Solitary brain metastasis from prostate cancer: a case report

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Abstract: Brain metastases arising from prostate cancer are exceedingly rare and typically occur late in the course of the disease. Most patients have widespread metastatic disease before developing brain metastases from prostate cancer. We report the case of a 67-year-old male with prostate cancer presenting with an isolated symptomatic brain metastasis. Aggressive treatment of the metastatic site included tumor resection and adjuvant stereotactic radiation treatment (RT) to the surgical bed, resulting in a favorable outcome.

Keywords: Brain; brain metastases; metastatic cancer; prostate cancer; stereotactic radiosurgery; radiotherapy

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Introduction

Prostate cancer commonly metastasizes to the pelvic lymph nodes, axial skeleton, and lungs (1,2). Brain metastases from prostate cancer are rare and are usually discovered post-mortem. These metastases typically only occur in the context of widespread metastatic disease. It is even more uncommon to have the brain as the sole site of metastatic prostate cancer. We present the case of a 67-year-old male who presented with recurrence of prostate cancer with a solitary brain metastasis, treated with tumor resection and adjuvant stereotactic radiation treatment (RT) to the surgical bed.

Case presentation

A 67-year-old male was initially diagnosed with prostate cancer in 2008, presenting with a prostate specific antigen (PSA) of 53.13 ng/dL. Clinical exam and biopsy revealed a Gleason 8 (4+4), T3a prostate cancer. Staging with CT scans and bone scan did not show any evidence of systemic disease.

The patient received RT in a two phase plan to his pelvic lymph nodes and prostate. The pelvis received a dose of 46 Gy in 23 fractions in phase 1, and a total dose of 76 Gy in 38 fractions by the end of phase 2. Androgen deprivation therapy (ADT) was subsequently initiated for a period of three years. Approximately one year after initiation of ADT, his PSA was undetectable. The patient remained on ADT until 2012, and showed no evidence of recurrence until 2014, when he presented with symptoms of dizziness, mild dysphagia and imbalance. Following a suspicious fall in his urologist's office, he was referred to the Emergency Department where an MRI of his brain showed a heterogeneous, multi-lobulated intra-axial lesion in the left frontal lobe, with rim enhancement and surrounding edema. (Figure 1). He was referred to a neurosurgeon and...
had repeat staging which showed no evidence of extracranial disease. His PSA two years following termination of 

ADT rose from an undetectable <0.2 to 3.7 ng/dL.

A left temporal craniotomy and gross total resection of the tumor was performed. The final pathologic diagnosis confirmed prostate cancer, staining positive for PSA. The patient experienced a complication-free postoperative recovery with no neurological deficits. Tumor resection was followed by stereotactic radiation therapy to the surgical cavity with a dose of 30 Gy in 5 fractions (Figure 2). ADT was subsequently re-initiated, resulting in the patient's PSA returning to an undetectable level and remaining undetectable with no evidence of disease 17 months post-radiotherapy. Follow-up MRI imaging of his head confirmed no residual or recurrent disease (Figure 3).

Discussion

The ante-mortem diagnosis of a solitary metastasis to the brain from prostate cancer is exceedingly rare; our review of the literature identified 16 previously-reported cases in the literature over the past 25 years (3-13) (Table 1).
Table 1: Review of the literature of solitary brain metastases cases from prostate cancer

<table>
<thead>
<tr>
<th>Study (author, year)</th>
<th>Age</th>
<th>Initial presentation &amp; treatment</th>
<th>Brain metastases Size &amp; location of brain metastases</th>
<th>Treatment of brain metastases</th>
<th>Functional status</th>
<th>Disease &amp; survival outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rao et al., 1982 (3)</td>
<td>75</td>
<td>Presented with brain metastases</td>
<td>Solitary</td>
<td>Not applicable</td>
<td>Craniotomy and resection</td>
<td>Stable neurofunction</td>
</tr>
<tr>
<td>Lynes et al., 1986 (4)</td>
<td>65</td>
<td>Presented with headaches, gait disturbances, incoordination, memory loss and lethargy related to a brain metastasis, following transurethral resection of the prostate three months earlier</td>
<td>Solitary</td>
<td>Small infarct in right cerebellum</td>
<td>Suboccipital craniotomy with excision of the moderately-differentiated right cerebellar mass; external beam radiation irradiation to whole brain and posterior fossa</td>
<td>Almost total resolution of neurologic symptoms</td>
</tr>
<tr>
<td>Kasabian et al., 1992 (5)</td>
<td>75</td>
<td>Presented with brain metastases</td>
<td>Solitary</td>
<td>Right occipital lobe</td>
<td>Craniotomy and resection + post-operative WBRT</td>
<td>Relief of gait disturbance and dizziness</td>
</tr>
<tr>
<td>Kunkler et al., 1993 (6)</td>
<td>71</td>
<td>Not reported</td>
<td>Solitary</td>
<td>Right parietal lobe</td>
<td>Craniotomy and resection</td>
<td>Functioning normally except for some residual spasticity in the left leg</td>
</tr>
<tr>
<td>Gupta et al., 1994 (7)</td>
<td>55</td>
<td>Stage C prostate cancer treated with radical prostatectomy and external beam radiation</td>
<td>Solitary</td>
<td>Left pons/ left cerebral peduncle</td>
<td>Stereotactic biopsy and palliative external beam radiation to whole brain and brain stem</td>
<td>No residual neurological symptoms, but nonspecific gastrointestinal symptoms</td>
</tr>
<tr>
<td>Sutton et al., 1996 (8)</td>
<td>62</td>
<td>Presented with brain metastases</td>
<td>Solitary</td>
<td>3 cm × 4 cm mass in the right pons and cerebellar peduncle</td>
<td>Biopsy confirmed prostate cancer. Radiotherapy + intravenous steroids</td>
<td>Improved neurologic function</td>
</tr>
<tr>
<td>McCutcheon et al., 1999 (9) (case 1/6)</td>
<td>60</td>
<td>Stage C1 prostate cancer treated with radiotherapy</td>
<td>Multiple (&gt;4 metastases)</td>
<td>Not applicable</td>
<td>WBRT</td>
<td>Not reported</td>
</tr>
</tbody>
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Table 1 (continued)
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<th>Study (author, year)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>McCutcheon et al., 1999 (9) (case 2/6)</td>
<td>63</td>
<td>Stage A2 prostate cancer treated with prostatectomy and radiotherapy</td>
<td>Multiple (3 metastases)</td>
<td>WBRT</td>
<td>Not reported</td>
<td>Survived 1 month</td>
</tr>
<tr>
<td>McCutcheon et al., 1999 (9) (case 3/6)</td>
<td>64</td>
<td>Stage A2 prostate cancer treated with prostatectomy</td>
<td>Solitary</td>
<td>WBRT</td>
<td>Not reported</td>
<td>Survived 2 months</td>
</tr>
<tr>
<td>McCutcheon et al., 1999 (9) (case 4/6)</td>
<td>72</td>
<td>Stage C2 prostate cancer treated with prostatectomy and bilateral orchiectomy</td>
<td>Multiple (&gt;4 metastases)</td>
<td>WBRT</td>
<td>Not reported</td>
<td>Survived 2 months</td>
</tr>
<tr>
<td>McCutcheon et al., 1999 (9) (case 5/6)</td>
<td>77</td>
<td>Stage A1 prostate cancer treated with radiotherapy and chemotherapy</td>
<td>Solitary</td>
<td>Craniotomy and resection + post-operative WBRT</td>
<td>Not reported</td>
<td>Survived 2 months</td>
</tr>
<tr>
<td>McCutcheon et al., 1999 (9) (case 6/6)</td>
<td>80</td>
<td>Stage C1 prostate cancer treated with prostatectomy + radiotherapy</td>
<td>Multiple (2 metastases)</td>
<td>WBRT</td>
<td>Not reported</td>
<td>Survived 6 months</td>
</tr>
<tr>
<td>Salvati et al., 2005 (10)</td>
<td>68</td>
<td>Not reported</td>
<td>Solitary Temporal lobe</td>
<td>Craniotomy and resection + WBRT</td>
<td>Not reported</td>
<td>Alive 20 months post-operatively</td>
</tr>
<tr>
<td>Sweets et al., 2009 (11)</td>
<td>48</td>
<td>Presented with Gleason 9, PSA 26 ng/dL, clinical T2c tumor; treated with neoadjuvant chemotherapy and radical prostatectomy. Salvage radiotherapy for biochemical recurrence</td>
<td>Solitary 2 cm × 1 cm × 1 cm left parietal lobe</td>
<td>Craniotomy and resection with local brachytherapy (125I seeds)</td>
<td>Able to work and perform daily activities without assistance</td>
<td>Alive 5 years post-resection (PSA &lt;0.1 ng/dL)</td>
</tr>
<tr>
<td>Mithal et al., 2014 (12)</td>
<td>69</td>
<td>Gleason 9 prostate cancer</td>
<td>Solitary 3.4 cm in the right parietal lobe</td>
<td>Craniotomy and resection + WBRT</td>
<td>Not reported</td>
<td>Alive 3.5 years post-operatively</td>
</tr>
<tr>
<td>Craig et al., 2015 (13)</td>
<td>79</td>
<td>Clinical T2b, Gleason 6, PSA 5</td>
<td>Solitary 3.5 cm right frontal tumor</td>
<td>Craniotomy and resection</td>
<td>Asymptomatic</td>
<td>Recurrence 8 months later. Survived 19 months</td>
</tr>
</tbody>
</table>

WBRT, whole brain radiation therapy; PSA, prostate specific antigen.
Survival in these cases generally mostly ranged between 2 to 20 months, with some patients still alive at the time of reporting. In one case, a patient presenting with a right cerebellar infarct following transurethral resection of the prostate three months earlier was reported to remain alive and symptom-free 5 years post-operatively following sub-occipital craniotomy with excision of the mass, which was noted to be moderately differentiated adenocarcinoma, and whole brain radiation therapy (WBRT) and radiotherapy to the posterior fossa (4). In another case, a patient with pathologic Gleason 9 (4+5) prostate adenocarcinoma was reported to remain alive 5 years post-treatment without signs of recurring disease (11).

For decades, surgical resection with adjuvant WBRT has been the standard of care for solitary metastases in the brain. This combined therapy strategy has been evaluated in randomized studies and found to significantly reduce the risk of recurrence when compared with surgical resection or WBRT alone (14-17). These studies, however, did not include any patients with prostate cancer brain metastases patients. Due to concerns of WBRT-related neurotoxicity and the risk of neurocognitive side effects, the application of high dose radiation to the postoperative surgical bed through stereotactic radiosurgery has been increasing in clinical practice (18). Stereotactic radiosurgery alone following surgical resection of a brain metastasis has the potential to limit long-term neurocognitive side effects and improve local control as compared to WBRT (19,20).

The risk of distant brain recurrence in patients with brain metastases from prostate cancer is unknown. The potential for WBRT to decrease distant brain recurrence as compared to cavity stereotactic radiosurgery is, therefore, also unknown. In this case, given that there was only one site of disease, it was felt to be reasonable to forego WBRT and monitor with brain imaging on a three-month basis. The approach has appeared effective thus far, with no evidence of new or recurrent disease in the brain at the time of report.

Conclusions

Metastatic disease exclusive to the brain in prostate cancer patients remains extremely infrequent. This unique case of a 67-year-old male with a solitary brain metastasis arising from prostate cancer demonstrates that aggressive treatment with tumor resection and adjuvant stereotactic RT to the surgical bed without WBRT may be optimal in the management of such patients.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Informed Consent: Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

References
