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Serum lactate dehydrogenase as a prognostic marker for treatment response in IDH wild-type glioblastoma patients undergoing stupp protocol

Paolo Tini ¹, Elisa Cinelli ², Mariya Yavorska ², Flavio Donnini ², Francesco Marampon ³, Pierpaolo Pastina ², Giovanni Rubino ², Salvatore Chibbaro ⁴, Alfonso Cerase ⁵, Maria Antonietta Mazzei ⁶, Anna Maria Di Giacomo ⁷, Giuseppe Minniti ^{3 8}

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Abstract

Background and aim: Elevated lactate dehydrogenase (LDH), a marker of tumor aggressiveness and metabolic alterations, may predict treatment response and overall survival across various tumors. This study investigates the correlation between serum LDH levels and clinical outcomes in glioblastoma patients treated with radiotherapy (RT) and temozolomide (TMZ).

Materials and methods: This retrospective study analysed patients with IDH wild-type glioblastoma (IDH-wt GB) treated at the Radiotherapy Department of Azienda Ospedaliero-Universitaria Senese from 2018 to 2023. Clinical data, including hematologic parameters (e.g., LDH), imaging (MRI), and MGMT promoter methylation status, were collected. All patients received RT and TMZ following the Stupp protocol. Serum LDH levels were measured one week before RT, and Radiological Response (RR) was assessed using RANO criteria. Overall survival (OS), progression-free survival (PFS), and RR were primary endpoints. Statistical analyses included Kaplan-Meier, Cox regression, and decision tree analysis for LDH cut-off determination.

Results: In a cohort of 147 IDH wild-type glioblastoma patients treated with the Stupp protocol, the median OS was 14 months and median PFS was 8 months. Elevated baseline LDH levels were associated with significantly poorer outcomes, showing a median OS of 9 months versus 20 months and a median PFS of 6 months versus 13 months for lower LDH levels ($p < 0.001$ and $p = 0.0001$, respectively). LDH levels also correlated with RR ($p = 0,001$). Multivariate analysis confirmed high LDH as an independent predictor of worse OS (HR = 2.31) and PFS (HR = 2.60), suggesting its utility as a prognostic biomarker.

Conclusions: Elevated LDH levels before starting the Stupp protocol are clinically significant as they predict poorer overall survival and progression-free survival in glioblastoma patients and worse RR. Incorporating LDH measurements into treatment planning can help identify patients at higher risk of poor outcomes, allowing for more tailored and potentially aggressive treatment strategies to improve management and therapeutic responses in glioblastoma.

Keywords: Glioblastoma; Prognostic biomarkers; Radiotherapy; Serum LDH; Temozolomide.

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