

Cervical Sympathetic Chain Schwannomas:

A Global Narrative Review Provides Insight on Diagnostic, Treatment, and Outcomes

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Abstract

Objective: This study reviewed the diagnostic approach, surgical treatment and outcomes of Cervical Sympathetic Chain Schwannomas (CSCS) to guide clinical decision-making.

Data Sources: Medline, EMBASE, and Cochrane databases

Review Methods: A literature review from 1998 to 2013 identified 156 articles of which 51 representing 89 CSCS cases were evaluated in detail. Demographic, clinical and outcomes data were extracted by two independent reviewers with high inter-rater reliability ($\kappa=0.79$). Cases were mostly international (82%), predominantly treated in Asia (50%) and Europe (27%).

Results: On average, patients were 42.6 years old (SD=13.3) and had a neck mass ranging 2 to 4 cm (52.7%) or >4 cm (43.2%). Nearly 70% of cases were asymptomatic at presentation. Pre-surgical diagnosis relied on CT (63.4%), MRI (59.8%) or both (19.5%), supplemented by cytology (33.7%) which was nearly always inconclusive (96.7%). U.S.-treated cases were significantly more likely to receive pre-surgical MRI than internationally-treated cases, but less likely to have cytology ($p<0.05$). Pre-surgical diagnosis was challenging, with only 11% confirmatory accuracy post-surgically. Irrespective of mass size, extracapsular (complete) resection was the most frequently (87.6%) performed surgical procedure. Common post-surgical adverse events (AEs) included Horner's syndrome (91.1%), First Bite syndrome (21.1%) or both (15.7%), with higher prevalence when mass size was >4 cm. AEs persisted in 82.3% of cases at an average 30.0 months (SD=30.1) follow-up time.

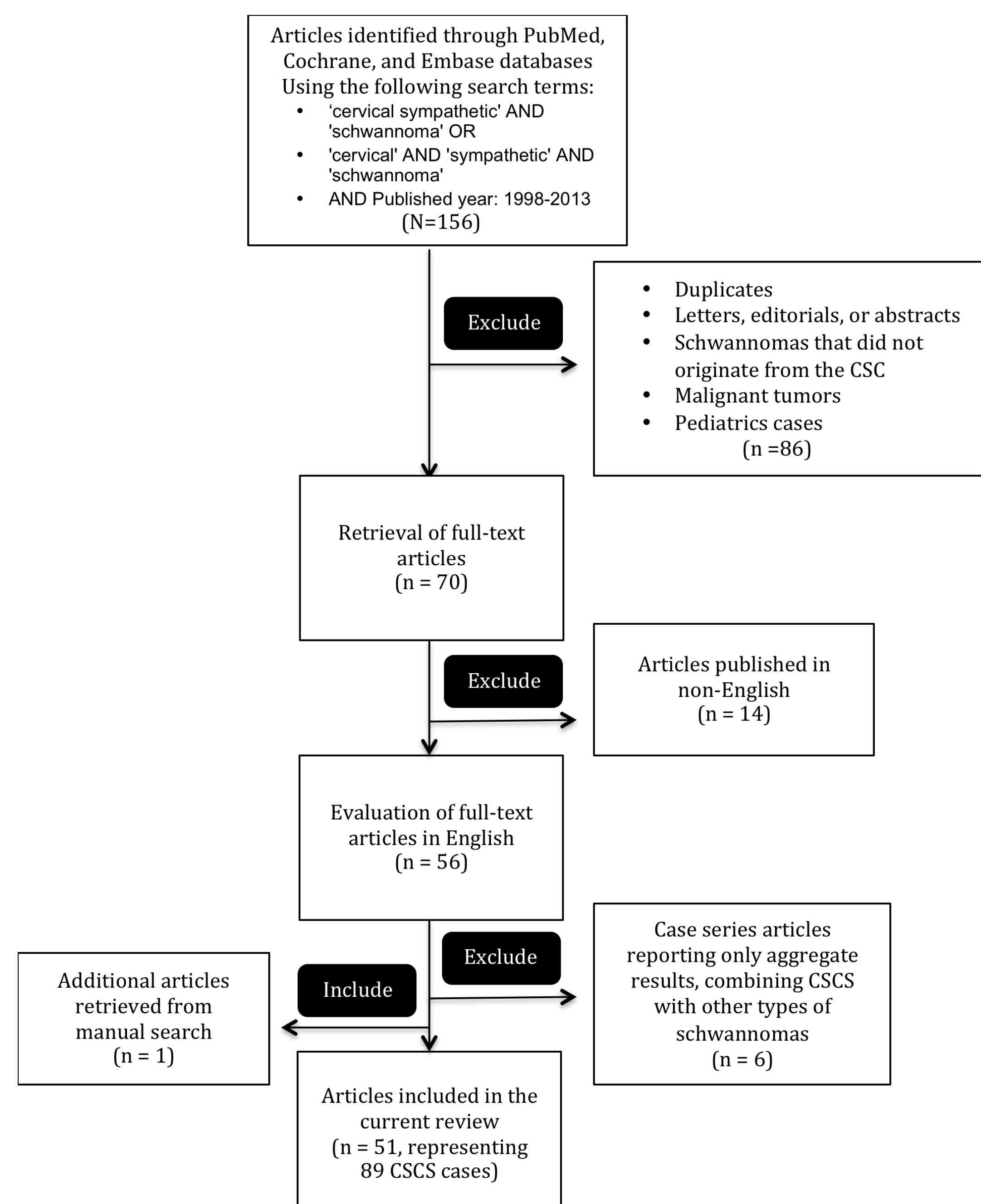
Implications for Practice: Given the typical CSCS patient is young and asymptomatic and the likelihood of persistent morbidity is high with standard surgical approaches, less invasive alternative therapies should be considered.

Introduction

- Schwannomas are slow growing peripheral nerve tumors, the vast majority of which (>90%) are benign.^{1,2}
- The literature on head and neck schwannomas has focused primarily on intracranial acoustic neuromas³⁻⁵, despite the fact that most schwannomas in the head and neck region are non-vestibular and extracranial.⁶
- In the neck, cervical sympathetic chain schwannomas (CSCS) are the 2nd most frequent types of tumor, accounting for 25% of all cases.⁶⁻⁸
- With the exception of one general review published in 1997⁹, no synthesized knowledge-base exists to facilitate clinical decision-making.

Methods

Figure 1. Article Selection Flow Chart



Results

Table 1. Demographic Characteristics and Clinical Profiles of Cases

Variable*	N	%
Age (N=75)		
30 or younger	15	20.0%
31-50	37	49.3%
51-64	18	24.0%
65 or older	5	6.7%
Sex (N=75)		
Male	39	52.0%
Female	36	48.0%
Asymptomatic (N=66)	46	69.7%
Location of mass (N=58)		
Right	27	46.6%
Left	30	51.7%
Bilateral	1	1.7%
Mass size (N=62)		
Small	3	4.8%
Medium	27	43.5%
Large	32	51.6%

*Detailed data at the individual level were available for 77 out of 89 cases. Each variable was computed based on available information with some data missing, as indicated in total N.

Figure 2. Number of Cervical Sympathetic Chain Schwannoma Cases by Treatment Region and Publication Year

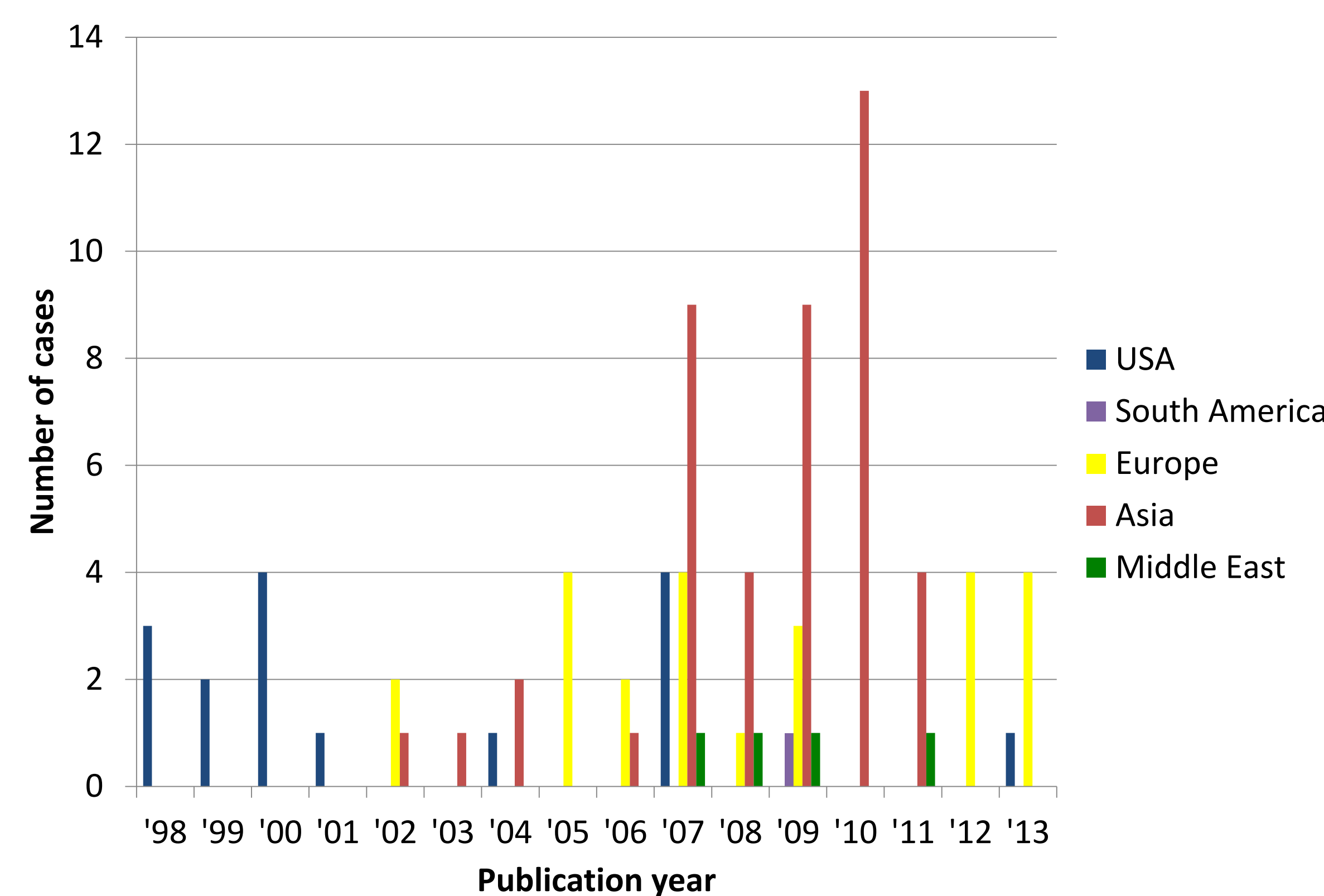


Table 2. Comparative Summary of Diagnostic Approaches Before and After Surgery

Variable	Surgical Work-up			
	Before Surgery		After Surgery	
	N	%	N	%
Diagnostic Approach				
<i>Radiology (Before surgery N=82, After surgery N=62)</i>				
Any Radiology	80	97.6%	2	3.2%
Any CT	52	63.4%	1	1.6%
Any MRI	49	59.8%	1	1.6%
Any US	19	23.2%	-	-
CT + MRI and/or MRA	16	19.5%	-	-
Cases with missing data*	7	7.9%	27	30.3%
<i>Histopathology (Before surgery N=66, After surgery N=84)</i>				
Any Histopathology	9	13.6%	81	96.4%
Cases with missing data*	23	25.8%	5	5.6%
<i>Tumor vascularity (Before surgery N=49, After surgery N=38)</i>				
Any Tumor vascularity	11	22.4%	2	5.3%
Cases with missing data*	40	44.9%	51	57.3%
<i>Cytology (Before surgery N=63, After surgery N=69)</i>				
Any Cytology	30	47.6%	35	50.7%
Cases with missing data*	26	29.2%	20	22.5%
Differential Diagnosis				
Branchial cyst	2	5.4%	0	0%
Carotid body tumor	10	27%	0	0%
CSCS	4	10.8%	89	100%
Lymph node related	6	16.2%	0	0%
Parapharyngeal space mass	4	10.8%	0	0%
Vagal schwannoma	1	2.7%	0	0%
Other**	4	10.8%	0	0%
Inconclusive	6	16.2%	0	0%
Cases with missing data*	52	58.4%	0	0%

*Indicates that N=89 was used to calculate frequency of missing data; **Other diagnoses included thyroid mass, tumor in upper mediastinum, and left lateral cervical mass; - indicates no data were available in original articles.

Table 3. Summary of Surgical Procedures and Outcomes

Variable	N	%
Surgical Procedure (N=89)		
Extracapsular	78	87.6%
Intracapsular	11	12.4%
Horner's Syndrome and Related Sequela (N=79)		
Yes	72	91.1%
No	7	8.9%
Cases with missing data*	10	11.2%
First Bite Syndrome (N=71)		
Yes	15	21.1%
No	56	78.9%
Cases with missing data*	18	20.2%
Horner's Syndrome & First Bite Syndrome (N=89)		
Yes	14	15.7%
No	75	84.3%
Recurrence of Tumor (N=31)		
Yes	1	3.2%
No	30	96.8%
Cases with missing data*	58	65.2%
Adverse Events at follow-up (N=51)		
Complete persistence	40	78.4%
Partial persistence	2	3.9%
Cases with missing data*	38	42.7%

*Frequency calculations were based on N=89.

Conclusions

Differential Diagnostication

- Pre-surgical diagnosis of CSCS remains a substantial challenge for physicians.
- Patients were most often asymptomatic and without neurologic deficits at presentation. When symptoms were present, they were non-specific, suggestive of many competing explanatory diagnoses including paraganglioma, carotid body tumor, brachial cleft cyst, vagal schwannoma, malignant lymphoma, and metastatic cervical lymphadenopathy.⁶¹
- Fine needle aspiration cytology offered little pre-surgical utility in discerning the diagnosis of CSCS.
- MRI with contrast was reported to be essential in the pre-surgical differential diagnosis of CSCS.^{34,51,62}

Prevalence of Post-Surgical Adverse Events

- Prevalence of sustained morbidity following surgery was not minor.^{9,63,64}
- The most pervasive complication following surgery was Horner's Syndrome (HS) for which there is no effective treatment
 - ✓ HS can affect Health-related quality of life (HRQoL) by resulting in distortion of the eyelid and pupils affecting facial aesthetics, visual impairment, and pain.⁶⁶⁻⁶⁹
- In addition to HS, approximately 1 in 5 cases evaluated in this review developed First Bite Syndrome (FBS).
- Although intracapsular enucleation has been shown to result in less morbidity than extracapsular resection due to nerve preservation, only ~12% of patients received this less invasive surgical procedure.⁶⁵

Study Limitations

- Limited to level IV evidence (case reports or case series).
- Relatively poor quality publications due to large volume of missing data.
- Unknown influences of potential confounders, such as physician preferences or health insurance payers, on the use of pre-surgical diagnostic procedures.
- Case identification process was limited to articles that were published in English language. However, review included the vast majority of cases from international sources (84%), thus it is unlikely that the results would be markedly different with the inclusion of the few non-English articles.

Future Directions

- A multitude of factors could account for variations in the choice of diagnostic procedures and surgical technique such as surgeon preferences, aptitudes, skills, and training; patient preferences; and health insurance payers. These factors should be examined to determine which are mutable and which are not.
- Need clinical guidelines for best practices for CSCS diagnosis and treatment.
- Relative to more invasive surgical intervention, alternative treatments that rely on the use of advanced technologies such as Gammaknife^{70,71}, Cyberknife⁷²⁻⁷⁵, Novalis Tx linear accelerator system⁷⁶, and frameless fractionated stereotactic radiotherapy⁷⁷ should be investigated given they have been shown to lower the risk of morbidity, result in long-term tumor growth control, and yield better HRQoL outcomes for other benign schwannomas.^{4,78-84}
- The most common influencers that have been shown to impact the use of less invasive therapeutic modalities include tumor size⁸⁵⁻⁸⁷ and patient⁸⁸ or physician⁸⁹⁻⁹¹ preferences.

References

- Available from Maryam Navaie, Dr.P.H., President and Chief Executive Officer, at mnavaie@advancehealthsolutions.com.