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Abstract: PURPOSE: To analyze the relationship between pre-treatment measurements of tumor oxygen tension (pO2) and survival in advanced head and neck cancer. PATIENTS AND METHODS: Eppendorf pO2 measurements in 397 patients from seven centers were analyzed using the fraction of pO2 values < or =2.5 mmHg (HP2.5), < or =5 mmHg (HP5) and median tumor pO2 (mmHg) as descriptors. All patients had intended curative radiation therapy alone or as pre- or post-operative radiotherapy or radio-chemotherapy according to the practice at each center. RESULTS: The degree of hypoxia varied between tumors with an overall median tumor pO2=9 mmHg (range 0-62 mmHg), a median HP2.5=19% (range 0-97%) and HP5=38%, (range 0-100%). By quadratic regression median tumor pO2 correlated with Hb (2P=0.026, n=357), while HP2.5 or HP5 did not. HP2.5 above the population median was the only parameter that associated with poor overall survival (Kaplan Meier analysis, P=0.006). In a multivariate Cox Proportional Hazards analysis, stratified according to institution HP2.5 was by far the most statistically significant factor in explaining the variability in survival. After adjusting for HP2.5, clinical stage, radiation dose and surgery hemoglobin concentration was not significant in the model. The
prognostic model shows that the 5-year survival is almost constant for HP2.5 values in the range from 0 to 20%, whereas the 5-year survival approaches 0% in the most hypoxic tumors. CONCLUSION: This study provides evidence that tumor hypoxia is associated with a poor prognosis in patients with advanced head and neck cancer.