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Dimensions of Reproducible Malignant Transformation as Brain Infiltration by Glioma

Lawrence M Agius^{1*}

¹Department of Pathology, Mater Dei Hospital, Tal-Qroqq, University of Malta Medical School, Msida, Malta Europe

***Corresponding Author:** Lawrence M Agius, Department of Pathology, Mater Dei Hospital, Tal-Qroqq, University of Malta Medical School, Msida, Malta Europe; Tel: +356-21451752; Email: lawrence.agius@um.edu.mt

Received Date: 11-07-2020; **Accepted Date:** 02-08-2020; **Published Date:** 10-08-2020

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Abstract

Frameworks of operability and dysregulation are paramount considerations in the evolutionary history of a malignant glioma in particular as further emphasized by the embryonic nature of characterization of the cells of origin of a given neoplasm. It is in terms of evolving constitution that the infiltrated surrounding brain tissue of a malignant glioma recapitulates the derivative nature of oncogenesis with its multi-varied dimensions of spread into the surrounding tissues as support and inducing influence in oncogenesis. Radio-nuclides are parametric models that attempt directing suppression primarily of such infiltrative margins of malignant gliomas, as well exemplified by models of generation and duplication of the malignant transformation process from the initial stage of conception to the culmination as infiltrative margins of a given malignant glioma. The main aim in this review is to clarify to some extent the involvement of infiltrative phenomena on the part of malignant gliomas and also of malignant neoplasms as a whole in the essential lesion progression. The dynamics of progression are direct derivative processes that impact also the growth and further infiltration of “normal” brain tissue or stroma. Indeed, the infiltrative phenomenon is a principal mechanism in the further progression of glioma genesis per se.

Keywords

Malignant Gliomas; Anticancer Effects; Tumor; Brain Tissue

Agius LM | Volume 1; Issue 1 (2020) | JSRP-1(1)-002 | Review Article

Citation: Agius LM. Dimensions of Reproducible Malignant Transformation as Brain Infiltration by Glioma. J Surg Res Prac. 2020;1(1):1-6.

DOI: <http://dx.doi.org/10.46889/JSRP.2020.1102>

Introduction

The conceptual approach of treating malignant gliomas with radio labelled antibodies is based on the tumor directed toxicity of the radio-isotope within frameworks of attempted concentrating localization to the tumor as directed by systems of operative and also external radiation. Neoadjuvant nivolumab in glioblastoma patients resulted in enhanced expression of chemokine transcripts, higher immune cell infiltration and augmented TCR clonal diversity among tumor-infiltrating T-lymphocytes, indicating a local immunomodulatory effect of PD-1 blockade [1]. The significance of such attempts is within the scope of realization as borne out by schemes of operative management of newly diagnosed patients as well as for recurrent tumor patients. The anticancer effects of dietary phytochemical such as curcumin can promote targeting of multiple signalling pathways in Glioblastoma (GBM) [2]. Within such scenarios, the further participation of injury pharmacokinetics directed mainly towards the tumor mass is dependent on several hemodynamic parameters as borne out by such measures as hyperthermia that both increases tumor blood supply and also vascular permeability.

Radio Labelling

The further improved radio labelling isotopes and the specific attached antibody affinities are attempts within the system profiles of the degree of stability of both radio-nuclides and the antibody conjugates.

The lack of functional dendritic cells from the brain causes the brain to lack the priming of systemic immune responses to glioma antigens [3].

As such, the further involvement of the targeting dynamics approaches a specific enhancement as demonstrable within such therapeutic attempts. Challenges of Brain Cancer Therapy (BCT) clinically are to overcome chemo- and radio-resistance, to improve drug deliver to tumors and the development of effective drug screening [4]. The significant formulation of essential dynamics are proof of principle within systems that operate in vivo as terms of reference and as formatting pathways of decreased viability of the relevant tumor cells within encompassed tumor integrity.

Labelling with the alpha particle emitting Bi-213 is promising due to the high linear energy transfer and the very short tissue range; future development needs to focus on improvement of the stability of the compound and application of dedicated catheter systems to improve intratumoral distribution within infiltrative margins of the glioma [5]. Performance at-tributes allows the creation of permissive elements within the significant infiltrating potentialities of Malignant Gliomas (MG) in particular. The administration of Radionuclide Labelled (RNL) monoclonal antibodies is severely compromised by the systemic toxicity patterns particularly to normal neural tissues and to the bone marrow. As such, the specific modes of administration

has been further explored in terms of incremental escalating doses of the targeting antibody conjugate as dictated by non-systemic routes of delivery.

The significant selectivity that has been developed is compartmental in mode of administration as performed especially into tumor cavities either as spontaneous cysts or as post-surgical resection cavities.

Stabilized Tumor Dynamics

Stabilization of the tumor dynamics by such delivered radio-nuclides is an observed phenomenon within the performance of delivery parameters as borne out also by delayed recurrence of the tumors and at times by prolongation of survival of the tumor animal models especially xenograft rat human systems. Results from single agent targeted therapy trials have been modest; lack of efficacy result from poor Blood Brain Barrier (BBB) penetration, the genetic heterogeneity of the tumors and the development of resistance mechanisms [6]. Participation of tumor cell injury is correlated with a concentrated localization of such radio-nuclides that emit either alpha or beta radio-emission. A multi-disciplinary approach to the therapy of MG and GBM is indicated [7]. It is further to such approaches that the targeting of tumor cells is problematic in the abnormal brain tissue invaded by the expanding and infiltrative advancing edge of MG.

Long noncoding RNAs show increasing aberrant expression in glioma tissues and cell lines and may be critical for glioma initiation, progression and malignant phenotype; Inc RNAs are potential biomarkers and therapeutic targets in gliomas [8].

Tumor-associated macrophages are significant in contributing to tumor growth, metastasis and neovascularization; potential therapeutic targets to intervene in tumor angiogenesis are being explored [9].

Brain Infiltration

It is further to such considerations that the brain tissue infiltrated by the growing edge of malignant neoplasms but especially by malignant gliomas is inherently abnormal and reproduces a micro-environment that is strongly conducive to the further growth and spread of the tumor.

Molecular networks govern glioma biology and focus on intracellular signalling molecules in gliomas that associate with each other and regulate refractoriness against current therapy [10].

The paradoxical systems conducive to further spread of a malignant glioma including the GBM are paramount considerations in the therapeutic approach to the tumor with the added

considerations of spread as dysfunctional conditioning of the parent neoplasms. The vasculature of neo-plasms is an expression of such a concept of infiltrated brain tissue in supplying the essential milieu for tumor growth and spread. In such terms, mesenchymal vascular support for neoplasms enhances and further provokes the glioma genesis and directs in multi-varied ways the development of essential support for the parent tumor and infiltrating edge of the glioma.

Malignant Transformation

Such considerations revolve in terms of the nature of the infiltrated brain tissue within encompassed definition of regions for malignant transformation. Recent research has proposed canonical transient receptor potential channels to be newly emerged potential drug targets for glioma and are involved in proliferation, migration, invasion, angiogenesis and metabolism of glioma cells [11]. The actual process of origin of the infiltrating gliomatous cells is derivative exponent of the surrounding brain tissue in terms of incremental employment of such derived trophic factor supply and angiogenesis. The Cancer Genome Atlas and other projects have shown the somatic alterations and molecular subtypes of glioma at diagnosis; however, gliomas develop along significant cellular and molecular evolutionary courses during disease progression [12]. It is indeed the nature of transformations occurring within the adjacent surrounding brain tissue that there arises incremental growth and recurrence of neoplasms as so well exemplified by microscopic foci of recurrent glioma left viable at surgery. The terms of reference of such infiltrative phenomena include the establishment of amplification of trophic effect and above all of transforming potentiality within systems of modelled gene transduction and protein translation and also within the inherent production of such mediators as adhesion molecules. Multi-targeted kinase inhibitors or combinations of agents targeting different mitogenic pathways may over-come the resistance of tumors to single agent targeted therapies [13].

Such systems that are applicable to gliomas are relevant with similar emphasis to malignant neoplasms as a whole and offer formidable hurdles to the complete expiration of a given malignant neoplasm. Although no large controlled series have so far been reported, radiolabelled substance P-based targeted glioma therapy compare well with conventional therapy. Dedicated catheter delivery requires further specificity for better intratumoral distribution and enhanced molecular stability requires further improvement. It is further to supporting frameworks of the tumor that the incremental distinctive and advancing nature of infiltrative phenomena in the primary neoplasm is itself subject to the nature of the infiltrating edges of tumor cells and that these latter are patterned by the surrounding in-filtrated brain tissue. It is still a struggle to develop modalities to expose the entire tumor to therapeutics at pharmacologically meaningful quantities [14-19].

Concluding Remarks

The paradoxical attributes of exposing influences to the infiltrating margins of a given MG are testimonial parameters within encompassed micro environmental factors of influence that beget the malignant transformation as genitor event in oncogenesis. The distributional nature of the primary neoplasm and its genesis includes derivative phenomena that reproduce the essential requirements of the original cell changes in oncogenesis and neogenesis of the parent neoplasm. Pathway inhibition, via multi-site kinase inhibitors or a carefully selected combination of molecular drugs with or without cytotoxic agents, is currently being evaluated in clinical trials.

In such terms, the overall configurational dimensions of incremental effect are expression of the amplifying nature of the malignant transformation events within systems for further growth and spread of initial on-cogenesis steps. It is further to this that the parameters of control and loss of control in cell division and spread are amplification in essential nature and further conform to necessities of induction within embryonic terms of reference in oncogenesis and glioma genesis. Epidermal Growth Factor Receptor (EGFR) is commonly amplified and/or mutated in high-grade gliomas; the ability of certain neoplastic cells to maintain signalling through AKT and ERK under EGFR inhibition may constitute a potential mechanism of resistance by tumor cells to escape the anti-proliferative activity of EGFR inhibitors.

Parametric redefinition of such processes is fundamental to a realization of cell injury in a manner that is of importance in considering the toxicity spectra of induced action when delivering radionuclides labelled with targeting monoclonal antibodies. It is indeed in redefined conceptual approaches that the glioma and neoplasms in general both derive the incremental nature of neoplastic progression. Technologic refinements in molecular analysis allow for single cell sequencing to assess given cell types in the brain tumor microenvironment. Consequential attributes of redefined tumor parameters conclusively model patterns of derivation as substituted indices of biologic progression of a given glioma.

The most prominent hallmark of adult gliomas is their invasive properties marked by a markedly plastic phenotype and also malignant progression from low to high grade tumor types. Further reproductive patterns of pattern duplication require a modification in molecular frameworks in the employment of toxic injuries inflicted to tumor cells and exclusively to such tumor cells. One principal approach is to gain control of the behaviour of the microglia which are modulated by malignant glioma and support its progression. Local administration of radiolabelled monoclonal antibodies has been confirmed as the most effective management for these malignant neoplasms. Alpha particles deliver a high proportion of their energy in close proximity to the targeted glioma cells with also less side effects. Successful localisation was attained for 123-I-labeled mono-clonal antibodies against EGFR1 or placental alkaline phosphatase in 18 out of 27 patients. Such considerations are particularly applicable to targeted

therapies to gliomas that primarily infiltrate and subsequently and secondarily undergo cell division.

References

- Schaper KA, Rodriguez-Ruiz ME, Diez-Valle R, Lopez-Janeiro A, Porciuncula A, Idolate MA, et al. Neoadjuvant nivolumab modifies the tumor immune microenvironment in resectable glioblastoma. *Nat Med.* 2019;25(3):470-6.
- Shahcheraghi SH, Zangui M, Lotfi M, Ghayour-Mobarhan M, Ghorbani A, Jaliani HZ, et al. Therapeutic potential of cur cumin in the treatment of glioblastoma multiforme. *Crr Pharm Des.* 2019;25(3):333-42.
- Lowenstein PR, Castro MG. Evolutionary bass of a new gene- and immune-therapeutic approach for the treatment of malignant brain tumours: from mice to clinical trials for glioma patients. *Clin Immunol.* 2018;189:43-51.
- Patil SA, Hosni-Ahmed A, Jones TS, Patil R, Pfeffer LM, Miller DD. Novel approaches to glioma drug design and drug screening. *Expert Opin Drug Discov.* 2013;8(9):1135-51.
- Cordier D, Krolicki L, Morgenstern A, Merlo A. Targeted radiolabeled compounds in glioma therapy. *Semin Nucl Med.* 2016;46(3):243-9.
- Miller JJ, Wen PY. Emerging targeted therapies for glioma. *Expert Opin Emerg Drugs.* 2016;21(4):441-52.
- Oberheim Bush NA, Chang SM, Berger MS. Current and future strategies for treatment of glioma. *Neurosurg Rev.* 2017;40(1):1-14.
- Peng Z, Liu C, Wu M. New insights into long noncoding RNAs and their roles in glioma. *Mol Cancer.* 2018;17(1):61.
- Zhu C, Kros JM, Cheng C, Mustafa D. The contribution of tumor associated macrophages in glioma net-angiogenesis and implications for anti-angiogenic strategies. *Neuro Oncol.* 2017;19(11):1435-46.
- Tomiyama A, Ichimura K. Signal transduction pathways and resistance to targeted therapies in glioma. *Semin Cancer Biol.* 2019;58:118-29.
- Li Shanshan, Ding Xia. TRPC channels and glioma. *Adv Exp Med Biol.* 2017;965:157-65.
- GLASS Consortium. Glioma thought the looking GLASS: molecular evolution of diffuse gliomas and the glioma longitudinal analysis consortium. *Neuro Oncol.* 2018;20(7):873-84.
- Sathornsumetee S, Rich JN. New treatment strategies for malignant gliomas. *Expert Rev Anticancer There.* 2006;6(7):1087-104.
- van Tellingen O, Yetkin-Arik B, de Gooijer MC, Wesseling P, Wurdinger T, de Vries HE, et al. Overcoming the blood-brain tumour barrier for effective glioblastoma treatment. *Drug Resis Update.* 2015;19:1-12.
- Patel M, Vogelbaum MA, Barnett GH, Jalali R, Ahluwalia MS. Molecular targeted therapy in recurrent glioblastoma: current challenges and future directions. *Expert Opin Investig Drugs.* 2012;21(9):1247-66.
- Li B, Chang CM, Yuan M, McKenna WG, Shu H-K G. Resistance to small molecule inhibitors of Epidermal growth factor receptor in malignant gliomas. *Cancer Res.* 2003;63(21):7443-50
- Torres D, Canoll P. Alterations in the brain microenvironment in diffusely infiltrating low-grade glioma. *Neurosurg Clin N Am.* 2019;30(1):27-34.
- Alfonso JCL, Talkenberger K, Seifert M, Klink B, Hawkins-Daarud A, Swanson KR, et al. The biology and mathematical modelling of glioma invasion: a review. *JR Soc Interface.* 2017;14(136):20170490.
- Li W, Holsinger RMD, Kruse CA, Flugel A, Graeber MB. The potential for genetically altered microglia to influence glioma treatment. *CNS Neurol Discord Drug Targets.* 2013;12(6):750-62.