	85				
Percentages		20% bilateral 80% unilateral	71.7%	85.8%	100%

TABLE 1 Cases of isolated radial nerve palsy described in the literature.

(*) No clear documentation on when full recovery occurred.

(-) No documentation about presence or absence of skin lesion/circumstances of birth.

Treatment

Before discharge from the postnatal ward, the baby was referred for physiotherapy. Her parents were taught to perform passive stretches (wrist extension, finger extension,

finger abduction and thumb abduction). They were encouraged to perform these exercises regularly, to coincide with nappy changes. Sensory stimulation was also demonstrated and a follow-up up appointment was arranged.

Outcome and follow-up

At two months of age, the baby presented for her follow-up appointment. There was no wrist or finger drop. Her left wrist and digital extension were almost comparable to that on the right side. There was also a significant improvement in left finger power. However, it was still slightly weaker than the right side. Therefore, the decision was made to continue physiotherapy until full recovery of strength on the left side was achieved. This was achieved by six months of age and she was discharged from physiotherapy.

Discussion

Epidemiology

Isolated radial nerve palsy is rare in newborns. We carried out a literature search for the number of cases reported in literature using a PubMed search of “radial nerve and newborn”; “radial nerve and neonate”; “wrist drop and neonate” and “wrist drop and newborn”. We found 84 cases reported before our case, excluding cases where there was other pathology causing radial nerve injury.²⁰⁻²⁶

Pathophysiology

The pathophysiology of isolated radial nerve palsy is thought to be caused by compression of the distal part of the arm at the location of the spiral groove. This is where the course of the radial nerve is most superficial.

There is data to suggest that the compression can occur either before the onset of labour while the baby is intra-uterine, or during labour itself. In one case study, neurophysiology studies showed a denervation pattern suggestive of the injury occurring before onset of labour.³ Hence, it was suggested that it was caused by prolonged compression of the nerve at the lower part of the arm against the pelvic brim, either in utero or during labour.³ This reasoning is supported by the presence of a skin lesion at the postero-lateral aspect of the arm where the radial nerve passes in 71.7% of cases reported in the literature. This skin lesion can be a bruise, ecchymosis or more commonly, fat necrosis.⁴ These are thought to be consequences of the prolonged compression that causes the skin lesions as well as the radial nerve palsy.

Clinical picture

Isolated radial nerve palsy presents with

	Erb's palsy	Klumpke's palsy	Radial nerve palsy
Presentation	Waiter's tip wrist	Claw hand	Wrist and finger drop
Moro reflex	Lost	Present	Present
Palmar grasp reflex	Present	Lost	Present

TABLE 2 Simplifying differences between causes of OBPP and isolated radial nerve palsy.

wrist and finger drop with inability to extend the wrist, metacarpophalangeal joint and interphalangeal joints. However, normal full range of active movement will be present in both the shoulder and the arm. Palmar grasp reflex will also be present.²

Review of isolated radial nerve injury in the literature

Assessment and diagnosis

Differentiating obstetric brachial plexus palsy from isolated radial nerve injury is important because it will help in explaining the prognosis to the parents and providing reassurance. Erb's palsy presents with loss of shoulder abduction, loss of shoulder external rotation and loss of arm flexion, which is described as “waiter's tip wrist”.²⁷ These babies will have abnormal Moro reflex which should raise the suspicion of Erb's palsy. However, the exclusion of clavicular fracture is important as it can cause pseudoparalysis, which can be easily mistaken for Erb's palsy.²⁷

Klumpke's palsy affects the muscles of the forearm and hands. Hence, it presents with wrist extension, extension at metacarpophalangeal joints and flexion at interphalangeal joints, which gives the appearance of a “claw hand”.²⁸ It is worth mentioning that it may be associated with Horner syndrome (ptosis, miosis and anhidrosis) as the injury might involve T1 nerve root.²⁸ Palmar grasp reflex is absent in these babies, as ulnar and median nerves are involved in the reflex²⁹ and both will be injured in Klumpke's palsy.

Prognosis

Isolated radial nerve palsy is rare. However, its prognosis is excellent with complete recovery by six months without needing surgical intervention. In contrast, other causes of radial nerve injury in neonates vary in their prognosis and there are situations where surgical intervention is required.

References

1. **Malik S, Bhandekar HS, Korday CS.** Traumatic peripheral neuropraxias in neonates: a case series.

JCDR 2014;8:10-12. Online at: doi.org/10.7860/JCDR/2014/9205.5059

2. **Carrato V, Troisi A, Berti I et al.** A newborn with a wrist drop and a skin marking. *J Pediatr* 2020;216:237.e1. Online at: doi.org/10.1016/j.jpeds.2019.08.019

3. **Alsubhi FS, Althunyan AM, Curtis CG, Clarke HM.** Radial nerve palsy in the newborn: a case series. *CMAJ* 2011;183:1367-70. Online at: doi.org/10.1503/cmaj.110272

4. **Carsi MB, Clarke AM, Clarke NP.** Transient neonatal radial nerve palsy. A case series and review of the literature. *J Hand Ther* 2015;28:212-16. Online at: doi.org/10.1016/j.jht.2014.10.006

5. **Morgan L.** Radial nerve paralysis in the newborn. *Arch Dis Child* 1948;23:137-39. Online at: doi.org/10.1136/adc.23.114.137

6. **Lightwood R.** Radial nerve palsy associated with localized subcutaneous fat necrosis in the newborn. *Arch Dis Child* 1951;26:436-37. Online at: doi.org/10.1136/adc.26.129.436

7. **Feldman GV.** Radial nerve palsies in the newborn. *Arch Dis Child* 1957;32:469-71. Online at: doi.org/10.1136/adc.32.165.469

8. **Coppotelli BA, Lonsdale JD, Jr, Kass E.** Sclerema neonatorum complicated by radial nerve palsy following nontraumatic delivery. *Mt Sinai J Med* 1979;46:143-44. PMID: 312440

9. **Ross D, Jones R Jr, Fisher J, Konkol RJ.** Isolated radial nerve lesion in the newborn. *Neurology* 1983;33:1354-56. Online at: doi.org/10.1212/wnl.33.10.1354

10. **Lenn NJ, Hamill JS.** Congenital radial nerve pressure palsy. *Clin Pediatr* 1983;22:388-89. Online at: doi.org/10.1177/000992288302200512

11. **Hayman M, Roland EH, Hill A.** Newborn radial nerve palsy: report of four cases and review of published reports. *Pediatr Neurol* 1999;21:648-51. Online at: doi.org/10.1016/s0887-8994(99)00061-2

12. **Deshmukh NV, Phillips GE.** Isolated radial nerve palsy in a newborn: report of two cases. *Hand surgery: an international journal devoted to hand and upper limb surgery and related research. J Hand Surg Asian Pac* 2002;7:293-94. Online at: doi.org/10.1142/s0218810402001047

13. **Monica JT, Waters PM, Bae, DS.** Radial nerve palsy in the newborn: a report of four cases and literature review. *J Pediatr Orthop* 2008;28:460-62. Online at: doi.org/10.1097/BPO.0b013e31817440e0

14. **Lundy CT, Goyal S, Lee S, Hedderly T.** Bilateral radial nerve palsy in a newborn. *Neurology* 2009;72:576. Online at: doi.org/10.1212/01.wnl.0000342126.70570.33

15. **Haider S.** Images in paediatrics: subcutaneous fat necrosis causing radial nerve palsy. *Case Reports* 2012. Online at: doi.org/10.1136/bcr.2011.4904

16. **Ghinescu CE, Kamalanathan AN, Morgan C.** Unilateral radial nerve palsy in a newborn. *Arch Dis Child - Fetal Neonatal Ed* 2012;97:F153. Online at: doi.org/10.1136/archdischild-2011-300357

17. **Siqueira MG, Scaramuzzi V, Heise CO et al.** Bilateral radial nerve compression neuropathy in the

- newborn. *Childs Nerv Syst* 2014;30:1435-39. Online at: doi.org/10.1007/s00381-014-2362-2
18. **Böhringer E, Weber P.** Isolated radial nerve palsy in newborns-case report of a bilateral manifestation and literature review. *Eur J Pediatr* 2014;173:537-39. Online at: doi.org/10.1007/s00431-013-2033-4
 19. **Rocio Vazquez Do Campo, Starnes K, Viorritt E.** Isolated bilateral radial nerve palsies in a newborn. *Neurology* 2017;88:(16 Supplement) P6.122. Online at: doi.org/10.1212/WNL.88.16_supplement.P6.122
 20. **Finsterbush A, Hussein N.** Infantile cortical hyperostosis with unusual clinical manifestations. *Clin Orthop Relat Res* 1979;276-79. Online at: pubmed.ncbi.nlm.nih.gov/394897
 21. **Sünram F, Hippe P.** Radialislähmung bei angeborenem angioleiomyom [Radial nerve paralysis in congenital angioleiomyoma]. *Handchirurgie* 1979;11:27-29.
 22. **Sünram F, Harms D, Mau G.** Neonatale radialisparese bei gutartigem angioleiomyom [Neonatal paresis of the radial nerve due to benign angioleiomyoma] *Zeitschrift für Orthopädie und ihre Grenzgebiete* 1977;115:124-28.
 23. **Richardson GA, Humphrey MS.** Congenital compression of the radial nerve. *J Hand Surg* 1989;14:901-03. Online at: doi.org/10.1016/s0363-5023(89)80099-1
 24. **Fleming AN, Quarmby C, Hudson DA.** Intrauterine stab leading to a radial nerve palsy. *Annals Plast Surg* 2001;47:562-64. Online at: doi.org/10.1097/0000637-200111000-00016
 25. **Lejman T, Strong M, Michno P.** Radial-nerve palsy associated with septic shoulder in neonates. *J Pediatr Orthop*. 1995;15:169-71.
 26. **Töllner U, Bechinger D, Pohlandt F.** Radial nerve palsy in a premature infant following long-term measurement of blood pressure. *J Pediatr* 1980;96:921-22. Online at: doi.org/10.1016/s0022-3476(80)80582-8
 27. **Chater M, Camfield P, Camfield C.** Erb's palsy – who is to blame and what will happen? *J Paediatr Child Health* 2004;9:556-60. Online at: doi.org/10.1093/pch/9.8.556
 28. **Al-Qattan MM, El-Sayed AA.** A case of Klumpke's obstetric brachial plexus palsy following a Cesarean section. *Clinical Case Reports* 2016;4:872-75. Online at: doi.org/10.1002/ccr3.644
 29. **Anekar AA, Bordon B.** Palmar Grasp Reflex. 2023 online at: www.ncbi.nlm.nih.gov/books/NBK553133

Avoid the scrum - get your own copy of *Infant*

Keep up to date with *Infant* for just **£48** for a whole year

Infant is the essential journal for neonatal and paediatric healthcare professionals, containing authoritative articles with a clinical or practical bias written by experts in their field.

Printed and online subscriptions for the coming year give instant access to all issues to date, including the full text of over 70 articles published in the past two years, available exclusively to subscribers.

Subscribe online at www.infantjournal.co.uk
or email subscriptions@infantjournal.co.uk
or call Victoria on 01279 714511



infant