Hearing Preservation After Gamma Knife Radiosurgery for Gardner Robertson Class 1 Patients with Acoustic Neuromas

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Introduction

Acoustic neuroma patients with Gardner Robertson (GR) class I hearing seek to maintain hearing whenever possible. We evaluated hearing outcomes in GR class I acoustic neuroma patients before and after Gamma Knife stereotactic radiosurgery (GKSRS).

Methods

Sixty-eight patients with GR class I hearing underwent GKSRS for previously untreated acoustic neuromas. Twenty-five patients had no subjective hearing symptoms (Group A) and 43 patients reported subjective hearing loss (Group B) before GKSRS. Patient demographics, GR class, pure tone audiogram (PTA), speech discrimination scores (SDS), tumor volume, radiosurgical technique and doses, and time intervals between audiograms were recorded for each patient. Data reported as Mean ± Standard Error (SEM).

Results

Patient ages were different between Group A (43.0±2.5 years) and Group B (50.9±1.4 years, p=0.005). Pre- and post-GKSRS PTA scores for Group A were 12.8±1.4 dB and 15.2±1.5 dB (p=0.028), while scores for Group B were 21.4±1.1 dB and 45.5±2.9 dB (p<0.001). Pre- and post-GKSRS SDS scores for Group A were 97.7±0.8% and 97.8±0.6% (p=0.802), while scores for Group B were 91.1±1.3% and 56.7±5.5% (p<0.001). Twenty-three (96%) patients in Group A and fifteen (35%) patients in Group B retained GR class I status. One patient (4%) in Group A and eleven patients (25%) in Group B progressed to GR class II. Eighteen patients (40%) in Group B had progressive hearing loss (GR class III, IV or V). There were no differences in tumor volumes (2.2±0.6 cc versus 1.9±0.3 cc, p=0.348), cochlear radiation doses (4.0±0.3 Gy versus 4.2±0.2 Gy, p=0.289), GKSRS margin dose (12.4±0.05 Gy versus 12.5±0.02 Gy, p=0.225), or time between audiograms (2.8±0.3 years vs. 2.9±0.3 years, p=0.387).

In Group A, the rate of hearing preservation within the same GR class was 100% at 1 year, 91% at 2 year, 91% at 3 years. In Group B, the rate of hearing preservation within the same GR class was 60% at 1 year, 31% at 2 years, and 20% at 3 years. Group A, subjectively asymptomatic, was significantly associated with higher rate of hearing preservation within the same GR class (p< 0.0001) (Fig. 1).

In Group A, the rate of hearing preservation within serviceable hearing (GR grade I or II) was 100% at 3 years. In Group B, the rate of hearing preservation within serviceable hearing was 81% at 1 year, 60% at 2 years, and 57% at 3 years. Group A, subjectively asymptomatic, was significantly associated with higher rate of hearing preservation within serviceable hearing (p< 0.0005) (Fig. 2).

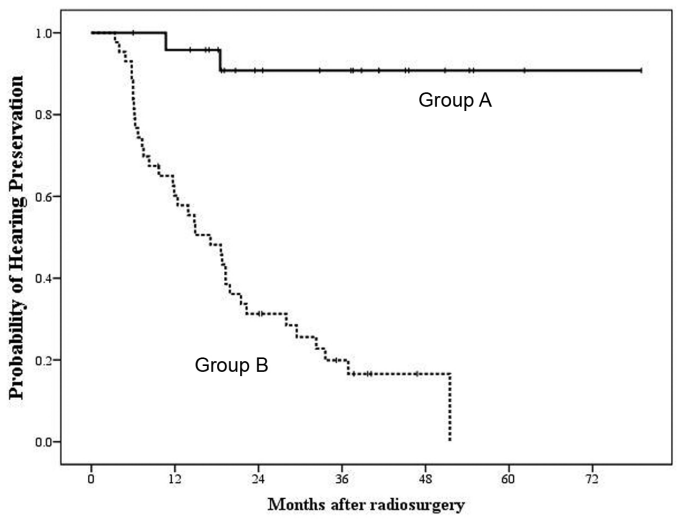
Conclusions

GKSRS provides excellent hearing retention in GR class I acoustic neuroma patients with or without pre-procedural subjective hearing loss. No subjective hearing loss in patients with GR class I acoustic neuroma was significantly associated with higher rate of hearing preservation. We suggest that patients with or without subjective hearing loss consider early radiosurgery.

Learning Objectives

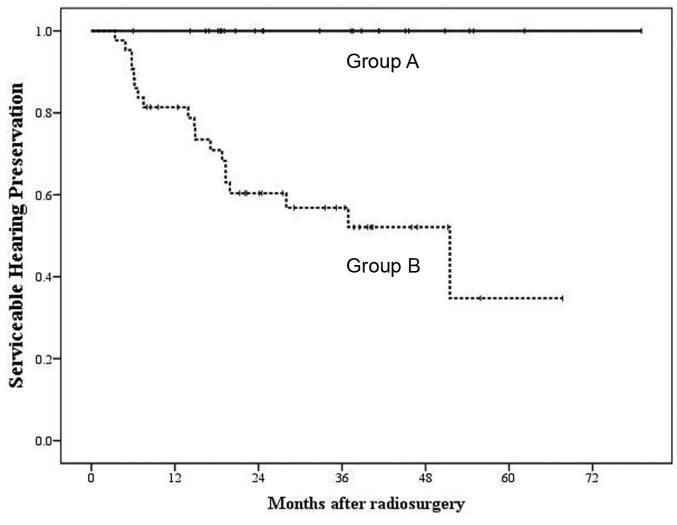
This work describes (1) rates of hearing preservation after stereotactic radiosurgery for acoustic neuromas with patients with Gardner Robertson class 1 hearing; (2) provides a framework for counseling patients prior to radiosurgery about procedural risks; (3) demonstrates preservation of useful post-procedural hearing in a vast majority of patients with or without hearing loss.

Figure 1



Probability of hearing preservation after SRS

Figure 2



Searviceable hearing preservation after SRS