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Association of Visceral Adiposity with Ph-Like Acute Lymphoblastic Leukemia and Hepatotoxicity of Asparaginase Containing Regimen

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Abstract

Background

Obesity is frequently encountered in patients who initiate ALL treatment. While body mass index (BMI) is routinely used to assess obesity, computed tomography (CT) can quantify visceral (VA) and subcutaneous adiposity (SA), which may better predict treatment-related toxicity. We evaluated the impact of adipose tissue distribution on induction outcomes and toxicity in adults with newly diagnosed ALL.

Methods

We retrospectively analyzed adults with newly diagnosed Philadelphia chromosome-negative ALL treated at City of Hope with asparaginase-containing induction between 2013 and 2025 who underwent baseline CT imaging. VA and SA were quantified from CT scans. Primary endpoints included grade ≥3 hepatotoxicity, hyperglycemia, complete remission (CR/CRi), and measurable residual disease (MRD) negativity by multiparameter follow cytometry after induction.

Results

Sixty-eight patients were included. Median age was 31.5 years, 76.5% were Hispanic, and 72.1% had B-ALL, including 32.4% with Philadelphia chromosome-like (Ph-like) ALL. Median BMI was 30 kg/m2, median VA and SA were 112 cm2 and 183 cm2 respectively, and 47.1% had hepatic steatosis at baseline. Overall CR/CRi and MFC MRD-negative rates were 89.6% and 53.3%, respectively. Grade ≥3 hepatotoxicity occurred in 29.4% of patients. On univariable analysis, BMI >30 (p=0.0015), Ph-like ALL (p=0.0049), and VA >130 cm2 (p=0.0014) were associated with grade ≥3 hepatotoxicity. On multivariable analysis, VA >130 cm2 independently predicted grade ≥3 hepatotoxicity (OR 1.27, 95% CI 1.03–1.59; p=0.032). Patients with Ph-like ALL demonstrated significantly greater VA (p=0.009) and experienced higher rates of hyperglycemia (81.8% versus 41.3%, p=0.002) and lower MRD negativity (p=0.042) following induction.

Conclusion

VA is an independent predictor of severe hepatotoxicity during asparaginase-containing induction for adult ALL and appears more informative than BMI alone. Patients with Ph-like ALL exhibit increased VA and an adverse metabolic profile, identifying a subgroup that may benefit from risk-adapted supportive care and prospective evaluation of metabolic interventions.

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