Cerebellar Metastasis from Pancreatic Adenocarcinoma: case report

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ABSTRACT

Background: Pancreatic cancer is a highly aggressive and refractory malignancy, ranking as the seventh leading cause of cancer-related mortality globally. Metastasis to the central nervous system (CNS) is exceptionally rare in adenocarcinomas, comprising only a small fraction of cases. This report presents a unique case of cerebellar metastasis in a patient with moderately differentiated pancreatic adenocarcinoma, aiming to shed light on this infrequent occurrence.

Case Presentation: Male patient, 55-year-old, Caucasian, diagnosed with pancreatic adenocarcinoma and lung metastasis presented with sudden-onset neurological symptoms. Imaging studies revealed a lesion in the right cerebellar hemisphere, which was surgically resected and histopathologically analyzed. Immunohistochemistry was performed to evaluate marker expression associated with prognosis. Histopathological analysis confirmed moderately differentiated adenocarcinoma infiltrating the cerebellar parenchyma. Immunohistochemistry indicated positivity for markers associated with worse prognosis, notably MUC1. Surgical intervention led to a progressive neurological improvement, but the patient later succumbed to systemic disease progression.

Conclusion: CNS metastasis from pancreatic adenocarcinoma remains an uncommon event with a dismal prognosis. This case highlights the importance of early intervention for CNS metastases when feasible, potentially improving the patient’s quality of life and extending survival. However, further research is needed to assess the impact of such interventions. Additionally, this report represents the fourth documented instance of cerebellar metastasis from pancreatic adenocarcinoma in the medical literature, contributing to our understanding of this rare phenomenon and providing insights for future literature reviews and treatment strategies.

Keywords: Pancreatic adenocarcinoma; Cerebellar metastasis; Neuro-oncology; Neurosurgery

RESUMO

Introdução: O câncer pancreático é uma malignidade altamente agressiva e refratária, ocupando o sétimo lugar entre as principais causas de mortalidade relacionada ao câncer globalmente. A metástase para o sistema nervoso central (SNC) é excepcionalmente rara em adenocarcinomas, representando apenas uma pequena fração dos casos. Este relato apresenta um caso único de metástase cerebelar em um paciente com adenocarcinoma pancreático moderadamente diferenciado, com o objetivo de esclarecer essa ocorrência incomum.

Relato de caso: Paciente masculino, caucasiano, de 55 anos, diagnosticado com adenocarcinoma pancreático e metástase pulmonar,
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INTRODUCTION

Pancreatic cancer ranks among the neoplasms with high biological aggressiveness and therapeutic refractoriness, standing as the seventh leading cause of cancer-related death worldwide. Its 5-year survival rate is less than 5%, with most patients succumbing within 2 years of diagnosis. Of these cases, 95% are adenocarcinomas. However, the incidence of metastases from adenocarcinoma to the central nervous system (CNS) is rare and sparsely reported in medical literature. Considering this, the present report details a case of cerebellar metastasis in a patient already undergoing oncological treatment for moderately differentiated pancreatic adenocarcinoma, who experienced a sudden onset of neurological symptoms.

CASE PRESENTATION

The case report refers to a 55-year-old Caucasian man diagnosed with moderately differentiated pancreatic adenocarcinoma with lung metastasis, presented with stage IV disease, histologically graded as 3 (G3). He sought care from the oncological Neurosurgery department due to the sudden onset of persistent nausea, vomiting, and dizziness. The patient has no family history of cancer and began treatment for pancreatic cancer with external beam radiotherapy one year ago, resulting in significant improvement of symptoms.

The patient was in stable vital condition, with a good overall state of health, well-hydrated, and had an Eastern Cooperative Oncology Group (ECOG) performance status of 2. Neurological examination revealed a Glasgow Coma Scale (GCS) score of 15, normal coordination of movements, normal rapid alternating movements, symmetric and reactive pupils, no nystagmus, and preserved muscular strength.

In the performance of a cranial computed tomography scan, a lesion was observed in the right cerebellar hemisphere along with evidence of local bleeding (Figure 1), findings that were subsequently confirmed and detailed through magnetic resonance (MRI) (Figures 2, 3, 4). The patient had a Karnofsky Performance Status (KPS) of 70 and a Graded Prognostic Assessment (GPA) index of 1, with a median survival (months) of 3.1 months. Upon histopathological analysis, with multiple irregular fragments of brownish, soft, and non-elastic tissue submitted to, a lesion consistent with moderately differentiated adenocarcinoma with areas of mucin was identified, infiltrating the cerebellar parenchyma (Figures 5 and 6). Regarding the immunohistochemical evaluation, the tumor showed positivity for the markers CK20, MUC1, CK19, TTF-1, with these markers being associated with a worse prognosis. Particularly, MUC1 potentially remains linked to increased hematogenous dissemination.

Given the clinical scenario, the decision was made to proceed with surgical intervention for the lesion, along with the submission of material for histopathological analysis. The surgery took place on October, 2021 followed by postoperative radiotherapy under the care of the hospital’s clinical oncology department. Furthermore, for the management of systemic disease, the patient underwent chemotherapy under FOLFIRINOX regimen (5-fluorouracil, leucovorin, irinotecan, oxaliplatin).

Palavras-chave: Adenocarcinoma pancreático; Metástase cerebelar; Neuro-oncologia; Neurocirurgia

Figure 1. CT scan in axial section. Lesion in the right cerebellar hemisphere outlined by the red circle, associated with edema and perilesional hematoma indicated by green arrows.

Figure 2. MRI axial view. Lesion in the right cerebellar hemisphere outlined by the blue circle.

Figure 3. MRI on T2-weighted sequence in coronal view. A well-defined, irregularly shaped lesion is observed in the right cerebellar hemisphere. Surrounding edema is evident, indicated by a perilesional region. There is an associated mass effect on adjacent structures.

Figure 4. MRI on T2-weighted FLAIR sagittal view. An irregularly shaped lesion in the right cerebellar hemisphere is evident. The lesion demonstrates heightened signal intensity, indicating increased fluid content. Surrounding edema is prominent, characterized by an area of significantly heightened signal on T2-weighted FLAIR sequence. Mass effect is noted, causing displacement of adjacent structures.
He was admitted urgently due to a blood oxygen saturation level of 74%, along with respiratory symptoms, and was subsequently hospitalized for bronchopneumonia. Despite an improvement in respiratory symptoms, the patient passed away due to systemic progression of the disease, 4 months after the surgical resection of the cerebellar lesion.

DISCUSSION

Pancreatic cancer, in general, exhibits few signs for early diagnosis, and the possibility of cure relies on complete tumor resection, making the prognosis for metastatic cases grim\(^{10}\). The incidence of brain metastases from pancreatic adenocarcinoma is rare, accounting for approximately 0.33% of cases\(^{11}\), with only 23 cases documented in medical literature, including the present case. In these cases, the average age of patients was 57.8 years, with a predominance of white individuals and males, and the liver as the primary concurrent extracranial metastatic focus\(^{11,12}\).

These patients exhibited an average time of 17 months for the development of brain metastasis, and a survival rate of 1.5 months post-diagnosis\(^{2,13}\). This indicates that CNS metastasis is quite uncommon and typically predicts a very poor prognosis.

Furthermore, among the documented cases of pancreatic adenocarcinoma metastasizing to the central nervous system, the occurrence of lesions in the cerebellum appears to be even more atypical than in other areas of the neuroaxis. As far as we are aware, only three cases have been published, one by Caricato et al.\(^{14}\) and two others in the case series by Kumar et al.\(^{15}\) at Johns Hopkins Hospital. Therefore, the current case represents the fourth documented instance of pancreatic adenocarcinoma metastasizing to the cerebellum to be incorporated into scientific literature.

Regarding treatment, the only chance for cure lies in complete surgical resection of the tumor, a possibility that applies to around 20% of all diagnosed patients. According to the European Association of Neuro-Oncology (EANO), this option should only be considered for patients with a limited number (1 to 3) of newly diagnosed brain metastases. This is particularly applicable in cases of lesions ≥ 3 cm in diameter, lesions with necrotic or cystic appearance and edema/mass effect, lesions located in the posterior fossa with associated hydrocephalus.
and lesions located in symptomatic eloquent areas\textsuperscript{16,17}. However, a challenge even greater is the metastasis to the central nervous system (CNS) which although prevalent in 50% of cancer cases, is predominantly associated with primary lung cancer, breast cancer, or malignant melanoma\textsuperscript{18}.

An increase in CNS metastases occurrence is attributed to prolonged survival from new treatments\textsuperscript{9}. Consequently, due to the scarcity of data, controversies regarding the efficacy of surgical resection in prolonging patient life are still prevalent, particularly after recent reports of two successful cases with long-term survival and no signs of tumor recurrence\textsuperscript{12}.

Early surgical intervention can lead to a significant improvement in neurological symptoms and potentially enhance the patient’s quality of life. However, further studies are needed to better understand the impact of such interventions in similar cases, and this report contributes to the limited knowledge on this rare phenomenon, highlighting the importance of prompt evaluation and treatment when appropriate. Ultimately, this should make the criteria for microsurgical resection of intracranial metastases clearer and more evidence-based.

\section*{CONCLUSION}

Finally, the surgical treatment of CNS metastases in this case was associated with a significant improvement in neurological symptoms and potentially prevented the patient’s premature death due to acute complications from mass effect in the posterior fossa, such as brainstem compression, herniation of cerebellar structures through the foramen magnum, hydrocephalus, and intracranial hypertension\textsuperscript{16-19}. In this regard, we believe that early intervention in CNS metastases, when appropriate, can enhance the patient’s quality of life and possibly extend their survival. However, further studies are required to quantify this impact.

\section*{REFERENCES}

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