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Publication history

Published article online:
12 Nov 2007

Received for publication: 12
May 2007 Accepted for
publication: 7 September
2007

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International Journal of Experimental Pathology

OnlineEarly Articles

To cite this article: Norihiko Saito, Tsutomu Hatori, Nozomu Murata, Ze-An Zhang, Hiroko Nonaka, Kazuya Aoki, Satoshi Iwabuchi, Morikazu Ueda
Comparison of metastatic brain tumour models using three different methods: the morphological role of the pia mater
International Journal of Experimental Pathology (OnlineEarly Articles).

doi:10.1111/j.1365-2613.2007.00563.x

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Abstract

ORIGINAL ARTICLE

Comparison of metastatic brain tumour models using three different methods: the morphological role of the pia mater

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Summary

As methods of cancer diagnosis and treatment progress, interest

in metastatic brain tumours continues to increase. There are many studies using various methods of animal model and we considered that each model reflects different pathological processes because of the unique composition of the brain. We prepared metastatic brain tumour models using three different methods. In this study, we attempted to elucidate the roles of the pia mater in brain metastasis. The metastatic foci showed an angiocentric pattern, forming collars of neoplastic cells, and were designated 'perivascular proliferations'. Furthermore, we observed neoplastic cells that infiltrated the brain parenchyma, the border of which had become indistinct. These were labelled 'invasive proliferations'. The internal carotid artery injection model reflects haematogenous metastasis. In this model, both perivascular and invasive proliferations were observed. The intrathecal injection model reflects leptomeningeal carcinomatosis. In this model, metastasis to the meninges was observed. In the stereotactic injection model, the tumour proliferation at the injection site and the infiltration into the brain parenchyma were observed. The pia-gliar membrane serves as a scaffold when neoplastic cells spread to the perivascular space forming angiocentric pattern. The pia-gliar membrane is found between the brain parenchyma and blood vessels. Blood vessels penetrate the brain through tunnels known as perivascular spaces that are covered by pia mater. Three different methods which we prepared reflect three different pathological processes. Our findings suggest that the pia mater is a critical factor in brain metastasis.

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