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Case Report

Intramedullary Spinal Cord Metastasis from Urothelial Carcinoma

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Abstract

Intramedullary spinal cord metastases (ISCM) are rare neoplasms often associated with significant neurological deterioration. Spinal cord metastases secondary to bladder carcinoma are particularly rare. We report a 56-year-old male found to have an intradural intramedullary lesion at T12. A bladder mass was also discovered on ultrasound, as well as additional systemic metastases. A dorsal approach was undertaken for the spinal cord lesion. Bladder carcinoma was confirmed as the origin of this metastasis histopathologically. ISCM carries a poor prognosis and information is limited to case reports and series. Early recognition could improve patient therapy and quality of life.

Keywords: Bladder Carcinoma; Intramedullary Spinal Cord Metastasis; Neurooncology; Spinal Cord Surgery

Introduction

In comparison to oncological spread to the bony elements of the spine, intramedullary spinal cord metastases (ISCM) are far less common. Metastatic lesions in the cord account for only 1 to 3% of all intramedullary spinal cord lesions, which are quite rare of their own accord [1]. Intra-axial spinal tumors generally portend a poor prognosis and can cause profound morbidity [2,3]. While bladder carcinoma accounts for 2% of all malignancies, spread ISCM from this source is rare [1,4]. Given that the data is limited to case reports, occasional series, and autopsy studies, judicious decision-making is necessary to provide patients with appropriate management in lieu of outcomes-based research [5].

Case Presentation

A 56-year-old male presented to an outside hospital for worsening lower extremity weakness for several weeks, requiring a cane in each hand to ambulate at home until ultimately being confined to a wheelchair. Prior to transfer, he became acutely paraplegic, with no movement in the lower extremities, hyporeflexic patellar reflexes, positive clonus bilaterally, and a T11 sensory level. Contrast-enhanced magnetic resonance imaging (MRI) found an intradural intramedullary lesion centered at T12 (Figure 1). In addition, he complained of urinary retention, and workup revealed a new bladder mass along the posterior bladder wall on ultrasound. He was taken emergently for spinal decompression surgery.

From the prone position, T11 to L1 bilateral laminectomies were performed. Ultrasound-guidance was used to center the durotomy over the lesion, and subsequently to guide the extent of surgical resection. Intraoperatively, some areas of tumor peeled away from the spinal cord, but there were other layers that stuck and could not be fully resected. Histological preparation of the lesion demonstrated small papillary groups of atypical epithelioid cells with prominent nucleoli and occasional mitotic figures. The neoplastic cells infiltrate the cord parenchyma in a pushing fashion (Figure 2).

Figure 1: An intradural intramedullary lesion at T12 seen on (A) T2 sagittal MRI (white arrow) with cord signal changes up to T4, presumably due to dilation of the central canal. Pre-operative T1 contrast-enhanced MRI in the axial (B) and sagittal (C) planes showing that the lesion is intramedullary with a target-shaped enhancement pattern. Corresponding intraoperative ultrasound in the axial (D) and sagittal (E) planes correlate well to the pre-operative MRI, including the demonstration of the bulls-eye in the center of the tumor (arrowhead). Post-operative T1 contrast-enhanced MRI in the axial (F) and sagittal planes (G) demonstrates the extent of resection, with re-expansion of the spinal cord (black arrow).

Figure 2: Representative histological sections demonstrating interfacing of the intramedullary spinal cord tumor with spinal cord tissue (A) at low power (100x) and (B) 400x. Immunohistological stains of the intramedullary spinal cord tumor are also shown; (C) the tumor cells are diffusely positive for cytokeratin 7 (200x), a specific marker for epithelia and epithelial tumors, and (D) GATA3 (200x) which is specific for breast and urothelial epithelium.

Immunohistochemical stains were performed to verify the urothelial nature of the neoplastic cells. Cytokeratin 7 diffusely highlights the tumor cells cytoplasm and GATA3 strongly stains the neoplastic cells nuclei (Figure 2). Cytokeratin 7 is a specific marker for epithelia and epithelial tumors. GATA3 is specific for breast and urothelial epithelium. The following week, he underwent removal of the bladder tumor via transurethral resection. The bladder tumor was confirmed to be high grade, invasive, papillary urothelial carcinoma. Post-operatively the patient's strength improved only slightly, regaining motor function in his right toes and foot alone. He received palliative radiation to the spine. At his 6-month post-operative visit, he remains functionally paraplegic.

Discussion

The prevalence of ISCM ranges from 0.9% to 2.1%, though many of these may not be clinically relevant [3,6,7]. Due to the advent of better imaging techniques and longer survival for cancer patients, the likelihood of discovering ISCM has increased [3]. Lung cancer is the leading culprit (roughly 50%), with limited data regarding lesions arising from primary tumors that classically spare the central nervous system (CNS) [2]. Other culprits include breast carcinoma, melanoma, lymphoma, renal cell carcinoma, and colorectal carcinoma, among others [1]. ISCMs derived from a bladder origin are quite novel in comparison, with only a few reported in the current literature [1,2], though epidural and brain metastases are also observed [4]. Of note, roughly half of the patients found to have an ISCM have concurrent intracranial tumors as well.

Bladder carcinoma itself is a common presentation, accounting for 2% of all malignancies. In a retrospective review of 359 patients with bladder carcinoma, neurological compromise was observed in 14%. While epidural cord compression (2%) and brain lesions (1%) were encountered in this cohort, there were no cases of ISCM from a bladder primary. This is despite the relatively high overall metastatic rate (67%) of bladder carcinoma [4]. In their review of 154 cases with CNS metastasis from urothelial carcinoma, Diamantopoulos., *et al*. found 73% of patients presented with cerebral lesions, compared to 3% that had spinal lesions, and 13% of patients with a combination of multiple CNS sites [8]. They also indicate an overall poor prognosis due to the aggressive nature of CNS metastasis from bladder cancer, reporting a median survival of 3-4 months after diagnosing CNS metastasis.

Common presentations of ISCM include motor deficits, sensory loss, and sphincter dysfunction [1,5,7,]. Additionally, Brown-

Sequard and pseudo-Brown-Sequard syndrome have a reported incidence among ISCM patients ranging from 23-45%, compared to 3% incidence found in spinal epidural metastasis [9,10]. Of note, while prior ISCM from bladder carcinoma cases were reported to present with Brown-Sequard Syndrome or hemiparaplegia [1,2], our patient presented with bilateral weakness. Nevertheless, these symptoms are not specific for ISCM and there is often a delay in diagnosis between onset of symptoms and establishing a diagnosis [7]. Furthermore, prior series have shown that a significant percentage of ISCM patients, 9.84%-25%, can present with ISCM as the initial signs of cancer [11,12]. Our patient was found to have bladder cancer after presenting with neurologic deficits, in contrast to previous case reports [1,2]. Of note, the insidious and rapid neurological decline seen helps to distinguish ISCM from primary CNS intramedullary tumors. Magnetic resonance imaging is the mainstay in diagnosis, allowing for premortem diagnosis of these lesions in contemporary medicine [13]. The use of adjunctive ultrasound during surgical resection may help in identifying these potentially obscure lesions. There is controversy as to which area of the spinal cord is affected most frequently, noting that our patient, as well as other cases of ISCM from bladder cancer report thoracic involvement [1,2,5,7].

Treatment generally consists of radiation therapy either as primary treatment or in combination with microsurgical resection, with operative interventions favored in patients presenting with neurological compromise [14]. For patients who are spared from neurological deficits and suffer from a radiosensitive primary source, radiation therapy alone may be sufficient treatment [2,3,14]. As with all neurooncology patients, survival goals must be weighed against the expectations regarding quality of life and functional outcomes, especially due to difficulties in identifying the tumor-parenchyma margins [1]. As with the current case, ultrasound can help clarify this border [3]. Patients presenting with ISCM are limited to a shortened life expectancy, with a median survival of 6 to 9.4 months with surgery (3 to 5 months if treated conservatively) [3,5,7,15]. Chemotherapy is generally not considered to be a therapeutic option for these patients [7].

Conclusion

The survival rate of patients with ISCM remains poor, with a high possibility of neurological compromise despite surgical resection or targeted radiation therapy. Although current imaging techniques allow for more timely diagnosis of intramedullary tumors, little improvement is seen in the survival of these patients given the existing management paradigms. Further investigation into approaching patients with ISCM is required, though for now this is likely limited to small series or case reports given the infrequency of these lesions. Bladder carcinoma is a particularly rare etiology for ISCM, but should not be discounted as a cause if the histopathological analysis agrees with the diagnosis.

Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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