



Abstract

Introduction: Vestibular schwannomas (VS) are benign intracranial tumors, which may manifest clinically due to their mass effect on the vestibulocochlear nerve. Several surgical and non-surgical approaches have been implemented to definitively treat these tumors, including a recent trend of increasing utilization of stereotactic radiosurgery. The aim of the present study was to describe the recent trends in utilization of traditional surgical approaches to VS; namely middle cranial fossa (MCF), retrosigmoid (RS), and translabyrinthine (TL) approaches.¹

Methods: A retrospective review was performed of the ACS-NSQIP database performed from 2008-2016 using ICD-9/10 codes 225.1 and D33.3, respectively for VS. Surgical patients were further identified using the CPT codes 61591, 61520, and 61596, which represent middle cranial fossa (MCF), retrosigmoid (RS), and translabyrinthine (TL) approaches, respectively. Statistical analyses for significance of trend linearity were performed using the R statistical package.

Results: A total of 1407 cases were identified. 29 patients (2.1%) underwent TL, 114 (8.1%) underwent MCF and 1264 (89.8%) underwent RS. The method of resection utilized was found to be statistically significant ($p < .0001$) with individual tests for linearity of trend data for each approach.

Conclusions: Changes in the surgical management of VS are evident with utilization of the RS approach that is both rapidly increasing and outpacing the MCF and TL approaches, which have remained relatively stable over time. This may reflect a changing approach to management of VS where only large, clinically significant tumors are managed via open resection.

Introduction

Vestibular schwannomas are diagnosed in 2.9–8.1% of patients presenting with unilateral sensorineural hearing loss.² Decisions guiding treatment of these lesions are usually based on the severity of symptoms including degree of hearing loss, mass effect on critical neurological structures, severity of medical comorbidities, and evidence of rapid growth. Currently, treatment options include gross total resection, stereotactic radiosurgery, and/or observation. Gross total resection remains the treatment of choice for lesions exerting significant mass effect on critical neurological structures. In parallel, stereotactic radiosurgery has been well established for over 20 years and observation has similarly been reserved for patients who are deemed to be poor surgical candidates. As our knowledge regarding the natural history of vestibular schwannomas continues to expand, it becomes clear more patients are being closely observed with routine follow-up, and stereotactic radiosurgery has given way as a more minimally invasive means to manage this clinical condition.³ As a result, this study aims to characterize new perspectives in the surgical management of vestibular schwannoma, as this will guide otolaryngologists in understanding current practice patterns within the United States.

Methods and Materials

Patients who underwent surgical resection for VS were identified using ICD-9/10 codes 225.1 and D33.3m respectively. The specific technique employed was queried via the ACS-NSQIP database from 2008-2016 utilizing CPT codes 61591, 61520, and 61596, which represent middle cranial fossa (MCF), retrosigmoid (RS), and translabyrinthine (TL) approaches, respectively. Basic descriptive statistics and Kruskal-Wallis tests were performed. In addition, one-way ANOVA were implemented for comparative analysis. Tests for linearity for the yearly trends for each surgical approach were performed using the R statistical package.

Results

A total of 1407 cases were identified. 29 patients (2.1%) underwent TL, 114 (8.1%) underwent MCF and 1264 (89.8%) underwent RS. The utilization of each method of resection was found to be statistically significant ($p < .0001$). Tests for linearity of the trend for each surgical approach were similarly all found to be statistically significant ($p < .0001$). Furthermore, differentiation by primary surgeon demonstrated differences between each approach as highlighted in the table below.

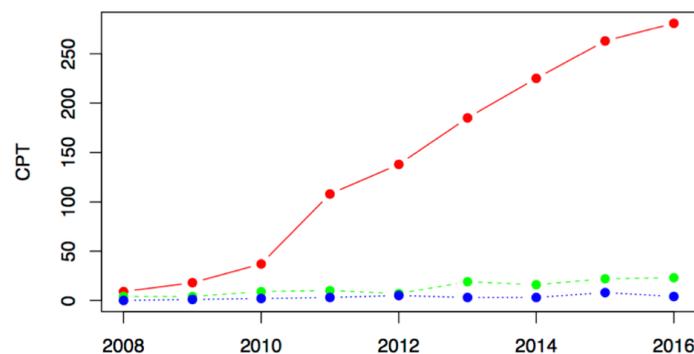
Results

The interpretation of the following trend analysis is that there exists a linear relationship between time and the utilization of each surgical approach. In comparison, no significant linearity would represent the null hypothesis of no trend in utilization of each approach over time. The RS approach has a positive linear relationship with respect to time, whereas the MCF and TL approaches are relatively stable overtime.

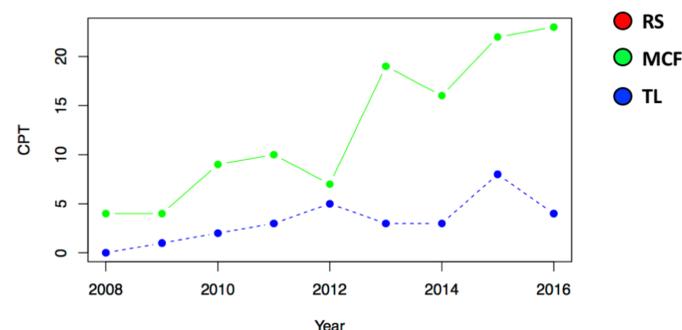
	Number of Cases (% total)	Mean Cases per Year	Primary Surgeon	
RS	1264 (89.8%)	140.4	ENT: 39 (3.1%)	Neuro: 1220 (97.5%)
MCF	114 (8.1%)	12.6	ENT: 80 (70.2%)	Neuro: 34 (29.8%)
TL	29 (2.1%)	3.2	ENT: 19 (65.5%)	Neuro: 10 (34.5%)
Sum	1407			

	2008	2009	2010	2011	2012	2013	2014	2015	2016
RS	9	18	37	108	138	185	225	263	281
MCF	4	4	9	10	7	19	16	22	23
TL	0	1	2	3	5	3	3	8	4
Sum	13	23	48	121	150	207	244	293	308

61520 (Red), 61591 (Green) and 61596 (Blue) vs YEAR



61591 (Green) and 61596 (Blue) vs YEAR



Discussion

The results of this study demonstrate changes in the surgical management of VS in recent years with RS becoming the dominant approach for open resection. In contrast, utilization of the MCF and TL approaches has remained low over the included study period. These trends may reflect the fact that the RS approach has demonstrated utility in addressing large, symptomatic tumors along with decreased injury to the facial nerve as compared to other open approaches.³ These trends may also result from the relative favorability of watchful waiting and radiosurgery for the management of smaller tumors without overt neurological deficits.⁴ These trends are relevant as they highlight a potential shift in the optimal management of VS.

Conclusions

Our analysis demonstrates a trend toward increased utilization of the RS approach as the preferred method for open resection of VS. Utilization of the MCF and TL approaches has remained low over time and is indicated in only select clinical situations. These trends may reflect favorable access to large tumors with the RS approach and the likely benefits of observation and/or radiosurgery for smaller tumors.

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