Topics in Neurology

Previously Undiagnosed Malignant Brain Tumor Discovered During Examination of a Patient Seeking Chiropractic Care

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Abstract

Objective: This case report describes the diagnosis of a malignant brain tumor in a patient requesting chiropractic care for headaches after a motor vehicle accident.

Clinical Features: A 30-year-old man presented with numbness and tingling in all extremities, lower extremity muscle weakness, and a recent increase in headaches with the loss of ability to concentrate. He was involved in a high-speed motor vehicle collision approximately 4 months before the onset of symptoms. Examination showed slow gait with a lack of arm swing, bilateral hip flexors and knee extensors were all graded as 4/5 on muscle testing, and cranial nerve examination was unremarkable with the exception of 2 beats of nystagmus on left lateral eye movement. Because of these findings and a family history of multiple sclerosis, the patient was referred for a brain magnetic resonance imaging scan.

Intervention and Outcome: Imaging showed a craniocervical junction mass centered at the floor of the fourth ventricle with obstruction of foramina and marked impingement on the medulla. A posterior fossa craniotomy and tumor removal procedure was performed by a neurosurgeon, followed by 34 sessions of radiation therapy. The final diagnosis was a grade II glioma with features of ependymoma.

Conclusions: This report describes the clinical presentation, examination, and medical management of a 30-year-old man presenting to a chiropractic practice with an unsuspected malignant brain tumor.

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Introduction

Primary malignant brain tumors are rare, resulting in 2% of all cancers in United States adults. They are more

common in men than in women: 7.6 vs 5.3 per 100,000 person-years.¹ Approximately 2000–3000 low-grade (grades I–II) gliomas are diagnosed in the United States every year. Low-grade gliomas are particularly common among white men aged 35–44 years.² The only proven environmental risk factor for the development of brain tumors is exposure to high-dose ionizing

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radiation. Other risk factors, including occupational exposures, electromagnetic radiation, pesticides, cellular telephones, and head trauma have not been causally linked.¹ A family history of glioma is unusual but, when observed, is associated with a 2-fold increased risk. A recent study looking at genomewide susceptibility loci found 5 new risk loci for glioma, bringing the total to 12. The authors estimated that these risk loci account for 27% of familial risk for glioblastoma and 43% of risk for nonglioblastoma tumors.³ Unlike almost every other form of cancer, early diagnosis and treatment of glioma unfortunately do not improve outcomes.⁴

There are 5 groups of primary malignant brain tumors: neuroepithelial tumors, tumors of cranial nerves and paraspinal nerves, tumors of meninges, lymphomas and hematopoietic neoplasms, and other. Of the 5, the most common are the neuroglial tumors (subtype of neuroepithelial), which account for 80% of primary brain tumors. There are 4 grades which determine the severity of the glioma. Grades I and II are considered low grade, whereas grades III and IV are considered high grade.¹

With the exception of a single case study describing a benign meningioma,⁵ the literature is devoid of articles discussing primary brain tumors presenting to chiropractic practices. Given that the most common presenting symptom of brain tumor is headache,⁴ this topic likely deserves more discussion in the literature.

The purpose of this article is to describe the clinical presentation, examination, and medical management of a 30-year-old man presenting to a chiropractic practice with an unsuspected malignant brain tumor.

Case Report

A 30-year-old man presented to a chiropractic college teaching clinic with numbness and tingling into all extremities, lower extremity muscle weakness, and recent increase in headaches with the loss of ability to concentrate. He was involved in a serious motor vehicle accident approximately 4 months earlier, where his car ran into another vehicle at approximately 50 miles per hour and then struck a barrier at an angle causing a secondary impact. There was no ambulance transportation or follow-up care after the accident. There were stiffness and muscular pain following the accident, which cleared after 2 months. Shortly after recovering from the accident-related symptoms, he began feeling muscle hypertonicity in the areas of the

spine, weakness of the gluteal and quadriceps muscles, numbness and tingling into the hands and feet, and an increase in headaches. At the same time, he noticed an inability to concentrate for even short periods of time. At the time of his visit, he was taking 100 mg of CoQ-10 per day, 2 g of omega 3 fish oils per day, 5000 IU of vitamin D3 daily, a B vitamin complex, and a daily multivitamin. There was a positive family history of multiple sclerosis (MS) with his father. No family history of brain cancer was present. The patient was concerned that the most recent symptoms he was experiencing could be early signs of MS.

Vitals were within normal limits (WNL). His gait pattern was slow with a lack of arm swing. Range of motion testing of the cervical spine showed decreased motion globally. Neurological examination findings were as follows: sensory examination including sharp/dull discrimination and vibration were WNL; right wrist extensors and flexors, bilateral hip flexors, and knee extensors were all graded as 4/5 on muscle testing (others WNL); reflexes were WNL. During cerebellar testing, the patient was able to perform heel to shin; however, he had limited ability to perform Romberg test in a single leg stance for longer than 2-3 seconds. The cranial nerve examination was unremarkable with the exception of 2 beats of nystagmus on left lateral eye movement on H-pattern testing. Results of orthopedic testing including cervical compression, maximum cervical compression, cervical distraction, Valsalva maneuver, and Lhermitte test were all negative. The 2 differential diagnoses at that time included MS and a space-occupying lesion in the brain.

Because of a family history of MS, along with abnormal neurological findings on examination, the patient was immediately referred to a local imaging center for a brain magnetic resonance imaging (MRI) with contrast. The report indicated the following results (Figs 1-4): craniocervical junction mass $4.8 \times 2.6 \times 3.8$ cm centered at the floor of the fourth ventricle with obstruction of foramina and marked impingement on medulla; well-defined margins and heterogeneous T1/T2 signal and heterogeneous enhancement; ventricles are mildly enlarged with a thin rind of hyperintense signal from transependymal edema; mild mass effect on cerebellum. The differential diagnosis provided by the interpreting radiologist was ependymoma, medulloblastoma, or other primary central nervous system neoplasm. The results were discussed with the patient, who was referred to a medical neurologist.

After meeting with his neurosurgical team, it was decided that a posterior fossa craniotomy and tumor removal procedure would be performed. This occurred

Fig 1. Axial flair image from brain MRI.

Fig 3. Coronal T2 image from brain MRI.

approximately 1 month after the patient's initial visit to the chiropractic clinic. Because of the location of the tumor, a near-total resection of the tumor was not possible. The pathology report of tissue removed during the procedure indicated that the growth was consistent with a grade II glioma with features of ependymoma. The patient was hospitalized for 14 days after the procedure, during which time he participated in daily physical therapy.

After being discharged from the hospital, he had multiple falls at home due to what was later diagnosed as dysautonomia. After this issue was controlled with medications, he participated in twice-weekly physical therapy for approximately 3 months. Another adverse effect of the surgery was difficulty swallowing. The patient was forced to feed via total parenteral nutrition for 3 months, during which time he lost 30 lb. Approximately 2 months after surgery, radiation

Fig 2. Coronal T1 image from brain MRI.

Fig 4. Sagittal T1 image from brain MRI.

therapy was initiated. A total of 33 radiation treatments were given over the course of 6 weeks. It was determined by genetic testing that the type of glioma present would not be responsive to chemotherapy, so this therapy was not added. An MRI performed approximately 10 months after surgery had the following findings: mild interval enlargement in the size of brainstem glioma as compared with a scan performed 3 months earlier; mild ventriculomegaly, increased as compared with the prior examination; no definite transependymal cerebrospinal fluid flow; hyperintensity within the upper cervical cord extending from the brainstem to upper C3 level, new as compared with the prior examination—this probably represents edema related to the brainstem mass or radiation effect. The patient continues to experience problems with changing positions quickly due to dysautonomia. He also experiences coordination problems with his legs when trying to run. There had been no further chiropractic care during the course of his medical treatment. The patient provided consent for his health information to be published.

Discussion

This case presented here is unique in that there were several factors that complicated the clinical presentation. First, there was a significant motor vehicle accident preceding trauma, and symptoms were initially linked to a possible postconcussive syndrome. Second, there was a positive family history of early-onset MS, which some of the symptoms were consistent with.

The clinical presentation of glioma is variable depending on the grade. Headaches are relatively frequent, present in about 50% of patients at diagnosis⁴ and frequently described as low-grade tension headache often present for greater than 6 months.¹ Other common presenting symptoms are seizure (50%), visual disturbance (40%), and nausea and vomiting (38%). Low-grade tumors most often present with seizure and cognitive dysfunction, and high-grade tumors most often present with nausea and vomiting.¹

Surgery is the initial treatment of choice for primary brain tumors. In high-grade glioma, the preference is to perform total tumor resection. Because of vague margins and slow growth, this type of resection is typically not possible for low-grade glioma.¹ Early aggressive tumor removal has been shown to improve 5-year survival rates (74%) vs watchful waiting (60%) in a group of 153 patients with grade II glioma.⁶

Four studies have compared the difference in outcomes (quality of life and overall survival) in patients with low-grade glioma who undergo surgical resection vs watchful waiting. Two of the studies favored watchful waiting, whereas the other 2 favored surgical resection.⁷

Following surgical resection, radiation therapy is the standard treatment for gliomas. External beam radiation therapy consists of 25 to 35 daily treatments administered over 5 to 7 weeks.¹ Another treatment option is gamma-knife radiosurgery, which delivers a single high dose of radiation in a 1-day session. Its use is mainly in glioblastoma multiforme or as a boost after conventional radiation.⁴ Shaw⁸ described the use of low- vs high-dose radiation in 211 patients with glioma. The 5-year overall survival rate was 72% with low-dose and 65% with high-dose radiation. Neurotoxic effects were seen in 10% of the high dose group vs 2% of the low-dose group. The use of chemotherapy is largely based on the genetic characteristics of the tumor. Silencing of the MGMT gene with chemotherapy has been shown to predict increased survival in glioma patients.¹

The prognosis of glioma is dependent on several variables, including grading, genetic characteristics of the tumor, and degree of surgical resection.

The results of a central radiology review indicated that 1 cm or more of residual tumor on MRI, a tumor size of ≥ 4 cm, and presence of astrocytic component were poor prognostic factors.⁶ The brain tumor registry of Japan⁶ indicated that 5-year survival rates ranged from 56.4% (50%-75% removal) to 87.8% (100% removal) depending on extent of tumor removal during surgery. Another group of glioma patients undergoing surgery documented the following correlation between tumor resection and 5-year survival: amount of resection 0%-40% (65% survival); 41%-89% (82%); 90%-99% (92%); 100% (98%).⁵ The 20-year survival rate in patients with grade II glioma is 10%-20%.⁵ Grade II glioma is reported to grow at an average rate of 3-5 mm per year. At recurrence, they undergo malignant transformation to higher-grade gliomas in 50%-90% of patients.⁶ A “cytokine signature” was recently developed to distinguish glioma serum from normal serum. These 18 cytokines can be used to identify glioma patients, as well as monitor responses to treatment and recurrence.⁹

According to the 2015 practice analysis of chiropractic,¹⁰ headache is the third most common complaint seen in chiropractic offices. As discussed above, the most common presenting symptom of glioma is headache (50% prevalence); therefore, including

glioma as a potential diagnosis when evaluating patients with headache is prudent. Headache, however, rarely occurs in isolation in brain tumor patients. Studies have found that only 2% of brain tumor patients present with headache as their only complaint.⁹ The International Headache Society has developed a description of a “brain tumor headache type,” which is localized, progressive, worse in the morning, and aggravated by coughing or bending forward.¹¹

Limitations

This patient was slightly younger than average for grade II glioma diagnosis. There were also suggestions based on the pathology report that features of ependymoma were present. For these reasons, it may not be possible to generalize the findings in this case to other patients with glioma.

Conclusion

This case describes a 30-year-old man who presented for chiropractic evaluation and treatment, was referred for a brain MRI, and was diagnosed as having a malignant brain tumor. Following this imaging diagnosis, the patient was referred for medical management. Although these types of tumors are quite rare, the main presenting symptom of headache is quite common in chiropractic practice. When combined with multiple abnormal neurological findings, the clinician should recognize the possibility of serious pathology and refer for appropriate imaging and follow-up.

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