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SNI: Unique Case Observations

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Case Report

Unusual brain metastasis from colon cancer

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ABSTRACT

Background: Brain metastases due to colorectal cancer correspond to 3–5% of all brain metastases. The prognostic factors are based on age, functional status, and single metastasis. Its management is multidisciplinary, with poor prognosis despite the management.

Case Description: A case of a 64-year-old male presented with symptoms of headache, disorientation, and nausea. The enhanced magnetic resonance image showed a mass in the right frontal horn of the lateral ventricle, contrast enhancing, with irregular borders, but defined, without restriction in diffusion-weighted images, associated with obstructive hydrocephalus. The investigations in search of a primary neoplasm were negative. A ventricular endoscopic approach was performed, with total resection of the lesion. Four months later, he developed a bowel obstruction with surgical management to control the primary, followed by chemotherapy and radiotherapy, with a current survival longer than 1 year.

Conclusion: Brain metastases due to colorectal cancer are rare, and usually, when diagnosed, there are already pulmonary and hepatic metastases. Multidisciplinary management is recommended, where surgical management can be included in selected cases with controlled systemic disease, good functional condition, and single metastasis.

Keywords: Brain metastasis, Cerebral ventricle neoplasms, Colon cancer, Neoplasms unknown primary, Brain cancer

INTRODUCTION

Brain metastases from colorectal cancer are 3–5% of all brain metastases but are very rare, even though colorectal cancer is the third most common cancer in both men and women.[8,11,21] In general, at the time of diagnosis of metastatic brain tumor from colorectal cancer, 85% of patients already have lung metastases, and 50–76% already have liver metastases.[3,18,20]

Due to his scarce frequency, there is no protocol for the management of this type of patient, but studies performed determined the prognostic factors that are age under 65 years old, scale Eastern Cooperative Oncology Group (ECOG) of 0 or 1, single metastasis, <3 lines of previous chemotherapy and Karnofsky performance status (KPS) >70.[13,14,17]

In addition, it is not known the optimal treatment, but most studies suggest multimodal management, where radiotherapy and chemotherapy alone do not show a good response, and surgical management is the one that has shown the greatest survival, even >37 weeks, as long

as the patient remains in good physical state with systemic controlled disease.[1,3,22] Even in multimodal therapy, bevacizumab can be used.[10,13]

This is why a rare case is presented. Brain metastases from colorectal cancer where the initial investigations did not find a primary neoplasm underwent multimodal treatment and carried a survival of >1 year to the time of this manuscript.

CASE DESCRIPTION

A 64-year-old male patient was admitted with a 2-week history of headache, disorientation, and nausea without vomiting. The examination revealed a Glasgow Coma Scale (GCS) of 14 points without additional neurological signs. The contrast-enhanced brain magnetic resonance imaging (MRI) showed a mass at the right frontal horn of the lateral ventricle adjacent to the foramen of Monro that generates a dilation of that horn; it is isointense on T1, contrast-enhancing, with irregular but defined borders, isointense on T2, which does not restrict diffusion [Figure 1].

A contrast-enhanced thoracoabdominopelvic computed tomography (CT) was negative for primary neoplasms, and tumor markers were also negative. It was decided to operate endoscopically, with the use of a handmade endoport, where we saw a gray-brownish, hypervascularized tumor adjacent to the foramen of Monro, with defined borders at the anterior and medial plane, with insertion in the lateral and posterior region, as well as in the floor of the ventricle [Figure 2]. Due to intraoperative bleeding, it was decided to leave an external ventricular shunt, which was removed on the 5th postoperative day. The postoperative contrast-enhanced brain CT appears to be a total resection of the tumor, without hydrocephalus, with little bleeding in the surgical field, and without abnormal contrast enhancement [Figure 2]. At our institution, we do not have an MRI available immediately, which should have been ideal to confirm total resection. On his 7th postoperative day, he was discharged with a GCS of 15 points, without additional neurological signs, and a surgical wound in adequate condition.

The result of the pathological anatomy showed that it was a metastatic mucosecretory type adenocarcinoma, cytokeratin 20 (CK20) positive, B catenin positive, cytokeratin 7 (CK7) negative, thyroid transcription factor - 1 (TTF1) negative, glial fibrillary acidic protein (GFAP) negative, neuron-specific enolase (NSE) negative, Ki67 90-95%, suggestive of the colon as a possible primary [Figure 3]. Due to this result, the anamnesis was expanded when the patient mentioned that he had suffered from chronic diarrhea since 1 year ago, associated with abdominal distension and weight loss (without reaching wasting syndrome).

Four months after surgery, the patient was admitted with symptoms of a 10 kg loss in the past 2 months, and 1 day before admission, he presented constipation, abdominal distension, nausea, and fecaloid vomiting, for which an abdominal X-ray was performed, showing air-fluid levels, a new contrast-enhanced abdominopelvic CT scan was performed which revealed a neoplastic lesion in the

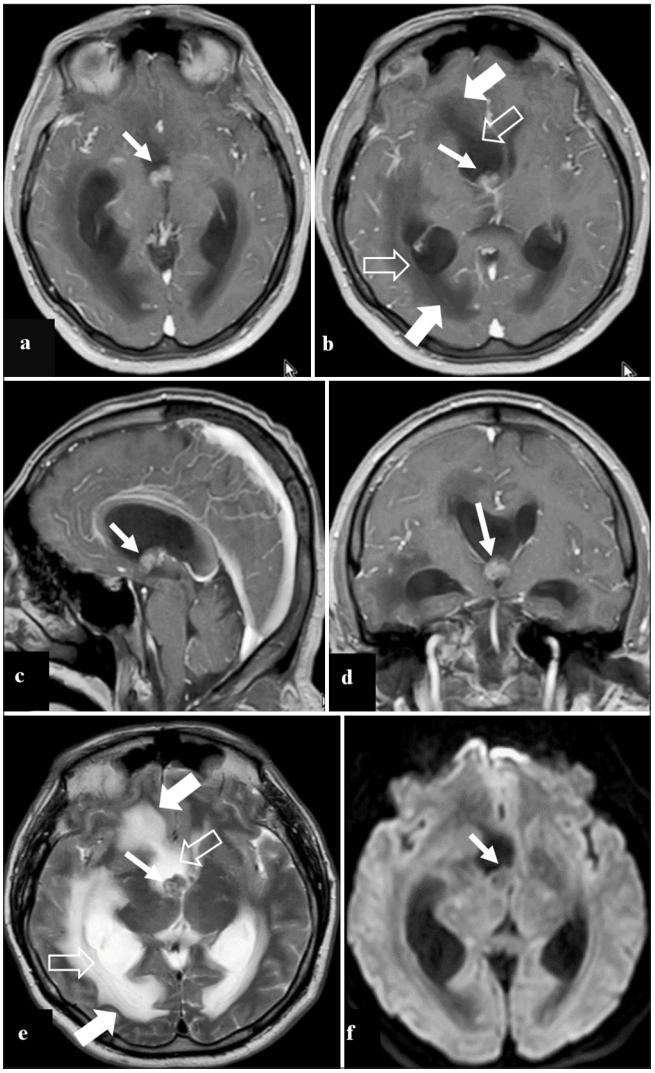

Figure 1: Contrast-enhanced brain magnetic resonance imaging preoperative. (a) Contrast-enhanced T1 image in the axial section that shows a mass in the right frontal horn (arrow), which seems to obstruct the ipsilateral foramen of Monro. (b) Contrast-enhanced T1 image in axial view, 5 mm above image a, which shows the same tumor (thin arrow); furthermore, it shows ventricular dilation (empty arrow) with transependymal edema (thick arrow). (c) Contrast-enhanced T1 image in sagittal view shows the tumor in the right foramen of Monro (arrow). (d) Contrast-enhanced T1 image in coronal view, which evidences the tumor in the lower edge of the right frontal horn (arrow) close to the ipsilateral foramen of Monro. (e) T2 image shows a tumor in the right frontal horn, isointense (arrow thin), associated with ventricular dilation (empty arrow) and transependymal edema (thick arrow). (f) Diffusion-weighted image shows no restriction of the tumor of the right frontal horn (arrow).

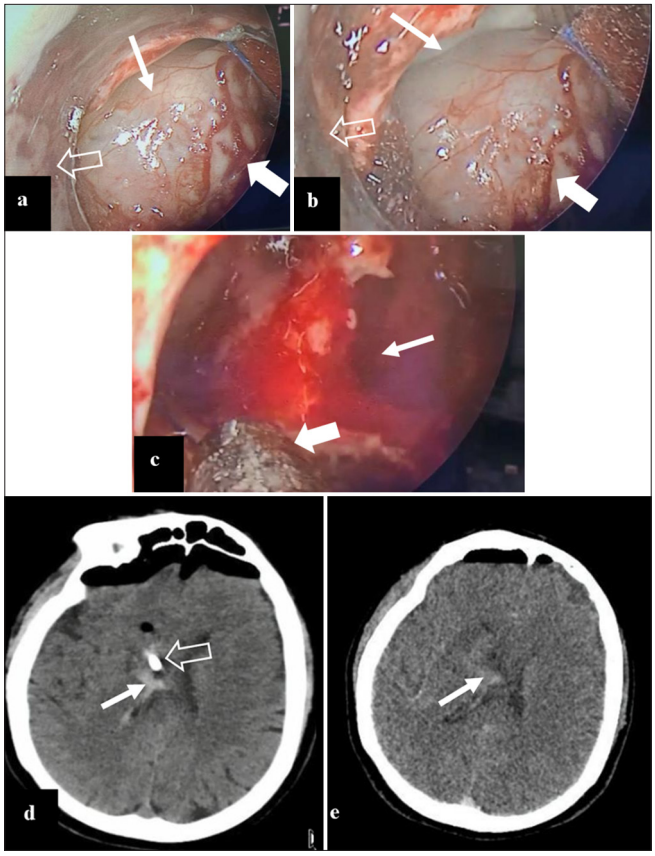

Figure 2: (a) Intraoperative image, showing a brownish gray tumor (thin arrow), hypervascularized (thick arrow), by endoscopic view using a handmade endoport (empty arrow). (b) Intraoperative endoscopic image with a handmade endoport (empty arrow), where the same tumor is shown (thick arrow) with defined borders (thin arrow) that allow distinguishing the tumor from the medial wall of the right frontal horn of the lateral ventricle. (c) Intraoperative image with partial resection tumor with moderate bleeding (thin arrow), where the resection continued with aspiration (thick arrow). (d) Nonenhanced brain computed tomography (CT) on the 1st postoperative day, absence of tumor, with little bleeding in the surgical field is shown (thin arrow), also the distal end of the external ventricular catheter is seen (empty arrow). (e) Enhanced brain CT on the 5th postoperative day, without external ventricular shunt, where there is no evidence of contrast-enhancing lesions, with little bleeding in the surgical field (arrow).

transverse colon. In addition, a contrast-enhanced brain MRI was performed during the hospitalization, which showed a recurrence/residual tumor in the right frontal horn of the lateral ventricle, as well as another metastasis in the IV ventricle, without hydrocephalus [Figure 4].

He underwent a right hemicolectomy extended to transverse for a tumor of the proximal transverse colon plus ileotransverse anastomosis end-to-side plus the closure of the transverse colon stump plus cavity lavage and two laminar drains were placed (right parietocolic and rectovesical

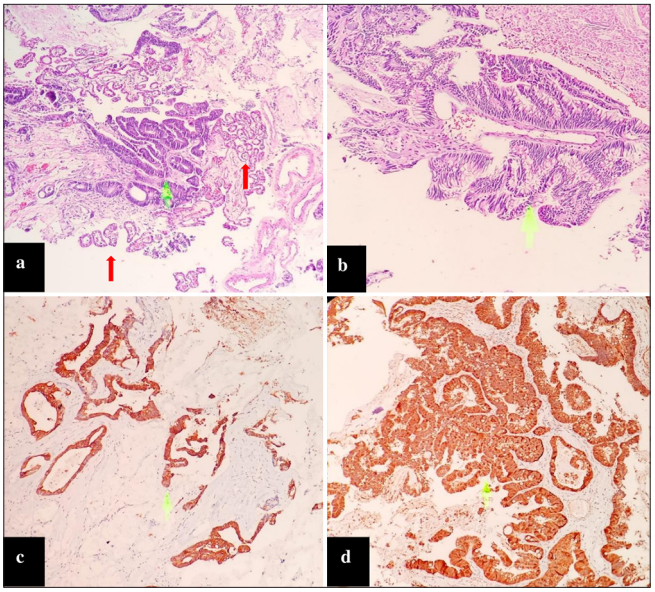

Figure 3: Microscopic description: (a) Proliferation of malignant glandular formations (green arrow) immersed in a mucinous matrix. Note the presence of choroid plexuses with benign characteristics (red arrows). Hematoxylin and eosin (HE) ×4. (b) Malignant glandular epithelium, with mucinous cytoplasm. HE ×10. (c) Malignant cells were positive for CK20. HE ×4. (d) They were also positive for β catenin. HE ×10.

pouch). After tolerating oral administration without complications, he was discharged 15 days after surgery.

The pathological anatomy of the colon showed an invasive mucinous adenocarcinoma with moderate differentiation of the transverse colon that invades pericolonic adipose tissue, ileocecal valve without evidence of neoplasia, appendix without evidence of neoplasia, negative surgical margins, and three positive lymph nodes out of 23.

He began chemotherapy 6 months after brain surgery and 2 months after abdominal surgery, with an ECOG scale of 1, with the capecitabine and oxaliplatin regimen, of which he received eight cycles in 6 months, having an ECOG of 2 at the end of it.

One year after cranial surgery, he received stereotaxic radiosurgery with a linear accelerator with a total dose of 27 Gy in 3 doses, with 95% isodose. After this, the patient is with ECOG 2, with thoracoabdominopelvic enhanced CT without evidence of recurrent disease or liver or lung metastases. At the time of writing this article, the patient had survived 15 months since cranial surgery, and the possibility of starting monotherapy with capecitabine had been considered.

DISCUSSION

Brain metastases occur in 20–30% of cancer patients, and brain metastases from colorectal cancer account for 3–5% of all brain

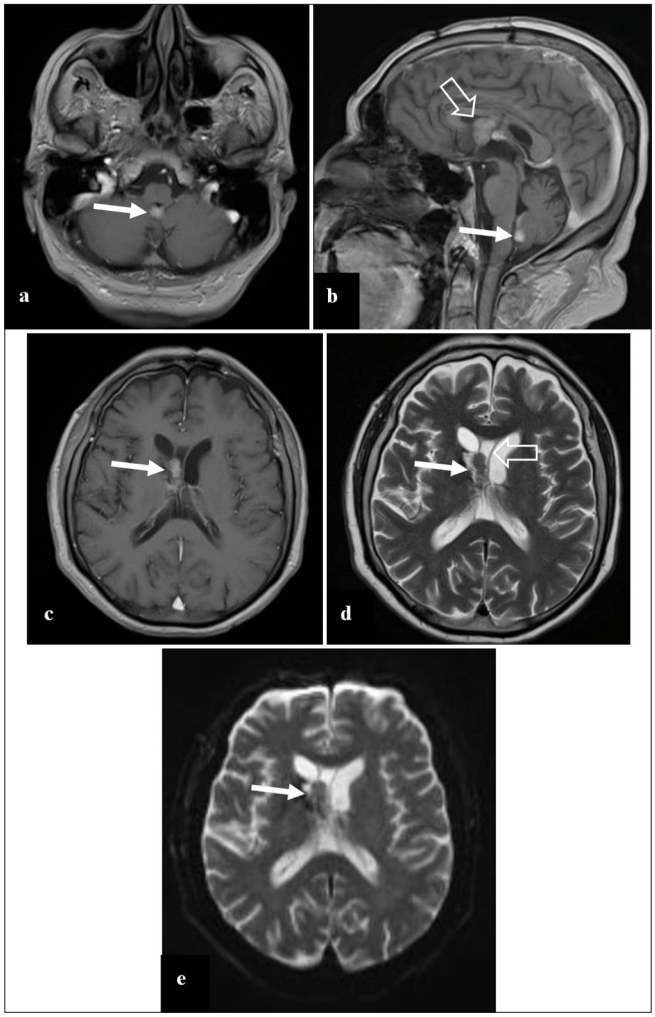

Figure 4: Contrast-enhanced brain magnetic resonance imaging in the 4th postoperative month. (a) Contrast-enhanced T1 image in axial view shows a new metastasis, nodular, contrast-enhancing in the inferior border of the IV ventricle (arrow). (b) Contrast-enhanced T1 image in sagittal view shows the metastasis in the IV ventricle (arrow); in addition, the lesion recurrence in the right front horn is seen (empty arrow). (c) Contrast-enhanced T1 image in axial view shows the recurrence of the contrast-enhancing right frontal horn tumor (arrow), without associated ventricular dilation. (d) T2 image shows a recurrence of the right frontal horn tumor, isointense (thin arrow), that seems to invade the cavum vergae (empty arrow) and not the former surgical field. (e) Diffusion-weighted image shows no signal restriction (arrow).

metastases.[8,11,21] The incidence of brain metastases in colorectal cancer is between 0.4% and 1.8% compared to 40–50% in lung cancer, 5–15% in breast cancer, 10–15% in testicular cancer, and 10% in melanoma,[11,13] that is, they are very rare.[13,19]

It is known that distant metastasis is the most common form of colorectal cancer recurrence, with the liver being the first with 79%, followed by lung, bone, or central nervous system, all with <6%,[11,16] but in this case, our patient has a brain metastasis without primary neoplasm known in the first instance before surgery, hence the importance of its description.

In general, at the time of diagnosis of a metastatic brain tumor from colorectal cancer, 85% of patients have lung metastasis, and 50–76% have liver involvement. They are rarely diagnosed before the primary one and even more, so that they do not have involvement of other organs,[3,18,20] as is the case of our patient, due to the failure of the tomography to detect the primary neoplasm.

Brain metastasis from colorectal cancer on MRI is usually well-defined lesions, isointense on T1 and hyperintense on T2, with ring contrast-enhancement with central necrosis and with or without restricted diffusion, with moderate perilesional edema, and rarely has calcifications.[9,12,18] It has been seen that the most frequent location is the cerebellum, reaching 35%,[3,7] but in our case, it has a very peculiar location, which is intraventricular in the right frontal horn of the lateral ventricle.

Three possible routes of hematogenous dissemination of colorectal cancer are proposed to generate brain metastasis. The first is the spread through the rectal venous plexus toward the inferior vena cava, then to the lungs, and finally to the brain without passing through the liver; the second is the spread toward Batson's vertebral plexus without passing through the liver or lungs; and the third is the spread to the portal veins, passing to the liver, then to the lungs and finally to the brain.[3]

Carcinoembryonic antigen (CEA) is a useful marker in colorectal neoplasm follow-up, but its value in terms of neurological compromise has not been demonstrated in series. It is known that CEA can be useful in leptomeningeal metastases but not in brain metastases[2,3,6], such as in the case of our patient, where all tumor markers were negative.

Roussille *et al*. found in their study that the factors associated with a good prognosis were age under 65 years, ECOG scale of 0 or 1, single metastasis, and <3 lines of prior chemotherapy.[17] Other authors mention that KPS is also a prognostic factor, being an independent factor; when it is <70 is a poor prognostic factor.[13,14] However, it is also known that the survival of patients with brain metastases depends on the histological type of cancer. Due to the few cases of colorectal cancer, there is little data on this[3,11], which is why Li *et al*. conclude that brain metastases due to colorectal cancer are highly lethal. Despite this, it is necessary to use all available therapies to improve survival.[13,15]

The response to radiotherapy is much lower than its counterparts caused by lung or breast cancer, without variations in response in the different radiotherapy schemes, with a study that showed a response in only two patients of the 11 treated, with a 9-week survival average.[1,3]

Chemotherapy also did not show a good response in brain metastases.[3,22]

However, stereotactic radiosurgery is a good option, with studies showing local disease control in 77.8% of patients after 1 year of follow-up and an average survival rate of 7 months; Chernov concluded that it is as effective as whole-brain radiotherapy.[5]

On the other hand, in the case series, surgical resection is the one that has had the best survival rate, even >37 weeks, and generally, the patients are in good physical and general condition, with controlled systemic disease.[3] Some studies even suggest that microsurgical resection followed by whole-brain radiotherapy for a single metastasis has a better survival rate and a lower recurrence rate. In the case of resectable brain metastases with favorable prognostic factors, aggressive management should be considered.[15]

Recent studies show that multimodal management, with a combination of radiotherapy, chemotherapy, or targeted therapy, improves the prognosis of patients with nonoperable colorectal cancer.[4,13] Lu *et al*. found that patients with monotherapy had a survival of 4 months, whereas, for those treated with multimodal management (microsurgical resection, radiotherapy, and chemotherapy), the survival was 11 months.[13,14]

CONCLUSION

Brain metastases from colorectal carcinoma are rare, and when they occur, they usually already have lung or liver metastases. In the case of single metastasis with controlled systemic disease and good performance status, they are the best candidates for first-line surgical management followed by complementary treatment (chemotherapy, radiotherapy, or targeted therapy). In other cases, multimodal management is the best and should be personalized according to each case.

Ethical approval

Institutional Review Board approval is not required.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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