Career Point International Journal of Research (CPIJR)
©2022 CPIJR | Volume 3 | Issue 3 | ISSN: 2583-1895
July-September-2024 | DOI: https://doi.org/10.5281/zenodo.14029553

Brachial Plexus Injury in Neonates: Causes, Recovery, and Treatment Approaches

Kalpesh Purohit[1], Sonal Joshi[2], Girish Kumar Vyas[3]

[1] Student, Jinzhou medical university, Jinzhou, Liaoning, China

[2] School of Pharmaceutical Studies, Dr. K. N. Modi University, Newai, Rajasthan

[3] Associate Professor, School of Pharmacy, Career Point University, Kota, Rajasthan

Author: Kalpeshpurohit8008@gmail.com, joshisonal1029@gmail.com, girishvyas10@gmail.com

Abstract

Brachial Plexus Injury (BPI) in neonates is a prevalent birth trauma characterized by damage to the brachial plexus nerves, typically resulting from excessive stretching during delivery. This review aims to elucidate the causes and risk factors associated with BPI, emphasize effective recovery exercises, and discuss treatment options that promote recovery in affected infants. Key causes include shoulder dystocia, assisted deliveries, breech births, and larger fetal size. Early intervention with a combination of physical therapy, such as passive range of motion exercises, stretching, tactile stimulation, and proprioceptive training is crucial for enhancing recovery potential. While mild to moderate cases often demonstrate significant improvement, severe injuries may require surgical intervention. This review highlights the importance of timely diagnosis and intervention, the variability of recovery timelines, and the need for ongoing research to optimize rehabilitation strategies for neonates with BPI. Ultimately, a comprehensive understanding of BPI's etiology and treatment approaches can significantly improve outcomes for affected infants and their families.

Keywords: Brachial Plexus Injury (BPI), neonatal birth trauma, BPI physical therapy, neonatal recovery timelines, therapeutic interventions for neonates.

1. Introduction

Brachial Plexus Injury (BPI) in neonates is a serious yet manageable condition resulting from trauma to the brachial plexus nerves, which run from the spinal cord through the neck to the shoulder, arm, and hand. Often occurring during childbirth, BPI leads to varying degrees of motor dysfunction in the upper limb. BPI in newborns, commonly associated with shoulder dystocia during labor, affects 1-2 per 1,000 live births globally. This injury can lead to long-term disability if not addressed with timely and appropriate interventions. Hence, understanding BPI's etiology, recovery processes, and therapeutic options is essential for healthcare professionals and parents (1-3).

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | Volume 3 | Issue 3 | ISSN: 2583-1895
July-September-2024 | DOI: https://doi.org/10.5281/zenodo.14029553

2. Objective of this Review

- Outline the causes and risk factors associated with Brachial Plexus Injury in neonates.
- Describe effective treatment and recovery exercises available to support neonatal BPI recovery.
- Discuss prognosis and the expected recovery timeline for BPI, focusing on evidence-based exercises.
- Highlight gaps in research and explore emerging rehabilitation strategies to improve neonatal outcomes (4,5).

3. Causes of Brachial Plexus Injury

Brachial Plexus Injury in neonates typically occurs due to excessive stretching, compression, or tearing of the brachial plexus nerves during delivery (4-7). Common causes include:

A. **Shoulder Dystocia:** When the infant's shoulder becomes lodged against the maternal pelvis during childbirth, resulting in forceful stretching of the brachial plexus nerves.

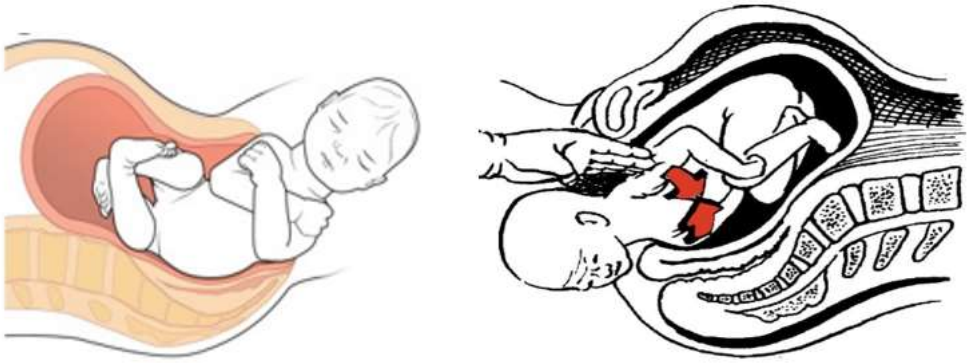

Figure 1: Shoulder Dystocia at child birth by hands or rotation

B. **Assisted Deliveries:** The use of forceps or vacuum extraction during childbirth may increase the risk of nerve injury.

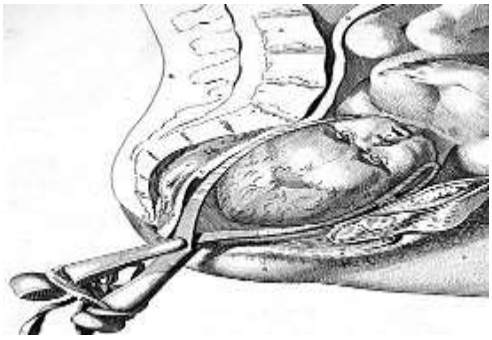

Figure 2: Forceps or vacuum extraction at child birth

C. **Breech Births:** In breech presentations, abnormal fetal positioning can lead to undue pressure on the arms and shoulders.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | Volume 3 | Issue 3 | ISSN: 2583-1895
July-September-2024 | DOI: https://doi.org/10.5281/zenodo.14029553

Figure 3: Abnormal Fetal Positioning or Breech Births

D. **Larger Fetal Size:** Larger infants (macrosomia) may be at greater risk of BPI due to the increased difficulty in passing through the birth canal.

4. Recovery Exercises and Treatment Options

Effective management of Brachial Plexus Injury combines non-invasive therapeutic exercises with, in some cases, surgical interventions. Early intervention is critical to maximize recovery potential and prevent complications (3, 5, 7-9).

4.1 Recovery Exercises

Physical therapy exercises aim to promote muscle strength, flexibility, and nerve recovery. Exercises should be introduced in the early weeks of life under a trained therapist's supervision.

- **Passive Range of Motion (PROM) Exercises**: Gentle movement of the infant's arm through its natural range of motion to prevent stiffness.

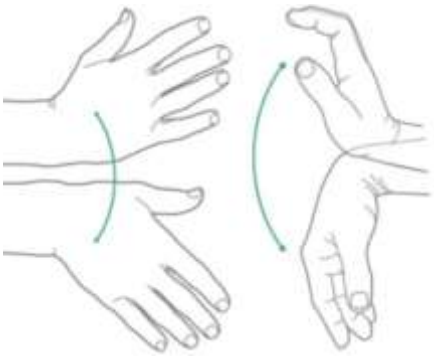

Figure 4: Movement of wrist to prevent stiffness

- **Stretching and Flexibility Exercises:** Specific stretching exercises for the shoulder and elbow joints help maintain flexibility, improve circulation, and facilitate nerve recovery.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | Volume 3 | Issue 3 | ISSN: 2583-1895
July-September-2024 | DOI: https://doi.org/10.5281/zenodo.14029553

Figure 5: Stretching and Flexibility Exercises

- **Tactile Stimulation:** Lightly stimulating the skin around the affected area enhances nerve sensitivity and promotes sensory feedback.

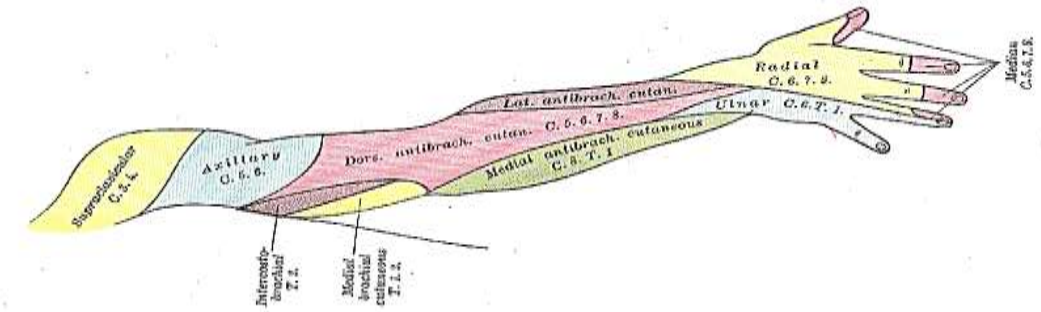

Figure 6: Tactile Stimulation for nerve sensitivity

- **Proprioceptive Training**: Exercises involving gentle weight-bearing through the arm, aiding proprioception and improving motor control in recovering muscles.

4.2 Additional Treatments

- Occupational Therapy: Tailored to support fine motor skills and hand function as the infant grows.
- Electrical Stimulation Therapy: For severe cases, low-intensity electrical stimulation may be used to stimulate muscle contractions and promote nerve function.
- Surgical Intervention: In cases of significant nerve damage, surgical options like nerve grafting or transfers may be considered, typically within the first 6-12 months if there is little to no recovery (8,9).

5. Discussion

Brachial Plexus Injury in neonates presents both short- and long-term challenges for families and healthcare professionals. Studies indicate that early and consistent physical therapy can yield positive outcomes, with 70-90% of mild to moderate cases showing considerable improvement by six months. While passive exercises are commonly recommended, recent evidence suggests that active movement and weight-bearing exercises significantly aid nerve regeneration. Additionally, the combination of tactile stimulation with physical therapy exercises enhances recovery rates, especially when initiated within the first few weeks of life. The prognosis of BPI depends on the extent of the initial nerve damage. Injuries involving only minor stretching of the brachial plexus nerves generally show spontaneous recovery. However, nerve rupture or avulsion may necessitate surgical intervention. Future research is needed to explore genetic and cellular factors influencing nerve regeneration, as well as innovations in therapeutic exercises for improving muscle strength and function in BPI-affected limbs (7-10).

6. Conclusion

Brachial Plexus Injury is a critical condition that, if identified early, can often be effectively managed through a combination of physical therapy exercises and, in severe cases, surgical intervention. Understanding the etiology, optimal treatment methods, and realistic recovery timelines allows caregivers and healthcare providers to support infants effectively. Early intervention is paramount for favorable outcomes, emphasizing the importance of prompt diagnosis and therapy initiation. As more research on nerve regeneration emerges, the potential for improved rehabilitation methods will continue to evolve, offering hope for neonates affected by this condition.

7. References

1. Pondaag W, Malessy MJA. The evidence for nerve repair in obstetric brachial plexus palsy revisited. Biomed Res Int. 2014;2014:434619.
2. Hale HB, Bae DS, Waters PM. Current concepts in the management of brachial plexus birth palsy. J Hand Surg Am. 2010;35(2):322-331.
3. Mohammad M, Zuo KJ, Mioton LM, et al. The natural history of neonatal brachial plexus palsy. J Pediatr Orthop. 2014;34(4):388-394.

4. Ho ES, Curtis CG, Clarke HM. Pediatric evaluation of disability inventory before and after primary surgery for obstetric brachial plexus palsy. J Hand Surg Am. 2006;31(8):1337-1342.
5. Everson RE, Wilkes D, Awad A. Early and late microsurgical reconstruction of the brachial plexus following birth trauma. Plast Reconstr Surg. 2015;136(6):1381-1388.
6. Singh J, Shah H, Doddabasappa SN, Joseph B. Obstetric brachial plexus palsy: Management and outcome. Indian J Orthop. 2014;48(5):427-431.
7. Berger A, Fries PD, Sarwark JF. Brachial plexus palsy: Evaluation and management. J Am Acad Orthop Surg. 2021;29(16):e804-e815.
8. Garg R, Merrell GA, Hillstrom HJ, Wolfe SW. Brachial plexus birth palsy: Management and outcomes. Clin Orthop Relat Res. 2011;469(9):2478-2484.
9. Verhage SM, Postema SG, van der Sluijs JA, et al. Factors associated with recovery of shoulder function in children with obstetric brachial plexus injury. J Pediatr Orthop. 2017;37(7):e440-e445.
10. Al-Qattan MM. Obstetric brachial plexus palsy associated with breech delivery. Ann Plast Surg. 2003;51(3):257-264.