

Summary

- Malignant peripheral nerve sheath tumors (MPNSTs) of the eighth cranial nerve, often referred to as malignant vestibular schwannomas, are exceedingly rare and poorly characterized in the literature.
- Using the SEER database (2000–2020), 39 patients with malignant acoustic nerve tumors (C72.4) were identified.
- Age ≥ 65 years was the strongest predictor of mortality, demonstrating significantly worse outcomes in both univariate (HR 5.6, $p < 0.01$) and multivariable analyses (HR 264, $p < 0.001$).
- No clear survival benefit was observed from surgical intervention.
- These findings represent the largest population-based survival analysis of malignant eighth nerve tumors to date and highlight age as a dominant prognostic factor.

Introduction

Malignant vestibular schwannomas or malignant peripheral nerve sheath tumors of the eighth nerve are exceedingly rare and associated with poor prognosis. Data in the literature thus far is scarce and mostly consists of case reports. To better understand the prognosis and survival predictors, we performed a population-based analysis of demographic and treatment-related factors.

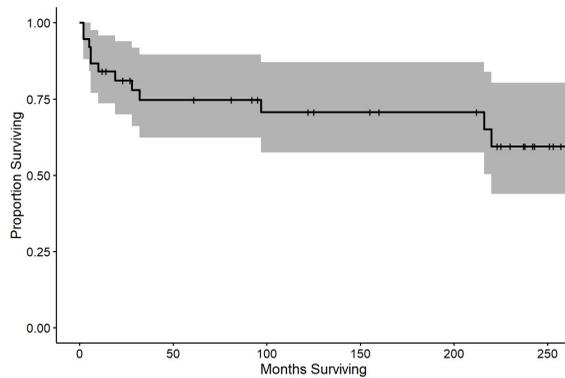


Figure 1. Kaplan-Meier survival curve of the whole cohort.

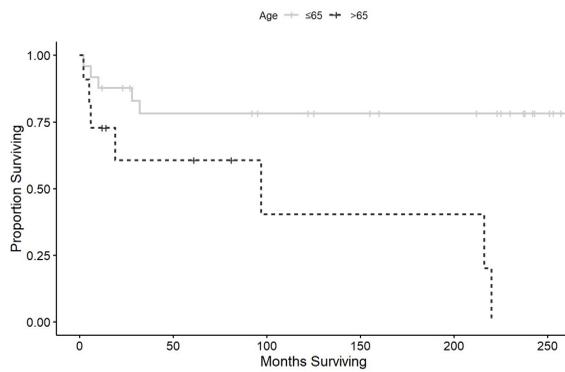


Figure 2. Kaplan-Meier survival curve stratified by age.

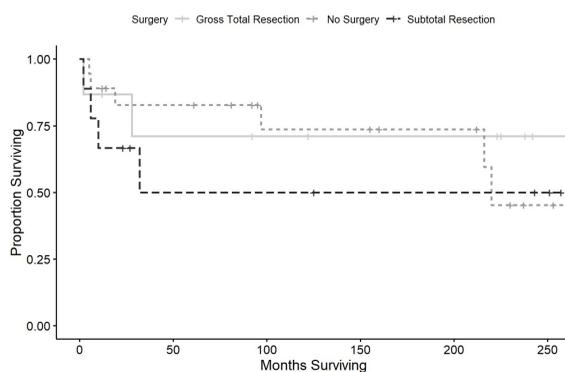


Figure 3. Kaplan-Meier survival curve stratified by extent of resection.

Methods and Materials

From 2000 to 2020, all patients with malignant tumors of the eighth cranial nerve were identified from the Surveillance, Epidemiology, and End Results (SEER) database. Selection criteria included patients with only malignant behavior tumors that were in primary site code 'C72.4-Acoustic Nerve' and were classified either as malignant neurilemmomas or malignant peripheral nerve sheath tumors. The Kaplan–Meier method was used to estimate overall survival (OS), and Cox proportional hazards regression was applied for univariate and multivariable analyses. Survival by age and treatment modality was visualized with Kaplan–Meier plots.

Results

- A total of 39 patients were included in the analysis.
- The overall 1-, 2-, and 5-year survival was 79%, 77%, and 68%, respectively.
- Sex distribution showed 23 females and 16 males and was not significantly associated with OS (HR 1.3, 95% CI 0.7–4.2, $p = 0.6$).
- Median age at diagnosis was within the mid-50s, with 73% age < 65 years and 27% age ≥ 65 years. In contrast, age ≥ 65 years emerged as the strongest predictor of poor survival, significant in both univariate (HR 5.6, 95% CI 1.3–18, $p < 0.01$) and multivariable analysis (HR 264, 95% CI 9–7240, $p < 0.001$).

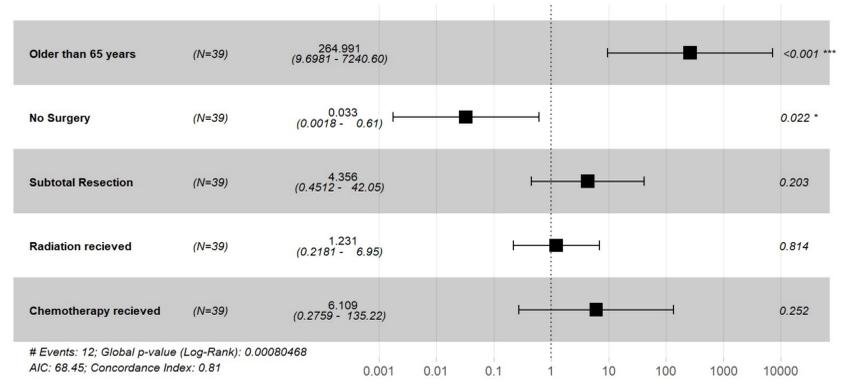


Figure 4. Multivariable analysis Forest plot.

Discussion

- Malignant transformation of vestibular schwannoma, or primary MPNST of the eighth nerve, remains an exceptionally rare clinical entity, and current understanding is largely derived from case reports and small pooled analyses. This SEER-based study provides population-level survival data across two decades.
- Prior literature demonstrates poor short-term survival. Li et al. (*Front Oncol.*, 2021) reported 1- and 2-year overall survival rates of only 42% and 19%, respectively, following malignant transformation of vestibular schwannoma, while Carlson et al. (*J Neurosurg.*, 2016) highlighted high disease-specific mortality in reported cases of eighth-nerve MPNST. In contrast, our population-based SEER cohort demonstrated a 5-year overall survival of 68%. This divergence likely reflects registry heterogeneity, lack of molecular validation, potential inclusion of lower-grade lesions, and survivorship bias.
- Age ≥ 65 years emerged as the strongest independent predictor of mortality, suggesting that elderly patients represent a particularly high-risk subgroup. Given limited prospective evidence and unclear benefit from aggressive intervention, treatment decisions should be individualized within a multidisciplinary framework, with careful consideration of age and overall clinical status.
- Notably, no survival benefit from surgical intervention was observed. Given the morbidity of cerebellopontine angle surgery and the poor outcomes observed in older patients, aggressive surgical management may not confer a meaningful survival advantage.
- Limitations include retrospective design, registry coding constraints, lack of tumor size and molecular data, absence of recurrence information, and inability to assess adjuvant therapy timing or prior radiation exposure. Despite the limitations, this study provides the most comprehensive population-based survival data for malignant eighth nerve tumors and identifies advanced age as a critical prognostic determinant.

Conclusions

In this rare, highly malignant tumor patients, age is an important prognostic factor, with older patients experiencing significantly worse survival. Given the absence of clear survival benefit from surgical intervention, careful patient selection is warranted. These findings emphasize the need for judicious treatment strategies and collaborative efforts to improve outcomes in this aggressive disease.

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References

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