OBSERVATION

Medial Migration of an Untreated Intracanalicular Vestibular Schwannoma

Medial migration of intracanalicular vestibular schwannoma (VS) with associated widening of the fundal cap is a rare phenomenon that, to our knowledge, has only been described in a patient following stereotactic radiation treatment. Herein, we present a case of a woman in her 60s with an untreated intracanalicular VS that demonstrated medial migration on serial magnetic resonance imaging (MRI) scans over the course of 30 months.

Report of a Case | A woman in her 60s with a history of right sensorineural hearing loss presented with worsening symptoms of vertigo. Axial, high-resolution T2-sampling perfection with application optimized contrasts using different flip angle evolution (SPACE) sequence MRI of the internal auditory canal (IAC) showed a right-sided spherical intracanalicular VS (Figure 1A) measuring 6 mm in diameter and situated 1.2 mm from the AIC of the fundus. Serial surveillance MRI demonstrated growth and progressive medial migration of the VS (Figure 1). At 6 months, the VS demonstrated 1 mm of growth and 1.5 mm medial migration. At 18 months, the VS showed a further 1.2 mm of growth and 1.3 mm medial migration. At 30 months, the VS demonstrated a further 2.8 mm of growth and 1 mm of medial migration. The VS reached a final axial dimension of 11 mm with a slightly flattened morphology along with protrusion into the cerebellopontine angle cistern. Relative to the baseline MRI, the VS had migrated medially over a distance of 3.8 mm. Accompanying the medial migration of the VS was progressive buckling of the cisternal segment of the facial and vestibulocochlear nerves (Figure 2). Subsequently, the patient underwent gamma knife treatment to the VS with a prescribed dose of 12.5 Gy delivered to the 50% isodose. The patient tolerated treatment well without adverse events. The patient is yet to attend post-therapy clinical and MRI surveillance follow-up.

Discussion | Medial migration of intracanalicular VS from the IAC fundus toward the porus acusticus has only been described after stereotactic radiation treatment, hypothesized to be secondary to transient tumor swelling squeezing the VS medially toward the more spacious side of the IAC.1,2 Interestingly, the VS remained resting half a centimeter medial to its original location despite volume reduction 4 years after stereotactic radiation treatment.1 We observed medial migration of an intracanalicular VS without prior radiation treatment and hypothesize a complex biophysical interaction between the IAC anatomy, tumor morphology, and growth to account for our observation. The conical shape of the IAC may create a propensity for unidirectional growth of the intracanalicular VS toward the more spacious medial IAC that is better suited to accommodate the increasing tumor volume.3 Despite only a modest 1 to 2 mm increase in tumoral diameter at the surveillance intervals, these changes equate to a 3- to 8-fold increase in tumor volume.3 An increase in the VS volume from either accelerated growth or transient tumoral edema may provide sufficient force for either translation or rotation to displace the VS medially.1 The observation of fundal cap widening indicates there is stretching or elongation of the par-
ent nerve. This, together with the possibility of nonuniform growth and contact with the bony IAC, would result in differing external forces and a rotational component of the migration, particularly if arising eccentrically from the parent nerve.

Rapid growth rate alone, however, is not sufficient to explain this phenomenon. A subset of enlarging VS averaging a rate of 1.9 mm growth per year shows medial tumoral extension rather than migration to accommodate for the change in tumoral volume.\(^4,5\) We believe spherical morphology of the VS may have enabled medial migration via rolling or translation.\(^1\) Lastly, anatomical variation of medial sloping and/or narrowed configuration of the IAC could also contribute to this complex biophysical phenomenon. Medial migration of the intracanalicular VS resulted in increased cerebrospinal fluid volume between the IAC fundus and VS, so called “fundal fluid” or “fundal cap.”\(^6\) The presence of the fundal fluid bears a prognostic significance with higher documented rates of hearing preservation after surgical resection.\(^6\) An increased distance between the lateral margin of the VS and the modiolus of the cochlea can help reduce radiation dose to the cochlea and vestibule during radiotherapy. As evident in this case, Carlson et al\(^1\) observed that medial migration of VS was accompanied by buckling of the cisternal segment of facial nerve with medial migration of VS there was no clinical deficit reported in the facial nerve.

Charlie Chia-Tsong Hsu, MBBS
Trevor William Watkins, MBBS, FRANZCR
Jennifer Sommerville, MBBS, FRANZCR

Author Affiliations: Department of Medical Imaging, Princess Alexandra Hospital, Brisbane, Australia (Hsu, Watkins, Sommerville); The University of Queensland, St Lucia, Queensland, Australia (Watkins).

Corresponding Author: Trevor William Watkins, MBBS, FRANZCR, Consultant Radiologist, Department of Medical Imaging, Princess Alexandra Hospital, Brisbane, Australia (trevor.watkins@health.qld.gov.au).


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