

Journal Article



Angiogenic patterns and their quantitation in high grade astrocytic tumors

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Summary

Background The objectives of this study on high grade astrocytic tumors were (i) to establish differences, if any, between grades III & IV tumors among angiogenic parameters, both qualitative and quantitative, and (ii) to correlate angiogenic parameters with proliferation indices, namely T2a and MIB1 labeling indices.

Design Twenty nine consecutive cases of WHO grades III (11) and IV (18) astrocytic tumors diagnosed in the year-2004 were studied, using H&E and CD34, MIB1 and T2a immunostaining by streptavidin biotin technique. Angiogenic patterns were studied and parameters quantitated using Image Pro Plus software (four hotspots) on CD34 immunostained sections to determine intratumoral microvessel density (iMVD), microvascular area (MVA), aspect, mean diameter (MD) and fractal dimension (FD).

Results Main angiogenic patterns of capillary (18) and glomeruloid (9) types were best developed in glioblastomas. Statistically significant differences ($P < 0.05$) were seen between grades III and IV in iMVD, aspect, MD and FD, but not in angiogenic patterns or MVA ($P = 0.27$). Statistically significant differences ($P < 0.05$) were seen between glioblastomas with glomeruloid vs. capillary types in iMVD and FD, but not in MVA, aspect and mean vessel diameter. T2a values correlated with MIB1 labeling indices ($R = 0.965$, $P < 0.001$). Intratumoral endothelial MIB1 LI was significantly higher in grade IV as compared to grade III, but did not correlate with angiogenic parameters. No correlation of angiogenic patterns and proliferation indices was noted ($R = -0.221$, $P = 0.26$). Limited follow up data showed all recurrent grade IV tumors to be of glomeruloid type.

Conclusion Increased angiogenesis in grade IV, as compared to grade III, astrocytic tumors is characterized by an increased number/density of vessels: an increase in

vessels characterized by disproportionate lengthening and likely associated with the infiltrative properties of the tumors; and an increase in pliable, irregularly shaped or structured vessels. In addition, there is a greater frequency of glomeruloid structures indicating inadequate directional migration of the newly formed vessels. The lack of correlation of these angiogenesis parameters with the MIB1 and T2a proliferation indices reflects the complexity of angiogenesis parameters in high grade gliomas. Further studies are needed to determine the usefulness of the angiogenic parameters in the improved diagnosis (grading) and prognosis of astrocytic tumors.

Keywords angiogenic patterns - astrocytoma grade III - astrocytoma grade IV - glioblastoma - intratumoral microvascular density - MIB1 - topoisomerase II alpha

The study was presented at the 94th Annual Meeting of the United States and Canadian Academy of Pathology, March 2005 at San Antonio, TX. (Mod Pathol 2005; 18 (suppl.1): 295A)

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