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Facial Nerve Dysfunction in a Child With B-Lymphoblastic Leukemia: Functional Improvement Following Multimodal Physiotherapy—A Case Report

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ABSTRACT

Background:
B-lymphoblastic leukemia (B-ALL) may be associated with neurological complications, particularly in the presence of central nervous system (CNS) involvement. Facial nerve dysfunction can result in facial asymmetry, impaired eye closure, reduced forehead movement, altered smiling, and impaired oral motor function. Evidence describing physiotherapy-based rehabilitation in children with B-ALL-associated facial nerve dysfunction is limited.

Case presentation:
A 9-year-old male child diagnosed with B-lymphoblastic leukemia with CNS involvement presented with right-sided facial nerve dysfunction. Baseline clinical examination demonstrated facial asymmetry, reduced forehead wrinkling, incomplete eye closure, impaired smile symmetry, inadequate lip closure, and reduced cheek inflation. A multimodal physiotherapy programme comprising neuromuscular re-education, mirror-based visual biofeedback, electrical stimulation, functional facial retraining, age-appropriate engagement strategies, and a home exercise programme supported by remote supervision was provided. Clinical reassessment over approximately three weeks demonstrated improvement in eye closure, smile symmetry, lip closure, and cheek inflation, which were graded as good at the final assessment. Forehead wrinkling improved from poor to moderate. Serial clinical and photographic assessments documented changes in facial motor performance during the rehabilitation period.

Conclusion:
This case describes the clinical course and functional improvement observed during multimodal physiotherapy in a child with B-lymphoblastic leukemia and coexisting facial nerve dysfunction. Although improvement was observed during rehabilitation, the relative contributions of physiotherapy, concurrent oncological management, and spontaneous neurological recovery could not be determined. Further studies using standardized outcome measures are required to evaluate the effectiveness of physiotherapy interventions in this population.

Keywords: B-Lymphoblastic Leukemia, Facial Motor Function, Facial Nerve Dysfunction, Facial Palsy, Pediatric Rehabilitation

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INTRODUCTION

B-lymphoblastic leukemia (B-ALL) is the most common subtype of childhood acute lymphoblastic leukemia (ALL), characterized by the proliferation of immature B-lineage lymphoid precursors.[1] Despite advances in diagnosis and treatment, central nervous system (CNS) involvement remains an important clinical concern in childhood ALL, as leukemic infiltration may produce neurological manifestations, including cranial nerve dysfunction.[2]

Facial nerve involvement is an uncommon neurological manifestation in children with leukemia. Dysfunction of the facial nerve may result in facial asymmetry, reduced forehead movement, incomplete eye closure, impaired smiling, and altered oral motor function. These impairments may affect facial expression and functional activities, making appropriate clinical assessment and rehabilitation clinically relevant.[3]

Assessment of facial nerve dysfunction involves clinical evaluation of facial symmetry and voluntary

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facial movements, supported where appropriate by neurophysiological investigations.[4] Physiotherapy interventions include neuromuscular re-education, visual biofeedback, functional facial exercises, and individualized rehabilitation strategies to facilitate facial motor performance.[5]

However, evidence describing physiotherapy-based rehabilitation in children with B-ALL-associated facial nerve dysfunction remains limited. This case report describes the clinical presentation, assessment findings, and functional changes observed during a multimodal physiotherapy programme in a child with B-ALL and right-sided facial nerve dysfunction.

CASE PRESENTATION

A 9-year-old male child was initially evaluated following the presentation of right axillary swelling. Ultrasonography revealed multiple enlarged right axillary lymph nodes, the largest measuring approximately 4.2 cm. The child was admitted the following day and underwent excision biopsy of an involved lymph node. He was discharged two days after admission. Histopathological examination, reported approximately one week after the biopsy, initially suggested non-Hodgkin lymphoma. Subsequent haematological evaluation established the diagnosis of B-lymphoblastic leukemia (B-ALL). Central nervous system involvement was also documented during disease management; however, the specific cerebrospinal fluid findings, neuroimaging results, and diagnostic criteria supporting this classification were unavailable for independent verification. Consequently, a direct causal relationship between leukemic CNS involvement and the subsequent facial nerve dysfunction could not be established.

During the course of treatment, the child developed right-sided facial nerve dysfunction, presenting with facial asymmetry, reduced forehead wrinkling, incomplete eye closure, diminished smile symmetry, impaired lip closure, and altered oral motor control.

The child was subsequently referred to the Department of Physical Medicine and Rehabilitation, Apollo Institute of Medical Sciences and Research, for physiotherapy assessment and rehabilitation. At the time of assessment, the child was alert and responsive, with intact communication and the ability to understand and follow instructions. The baseline physiotherapy assessment was performed on day 0, followed by reassessments on days 12, 14, and 18. The final assessment was conducted on day 21, completing a three-week rehabilitation and observation period.

Clinical examination revealed right-sided facial weakness, characterized by reduced forehead movement, incomplete eye closure, diminished activation of the facial musculature, impaired smile symmetry, and altered oral motor function. Facial asymmetry was particularly evident during voluntary facial movements.

Baseline facial motor assessment included examination of eyebrow raising, forehead wrinkling, eye closure, smiling, cheek inflation, lip closure, and oral motor control. At the initial assessment, the child demonstrated impaired eye closure, reduced smile symmetry, inadequate lip closure and cheek inflation, and diminished forehead wrinkling.

Facial motor performance was assessed serially during the rehabilitation period. At the final assessment, eye closure, smile symmetry, lip closure, and cheek inflation showed improvement and were graded as good, whereas forehead wrinkling improved from poor to moderate. Serial clinical examinations and photographic documentation were used to monitor changes in facial symmetry and voluntary facial movements over the assessment period. The descriptive categories of poor, moderate and good were used to document changes over time.[4]

During the three-week physiotherapy rehabilitation period, the child continued to receive chemotherapy for B-lymphoblastic leukemia. Physiotherapy was provided alongside ongoing oncological management. Improvements in facial motor performance were observed during this period of concurrent treatment.

The diagnosis of B-lymphoblastic leukemia (B-ALL) was established following histopathological and subsequent haematological evaluation. Central nervous system (CNS) involvement was documented during the course of disease management. The child subsequently developed right-sided facial weakness, clinically identified by the treating medical team. Clinical examination revealed facial asymmetry, reduced forehead movement, incomplete eye closure, impaired smile symmetry, reduced lip closure and difficulty with cheek inflation. Cranial nerve palsies, including facial nerve involvement, have been reported in children with acute lymphoblastic leukemia and other haematological malignancies[3,6].

The clinical assessment was based on observation of facial symmetry and the child's ability to perform individual voluntary facial movements, including eyebrow raising, forehead wrinkling, eye closure, smiling, lip closure and cheek inflation. Serial electrical stimulation threshold measurements were recorded during rehabilitation by documenting the current intensity required to elicit visible muscle contraction at a fixed pulse duration. Between baseline (day 0) and final assessment (day 21), the recorded stimulation thresholds decreased for eye closure (2.8 to 1.1 mA), smiling (5.6 to 3.0 mA), lip closure (5.3 to 2.1 mA), cheek inflation (5.6 to 3.0 mA), and eyebrow raising (3.0 to 2.1 mA). These measurements were considered descriptive indicators of changes in electrical stimulation requirements rather than direct measures of voluntary facial motor function or nerve regeneration.

A formal facial nerve conduction study and conventional strength–duration curve assessment were not performed. Facial motor performance was descriptively classified as poor, moderate or good based on the extent and quality of visible movement and the child's ability to perform the requested action. Poor performance indicated absent or minimal visible movement; moderate performance indicated partial movement with incomplete execution; and good performance indicated clearly visible, near-complete movement with improved symmetry. These categories were used for descriptive clinical documentation and were not derived from a validated standardized facial nerve grading system[4].

The clinical course of the patient is summarized as follows:

A multimodal physiotherapy programme was administered over a three-week period (rehabilitation days 0–21). Supervised physiotherapy sessions were conducted three times per week, with each session lasting approximately 45 minutes. The intervention included neuromuscular re-education targeting the facial musculature, mirror-based visual biofeedback to facilitate symmetrical muscle activation, electrical stimulation as an adjunct intervention, and functional facial retraining involving eye closure, eyebrow raising, smiling, lip closure and cheek inflation.

Electrical stimulation was administered using the same device and consistent electrode placement throughout the rehabilitation period. Pulse duration was maintained at a fixed setting, while current intensity was adjusted according to the visible muscle response.

Relative timeline	Clinical event
Initial evaluation	Ultrasonography revealed multiple enlarged right axillary lymph nodes, the largest measuring approximately 4.2 cm.
Following day	Hospital admission and excision biopsy of an involved lymph node.
Two days after admission	Discharged from hospital.
Eight days after biopsy	Histopathological report initially suggested non-Hodgkin lymphoma; subsequent haematological evaluation established B-ALL.
During disease management	CNS involvement was documented, and right-sided facial nerve dysfunction developed.
Rehabilitation day 0	Baseline physiotherapy assessment, approximately eight weeks after the initial evaluation.
Rehabilitation days 12, 14 and 18	Interim physiotherapy reassessments.
Rehabilitation day 21	Final physiotherapy assessment following three weeks of rehabilitation.

Table 1 : Clinical Timeline of the Case

On the remaining three days of the week, telephone-based follow-up was conducted to monitor adherence to the prescribed daily home exercise programme, provide guidance regarding exercise performance and encourage continuity of rehabilitation. Age-appropriate engagement strategies were incorporated to facilitate the child's participation.

Serial clinical assessments demonstrated improvement in facial motor performance during the rehabilitation period. At baseline, eye closure, smile symmetry, lip closure, and cheek inflation were graded as poor. By the final assessment, these movements had improved to good performance, while forehead wrinkling improved from poor to moderate. Serial photographic documentation also demonstrated changes in facial symmetry and voluntary facial movements.



Figure 1 : Baseline (day 0) and post-rehabilitation (day 21) clinical photographs demonstrating changes in facial symmetry and voluntary facial movements following the three-week rehabilitation programme.

Serial electrical stimulation measurements showed a reduction in the current intensity required to elicit visible muscle contraction across the assessed facial motor functions between baseline and final assessment. The recorded values are presented in Table 2. These measurements were interpreted descriptively and considered alongside the clinical findings rather than as independent evidence of nerve recovery.

Parameter	Baseline	Follow-up
Eye closure	2.8 mA	1.1 mA
Smile symmetry	5.6 mA	3.0 mA
Lip closure	5.3 mA	2.1 mA
Cheek inflation	5.6 mA	3.0 mA
Eyebrow raising	3.0 mA	2.1 mA

Table 2 : Electrical Stimulation Threshold Measurements During Rehabilitation

DISCUSSION

Facial nerve dysfunction is an uncommon neurological manifestation reported in children with B-lymphoblastic leukemia (B-ALL). Potential mechanisms include leukemic infiltration of the nervous system and treatment-related neurological complications.[6] In the present case, the child developed right-sided facial weakness, characterized by facial asymmetry, reduced forehead movement, incomplete eye closure, impaired smiling, and altered oral motor function. These impairments affected voluntary facial movements and highlighted the need for individualized rehabilitation.

The multimodal physiotherapy programme incorporated neuromuscular re-education, mirror-based visual biofeedback, electrical stimulation, functional facial retraining, and a remotely supervised home exercise programme. Improvements were observed in eye closure, smile symmetry, lip closure, and cheek inflation, while forehead wrinkling improved from poor to moderate performance. Although previous systematic reviews have examined physical rehabilitation for facial palsy, much of the available evidence concerns Bell's palsy and other causes of facial nerve dysfunction.[7] Its applicability to children with leukemia and concurrent oncological treatment remains uncertain. Furthermore, because improvement occurred alongside ongoing chemotherapy, the independent contribution of physiotherapy could not be determined.

Serial clinical assessments and photographic documentation provided a record of changes in facial motor performance. Electrical stimulation threshold measurements also showed reduced current requirements to elicit visible muscle

contraction during follow-up. However, these measurements represent changes in stimulation requirements and should not be interpreted independently as evidence of nerve regeneration or electrophysiological recovery. The findings emphasize the importance of interpreting stimulation measurements alongside clinical observations rather than relying on a single assessment parameter.[8]

From a clinical physiotherapy perspective, this case highlights the importance of combining selective facial muscle activation, visual feedback, functional retraining, and home-based exercises within an individualized rehabilitation programme. Remote supervision of home exercises may also support continuity of rehabilitation between supervised sessions, particularly in children undergoing prolonged medical treatment.[9]

The strength of this case report is the serial documentation of facial motor performance through clinical examination, photographic assessment, and electrical stimulation threshold measurements. However, this report describes a single patient, limiting generalizability. A formal facial nerve conduction study was not performed, and the clinical grading was descriptive rather than based on a validated facial nerve grading scale. Furthermore, concurrent chemotherapy may have influenced the observed improvement, making it difficult to determine the independent contribution of physiotherapy. The follow-up period was limited to approximately three weeks; therefore, the long-term sustainability of functional improvement could not be established.

Overall, this case describes improvement in clinically observed facial motor performance in a child with B-lymphoblastic leukemia and coexisting right-sided facial nerve dysfunction during a three-week multimodal physiotherapy rehabilitation programme. Serial clinical assessments and electrical stimulation threshold measurements provided complementary information about changes observed during the rehabilitation period.[10] However, concurrent chemotherapy, the absence of a formal facial nerve conduction study, and the short follow-up period limit interpretation of the findings. This case highlights the importance of individualized physiotherapy and serial clinical monitoring as components of multidisciplinary care in children with leukemia-associated neurological complications.

CONCLUSION

This case report describes functional improvement in a child with B-lymphoblastic leukemia and coexisting right-sided facial nerve dysfunction during a three-week multimodal physiotherapy programme. Improvements were observed in eye closure, smile symmetry, lip closure, cheek inflation, and forehead movement. However, the contributions of physiotherapy, concurrent oncological treatment, and spontaneous neurological recovery could not be independently determined. This case highlights the potential role of individualized facial rehabilitation and serial clinical monitoring within multidisciplinary pediatric oncology care. Further studies using standardized outcome measures and longer follow-up are warranted.

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Conflict Of Interest : The authors declare no conflict of interest.

Consent : Written informed consent was obtained from the patient's parent/guardian for publication of this case report and accompanying images.

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