Neurosciences & Brain Imaging

Open access Short Communication

Postradiation Cerebral Hemodynamic and Metabolic Dysregulation

Mario Zuccarello*

Department of Neurosurgery, University of Cincinnati Medical Center, USA

INTRODUCTION

In 22 cases of Arteriovenous Malformation (AVM) treated with gamma unit radiosurgery, postradiation changes in angiographically determined nidus volume were quantified. By the 2nd year after treatment, the post-radiosurgery decrease was statistically significant (p. 05). AVMs cleared faster in children than in adults. Volume reduction was faster in nidi receiving 25 Gy or more than in those receiving less than 25 Gy (p. 01). However, there were no significant differences in nidus volume decline between the two dose groups at the second or third post-radiosurgical year.

DESCRIPTION

Dose response curves were obtained one, two and three years after treatment. Cerebral arteriovenous malformations (AVMs) exemplify the delicate balance that cerebrovascular specialists must strike when weighing treatment risk against the natural history of a pathological lesion. The aim of our review was to provide an overview of the current evidence for the treatment of cerebral AVMs and to describe a modern approach to the development of a treatment strategy based on the individual characteristics of AVMs. New tumor-conforming modes of radiation therapy have been developed with the goal of sparing normal tissue while maintaining or improving local tumor control. We used a dynamic susceptibility-weighted contrast-enhanced MR technique to measure regional cerebral blood volumes (rCBV) to document radiation-induced changes in normal brain and low-grade astrocytoma. We tried to evaluate pre-therapeutic rCBV values as well as time and dose-dependent changes after radiotherapy. 25 patients with histologically proven fibrillary astrocytoma were examined before radiotherapy and during follow-up to prospectively and longitudinally evaluate rCBV in normal patients. Three-dimensional treatment planning was performed using CT and MR data sets in a stereotactic setting. Radiotherapy was administered at a mean and median total dose of 60.9 and 60 Gy, respectively, using fractionated stereotactic radiotherapy. 55 T2-weighted gradient echo images were acquired before, during, and after intravenous contrast bolus injection during MR imaging for treatment planning and follow-up examinations. The obtained signal-time curves were converted to concentration-time curves. The area under the tissue concentration-time curve was calculated and normalized to the integrated arterial input function. The dangerous nature of Arteriovenous Malformations (AVMs) has been evident since the first attempts at surgical obliteration. Dr. in their 1928 book on cerebrovascular malformations, Cushing and Bailey wrote about deep AVMs. The surgical history of most reported cases shows not only the futility of attempting to surgically remove one of these angiomas, but also the extreme risk of serious cortical damage it entails. In summary, lesions that are discovered incidentally by the surgeon should be left alone. Ongoing research and new treatment approaches have made many AVMs curable in the century since this statement was made. Three main interventional approaches have been pursued to achieve the goal of complete removal of lesions and prevention of neurological damage. Early attempts at cure focused on open surgical resection, with Fedor Krause providing the first report of cerebral AVM resection in his 1908 text on cranial surgery. Although surgical resection is still the mainstay of AVM treatment, endovascular and radiosurgery alone or in combination with surgery are increasingly used. It was thus possible to calculate the absolute values of rCBV. Although most tumors showed no change in diagnostic MR imaging, the method was able to document radiation effects in low-grade astrocytoma [1-4].

CONCLUSION

The decrease in rCBV caused by radiation was correlated with the total dose delivered to the tissue area, with high dose causing a significant decrease. The smaller decrease in rCBV in GM and WM outside high-dose areas after stereotactic radiotherapy confirms the effectiveness of modern conformal radiotherapy techniques in preserving normal brain tissue. However, the

Received:	31-August-2022	**Manuscript No:**	IPNBI-22-14830
Editor assigned:	02-September-2022	**PreQC No:**	IPNBI-22-14830 (PQ)
Reviewed:	16-September-2022	**QC No:**	IPNBI-22-14830
Revised:	21-September-2022	**Manuscript No:**	IPNBI-22-14830 (R)
Published:	28-September-2022	**DOI:**	10.36648/ipnbi.6.5.25

Corresponding author Mario Zuccarello, Department of Neurosurgery, University of Cincinnati Medical Center, USA, Email: zucarm@ucmail.uc.edu

Citation Zuccarello M (2022) Postradiation Cerebral Hemodynamic and Metabolic Dysregulation. J Neurosci Brain Imag. 6:25.

critical minimum dose that initiates rCBV changes is unknown.

ACKNOWLEDGEMENT

None.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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