Malignant Transformation Surrounding Iodine-125 Beads after Treatment of a Low-Grade Glioma

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Abstract
Permanent iodine-125 beads have been used in the treatment of low- and high-grade gliomas with good results. On computed tomography (CT) and magnetic resonance imaging (MRI), increased enhancement around these beads is common and is usually thought to represent radiation necrosis or disruption of the blood brain barrier. Further investigation of these areas of enhancement is warranted due to the rare possibility of malignant transformation occurring around these beads. Advances in radiological imaging, such as Fludeoxyglucose Positron Emission Tomography (FDG PET), have been useful in differentiating malignant transformation from benign entities. We present the first reported case of a 33-year-old lady with malignant transformation occurring around these beads approximately three years post-resection of a low-grade glioma.

Categories: Pathology, Radiation Oncology, Neurosurgery
Keywords: low-grade glioma, glioblastoma multiforme, iodine-125 beads, fdg-pet scan, malignant transformation

Introduction
Iodine-125 beads have been used in the treatment of low- and high-grade gliomas. They provide a cumulative therapeutic dose of 50-65 Gray within nine months. We present the first reported case of a 33-year-old lady with malignant transformation occurring around these beads approximately three years post-resection of a low-grade glioma. Informed patient consent was obtained.

Case Presentation
A 33-year-old lady previously underwent craniotomy and resection of a Grade 2 astrocytoma in 2003 in Germany. She was followed up with serial scans that showed no evidence of tumour recurrence. However, in 2007 a recurrence of the Grade 2 tumour was noted. A repeat craniotomy was performed in 2007 with the insertion of iodine-125 seeds. Regular follow-up was continued to ensure no recurrence, but she presented with absence seizures in June 2010. A magnetic resonance imaging (MRI) scan demonstrated enhancement of the right frontal region surrounding the areas of the previous radioactive seeds.

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FIGURE 1: Axial T1-weighted MRI with contrast demonstrates areas of contrast enhancement surrounding the implanted radioactive iodine beads.

It was unsure if these were changes in relation to radionecrosis or malignant transformation. A fludeoxyglucose positron emission tomography (FDG PET) scan was then performed which showed increased uptake in the enhancing areas, favouring malignancy over radionecrosis.
A craniotomy and resection of the right frontal tumour with removal of the iodine seeds was performed in August 2010. The seeds were examined by the nuclear medicine team, and there was no evidence of radioactive decay. Histology of the resected tissue confirmed glioblastoma multiforme.
transformation around these beads with normal malignant progression of a low-grade glioma. To confirm histological diagnosis. Further studies may be useful in comparing rates of malignant serious entities. A low threshold for biopsy or resection of these areas of enhancement should be advocated of FDG PET imaging should be considered as it may reliably distinguish malignant transformation from less serial CT or MRI imaging. If increased contrast enhancement or uptake is noted around these beads, the use of radioisotope in the areas of contrast enhancement around the implants should be further investigated. FDG PET scanning may also demonstrate increased uptake in areas of local blood brain barrier disruption without the presence of a malignant tumour.

In this study, the presence of malignant transformation has been confirmed by histology. There does not seem to be any published literature about malignant transformation surrounding iodine-125 implants used in Grade 2 gliomas. On follow-up imaging of patients with low grade gliomas with iodine-125 implants, areas of contrast enhancement around the implants should be further investigated. FDG PET scanning should be initially carried out to differentiate radiation necrosis versus local blood brain barrier disruption or malignant transformation. If there is increased uptake of radioisotope in the areas of contrast enhancement, this should not be attributed solely to disruption of the local blood brain barrier. A low threshold for biopsy or resection of these areas of enhancement should be advocated to confirm histological diagnosis. Further studies in this area may be beneficial in determining if the rate of GBM transformation in previously known low-grade tumours is higher if radioactive iodine implants are used.

Conclusions
Patients with permanent iodine-125 interstitial implants for low-grade gliomas should be followed up with serial CT or MRI imaging. If increased contrast enhancement or uptake is noted around these beads, the use of FDG PET imaging should be considered as it may reliably distinguish malignant transformation from less serious entities. A low threshold for biopsy or resection of these areas of enhancement should be advocated to confirm histological diagnosis. Further studies may be useful in comparing rates of malignant transformation around these beads with normal malignant progression of a low-grade glioma.
Additional Information

Disclosures

Human subjects: Consent was obtained by all participants in this study. Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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