

The efficacy of an early rehabilitation intervention in high-risk infant: a case study

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Background

Preterm birth is a complex event that exposes the newborn to a high risk of clinical instability and complications, especially neurological ones, which may emerge from birth or over time. The brain's high neuroplasticity allows for greater neural reorganization and reaches its maximum potential in the pre- and post-natal period. Early and targeted intervention after birth can significantly affect evolutionary trajectories preventing future difficulties.

Objectives

The aim of this case study is to evaluate how an early intensive and personalized intervention tailored to individual needs supported the neuromotor development in a preterm infant with hydrocephalus, Ventricular Peritoneal (VP) shunt and Intraventricular Hemorrhage (IVH).

Methods

A single 27weeks of gestational age infants was enrolled in the Neonatal Intensive Care Unit (NICU) at Parma Hospital and observed from birth to the first corrected age year (July 2024 - October 2025). Parents filled out the informed consent and the privacy document. General Movements (GMs) exam was performed during the recovery. Neuro-Functional Assessment (NFA) was administered at three, seven and nine months of corrected age to monitor the neuromotor development. Magnetic Resonance Imaging (MRI) at three, seven, and twelve months of corrected age were performed to monitor the hydrocephalus and the functioning of the VP shunt. Direct infant observation and video recording were used during physiotherapy session to monitor patient's neuromotor evolution and adaptive responses. The Oblique Diameter Difference Index (ODDI) scale was used to monitor the plagiocephaly from discharge to five months of corrected age. At 12 months of correct age, the neurodevelopmental was assessed through the Bayley III Scale.

Results

Considering the neurological assessment and the neuro imaging, the need for early multidisciplinary intervention emerged and a reahabilitation project was defined. Despite of the worsening of the hydrocephalus, there was an improvement of infant motor organizations: the complete Range of Motion of the rotation of the head was recovered; ability to roll on both sides, functional manipulation skills in both hands and sitting position emerged. Reduction of plagiocephaly from discharge (ODDI=112) to 5 months of corrected age (ODDI=107) was observed. Normative infant neurodevelopment was obtained at 1 corrected age year.

Conclusion

The individualized rehabilitative approach allowed continuous adaptation of therapeutic goals even in absence of a diagnosis, highlighting the value of the early intervention focused on functional complexity and functional assessment. The achieved progresses and their generalization in multiple contexts, due to the active family involvement, encourage the potential of the early and individualized approach.

Keywords: preterm infant, early intervention, rehabilitation, neurodevelopmental outcome, neuroplasticity

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