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Case Report

A Rare Case of Colon Cancer Metastasis to the Brain anda Brief Review of its Treatment and Prognosis ☆

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ABSTRACT

Metastatic brain tumors are the most common brain masses in adults however it is rare for them to arise from colon cancer. We present a case of a metastatic colon cancer to the brain in a 68 year old male who presented with facial trauma after a fall he sustained secondary to neurological symptoms. He underwent computed tomography and magnetic resonance imaging of the head which revealed a brain mass. The mass was subsequently surgically resected and the diagnosis was confirmed. He went on to receive radiation therapy afterwards. In patients with a history of colon cancer, it is important for clinicians to be aware of the known risk factors for the development of brain metastases in order to best screen for these patients and optimize their prognosis. When brain metastases are discovered, multimodal therapy with surgery, radiation therapy, and chemotherapy provides patients with the most optimal survival.

Introduction

Colon cancer is the third most common cancer and third leading cause of cancer deaths in the United States, with the most common subtype being adenocarcinoma [1,2]. Common sites of metastasis include regional lymph nodes, liver, lung, and peritoneum [3]. Brain metastases are rare, with reported incidences ranging from 0.1% to 11.5%, and an average incidence of 2.1% [4]. We present a case of a patient with a history of colon cancer who presents with a brain mass.

Case Report

A 68 year old male presented to our institution with facial trauma after a mechanical fall. The patient reported left upper and lower extremity weakness and numbness for 3 days prior

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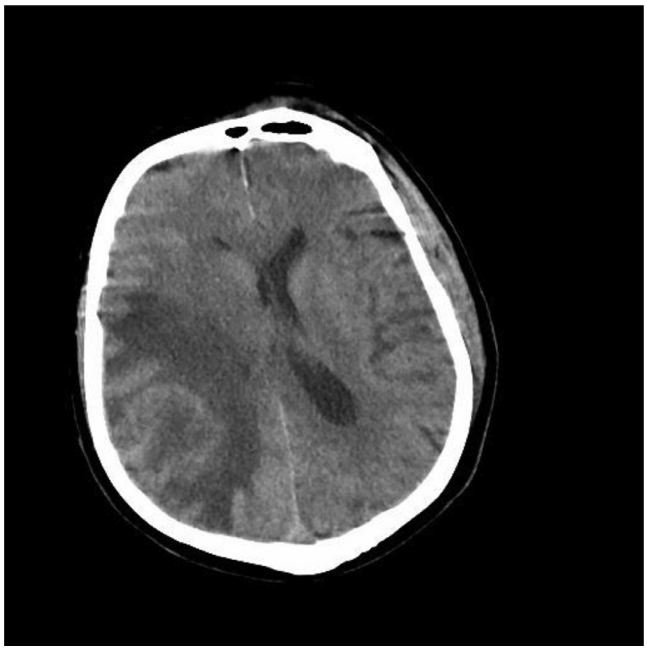

Image 1 – Axial CT of the brain without contrast showing a mass within the right parietal lobe with surrounding vasogenic edema, mass effect in the form of sulcal effacement in the right cerebral hemisphere and partial effacement of the right lateral ventricle, and an associated 5 mm leftward midline shift.

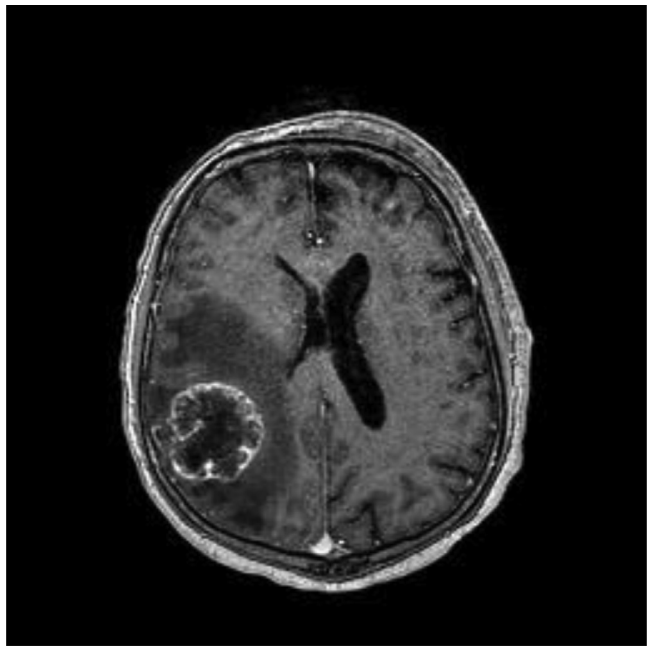

Image 2 – Axial T1-weighted image of the brain with contrast showing a heterogeneous predominantly peripherally enhancing mass within the right parietal lobe with associated edema and mass effect.

to this incident. His past medical history included colon cancer and diabetes. He had previously had a partial colectomy for stage IIA colon cancer and did not receive adjuvant therapy. Seven months after his resection, surveillance colonoscopy revealed recurrent colon cancer and subsequent positron emission tomography (PET) scan showed metastatic disease to the lung, liver and abdomen. He was then started on chemotherapy with follow up colonoscopy showing continued progression of disease. Three days prior to his presentation, he reported progressive memory loss, weakness, and fatigue during an office visit, which was attributed to chemotherapy side effects.

Upon presentation, a head computed tomography (CT) scan without contrast was performed which showed a new 3.3 × 2.9 cm mass in the right parietal lobe with surrounding vasogenic edema, mass effect in the form of sulcal effacement in the right cerebral hemisphere and partial effacement of the right lateral ventricle, and an associated 5 mm leftward midline shift. (Image 1) Subsequent brain magnetic resonance imaging (MRI) with contrast showed the mass to be heterogeneous and predominantly peripherally enhancing, with redemonstration of associated vasogenic edema, sulcal effacement, and midline shift. (Image 2, Image 3) The patient was started on dexamethasone because of his vasogenic cerebral edema and associated mass effects. Restaging imaging showed progressive metastatic disease with a new focus of disease in the cervical third (C3) vertebral body.

The patient underwent a right craniotomy and resection of the mass with pathology consistent with metastatic adenocarcinoma, morphologically consistent with primary origin from the colon.

The patient's postoperative clinical course was complicated by painless hematochezia and dropping hemoglobin levels requiring multiple blood transfusions. Sigmoidoscopy revealed an ulcerated partially obstructing tumor in the rectosigmoid colon which was oozing blood. The patient was started on radiation therapy (RT) to the colon for palliation of bleeding.

The patient subsequently received stereotactic body radiotherapy (SBRT) to the operative bed and RT to the C3 vertebral body.

Discussion

Colon cancer is known to metastasize to various sites throughout the body but rarely to the brain. When it does metastasize to the brain it carries a poor prognosis. Patients who receive multimodality treatment have the best median overall survival [5]. The vast majority of patients with brain metastases are asymptomatic at the time of diagnosis. In those with symptoms, gait disturbance, altered mental status, neurological symptoms, epileptic seizures, and signs of intracranial pressure are common symptoms [4, 6]. Our patient experienced left upper and lower extremity neurological symptoms prior to his fall which led to the discovery of metastatic disease to his brain.

There are a number of risk factors associated with brain metastases in colon cancer patients. Up to 90% of patients with brain metastases have other sites of metastases at the

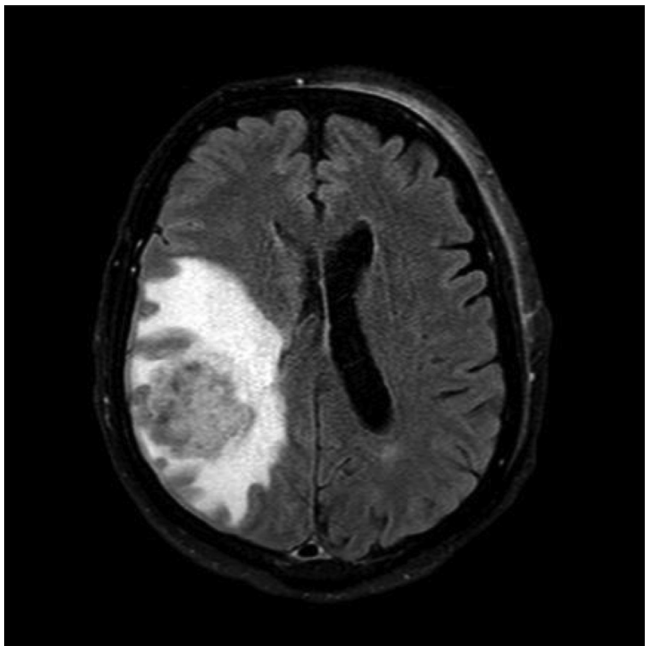

Image 3 – Axial T2-weighted fluid attenuated inversion recovery (FLAIR) image of the brain showing significant vasogenic edema surrounding the right parietal lobe mass.

time of diagnosis, most commonly in the liver and lungs [5]. In particular, lung and bone metastases have been shown to be independent risk factors for the development of brain metastases, both of which were present in this patient [4,7]. KRAS mutation, high CEA level, and cancer localized to the rectum are additional risk factors for brain metastases [4].

Treatment options for patients with brain metastases include surgery, whole brain radiation therapy (WBRT), multiple fractions of radiotherapy to the same site (SBRT), a single dose of radiation to the site (stereotactic radiosurgery (SRS)), and chemotherapy [8]. Surgery is indicated in those patients without significant comorbidities who have oligometastases with significant associated edema [6,8]. Adjuvant SBRT to the operative bed is typically performed as well. Occasionally, fractionated partial brain RT without surgery is performed. In patients with multiple metastatic lesions or in patients with a poor Karnofsky Performance Scale (KPS) score, which is a measure of a patient's performance status scored from 0 to 100 with 100 being optimal health, WBRT is the preferred treatment [8]. SBRT has been shown to have a similar survival outcome to WBRT with a 50% decrease in the incidence of cognitive dysfunction associated with WBRT. WBRT can result in cerebral atrophy, leukoencephalopathy, hydrocephalus, and hippocampal dysgenesis. However, in patients who are not candidates for SBRT, WBRT still plays a vital role in their treatment [8,9].

Multimodal treatment is key in the treatment of colon cancer brain metastases. Patients who receive surgery, RT, and chemotherapy have a median overall survival of 41.1 months, versus 14 months in those who only receive surgery and RT. In patients who are not surgical candidates, those who receive RT and chemotherapy have a median overall survival of 12.2 months, vs 3.13 months in those who only receive RT [10]. It is important to note that chemotherapy does not usually treat brain metastases as it does not usually cross the blood-brain barrier. The poorer outcomes seen in the patients who do not receive chemotherapy may reflect that these patients have a poorer performance status to start with and therefore are not chemotherapy candidates.

In patients who do not receive chemotherapy, the combination of surgery and RT results in better outcomes compared to surgery alone, with a median overall survival of 14 months versus 4.8 months, respectively [10,11]. It is important to note that the improved survival seen in patients who undergo surgery and RT could be a reflection of a lower initial disease burden in the brain, which makes them surgical candidates. In patients with multiple brain metastases who are not surgical candidates and receive only RT, the poorer outcomes seen could be because of their larger disease burden and not necessarily because they did not have surgery.

In addition to treatment modalities, there are other factors that can predict the prognosis of these patients. Age less than 70, KPS score $\geq$70, less than or equal to three metastatic lesions, and no history of chemotherapy prior to the diagnosis of brain metastases have all been shown to be associated with improved survival [8,10].

Conclusion

We present a rare case of a patient with a history of resected colon cancer who presented with a single brain mass discovered after a fall he sustained secondary to neurological symptoms. He had known local recurrence and distant metastatic disease at that time. After surgical resection of the mass, the diagnosis of metastatic colon adenocarcinoma was made. He went on to receive SBRT to the site oligometastatic disease in the brain. In patients with a history of colon cancer, it is important for clinicians to be aware of the known risk factors for the development of brain metastases in order to best screen for these patients and optimize their prognosis. When brain metastases are discovered, multimodal therapy with surgery, RT, and chemotherapy provides patients with the most optimal survival.

Patient consent

Formal consents are not required for the use of entirely anonymized images from which the individual cannot be identified- for example, X-rays, ultrasound images, pathology slides or laparoscopic images, provided that these do not contain any identifying marks and are not accompanied by text that might identify the individual concerned. Therefore, consent was not obtained for our case report.[][][]

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