



## Sympathetic Plexus Schwannoma of Carotid Canal: 2 Cases with Surgical Technique and Review of Literature

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### Key words

- Carotid canal
- Carotid plexus
- Petrous apex
- Schwannoma

### Abbreviations and Acronyms

**BOT:** Balloon occlusion test  
**CC:** Carotid canal  
**CP:** Cavernous plexus  
**CS:** Cavernous sinus  
**CSP:** Carotid sympathetic plexus  
**GSPN:** Greater superficial petrosal nerve  
**ICA:** Internal carotid artery  
**ICN:** Internal carotid nerve  
**ICP:** Internal carotid plexus  
**PA-CS:** Petrous apex–cavernous sinus  
**pICA:** Petrous internal carotid artery

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Citation: *World Neurosurg.* (2018) 118:63-68.  
<https://doi.org/10.1016/j.wneu.2018.06.244>

Journal homepage: [www.WORLDNEUROSURGERY.org](http://www.WORLDNEUROSURGERY.org)

Available online: [www.sciencedirect.com](http://www.sciencedirect.com)

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### INTRODUCTION

Carotid sympathetic plexus (CSP) schwannomas are rare, and only 3 cases have been reported to date. One arose from the cavernous sinus part of the plexus,<sup>1</sup> and 2 others arose in the region of the petrous part of the carotid canal.<sup>2</sup> Schwannomas form the third largest group of benign brain tumors after meningiomas and pituitary adenomas,<sup>3</sup> and the most common site of origin is the vestibular part of the eighth cranial nerve (vestibular schwannoma).<sup>4</sup> Schwannomas around the petrous apex–cavernous sinus (PA-CS) region arise mostly from the trigeminal nerve.<sup>5</sup> Schwannomas arising from the other cranial nerves (third, fourth, and sixth) in the cavernous sinus and from the distal

Carotid sympathetic plexus schwannomas are rare, and only 3 cases have been reported to the best of our knowledge. We report the fourth and fifth cases and define its origin on the basis of the exact division of the plexus from which the tumor arises. The surgical approach and technique in each variety and the postoperative outcome are also described. The relationship of partial Horner syndrome with the sympathetic plexus schwannoma of the internal carotid artery is discussed in detail.

portion of the greater superficial petrosal nerve or deep petrosal nerve in the petrous apex region are also described.<sup>6,7</sup> We describe 2 unique cases in this region arising from the CSP around the petrous internal carotid artery (pICA) and describe the surgical technique for these third and fourth cases of their kind in the literature to the best of our knowledge.

### CASE REPORT

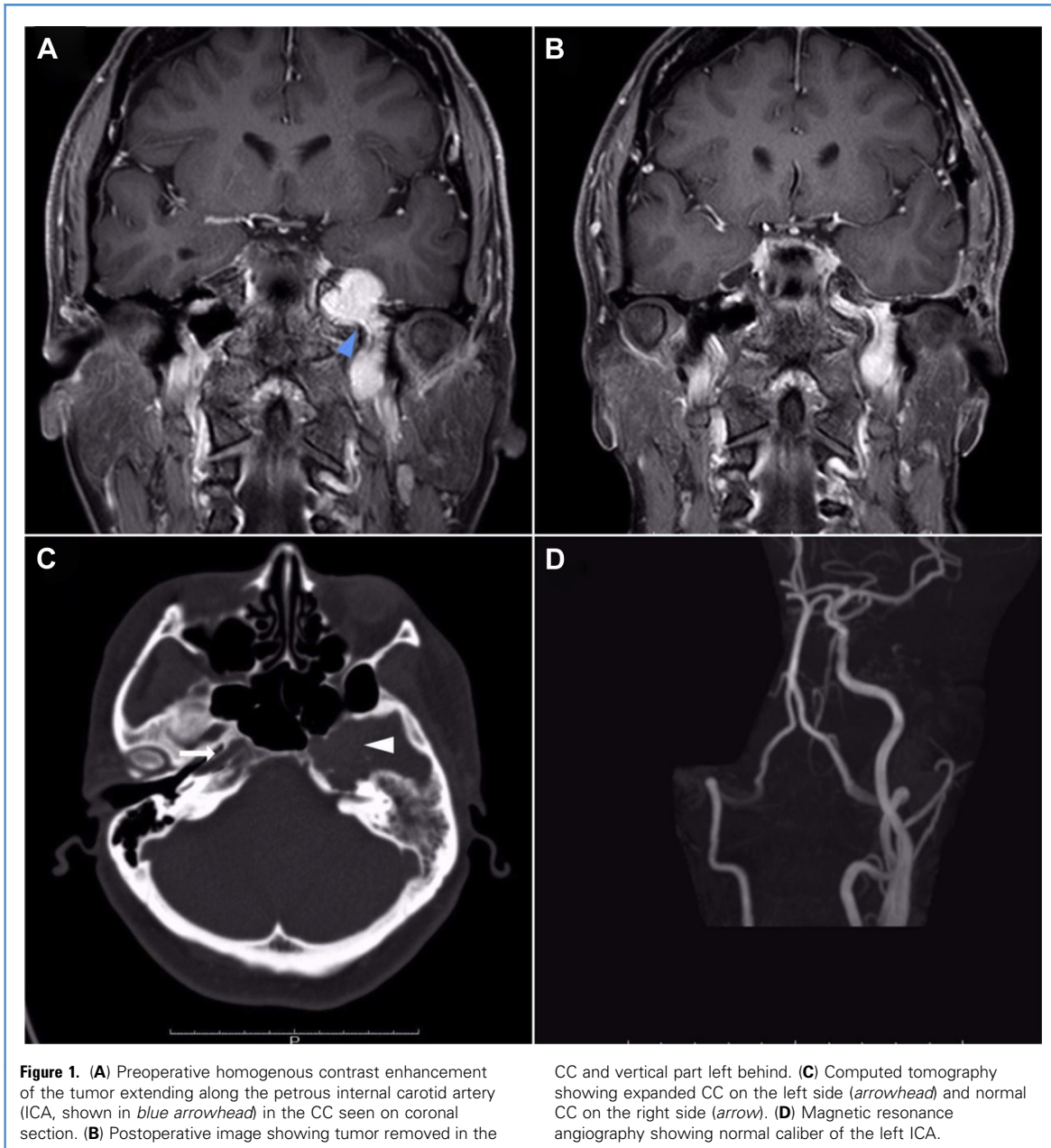
#### Case 1

A 50-year-old female patient presented with a 2-year history of chronic otitis media in the left ear, and on examination there was a conductive hearing loss of 48 dB. The patient was investigated for the same with magnetic resonance imaging and found to have homogeneously contrast-enhancing lesion in the left petrous apex region along the pICA adherent to it and pushing it anterior. The Eustachian tube was blocked, and lower down, the tumor extended into the parapharyngeal space. A computed tomography scan revealed an expanded left carotid canal (CC). CT angiogram was performed, and there was no evidence of any stenosis of the pICA, except for displacement of the pICA anteriorly. The patient was taken up for surgery under general anesthesia and brainstem auditory evoked potential monitoring. An extradural middle fossa approach was used, and meticulous

dissection was done. The greater superficial petrosal nerve (GSPN) was identified and cut to reach the tumor capsule. The carotid canal roof was destroyed by the tumor, which was removed piecemeal. The pICA was identified and found to be adherent to the tumor and delineated away. No extension into the CS was noted. The part of the tumor extending inferiorly into the parapharyngeal space was left behind as the neck of capsule connecting the vertical and horizontal parts of the tumor was narrow, and it was asymptomatic. The histology was suggestive of schwannoma. The patient recovered well from surgery without any complications, and her conductive deafness improved over time with no evidence of tumor growth at 1-year follow-up (Figure 1).

#### Case 2

A 49-year-old female patient presented with a 3-year history of fullness in the left ear and recent onset of diplopia. On examination she was found to have left abducens nerve palsy without any hearing impairment. On investigating, magnetic resonance imaging revealed a left petrous apex homogeneously contrast-enhancing lesion encasing the internal carotid artery (ICA) with expansion of the CC on computed tomography. Digital subtraction angiography showed no evidence of pICA stenosis, and a good collateral flow was established on balloon occlusion test (BOT) preoperatively. The patient was taken up for surgery under



general anesthesia and brainstem auditory evoked potential neuromonitoring. An anterior petrosal approach was used to dissect the interdural space and identify GSPN and V<sub>3</sub>. The roof of the CC was destroyed by a tumor capsule, which was entered and removed piecemeal. The pICA was encapsulated within the tumor and carefully dissected away from the tumor. Near-total tumor resection was done except for the part tightly adherent to the ICA. The vertical part of tumor extension was also removed maximally due to a wide neck. No

extension was noted into the CS. Histology turned out to be schwannoma. The patient recovered well postoperatively with no evidence of any Horner syndrome, and the abducens nerve function recovered at 3 months follow-up (Figure 2).

#### DISCUSSION

The anatomy of the PA-CS region is intricate with ICA, cavernous sinus, and multiple cranial nerves running along and sitting compact next to each other. Schwannomas,

though rare, are known to occur around this region from different cranial nerves. Their relation to the CS and the ICA has to be delineated preoperatively to decide on the surgical corridor for better postoperative outcome, considering the benign nature of the disease.<sup>8</sup> CSP, the rare site of origin for schwannomas in this region, arises from the internal carotid nerve (ICN), which is a direct continuation of the superior cervical ganglion. The ICN ascends with the ICA in the carotid canal to give a larger lateral branch forming the internal carotid plexus

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