The Clinical Implications of Spontaneous Hemorrhage in Vestibular Schwannomas

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Disclosures

The authors have documented that they have no financial relationships to disclose or Conflicts of Interest to resolve.
Introduction

Spontaneous hemorrhage in vestibular schwannomas (HVS)
• Rare phenomenon, <60 reports in published literature
• Reports of higher facial nerve dysfunction and mortality rates

Aims
1. What clinical and demographic factors may be associated with spontaneous hemorrhage in VS?
2. Does surgical intervention and clinical outcomes for HVS differ from non-hemorrhagic counterparts?

Figure. Representative (A-D) pre-operative images of a 79yo female on Coumadin presenting with acute headache, HB4 facial paralysis, and vocal cord dysfunction. Following urgent surgery, she recovered some swallowing ability albeit with persistent facial weakness. (E,F) Post-operative MRI obtained 6 months later with expected residual tumor.
Methods

• Systematic review of PubMed-indexed articles in last 50 years using PRISMA guidelines

• Retrospective review of own institutional experience over past 5 years

• HVS defined as presence of 2 of following criteria: histopathology, pre-operative imaging, gross (intra-operative) appearance
Results

Patient demographics and clinical presentation

- 53 patients from 28 publications
- Females: 28/53 (52.8%)
- Age: mean 53 years (range: 15-79)
- Anticoagulant/antiplatelet use: 9/53 (17%)
- Hearing loss (88%)
- Headache (70%)
- Facial weakness (House-Brackmann grade \( \geq 3 \)) (59%)
- Vertigo (55%)
- Facial numbness (43%)
Results

A trend towards larger tumors causing significant facial weakness

- Mean HVS tumor size was 3.1cm, larger than typically reported values of <2 cm for all VS in large databases
- Patients with improvement of facial weakness after surgery had significantly larger tumors, regardless of extent of resection

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<th>Yes</th>
<th>No</th>
<th>p-value</th>
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<tbody>
<tr>
<td>Pre facial weakness</td>
<td>3.29</td>
<td>2.80</td>
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<td>Pre facial numbness</td>
<td>3.31</td>
<td>2.91</td>
<td>0.13</td>
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<tr>
<td>Pre swallowing difficulties</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Pre vertigo</td>
<td>3.03</td>
<td>3.16</td>
<td>0.644</td>
</tr>
<tr>
<td>Pre headache</td>
<td>3.17</td>
<td>2.95</td>
<td>0.422</td>
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<td>Pre hearing loss</td>
<td>3.15</td>
<td>2.72</td>
<td>0.168</td>
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Table. Average tumor sizes (cm) for patients with vs. without pre-operative symptoms.
Results

Surgery improved most symptoms, including facial weakness

<table>
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<th>Symptom</th>
<th>Prec</th>
<th>Post</th>
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<tr>
<td></td>
<td>N</td>
<td>%</td>
<td></td>
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<tr>
<td>Facial weakness</td>
<td>25</td>
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<tr>
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<td>18</td>
<td>46.2</td>
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<td>Swallowing difficulties</td>
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<td>Vertigo</td>
<td>22</td>
<td>56.4</td>
<td>&lt;0.001</td>
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<tr>
<td>Headache</td>
<td>29</td>
<td>74.4</td>
<td>&lt;0.001</td>
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<tr>
<td>Hearing loss</td>
<td>36</td>
<td>92.3</td>
<td>0.711</td>
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</table>

Table. Comparison of rates of symptoms pre- and post-operatively.

Extent of resection data available in 35/53 patients
GTR: 21/35 (60%)
STR: 14/35 (40%)

Extent of resection did not influence degree of symptom improvement after surgery.
Results

Etiology of HVS

3 samples of HVS vs age-matched non-HVS for CD31 vessel staining

- HVS showed increased thin-walled, ectatic vessels, as well as increased vascular permeability and hypervascularity

No effect of blood-thinning medications

- 17% (9/53) of patients
- Did not influence degree of symptom improvement after surgical intervention
- Did not predict increased tumor size at time of presentation

HVS

Age-matched non-HVS
Discussion and take-home points

1. Compared to historical data for all VS, patients with HVS had relatively higher rates of peri-operative mortality, significant pre-operative facial weakness, and harbored relatively larger tumors that may be secondary to blood clot rather than intrinsically larger tumor size.

2. Surgery for HVS may result in significant improvement of facial weakness, among other symptoms, regardless of EOR.

3. Evacuation of mass effect may be considered the primary goal of surgery in HVS, especially for those who are particularly ill.

4. Symptomatic patients with HVS should be treated expeditiously, especially given that facial nerve dysfunction, which is identified in more than half of patients with HVS, appears to be reversible.

5. Factors underlying spontaneous hemorrhage in VS remain unclear and may be secondary to intrinsic tumor characteristics and/or existing coagulopathy.