# Leukoencephalopathy in children with acute lymphoblastic leukemia after chemotherapy: A retrospective single center study

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## INTRODUCTION

Acute lymphoblastic leukemia (ALL) has become one of the most common cancers in children. So far, chemotherapy is still the main treatment strategy for childhood ALL. Due to the continuous improvement of treatment regimens for ALL, the survival time of patients is prolonged, and more and more treatment-related chronic neurological complications are gradually recognized.

Leukoencephalopathy (LE) is a serious complication of ALL, and affects the long-term prognosis of patients. The occurrence of LE is closely related to chemotherapy. In terms of diagnosis, LE mainly depends on the results of magnetic resonance imaging, which is manifested as reduced white matter volume. Although many clinical symptoms of LE were thought to be transient, there was a significant decline in neurocognitive function among long-term survivors of ALL with LE compared with the control group.

## OBJECTIVES

To investigate the clinical and neuroimaging characteristics of leukoencephalopathy among children with acute lymphoblastic leukemia, especially after chemotherapy.

## MATERIALS & METHODS

Clinical data for 17 pediatric patients with leukoencephalopathy and 17 matched controls were retrospectively analyzed. All participants were admitted to the Children's Hospital of Soochow University from May 2011 to April 2021. The data mainly consisted of general information, laboratory studies, and imaging diagnostic results.

Enrolled patients were diagnosed with B-cell ALL (B-ALL). All patients were treated with a single chemotherapy-only protocol, and never received radiotherapy, transplantation, CAR-T, or other treatment before enrollment or during follow-up. The control group were matched by sex, age at diagnosis of ALL, and duration of ALL treatment.

Patients with the following conditions were excluded: central nervous system leukemia, intracranial infection, cerebrovascular disease (cerebral hemorrhage or cerebral infarction), intracranial mass, and other brain damage.

## RESULTS

Overall, 94.12% of the patients experienced neurological symptoms. The most common symptoms were seizure (7/17, 41.18%), nausea (5/17, 29.41%), vomiting (5/17, 29.41%), paralysis (5/17, 29.41%), and numbness (4/17, 23.53%). On neuroimaging, multiple and irregular lesions were observed, distributed mainly in the periventricular area (9/17, 52.94%), parietal lobe (6/17, 35.29%), and basal ganglia (5/17, 29.41%).

Moreover, there were significant differences in serum sodium ($P = 0.0001$), alanine transaminase ($p = 0.0108$), C-reactive protein ($P = 0.0124$), blood pressure ($P = 0.0271$), hemoglobin ($P = 0.0273$), platelets ($P = 0.0421$), and creatinine ($P = 0.0458$) between patients with and without leukoencephalopathy.

Chemotherapy was suspended after LE development. Eleven children were treated with glucocorticoid pulse therapy. Gamma globulin was added combined with neurotrophic drugs. Symptomatic treatment was performed simultaneously to control related. Additionally, six patients with mild symptoms were only treated with intravenous gamma globulin and/or neurotrophic drugs.After treatment, the clinical symptoms (12/17, 70.59%) and imaging lesions (11/13, 84.62%) gradually improved in most patients.

## CONCLUSIONS

Chemotherapy is an important risk factor related to leukoencephalopathy. Although the clinical symptoms of leukoencephalopathy vary widely, there is a high degree of consistency in its radiological features. Abnormal laboratory results may also help the identification of leukoencephalopathy. Early detection and treatment can improve brain development in the long term.

## REFERENCES

The imaging features summarized in this paper are consistent with those reported in previous studies.

Different from other studies, this study focused more on clinical characteristics rather than imaging features only. Furthermore, the clinical reference significance of hematological examination results is tentatively explored, which has been rarely involved in previous studies.

In addition, most studies believe that white matter damage is irreversible. However, in practical work, we found that active treatment still has a certain effect on the prognosis of leukoencephalopathy.