Primary glioblastoma of the trigeminal nerve root entry zone: case report

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Gliomas of the cranial nerve root entry zone are rare clinical entities. There have been 11 reported cases in the literature, including only 2 glioblastomas. The authors report the case of a 67-year-old man who presented with isolated facial numbness and was found to have a glioblastoma involving the trigeminal nerve root entry zone. After biopsy the patient completed treatment with conformal radiation and concomitant temozolomide, and at 23 weeks after surgery he demonstrated symptom progression despite the treatment described. This is the first reported case of a glioblastoma of the trigeminal nerve root entry zone.

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Although gliomas can manifest in any area of the CNS, they are located supratentorially in 70% of affected adults. Brainstem gliomas constitute 2%–3% of all adult gliomas.11,13,22 In modern series of adult brainstem gliomas, the incidence of glioblastoma appears to be approximately 6%.7,9,10,21 Gliomas arising from the root entry zone of the cranial nerves (CNs) are exceedingly rare. To our knowledge, there have been 11 reported cases of glial tumors arising purely from the root entry zone of CNs.1,2,4–6,8,12,14,15,19,23 The majority of these reported tumors involved CN VIII (8 cases), followed by CN V (2 cases) and CN III (1 case). In only 2 of these cases, respectively affecting CNs VIII and III, was the histology glioblastoma. We report the case of a 67-year-old man who presented with isolated facial numbness and was found to have a glioblastoma involving the trigeminal nerve root entry zone, making this the first reported instance of a glioblastoma involving this specific location.

Case Report
History and Examination
A 67-year-old man with a history of chronic obstructive pulmonary disease and hypertension presented with an 8-week history of facial numbness. The numbness began in the V2 distribution on the right side. Two weeks prior to presentation, the numbness spread to involve the entire right side of his face including the forehead and chin. He had no other signs or symptoms, specifically no facial pain or headache. He also denied any motor weakness or balance or coordination problems, and he had no fevers, chills, nausea, or vomiting. He was first seen in clinic where his neurological examination was notable for decreased sensation to light touch and pinprick in the right ophthalmic, maxillary, and mandibular distributions of the trigeminal nerve. The right corneal reflex was absent. He was otherwise neurologically intact with a normal mental status, CN I–IV and VI–XII function, motor strength, reflexes, coordination, and gait.

Laboratory examination revealed no hematological or electrolyte abnormalities. Cerebrospinal fluid cytology was benign. Magnetic resonance imaging with and without gadolinium demonstrated a 17 × 11 × 7–mm peripherally enhancing cystic mass in the right trigeminal nerve root entry zone, extending into the brachium pontis along
the expected course of the trigeminal nerve (Fig. 1). The lesion was T2 hyperintense and T1 hypointense with minimal associated edema. Proton MR spectroscopy revealed increased choline and decreased N-acetylaspartate within the lesion, relative to levels on the contralateral side, suggesting the diagnosis of glioma. Other differential diagnosis considerations included cystic intraaxial nerve sheath tumor or an inflammatory lesion such as neurosarcoidosis.

Operation

A biopsy of the lesion was performed via a right retrosigmoid craniotomy. Intraoperatively, the trigeminal nerve root entry zone was exposed and noted as abnormally widened, with the nerve resuming a normal caliber distally in its cisternal course (Fig. 2). After coagulating the pia, a small incision was made parallel to the direction of the nerve fibers at the root entry zone. A cystic cavity filled with yellow fluid was encountered. Multiple small samples were sent for frozen and permanent pathology.

Postoperative Course

Postoperatively, the facial numbness remained stable, but the patient experienced no new neurological symptoms or signs and was discharged on postoperative Day 2. After final pathology confirmed the intraoperative frozen section of glioblastoma, the treatment recommendation from the neurooncology service included conformal radiation (60 Gy in 2-Gy fractions over 6 weeks) with concurrent and adjuvant temozolomide per the Stupp protocol. The patient began radiation and chemotherapy 5 weeks after the biopsy, and he successfully completed the 6-week course of radiation. At 23 weeks after his initial biopsy, he had progression of symptoms, including right-sided hearing loss and subjective complaints of blurred vision in his right eye, although there was no documented vision loss. He was also receiving low-dose dexamethasone for occasional headaches.

Histopathological Findings

Microscopic examination of the tissue samples confirmed the intraoperative diagnosis of glioblastoma (WHO Grade IV). Tissue sections showed a population of pleomorphic neoplastic astrocytes diffusely infiltrating the background neuropil. Mitotic activity, microvascular proliferation, and focal necrosis were identified (Fig. 3). Oligodendrocyte transcription factor (OLIG2) and glial fibrillary acidic protein (GFAP) immunohistochemistry was positive in the tumor cells, consistent with a glioblastoma. No CN segment could be identified on H & E–stained sections or by immunohistochemistry for neurofilament protein. The tumor was negative for the R132H mutant form of isocitrate dehydrogenase 1 (IDH-1). Fluorescence in situ
hybridization (FISH) assays demonstrated a relative copy gain of epidermal growth factor receptor (EGFR) and confirmed phosphatase and tensin homolog (PTEN) deletion.

Discussion

Arnautovic et al. have discussed how glial tumors can arise from the proximal segment of a CN.1 This initial nerve segment (the root entry zone) contains glial cells that are gradually replaced by peripheral Schwann cells in the transition zone. Measurements of the length of the root entry zone have revealed that CN VIII has the longest glial segment (approximately 10 mm), followed by CN V (approximately 3 mm) and CN III (approximately 1 mm).3,10,17,20 These relative lengths correspond well with the relative numbers of reported cases of extraaxial primary glial neoplasms in each of these nerves (CN VIII, 8 cases; CN V, 3 cases; CN III, 1 case). The present case is the first report of a glioblastoma involving the trigeminal nerve root entry zone.

Following the diagnosis, the patient completed the recommended 6-week regimen of radiation with concomitant temozolomide per the current standard of care.18 He is recommended 6-week regimen of radiation with concomitant nerve root entry zone.

Conclusions

In summary, we report the first case of a primary glioblastoma of the trigeminal nerve root entry zone. Cranial nerve root entry zone glial tumors are exceedingly rare, with only two previously reported root entry zone glioblastomas in the literature. The location and distribution of these rare glial tumors appear to parallel the relative lengths of the CN root entry zones, with CN VIII, V, and III being most common. The previously reported cases of CN root entry zone glioblastoma have had shorter survivals than what has been reported for purely intraaxial brainstem glioblastomas.

References

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**Author Contributions**

Conception and design: Breshears, Berger. Acquisition of data: Ivan, Cotter. Drafting the article: Breshears. Critically revising the article: all authors. Reviewed submitted version of manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Breshears.

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