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Is improved detection of vestibular schwannoma leading to overtreatment of the disease?

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To the Editor

It is commonly held that the modern management of sporadic vestibular schwannoma (VS) is more conservative than in previous decades. This belief stems from the observation that an increasing proportion of patients now undergo an initial period of surveillance with serial imaging following diagnosis.¹ Paralleling this relative shift towards conservatism, the incidence of VS has significantly increased over recent decades.^{2,3} The rising incidence has largely been attributed to a heightened detection of small, often incidentally diagnosed tumors secondary to increasing access to high-resolution neuroimaging and screening protocols for asymmetrical sensorineural hearing loss.^{3,4}

However, the rising incidence of sporadic VS begs the question: In light of the widespread notion that modern management is more conservative than decades prior, has the incidence of *treated* VS actually decreased over time? In this way, is the belief that the management of VS is more conservative today simply driven by the fact that we are increasingly observing a subset of small tumors that were not previously detected during a patient's lifetime?

Using the same methodology as described in the articles by Marinelli, et al.,^{3,5} we attempt to address these questions within our population-based cohort in two ways. First, we examine the incidence of all treated VS from 1966 through 2016. Second, as a surrogate measure of

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disease severity, we describe trends in patient age, tumor size, and tumor location of treated VS over time.

Figure 1A shows that the incidence of all treated VS (i.e., microsurgery or radiosurgery) significantly increased over the past 50 years ($p<0.001$). Figure 1B shows that the incidence of microsurgery-treated VS did not significantly change over the study period ($p=0.48$).

The median age at treatment for all treated VS significantly increased over the past 50 years (Table, $p<0.001$). By contrast, the median extracranial tumor size decreased; however, the trend was not statistically significant ($p=0.11$). Of the tumors treated with microsurgery or radiosurgery in recent years, significantly more were confined to the internal auditory canal (IAC) compared to decades prior ($p<0.001$). This trend was similar when including patients managed with microsurgery only, with 62% of treated tumors confined to the IAC in the most recent decade compared to only 3% in the first three decades combined ($p<0.001$).

Taken together, the incidence trends of treated VS observed in these data suggest that the modern management of sporadic VS is not more conservative than in previous decades, with some evidence even suggesting the contrary. While the proportion of persons *diagnosed* with VS who are initially observed has significantly increased in recent years, the proportion of persons *treated* for VS in the general population has continued to increase, as well.

Thus, the impression that VS management has become more conservative over time appears to be driven by the rising incidence of VS. In reality, despite the proportion of small tumors that undergo an initial period of observation, the rising incidence of VS could actually be causing the management of VS to become more aggressive over time (i.e., more patients are treated for VS today than ever before). In this way, many patients with small tumors who are treated today would have likely lived their entire life having never known of their tumor in previous decades. Regarding the potential counterargument that these management trends could be unique to the Olmsted County patient population, it's worth noting that 70% of newly diagnosed VSs in Olmsted County undergo an initial period of observation – a proportion that exceeds current national trends.^{1,3}

We believe that these data underscore the importance of carefully considering an initial period of surveillance with serial imaging following diagnosis – especially considering that the treatment of small tumors increases upfront cost without showing quality of life benefit.⁶ Perhaps, even tolerance of slow growth in intracranial or small cerebellopontine angle tumors may be acceptable, as improved detection of VS could be contributing to overtreatment of the disease. Worth noting, these aforementioned conclusions hinge on the intuitive, but unverified theory that the rising incidence of VS is solely attributable to increased detection rather than stemming from a true biological shift in disease epidemiology.

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Figure 1A:
Incidence of all treated VS

Figure 1B:
Incidence of VS cases treated with microsurgery

Table.

Descriptive information for treated VS.

Feature	Calendar year period			P-value
	1966–1995	1996–2005	2006–2016	
VS TREATED WITH MICROSURGERY AND RADIOSURGERY (N = 94)				
Treatment age, yrs *	51 (45–65)	52 (40–60)	61 (54–71)	< 0.001
EC tumor size, cm (N = 52) *	2.5 (1.4–3.0)	1.4 (1.0–2.5)	1.2 (1.0–2.4)	0.11
Tumor location (N = 93) †				
IAC only	1 (3)	8 (31)	19 (50)	< 0.001
IAC and CPA	28 (97)	18 (69)	19 (50)	
VS TREATED WITH MICROSURGERY ONLY (N = 68)				
Treatment age, yrs *	51 (45–65)	51 (39–58)	56 (51–61)	0.53
EC tumor size, cm (N = 38) *	2.5 (1.4–3.0)	1.4 (0.8–2.6)	2.6 (2.3–3.0)	0.56
Tumor location (N = 67) †				
IAC only	1 (3)	5 (23)	10 (62)	< 0.001
IAC and CPA	28 (97)	17 (77)	6 (38)	

EC = extracranial; IAC = internal auditory canal; CPA = cerebellopontine angle

* Age and tumor size are reported as median and interquartile interval (25th percentile, 75th percentile). The p-value is from the Spearman rank correlation test.

† Tumor location is reported as number of persons and percent; N (%). The p-value is from the Wilcoxon rank sum test.