

Introduction

Trigeminal neuralgia (TN) is characterized by unilateral, brief, electric shock-like pain triggered by innocuous stimuli and confined to the distribution of the trigeminal nerve (CN V). According to its etiology, TN can be classified as classical (caused by neurovascular compression), idiopathic (with no identifiable cause), or secondary (associated with an underlying disease or tumor).

TN secondary to intracranial tumors is an uncommon but challenging entity in skull base surgery. Tumor-related TN often presents with atypical features, delayed diagnosis, and requires specific management strategies. Understanding the epidemiological distribution and clinical differences among tumor subtypes may guide diagnostic and therapeutic approaches.

Methods:

We retrospectively analyzed a cohort of patients with TN secondary to intracranial tumors treated at our center between 2015 and 2024. Clinical variables included age at symptom onset, symptom duration, sex, affected side, and tumor volume (calculated by the ellipsoid formula from MRI dimensions). Tumor frequencies were described, and the three most prevalent entities (epidermoid cysts, meningiomas, and vestibular schwannomas) were compared using non-parametric and chi-square tests.

Results:

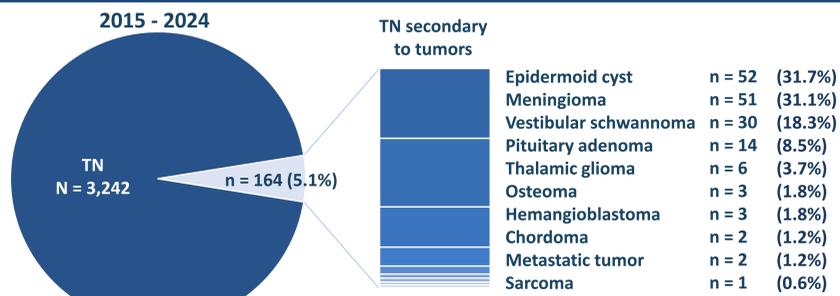


Figure 1. Number of patients and tumors causing TN.

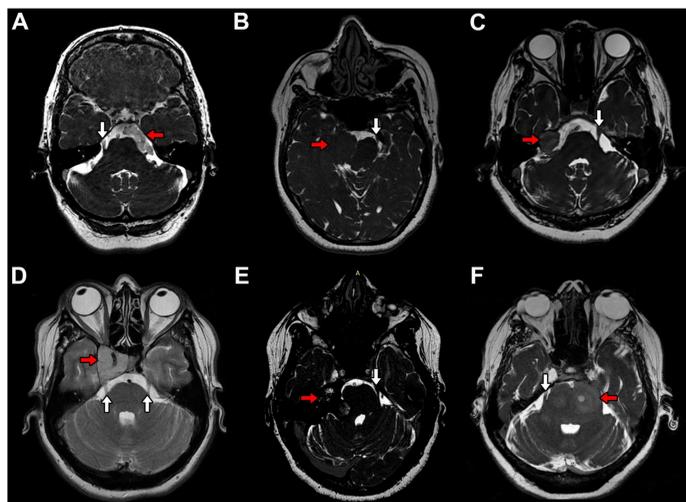
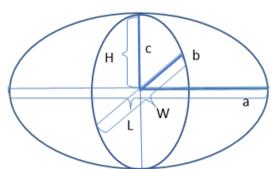


Figure 2. Representative MRI findings of tumors causing TN. (A) Epidermoid cyst, (B) Petroclival meningioma, (C) Vestibular schwannoma, (D) Pituitary adenoma, (E) Temporal bone osteoma, and (F) Thalamic glioma. The red arrow indicates the tumor location, while the white arrow highlights the CN V.



$$V_T = \frac{\pi}{6} (L \times W \times H)$$

Figure 3. Diagram of an ellipsoid used to calculate tumor volume. The tumor dimensions are length (L or 2a), width (W or 2b), and height (H or c).

Results:



Figure 4. Age at symptom onset

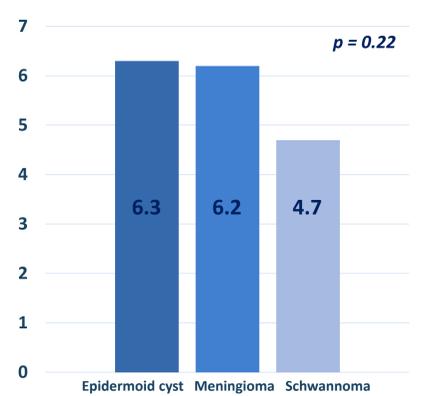


Figure 5. Duration of symptoms (years)

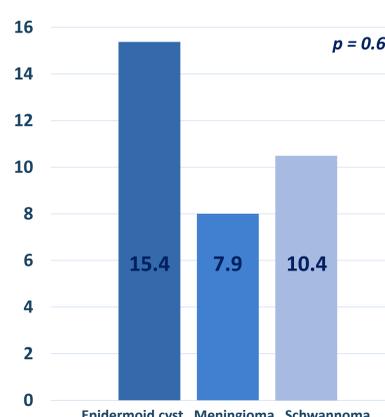
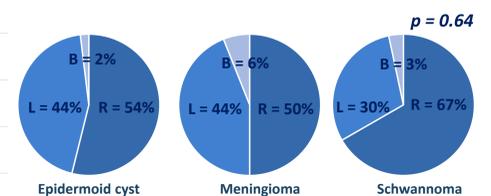


Figure 6. Tumor volume (cm³)



Graph 4. Symptomatic side

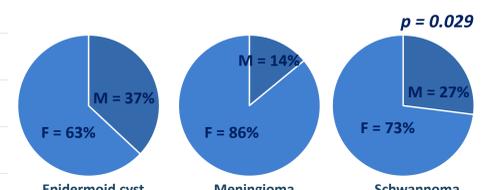


Figure 7. Patient's sex

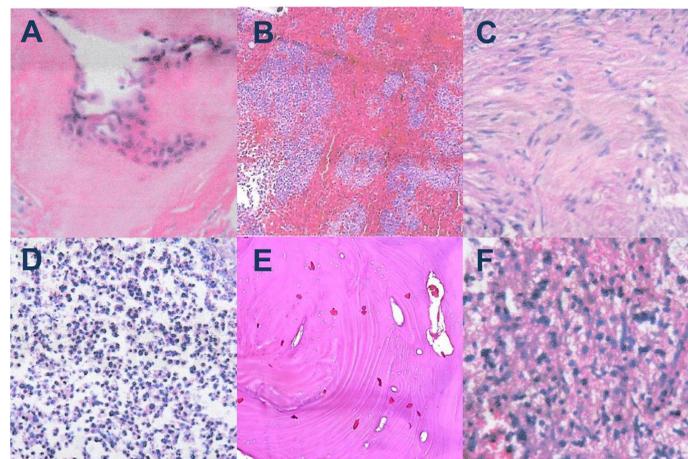


Figure 8. Representative images of hematoxylin and eosin stain of the tumors associated with TN. (A) Epidermoid cyst, (B) Petroclival meningioma, (C) Vestibular schwannoma, (D) Pituitary adenoma, (E) Temporal bone osteoma, and (F) Thalamic glioma. All images were obtained at a magnification of 100x.

Conclusions:

In this large single-center cohort, epidermoid cysts, meningiomas, and vestibular schwannomas accounted for more than 80% of cases of tumor-related TN. The main distinguishing factor was the significantly earlier onset of symptoms in epidermoid cysts and the strong female predominance in meningiomas. Symptom duration, laterality, and tumor volume did not differ significantly across tumor types. These findings highlight the importance of considering patient age and sex patterns in the differential diagnosis of tumor-related TN and underscore the heterogeneity of its clinical presentation.

Keywords:

Secondary trigeminal neuralgia, Skull base tumors, Epidermoid cyst, Meningioma, Vestibular schwannoma, Tumor dimensions.

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