

Translational Evaluation of ALDH and MMP-9 Expression in Osteosarcoma: Insights into Chemotherapy Response and Survival from a Single-Center Cohort

Authors

Ana Valeria Rigolino¹, Glauco José Pauka Mello¹, Matheus Silva Teixeira¹

Affiliation

¹Hospital Erasto Gaertner, Curitiba, Brazil

Introduction:

Osteosarcoma remains a biologically heterogeneous malignancy with limited prognostic biomarkers. Aldehyde dehydrogenase (ALDH), associated with cancer stem cell activity, and matrix metalloproteinase-9 (MMP-9), involved in extracellular matrix remodeling, have been implicated in tumor progression and metastasis. However, their role in treatment response remains unclear.

Materials & Methods: We conducted a retrospective cohort study of 28 patients with histologically confirmed osteosarcoma treated at a tertiary referral center (2005–2017). Immunohistochemical analysis of ALDH and MMP-9 expression was performed on 40 tumor samples obtained before and after neoadjuvant chemotherapy. Clinicopathological variables and survival outcomes were analyzed. Kaplan–Meier estimates and log-rank tests were used for survival analysis.

Results:

A total of 40 samples were analyzed (22 pre-treatment, 18 post-treatment). ALDH expression was positive in 10% of samples, while MMP-9 expression was observed in 17.5%. Patients with positive biomarker expression demonstrated a numerically higher proportion of mortality (ALDH: 50% vs. 43%; MMP-9: 50% vs. 37.5%). Overall survival at 5 years was approximately 46%. Although no statistically significant differences were observed between biomarker expression, chemotherapy status, or survival outcomes, a consistent trend toward worse prognosis was noted in marker-positive cases.

Conclusion:

ALDH and MMP-9 expression may reflect underlying tumor aggressiveness in osteosarcoma, with a trend toward poorer outcomes despite lack of statistical significance. These findings support the hypothesis that stemness-related and matrix-remodeling pathways contribute to disease progression. Larger, multicenter studies are warranted to validate these biomarkers as potential prognostic or therapeutic targets.