

A case of suspected forebrain glioma with spinal cord drop metastasis, successfully treated with radiation therapy.

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Background

Glioma is the second most common primary brain tumour of the dog. Certain breeds are predisposed, mainly brachycephalic breeds such as the French Bulldog ^[1]. Affected dogs usually present with intracranial signs, and a diagnosis of glioma is typically imaging based. Management of these tumours initially involves local disease control, with surgery, chemotherapy or radiation therapy (RT) ^[3]. Several reports have described metastasis of glioma within the central nervous system (CNS), a phenomenon known as “drop metastasis” ^{[2][3][4]}. This case report describes a dog who successfully received RT, for one such suspected drop metastasis lesion.

Case Summary

A 7-year old female neutered French Bulldog presented with epileptic seizures in April 2020. She had an MRI of the brain performed, which revealed a well-defined intra-axial right piriform lobe mass. It was a T2W hyperintense, T1W hypointense, non-contrast enhancing mass (figure 1, a and b). Given the appearance and location of the mass, a glioma was suspected. The dog received 3D conformal RT (20 fractions of 2.5Gy, total dose of 50Gy, prescribed to the planning target volume – PTV). The dog presented for follow up around 12 months later, with left thoracic limb paresis. Repeat imaging of the brain revealed that the mass had nearly completely resolved (RECIST criteria ^[5]) following RT treatment (figure 1, c and d).

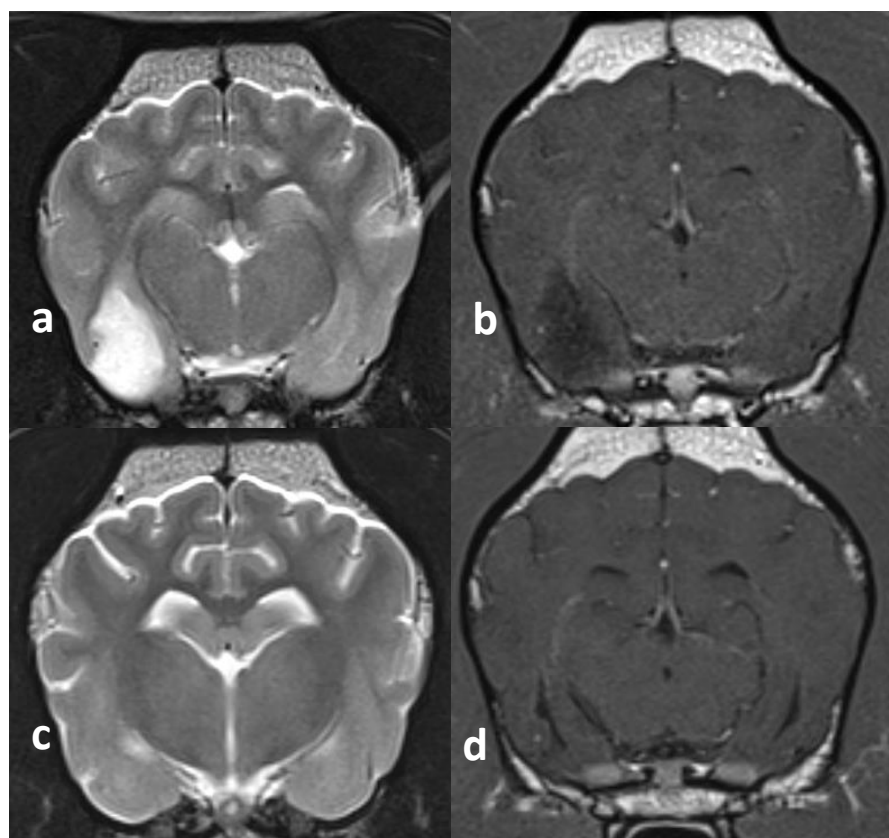


Figure 1. Transverse T2W (a) and (c), and T1W post-contrast (b) and (d), images of the brain. Images (a) and (b) represent the right piriform lobe mass, at the time of initial presentation (April 2020). Images (c) and (d) are from the MRI study acquired one year later, post-RT treatment (May 2021).

However, MRI revealed an intradural intramedullary, well demarcated T2W hyperintense, T1W hypointense lesion with an equivocal ring enhancement, at the level of C3-C4 vertebrae, (figure 2, e and f) which was suspected to be drop metastasis from the previously treated piriform lobe glioma. This lesion was observed to be ependymal as per the classification system from Bentley et al. (2021) ^[4]. This new lesion was treated with intensity modulated radiotherapy (10 fractions of 3.6 Gy, with a total dose 36 Gy prescribed to the PTV) (figure 3, g and h).

In order to contour the gross-tumour volume (GTV) and organs at risk, post-contrast CT and T2W MRI were registered to the pre-contrast CT. The GTV was defined as the T2W hyperintense intramedullary region. The clinical target volume (CTV) was defined as an extended 1cm margin cranially and caudally inside the spinal canal, from the GTV. The CTV margin was extended three dimensionally by 5mm, to define the planning target volume (PTV). This was to account for internal physiologic movements, patient motion and setup uncertainties. PTV size was determined based on our experience of immobilisation in this location, taking into account the immobilisation devices used (thermoplastic mask and bite block), and daily image verification with cone beam CT prior to treatment.

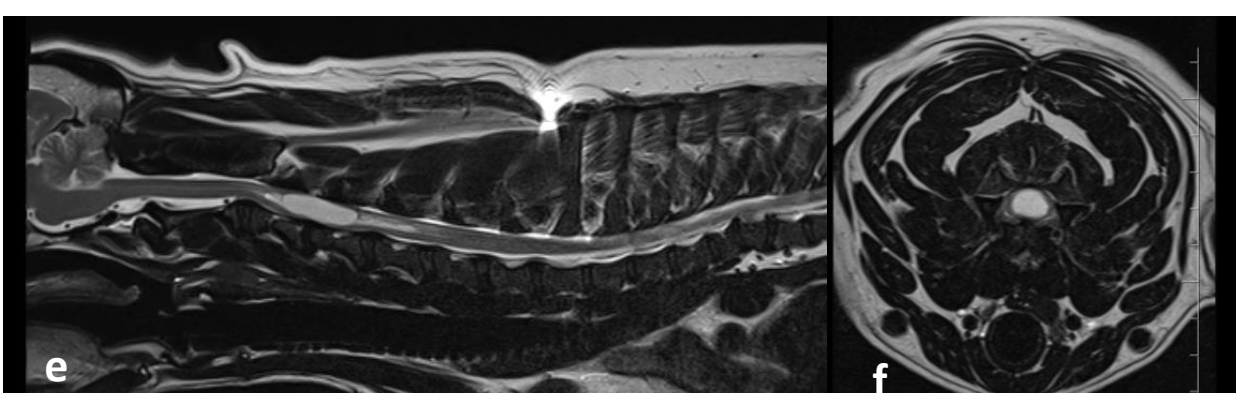


Figure 2. Sagittal (e) and transverse (f) T2W images of the cervical spinal cord, showing the well-defined T2W hyperintense intradural intramedullary lesion, located at the level of C3-C4 vertebrae, May 2021.

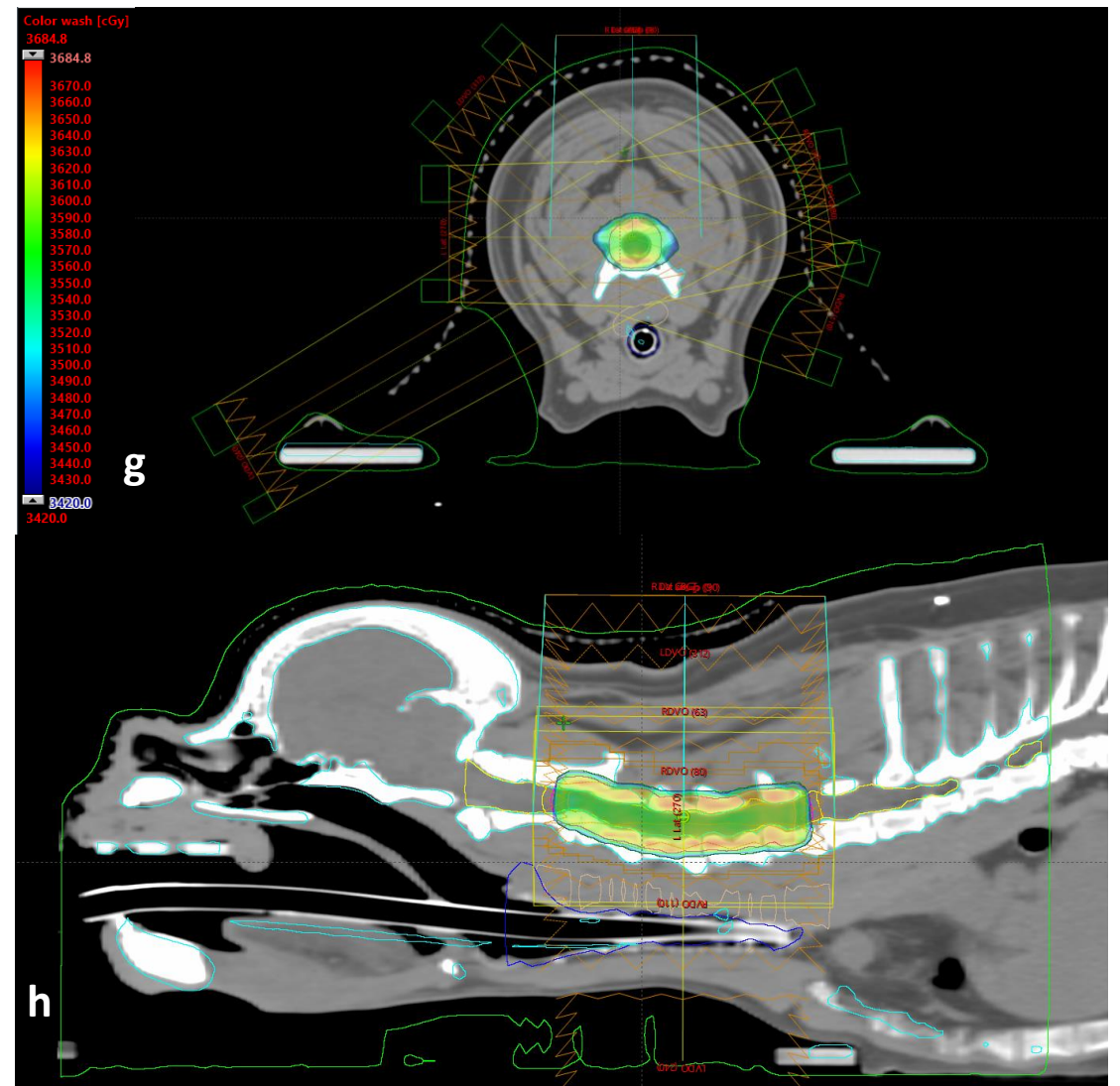


Figure 3. Representative transverse (g) and sagittal (h) CT images of the IMRT plan, which was created using Varian's Eclipse™ planning software. Colour wash shows the areas which received at least 95% of the prescribed dose (36Gy).

During RT, and for 3 weeks following treatment, the dog received prednisolone (0.5mg/kg PO SID), following this the dose was tapered to 0.2mg/kg PO SID which she has continued to receive long term. She was also receiving gabapentin (11.5mg/kg PO BID), and levetiracetam (27.5mg/kg PO TID) during treatment, and these have continued since.

Three months after treatment, the dog's left thoracic limb paresis had nearly resolved. MRI at three, and twelve months post-RT showed partial response of the spinal lesion (RECIST criteria, more than 30% reduction in longest diameter ^[5]) (figure 4, i and j), and static response of the primary lesion. The dog is doing clinically well 15 months following treatment of the suspected drop metastasis, and more than 2 years after treatment of the suspected piriform lobe glioma, with an unremarkable neurological examination.

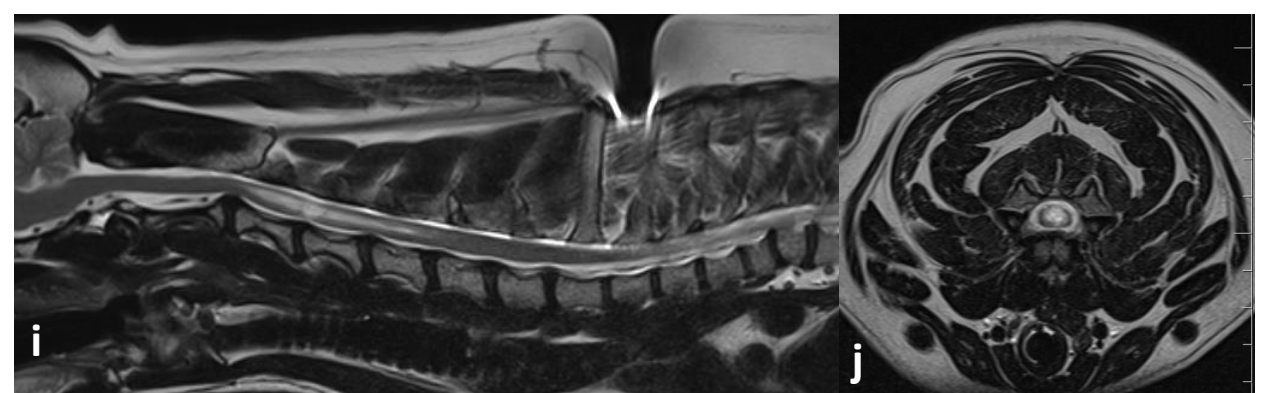


Figure 4. Sagittal (i) and transverse (j) T2W images of the cervical spinal cord, showing the T2W hyperintense intradural intramedullary lesion, one year following treatment with RT (May 2022).

Discussion

Metastases from glioma have become increasingly recognised. They typically occur months after treatment, caudal to the primary mass, following the flow of cerebrospinal fluid. Ante-mortem diagnosis is typically imaging based. Appearance and location of drop metastatic lesions varies widely ^[4]. Previous reports have described metastatic lesions within the brain that have been treated with various modalities (chemotherapy, radiotherapy) ^{[2][3][4]}. This is the first report to describe the successful treatment of suspected drop metastasis with radiation therapy in the spine, when the primary mass had already been successfully treated with the same modality.

References

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