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POWERING RECOVERY: TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS) FOR NEONATAL BRACHIAL PLEXUS PALSY – A NOVEL INTERVENTION

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Abstract

Background: Neonatal Brachial Plexus Palsy (NBPP) is a peripheral nerve injury occurring at birth, commonly due to shoulder dystocia or delivery complications. Transcutaneous Electrical Nerve Stimulation (TENS), though well-documented in adults, has limited literature support in neonates. This study evaluates the motor recovery outcomes of TENS in NBPP.

Methods: Four male infants diagnosed with NBPP were enrolled from the NICU of Saveetha Medical College. All underwent TENS therapy in addition to standard physiotherapy. Stimulation used galvanic current at 2.5–4.5 mA, 20 Hz, for 30–100 seconds, delivering 15 contractions per muscle. A bipolar electrode setup was used.

Results: All infants showed improvement. Two achieved scores of 4 and 5 on the Toronto Test, crossing the surgical intervention threshold. The remaining two, with scores <3.5, still demonstrated significant gains in strength and movement quality.

Conclusion: TENS is a promising adjunct therapy for NBPP, promoting motor recovery and potentially reducing surgical need. Further controlled studies are required.

Introduction

Neonatal Brachial Plexus Palsy (NBPP) affects approximately 1–4 per 1,000 live births and is often attributed to mechanical trauma during delivery, particularly shoulder dystocia or prolonged labor. This injury, resulting in varying degrees of motor and sensory loss in the upper extremity, can lead to long-term functional impairment in 20% to 30% of affected infants.

Transcutaneous Electrical Nerve Stimulation (TENS) is a non-invasive modality that stimulates peripheral nerves and muscles to promote muscle strength, improve circulation, and support neuroplasticity. Despite its widespread use in adult Brachial Plexus Palsy (BPP) rehabilitation, the role of TENS in neonatal populations remains underexplored. This study presents a case series from a tertiary NICU setting, highlighting outcomes following early initiation of TENS in NBPP management.

Materials and Methods

This prospective case series was conducted in the Neonatal Intensive Care Unit (NICU) at Saveetha Medical College and Hospitals, Chennai. Ethical clearance was obtained from the institutional ethics committee, and informed parental consent was secured prior to intervention.

Participants: Four male neonates with clinically diagnosed NBPP were included.

TENS Protocol: All infants received Electrical Muscle Stimulation (EMS) via galvanic current using a pediatric bipolar electrode configuration (fig.1). Stimulation parameters included:
- Current: 2.5 to 4.5 mA
- Frequency: 20 Hz
- Duration: 30 to 100 seconds per session
- Contractions: 15 per muscle point

Treatment was administered by a trained pediatric physiotherapist alongside conventional physical therapy protocols (fig 2).

RESULTS

All infants demonstrated functional motor improvements post-intervention.
Two infants surpassed the surgical intervention threshold on the Toronto Test, scoring 4 and 5 respectively, showing substantial muscle recovery and improved spontaneous movements.
The other two infants, while scoring <3.5, exhibited marked enhancements in upper limb strength, joint mobility, and quality of movement.

DISCUSSION

This case series underscores the potential of TENS as an adjunct to early physiotherapeutic intervention in infants with NBPP. The observed improvements align with adult rehabilitation findings where TENS facilitates neural activation, enhances synaptic plasticity, and improves voluntary muscle recruitment.

Early initiation, especially within the first week of life as in three of the four cases, may be critical in leveraging the window of heightened neuroplasticity in neonates. The fourth infant, who received TENS from day 35, also showed improvement, indicating that delayed intervention might still confer benefits.

Although these results are encouraging, limitations include the small sample size, absence of a control group, and short-term follow-up. Objective measurement tools like EMG or MRI were not utilized. Future studies should explore long-term outcomes, optimal stimulation parameters, and comparative efficacy with other modalities.

CONCLUSION

TENS therapy, when initiated early and used alongside physiotherapy, appears to improve motor outcomes in infants with NBPP. This non-invasive intervention may reduce the need for surgical correction in select cases. Larger controlled studies are needed to confirm its efficacy and establish standardized neonatal protocols.

Ethical Approval

This study was approved by the Institutional Ethics Committee of Saveetha Medical College and Hospitals, Chennai.

Consent

Written informed consent was obtained from the parents of all infants included in the study.

REFERENCES

1. Justice D, Awori J, Carlson S, Chang KW, Yang LJ. Use of Neuromuscular Electrical Stimulation in the Treatment of Neonatal Brachial Plexus Palsy: A Literature Review. Open J Occup Ther. 2018;6(3).
2. Frade F, Gómez-Salgado J, Jacobsohn L, Florindo-Silva F. Rehabilitation of Neonatal Brachial Plexus Palsy: Integrative Literature Review. J Clin Med. 2019;8(7):980.

Figures

Figure 1: TENS Unit and Electrode Accessories Used in the Study

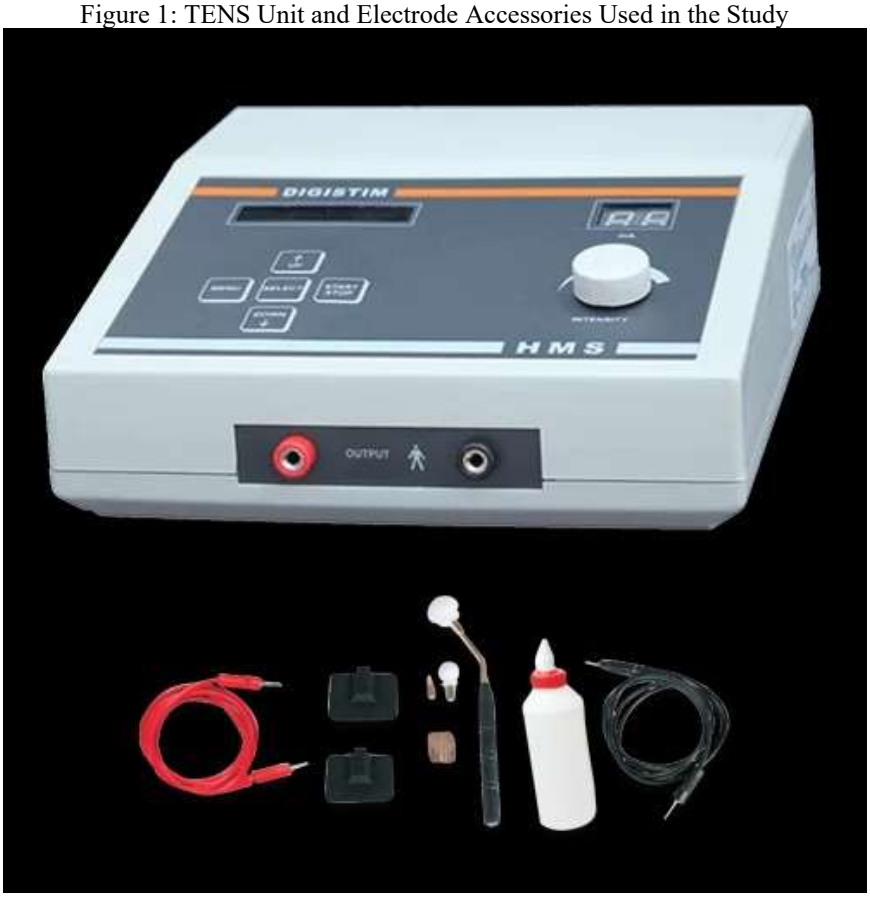

Fig 2: Clinical image showing TENS therapy.