Trends in Vestibular Schwannoma Management from 2001-2012 Using HCUP Database

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Abstract

Introduction: Multiple studies have shown a trend towards observation and radiotherapy for vestibular schwannoma (VS) over the past two decades.

Objective: To determine trends in management for VS over an eleven year period.

Methods: Cross-sectional analysis of National Inpatient Sample (NIS) of Healthcare Cost and Utilization Project (HCUP). ICD diagnosis and procedure codes were used to search the database. Spearman correlation coefficients were calculated.

Results: Data was extracted for 20,780 patients undergoing surgical resection of VS. The number of patients undergoing VS resection has decreased from 2,807 in 2001 to 1,900 in 2012. The Spearman’s rho revealed a significant relationship between year and number of patients undergoing surgery ($r = -0.63, p = .048$). Charges increased by $156\%$ from 39,093 to 100,231 ($r = .97, p < .0001$). Length of hospital stay between 2001 and 2012 has remained stable (5.23 days versus 5.22). Over the same time period, charges for stereotactic radiation (SR) have increased by 258$\%$ from $12,750$ to $45,710$ ($r = .97, p < .0001$). Hospital charges for all discharges increased by 145$\%$ from $14,957$ to $36,701$.

Conclusion: Surgery rates have declined over the past decade. In addition, while length of stay has remained stable, overall charges for surgery have increased.

Methods and Materials

The HCUP databases contain clinical and nonclinical information including diagnoses and procedures, discharge status, patient demographics, and charges for all patients. The Nationwide Inpatient Sample (NIS) is the largest publicly available inpatient health care database in the US. This study was a retrospective review using the NIS database 2001 through 2012. Relevant ICD-9 diagnosis codes and procedure codes were used. Values less than 0.05 were considered statistically significant.

Results Summary

- A total of 20,780 patients underwent surgical resection of VS from 2001 to 2012.
- Rates of discharges (per 100,000) and mean length of stay did not significantly change.
- Overall charges for patients undergoing microsurgery significantly rose from 2001 to 2012, a 156$\%$ increase.
- The number of patients undergoing microsurgery significantly declined from 2001 to 2012, a 47$\%$ decrease.
- Costs for SR also significantly increased from 2001 to 2012, a total of 258$\%$.
- The increases in cost for both microsurgery and SR have outpaced cost trends for all hospital discharges during this time period.

Discussion

This project analyzed VS management trends and costs using the NIS database. In line with prior research, our trends show a declining number or patients undergoing microsurgery for VS. This points to an overall trend towards conservative management, which might be attributed to their earlier detection with MRI. With earlier detection, tumor size at diagnosis is also decreasing, compared to about 3 cm during the late 1970’s to about 1 cm during the early 2000’s. Another study shows that almost half of all tumors are now being diagnosed at less than 1.5 cm. These factors may play a role in a larger proportion of tumors being treated with observation and SR.

This study also demonstrated significant increases in costs for both microsurgery and SR, with SR increasing by a much higher percentage (258$\%$ vs. 156$\%$ respectively). Compared to national trends which show average hospital costs (adjusted for inflation) increasing by an average of 2.0 percent per year between 2003 and 2011, the costs for management of VS have far outpaced this growth. This may be due to the complex interdisciplinary management required for these tumors, and providers should be cognizant of these costs. It remains to be seen if these costs will plateau or decrease in the coming years, in line with national predictions.

There is limited data available when comparing effective costs of microsurgery versus SR, but there seems to be suggestion that SR may be more cost effective than microsurgery in the short term for tumors less than 3 cm. Hospitalization costs for those undergoing microsurgery tend to be higher compared to SR, but follow-up for SR is greater, possibly because of a higher chance of recurrence. For patients who initially receive SR and ultimately require microsurgery, those overall cost benefits are lost. Also important to consider are indirect costs (such as time lost from work) which are less with SR given shorter recovery times. A prior study has shown the average number of workdays lost after microsurgery was 160, compared to only 8 after SR.

This study has several limitations inherent to database research. Many variables are not available for review, such as tumor size, surgical approach, or whether SR was used as primary or adjuvant therapy, etc. These all may affect treatment planning and overall costs.

Conclusions

- Overall rates of microsurgery are declining.
- Costs of both SR and microsurgery are increasing at higher rates when compared to overall hospital charges, with a greater percentage increase in SR costs.

Table 1. Summary of charges, discharge rates (per 100,000), and surgical resections for VS.

<table>
<thead>
<tr>
<th>Year</th>
<th>2001</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td># Resection</td>
<td>2,807</td>
<td>1,900*</td>
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<tr>
<td>Overall Charges</td>
<td>$39,093</td>
<td>$100,231*</td>
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<tr>
<td>Discharge Rate</td>
<td>1.3</td>
<td>0.9</td>
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References