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Case Report

Sixth Cranial Nerve Palsy and Craniocervical Junction Instability due to Metastatic Urothelial Bladder Carcinoma

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Keywords

Clivus · Craniocervical junction · Metastatic bladder urothelial carcinoma · Endoscopic endonasal approach · Occipitocervical fixation

Abstract

Metastases involving the clivus and craniocervical junction (CCJ) are extremely rare. Skull base involvement can result in cranial nerve palsies, while an extensive CCJ involvement can lead to spinal instability. We describe an unusual case of clival and CCJ metastases presenting with VI cranial nerve palsy and neck pain secondary to CCJ instability from metastatic bladder urothelial carcinoma. The patient was first treated with an endoscopic endonasal approach to the clivus for decompression of the VI cranial nerve and then with occipitocervical fixation and fusion to treat CCJ instability. At the 6-month follow-up, the patient experienced complete recovery of VI cranial nerve palsy. To the best of our knowledge, the simultaneous involvement of the clivus and the CCJ due to metastatic bladder carcinoma has never been reported in the literature. Another peculiarity of this case was the presence of both VI cranial nerve deficit and spinal instability. For this reason, the choice of treatment and timing were challenging. In fact, in case of no neurological deficit and spinal stability, palliative chemo- and radiotherapy are

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usually indicated. In our patient, the presence of progressive diplopia due to VI cranial nerve palsy required an emergent surgical decompression. In this scenario, the extended endoscopic endonasal approach was chosen as a minimally invasive approach to decompress the VI cranial nerve. Posterior occipitocervical stabilization is highly effective in avoiding patient's neck pain and spinal instability, representing the approach of choice.

Introduction

Clivus and craniocervical junction (CCJ) metastases are extremely rare, and the available literature is very limited [1–10]. Bone metastatic lesions most commonly arise from the breast, prostate, lung, thyroid, and melanoma [1, 6, 8]. Clival metastases may be clinically silent, but large lesions usually cause VI cranial nerve palsy due to the compression of the abducens nerve in Dorello's canal [6, 8]. Metastases destroying the CCJ typically present with flexion, extension, and rotational pain secondary to instability [7].

The simultaneous presence of these symptoms may cause diagnostic and therapeutic difficulties in patients with a history of urinary tract cancer. In fact, the most common sites of metastasis from bladder cancer include the lymph nodes, lungs, liver, and peritoneum, while only a few cases of metastatic bladder carcinoma at the level of the CCJ or clivus have been reported [1, 10].

We describe a rare case of simultaneous clival and CCJ metastases presenting with VI cranial nerve palsy and neck pain secondary to CCJ instability from bladder urothelial carcinoma.

Case Description

A 70-year-old male presented to our department with double vision, occipital headaches, and movement-related neck pain. The patient had a history of diplopia and headache worsening in the last month. His past medical history was positive, 3 years before, for invasive bladder cancer (pT3a N0 M0) treated with bladder resection, reconstruction, and adjuvant cisplatin-based chemotherapy. Neurologic exam showed left VI cranial nerve palsy and neck pain exacerbated by flexion-extension and rotational movements.

Imaging workup included a cranial and cervical computed tomography (CT) scan and magnetic resonance imaging (MRI) examination. An MRI scan of the brain revealed a large inhomogeneous tumor arising from the clivus and extending both toward the left cavernous sinus and toward the CCJ with contrast enhancement (Fig. 1a, b). The CT scan confirmed lytic bone destruction of occipital condyles, C1, and C2 (Fig. 1c, d). Whole-body PET/CT scan with FDG showed no relapse of the primary tumor or other metastases.

Due to the progressive VI cranial nerve palsy, the patient first underwent an extended endoscopic endonasal approach (EEA) both to sample tissue for diagnosis and to decompress the VI cranial nerve (Fig. 2a–e) under neuronavigation guidance, as already described in previous papers [3–5, 9]. Postoperative MRI showed partial resection of the tumor with decompression of left paraclival/cavernous sinus region along the course of the VI cranial nerve. Histological examination was consistent with metastatic urothelial carcinoma (Fig. 3a–c). The postoperative course was uneventful, and the patient presented improvement of diplopia. One month later, the patient underwent posterior fixation and fusion. We used an occipitocervical fixation with occipital plate, transarticular screws and rods because the patient had a significant osteolytic destruction of multiple spinal elements, including the C2 (body, odontoid, and

lateral masses), C1, and occipital condyles with subsequent instability. The postoperative course was uneventful as well, and postoperative X-rays and CT scan demonstrated realignment of CCJ elements and right positioning of screws/plate and rods (Fig. 2f).

At the 6-month follow-up, the patient presented complete recovery of VI cranial nerve palsy and absence of neck pain, and a CT scan demonstrated occipitocervical fusion.

Discussion

Metastases involving the clivus are quite rare and heterogeneous in origin. A recent review of the literature identified only 56 cases, with a 30% female and a 70% male population [1]. Metastatic lesions most commonly arise from the prostate, breast, lung, thyroid, melanoma, or hepatocellular carcinoma [1, 6, 8]. The main way of metastatic spread is hematogenous. Retrograde venous seeding along the extensively interconnected midline venous system, peculiar of the clival region, has also been postulated as a possible mechanism, mainly in the case of prostatic cancer [6]. Malignant tumors can also reach the cranial base through direct extension of head and neck cancer [1, 6, 10].

Diplopia due to a VI cranial nerve palsy is the most common symptom in patients with clival lesions, including metastases [1, 6, 8]. Direct compression of the petroclival segments of the nerve in Dorello's canal is considered a typical behavior of clival tumors and explains why, in these diseases, VI cranial nerve palsy is the most frequent presenting symptom [6]. From a radiological point of view, clivus metastases have no peculiar characteristics that allow a differential diagnosis with more common lesions of this anatomical region (chordomas and chondrosarcomas), but T2-weighted images may be useful because metastases are hypointense [1, 6, 10].

Metastases of the CCJ are rare and in most cases secondary to breast cancer, non-small cell lung carcinoma, and prostate cancer [1]. The typical presenting symptom is mechanical pain related to spinal instability. Neurological deficits due to spinal cord compression are rare for the wide diameter of the spinal canal at the CCJ. MRI and CT scan represent the most important diagnostic tools for CCJ metastatic diseases. MRI identifies with high specificity and sensitivity both bone and soft-tissue tumors at the CCJ, including the evaluation of spinal cord compression [1, 6–10]. CT scan is mandatory to determine the extent of bone destruction and spinal column alignment. Furthermore, dynamic X-rays with flexion and extension projection are an additional tool for assessing spinal stability [1, 6–10].

Bladder cancer has variable metastatic potential, and almost any organ may be involved by metastasis [10]. In a recent study, the lymph nodes, bones, lungs, liver, and peritoneum were reported as the most common sites of metastasis from bladder cancer [10]. However, clivus metastasis of bladder carcinoma has not been previously reported in the literature. In addition, only 3 cases of metastatic bladder carcinoma to the CCJ have been described [1, 6–10].

Another peculiarity of this case was the presence of both VI cranial nerve deficit and spinal instability. For this reason, the choice of treatment and timing were challenging. Indeed, in case of no neurological deficit and/or spinal stability, palliative chemo- and radiotherapy are usually the treatment of choice [1, 6, 8]. In our patient, the presence of progressive diplopia due to VI cranial nerve palsy required an emergent surgical decompression [11–15]. In this scenario, the extended EEA was chosen as a minimally invasive approach to decompress the VI cranial nerve. In fact, the EEA approach utilized a direct "natural" anatomical route to the lesion avoiding major neurovascular structures and brain retraction [3, 4, 9, 16–18]. This is a

minimally invasive approach used also in other tumors of the skull base [3–18]. In these cases, the better and close view guaranteed by the endoscopic technique can assist the surgeon to extend the decompression to hidden angles, such as Dorello's canal, along the course of the VI cranial nerve. This more accurate decompression can justify, in the present case, the unexpected finding of the improvement of the long-lasting VI cranial nerve palsy. One month after EEA, the patient underwent occipitocervical fixation and fusion. In fact, the extensive involvement of the CCJ (including the C2 body, odontoid, and lateral masses; C1 lateral masses; occipital condyles) precluded the effective use of short constructs, such as C1 lateral mass screws and C2 pars or pedicle screws [2, 3, 7]. As reported in the literature, posterior occipitocervical stabilization is highly effective in avoiding patient's neck pain and spinal instability, representing the approach of choice [7].

In conclusion, in this case, the simultaneous extension of metastasis to the clivus and to the CCJ caused diagnostic and therapeutic issues. The better and close view guaranteed by the EEA can assist the surgeon in extending the decompression to hidden angles, such as Dorello's canal, along the course of the VI cranial nerve. This more accurate decompression can justify, in the present case, the unexpected finding of the improvement of the long-lasting VI cranial nerve palsy. Posterior occipitocervical stabilization is highly effective in avoiding patient's neck pain and spinal instability, representing the approach of choice.

Statement of Ethics

The patient provided informed consent to participate in this study, which was approved by the institutional review board.

Disclosure Statement

There are no potential conflicts of interest for any of the authors with products or techniques discussed in the paper.

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Author Contributions

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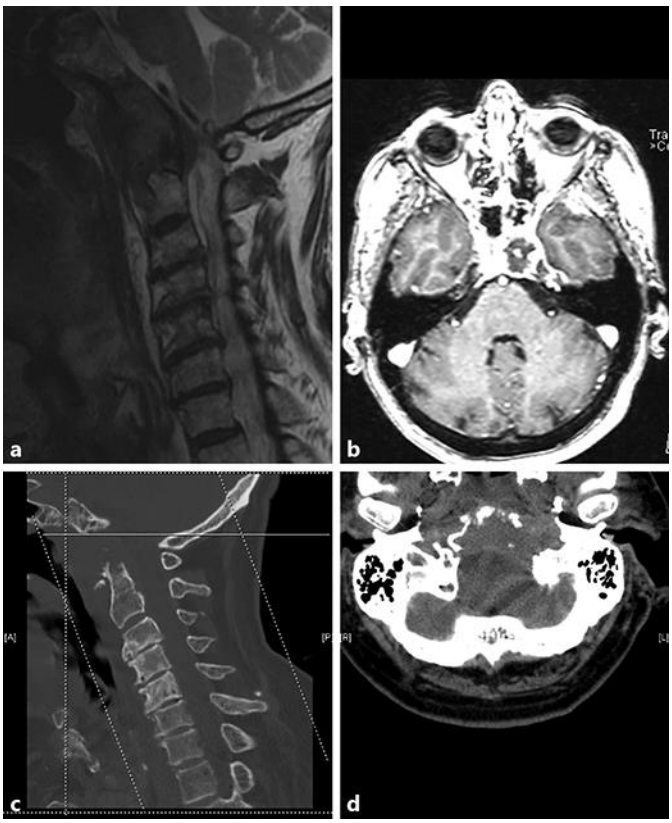

Fig. 1. Preoperative MRI and CT scan. **a**, **b** Preoperative T2-weighted sagittal and T1-weighted postgadolinium axial images demonstrating a large homogeneous tumor arising from the clivus and extending both toward the left cavernous sinus and toward the CCJ with contrast enhancement. **c**, **d** Preoperative sagittal and axial CT scan confirmed lytic bone destruction of occipital condyles, C1, and C2.

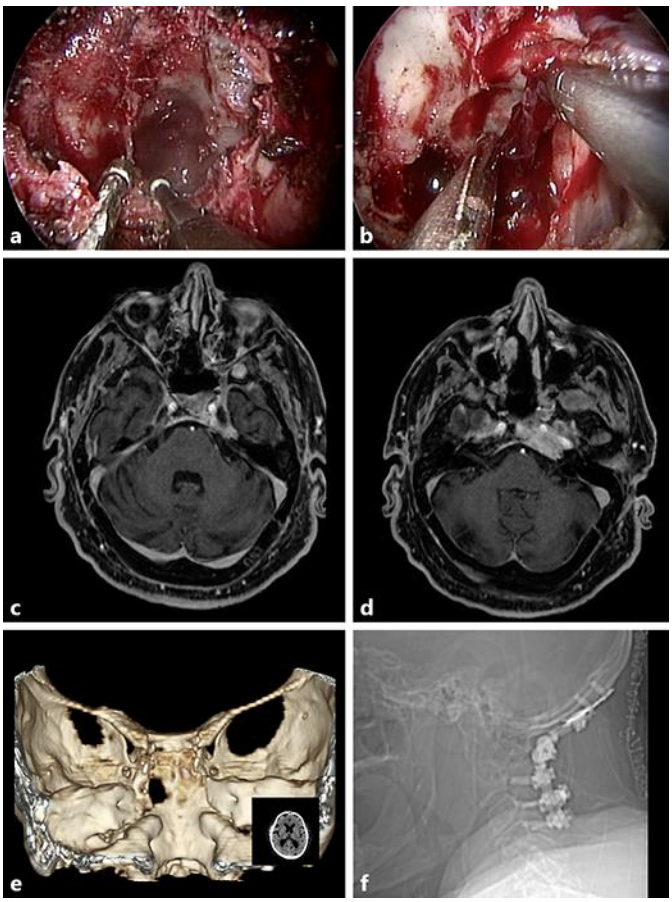

Fig. 2. **a**, **b** Intraoperative images during the endoscopic endonasal approach demonstrating the lesions at the level of the clivus and the left cavernous sinus and the removal of the tumor for tissue sampling and decompression of the VI cranial nerve at the level of Dorello's canal. **c**, **d** Postoperative MRI showing partial resection of the tumor with decompression of the left paraclival/cavernous sinus region along the course of the VI cranial nerve. **e** Postoperative CT scan with 3D reconstruction revealing the approach at the level of the clivus extended to the left carotid canal. **f** X-rays after occipitocervical fixation and fusion.

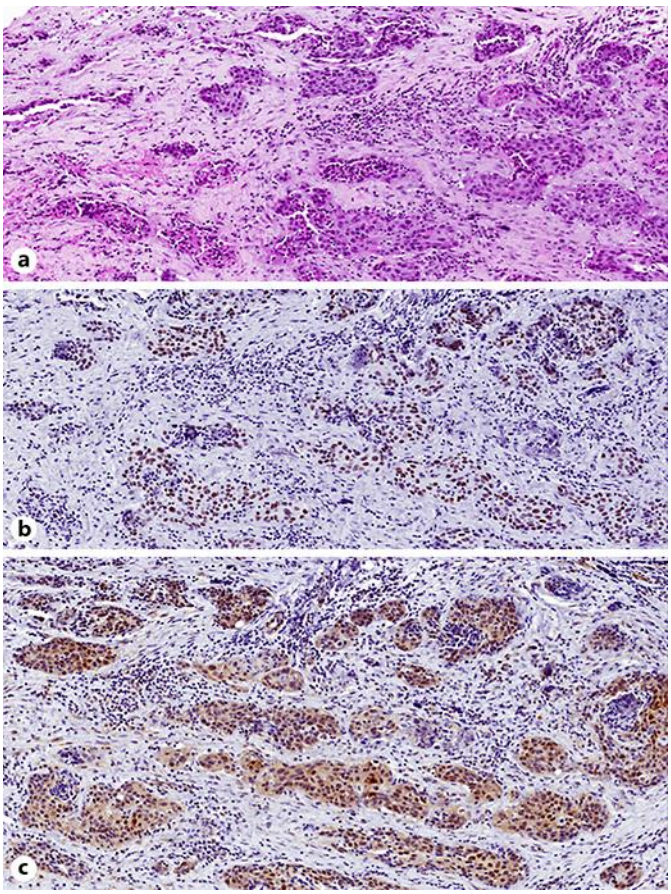

Fig. 3. Histological examination consistent with metastatic urothelial carcinoma. **a** Solid nests of carcinoma cells are present in a desmoplastic stroma. The neoplastic cells do not show any morphological differentiation (HE, 100× total magnification). **b**, **c** By immunohistochemistry, the carcinoma cells are positive for GATA3 (**b**) and uroplakin III (**c**), demonstrating an urothelial origin of carcinoma.