Impact of Insurance Status and Race on Receipt of Surgery for Acoustic Neuroma: A National Cancer Database Analysis

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Background

- **Acoustic neuroma (vestibular schwannoma)**
  - First discovered postmortem in 1777 by Sandifort
  - Benign tumors arising from Schwann cells, usually from the superior vestibular nerve
  - Typically presents with
    - Unilateral sensorineural hearing loss
    - Tinnitus
    - Imbalance
  - Annual incidence in the United States is 1 per 100,000
  - Approximately 2,500 new cases are diagnosed annually
Background

• The MRI era has allowed an increasing number of acoustic neuromas to be identified
  – Has led to a decrease in the size at diagnosis over the past decade in the United States (Carlson et al., 2015)
    • Size between 0-2 cm increased from 38.3% to 50.7% between 2004 and 2011
  – More difficult with CT due to their small size
Background (continued)

- Acoustic neuromas often arise near important structures
  - Brainstem
  - Adjacent cranial nerves

- Tend to enlarge within the first 1-2 years of diagnosis

- Predominant goals of acoustic neuroma (AN) treatment
  - Avoidance of injury to the brainstem
  - Avoidance of injury to adjacent cranial nerves
  - Prevention of tumor growth
Background (continued)

• In addition to gadolinium-enhanced MRI, comprehensive evaluation involves audiometric and vestibular testing.

• If AN is suspected following evaluation, there are four major treatment options:
  – Observation with serial MRIs
  – Microsurgical excision
  – Stereotactic radiosurgery
  – Fractionated stereotactic radiotherapy

• Due to the lack of Level I evidence, patient choice of treatment modality is greatly influenced by physician bias (Pogodzinski et al., 2004)
Background (continued)

- Most traditional approach = Microsurgical excision
  - Advantages
    - Tumor removal
    - Pathologic confirmation of diagnosis
  - Disadvantages
    - Increased hospitalization
    - Increased morbidity and mortality

- However, over the past decade there has been a general shift away from microsurgery and towards radiation for AN (Lau et al., 2012)
  - The rate for observation has remained stable
Previous studies involving a nationwide inpatient database have demonstrated that in-hospital morbidity and mortality following AN surgery is significantly higher in patients who are

- African American
- Without private insurance
Background (continued)

• The adjusted in-hospital mortality relative risk for African-Americans following AN surgery is 10.6 compared with Caucasian patients (Curry et al., 2009)

• There have been no studies examining the impact of insurance status and race on the receipt of surgery, radiation or observation for AN

• This study was performed to address this void by using a national cancer registry over a recent 10-year period
Methods

• The National Cancer Database (NCDB) was the data source for this study
  – Hospital-based cancer registry sponsored jointly by the American College of Surgeons and the American Cancer Society
  – Contains de-identified data on 70% of all newly diagnosed cancers in the United States
  – Has recorded nonmalignant central nervous system tumors (such as AN) since January 1, 2004
  – This study utilized data from 2004 through 2013
Methods (continued)

• The International Classification of Diseases for Oncology (ICD-O-3) codes were used for inclusion/exclusion criteria
  – Patients at least 18 years old with “neurilemmoma” (ICD-O code 9560) and “neuroma” (ICD-O code 9570) were selected
  – From this group, patients with ICD-O topography code of C72.4 (acoustic nerve) for their tumor primary site were retained to comprise the primary cohort for this study
  – To eliminate the possibility of analyzing patient data from death certificates or at autopsy, any patient without active follow-up information was excluded
Methods (continued)

• The NCDB site-specific sequence variables categorized treatment
  – Surgery group = Microsurgery defined as either gross or subtotal resection
  – Radiation group = Patients without microsurgery who had a radiation code indicating that beam radiation had been performed either at a medical oncology center or a hospital inpatient radiation treatment center
  – Observation group = All AN patients who did not receive microsurgery or radiation therapy

• Data collection involved demographic data for
  – Age, race, gender, income, geographic location
  – Type of hospital (academic/research facility, comprehensive cancer center, community, integrated network)
Methods (continued)

• Data collection also included involved demographic data for
  – Primary payer (Medicare, Medicaid, other government, private, no insurance)
  – Type of county (metropolitan or not)
  – Education (high school graduate or not)
  – Region of the United States (East/Atlantic, Central, West)
  – Income (median household income > $48,000)
  – Medical comorbidities (Charlson-Deyo score)
  – Tumor size

• Multivariate logistic regression was performed to determine the effects of patient/tumor characteristics on receipt of surgery, radiation, or observation for AN
Results

- The NCDB contained 11,614 patients in the United States from 2004-2013
  - Mean age = 51
  - 46% were men
  - 87% were white; 4% were African-American
  - 73% had private insurance; 15% had Medicare
  - 5% had Medicaid, 2% had other government insurance, and 3% had no insurance
  - 2/3 of patients had median household income at least $48,000
  - More than 70% of patients lived in an area of at least 250,000 people
Results (continued)

• Treatment centers
  – Academic/research facility = 54%
  – Comprehensive cancer center = 20%
  – Integrated network = 6%
  – Community hospitals = 1%

• Median tumor size = 2.1 cm

• 10,136 patients received surgery only
Receipt of Surgery

• Patients less likely to receive surgery for AN
  
  – Elderly (at least age 65)
    • OR = 0.4; 95% CI = 0.4-0.6; p < 0.0001

  – African-American
    • OR = 0.7; 95% CI = 0.5-0.9; p = 0.01

  – Medicare insurance
    • OR = 0.6; 95% CI = 0.4-0.7; p = 0.0005

  – Community hospital treatment
    • OR = 0.4; 95% CI = 0.2-0.7; p = 0.007
Receipt of Surgery (continued)

• Patients more likely to receive surgery for AN
  – Medicaid insurance
    • OR = 1.2; 95% CI = 0.8-1.8; p = 0.04
  – Charlson/Deyo comorbidity score of 1
    • OR = 1.9; 95% CI = 1.5-2.3; p = 0.002
  – Central United States residence
    • OR = 1.6; 95% CI = 1.4-1.9; p = 0.006
  – Integrated network treatment
    • OR = 1.2; 95% CI = 0.9-1.6; p = 0.0004
Conclusions

• The median acoustic neuroma tumor size in this study (2.1 cm) allowed for true clinical equipoise between the choice of surgery, radiation, and observation.

• Elderly patients and African-Americans were less likely to receive surgery.

• Patients on Medicare or treated at community hospitals were triaged away from surgery.
Conclusions

• However, patients on Medicaid or treated at integrated networks were triaged towards surgery.

• Given previous work regarding race and insurance status, findings from this study are best interpreted as follows:
  – The triaging of African-Americans and Medicare patients away from AN surgery may be beneficial.
  – The triaging of Medicaid AN patients towards surgery is likely detrimental.
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