

Letter to Editor

Microsurgery for symptomatic extratumoral cyst formation in vestibular schwannoma post-radiosurgery

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Dear Editor,

Stereotactic radiosurgery is an effective treatment for vestibular schwannoma (VS), providing excellent long-term tumor control in over 98% of cases while preserving neurologic function.^[1]

Microsurgery following radiosurgery is exceedingly rare, observed in only 1–2% of patients.^[1,2] The most common cause for redo surgery is tumor progression of the solid mass.^[2] However, cyst formation in primarily solid VS requiring microsurgical decompression is observed in only 1.6% of patients following radiosurgery.^[3]

As a team of neurosurgeons specialized in both microsurgery and Gamma Knife radiosurgery (GKRS), we present a rare case in which a new extratumoral cyst formed after radiosurgery, necessitating microsurgical intervention.

A 39-year-old right-handed female with a comorbidity of hypothyroidism presented with two episodes of vomiting followed by generalized tonic seizures. On neurological examination, only mild ataxia was noted. An audiogram revealed mild sensorineural hearing loss in the right ear.

On initial magnetic resonance imaging (MRI), a 41 × 39 × 34 mm (Koos grade IV) well-defined, contrast-enhancing, and extra-axial lesion in the right cerebellopontine angle and compression of the 4th ventricle with subsequent hydrocephalus was diagnosed [Figure 1a and b].

A right retrosigmoid craniotomy, drilling of the internal auditory canal, and an uneventful excision of the lesion were performed. As some parts of the tumor were adherent to the brainstem, total excision was avoided. Histopathology revealed the diagnosis of a VS. Postoperatively, the right ear was functionally deaf and a mild facial paresis (House-Brackmann grade II) was present, which was completely resolved during follow-up.

Follow-up imaging revealed a small residual tumor [Figure 1c] and GKRS (Leksell Gamma Knife[®] Perfexion[™], Elekta, AB, Sweden) was performed after 10 months. The prescription dose was 13 Gy at 50% isodose, delivered through 8 shots on a tumor volume of 0.97 cm³ [Figure 1d].

The 3-month control post-radiosurgery showed a stable tumor on MRI without signs of any cyst. Two years later, the patient experienced a new-onset of imbalance while walking. Neurological examination showed mild cerebellar ataxia and complete hearing loss on the right side. On MRI, the solid component was similar in size to the radiated tumor, but a large non-enhancing cystic component, measuring 35 × 30 × 29 mm with compression of the cerebellum and brainstem, had formed [Figure 1e and f].

A right retrosigmoid redo craniotomy was performed under facial nerve monitoring. Intraoperatively, the cyst, which contained cerebrospinal fluid, was opened. The tumor had a yellowish-white color, was non-suckable, firm, and moderately vascular. It was tightly adherent to the brainstem, with a breach of the pia. Complete decompression of the cyst was achieved, while a near-total resection of the radiologically stable solid tumor component was performed, leaving the adherent capsule on critical neurovascular structures. Postoperatively, no new neurological deficit was present.

A follow-up contrast-enhanced MRI brain scan showed a significant reduction in the solid component of the tumor and a decrease in the cystic part, without any mass effect [Figure 1g and h].

We present a rare case of new cyst formation in VS after GKRS, requiring microsurgery due to brain stem compression. Compared to solid recurrences, cyst development following GKRS occurs earlier and exhibits a

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Received: 16 July 2023 Accepted: 25 July 2023 Epub Ahead of Print: 04 September 2023 Published: 05 February 2024 DOI: 10.25259/JNRP_384_2023

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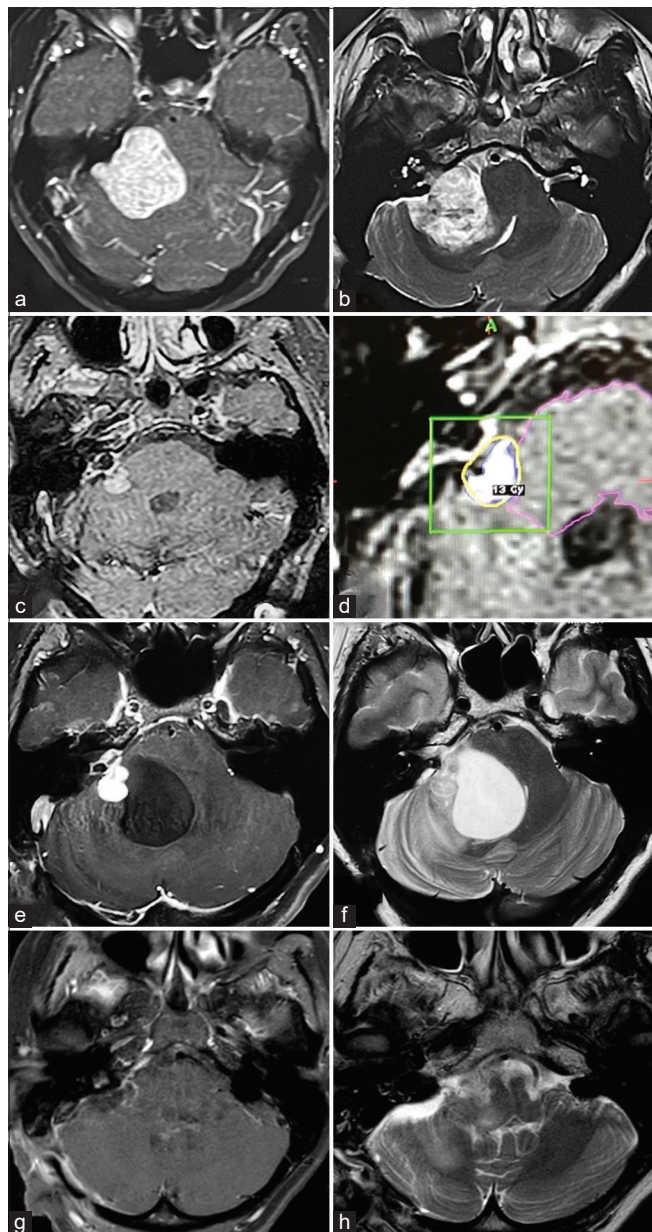


Figure 1: Magnetic resonance imaging at diagnosis is showing in contrast enhanced T1- (a) and T2-weighted (b) axial sequences a contrast-enhancing extra-axial lesion in the right cerebellopontine angle with significant brainstem compression. Subtotal resection (c) due to brainstem adherence revealed the diagnosis of a vestibular schwannoma. Gamma Knife radiosurgery was performed (d) with 13 Gy at 50% isodose. Two and a half years following radiosurgery, the patient presented with imbalance while walking. Contrast-enhanced T1- (e) and T2-weighted (f) axial sequences shows formation of a large extratumoral non-enhancing cyst. The cyst was decompressed and tumor near-totally resected (g and h) under facial monitoring, resulting in complete neurological recovery.

faster volume increase.^[4] There are two distinct types of post-radiosurgery cysts: intratumoral and extratumoral cysts.

Intratumoral cysts show thick contrast-enhanced walls and hemorrhagic changes on MRI.^[5] Extratumoral cysts are depicted as thin, non-contrast-enhanced walls, as shown in the present case. Unlike intratumoral cysts, extratumoral cysts do not harbor tumor cells and are instead attributed to arachnoid adhesions induced by radiosurgery. Extravasation of proteins leads to osmotic fluid accumulation and cyst enlargement even when the tumor remains stable.^[5] While intratumoral cysts necessitate resection of both the cyst and the solid component, in extratumoral cysts, decompression of the cyst alone is sufficient.

Surgery on VS post-radiosurgery poses challenges due to the absence of a clear dissection plane, radiation-induced fibrosis, and arachnoid scarring.^[6]

In case of strong adherence of the tumor to the brainstem, gross-total resection should not be pursued, particularly in cases of extratumoral cysts where the solid tumor component is effectively controlled after radiosurgery, as shown in the present case.^[6] Furthermore, intraoperative neuromonitoring is essential to avoid facial nerve injury.

Symptomatic extratumoral cyst development after radiosurgery for VS is a rare complication requiring microsurgical intervention despite successful control of the solid tumor component. Decompression of the cyst is indicated, while tumor resection is limited to the extent that is safely possible under continuous neuromonitoring. An aggressive total resection of the solid tumor mass, which is adherent to the surrounding neurovascular structures, is not recommended to preserve neurological functions.

Ethical approval

Institutional Review Board approval is not required.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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

The author(s) confirms 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 the AI.

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How to cite this article: Hosmann A, Misra BK. Microsurgery for symptomatic extratumoral cyst formation in vestibular schwannoma post-radiosurgery. *J Neurosci Rural Pract.* 2024;15:153-5. doi: 10.25259/JNRP_384_2023