Stomach Cancer: Interconnection between the Redox State, Activity of MMP-2, MMP-9 and Stage of Tumor Growth

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Abstract

© 2016, Springer Science+Business Media Dordrecht.High levels of reactive oxygen (ROS) and nitrogen (RNS) species can lead to the destruction of extracellular matrix facilitating tumor progression. ROS can activate matrix metalloproteinases (MMP), damage DNA and RNA. Therefore, the levels of MMP, ROS and RNS can serve as additional prognostic markers and for the estimation of the effectiveness of tumor therapy. Concerning gastric cancer, the prognostic role of MMP, its connection with the cancer staging remains controversial and correlations between the activity of MMP with the ROS and RNS levels are insufficiently confirmed. Superoxide generation rates, nitric oxide (NO) levels, concentrations of active forms of matrix metalloproteinases MMP-2 and MMP-9 in tumor and adjacent tissues of patients with stomach cancer at different disease stages were measured by electron spin resonance (ESR) including spin-trapping and polyacrylamide gel zymography. It is shown that the activity of MMP-2 and MMP-9 in tumor tissue correlate with the superoxide radicals generation rate and NO levels ($r = 0.48 \div 0.67$, $p < 0.05$). The activity of MMP-2 and MMP-9 in tumor tissues and superoxide radical generation rates correlate positively with the stage of regional dissemination ($r = 0.45$ and 0.37, correspondingly, $p < 0.05$), but MMP-2 and MMP-9 activity inversely depends on distant metastatic degree of stomach cancer ($r = 0.58$; $p < 0.05$). Additionally, the feasibility of ESR to locally determine oxidative stress is demonstrated.

Keywords

Electron paramagnetic resonance (EPR), Electron spin resonance (ESR), Gastric cancer, Matrix metalloproteinases, Metastasis, Reactive oxygen species (ROS), Stomach cancer