Abstract  Adult medulloblastoma is a rare intracranial tumor. Our patient is a 61 year old woman treated with cranial irradiation 15 years previously for a low grade astrocytoma in the left posterior temporal lobe that was recently diagnosed with medulloblastoma in the right cerebellum. This is the first reported case of radiation induced adult medulloblastoma.

Keywords  Neoplasms, Radiation-induced · Adult · Medulloblastoma · Astrocytoma · Radiotherapy

Introduction

Medulloblastoma is a rare occurrence in the adult population, constituting less than 1% of all adult brain tumors. In the past, treatment most commonly was craniospinal irradiation alone which was poorly tolerated by adult patients. Chemotherapy has since been added to the treatment regimen and the dose of craniospinal irradiation has decreased. The administration of chemotherapy to adult patients with medulloblastoma is based both on the pediatric experience with a trimodality approach and retrospective data of adult medulloblastoma treatment. Current recommendations for treatment include chemotherapy with craniospinal irradiation and a boost to the posterior fossa or tumor bed location.

The long term survival of adult medulloblastoma at 5 years is 50–60% and decreases to 40–50% at 10 years [1]. Studies have found improved overall survival and disease free progression with complete resection. Additionally, patient postoperative performance status has been shown to be a prognostic factor [2]. Adult medulloblastoma has an increased incidence of late relapse compared to the pediatric population. Nearly 30% of relapses are detected more than 5 years after treatment [3]. Pathological comparison of medulloblastoma in the pediatric and adult populations has found the desmoplastic variant to be more common in the adult population. Additionally, a more lateral tumor location is noted among adult patients [4].

While radiation-induced tumors are an uncommon but known possible complication of radiation therapy, no previous report has been made of radiation-induced medulloblastoma. This case report documents an adult patient diagnosed with medulloblastoma after a history of intracranial irradiation 15 years earlier for low grade astrocytoma. Based on clearly defined areas of permanent alopecia and skin changes directly abutting the bilateral temporal regions, the irradiation field delivered more than 50% of the dose to the site of medulloblastoma induction. The skin and hair changes noted
on physical exam are indicative of initial treatment with lateral fields as the primary mode of delivery.

Case report

A 61 year old woman presented with a 1 week history of worsening headaches and word finding difficulty. The patient’s medical history began approximately 30 years previously with the onset of seizures which were stable for nearly 10 years. When her seizures began to worsen, further investigation revealed a mass in the left posterior temporal region. Craniotomy was performed and the pathology was that of a low grade astrocytoma (WHO grade II) which was treated postoperatively with radiation therapy utilizing two lateral fields for approximately 6 weeks (per patient recollection). Despite our best efforts to obtain information regarding this initial treatment, the patient’s medical records and pathology slides had been destroyed. Therefore, it is not possible to confirm duration or dose of her radiation therapy, nor evaluate her initial tumor. On examination, bilateral skin changes consisting of permanent alopecia and skin telangiectasias were noted bilaterally in the posterior temporal region consistent with treatment delivery of two lateral fields. Sequelae associated with her original treatment included panhypopituitarism. Our patient suffered from a mild right-sided stroke 12 years after completing her treatment that resulted in left lower extremity weakness, but she was still able to walk. Brain imaging via MRI was obtained at regular intervals with stable changes consistent with patient’s history of surgery and radiation, with no evidence of recurrence within the initial tumor bed region (Fig. 1).

Our patient was stable until she developed worsening headaches and word finding difficulty which prompted further evaluation. On MRI, a new enhancing mass was noted in the right cerebellar hemisphere measuring $2.6 \times 2.8 \times 2$ cm (Fig. 2). Further work-up for a possible second primary malignancy with brain metastases was performed via CT imaging of the chest, abdomen and pelvis and revealed no evidence of primary or systemic disease.

Craniotomy was performed to obtain diagnostic material. Pathology was that of an anaplastic/large cell medulloblastoma tumor, confirmed by an outside institution. No epithelial, neural, or glial differentiation was found. On immunohistochemistry testing GFAP, pan keratin, and synaptophysin were negative. A high mitotic index, marked nuclear anaplasia, apoptosis, and occasional multinucleated cells were detected (Figs. 3 and 4). Postoperatively, work-up included MRI imaging of the spinal axis showing no disease and normal cerebrospinal fluid. Treatment options, including chemotherapy and radiation therapy, were discussed with the patient. Based on the patient’s overall health and preference, chemotherapy was not provided. Radiation was delivered at an outside institution to the tumor bed alone due to concern for patient tolerance of craniospinal irradiation. Unfortunately, disease has now spread along the spinal axis.

Discussion

Our patient was originally diagnosed with a low-grade astrocytoma after a long history of seizures. Five-year survival rates for these low grade tumors vary between 27–85% [5]. Currently, it is recommended patients...