Cochlear Function as a Novel Predictor of Hearing Preservation in Vestibular Schwannomas After Stereotactic Radiosurgery

Amparo M Wolf MD PhD; Svetlana Kvint MD; Aram Modrek; Carolina Gesteira Benjamin MD; John G. Golfinos MD; Joshua Silverman MD; Douglas Kondziolka MD, MSc, FRCS(C), FACS

Introduction

Patients with vestibular schwannomas (VS) are now commonly diagnosed earlier when tumors are small and while maintaining good hearing. The optimal timing of stereotactic radiosurgery remains in question, with a goal of maintaining hearing as long as possible. We aimed to evaluate short-term hearing outcomes after radiosurgery in VS patients with serviceable hearing and to identify novel predictors of early hearing loss.

Methods

Using a prospective registry of patients having undergone gamma knife radiosurgery (GKRS), we identified seventy patients with previously untreated unilateral VS and Gardner Robertson (GR) grades I or II hearing. The median imaging and audiological follow-up time was 17 months. The median margin dose was 12Gy and mean cochlear dose was 3.2 Gy. Pre and post GKRS audiograms were reviewed for pure tone averages (PTA), speech discrimination score and the presence or absence of distortion-product otoacoustic emissions (DPOAEs), a measure of cochlear outer hair cell function.

Results

By last follow up, 57 patients (81.4%) retained serviceable hearing. Loss of serviceable hearing occurred in 4 GRI and 9 GRII patients at a mean time of 8.4±1.6 months (4-24 months). Younger GRI patients and high speech discrimination scores were most likely to maintain hearing. Furthermore, of 27 patients with documented DPOAEs prior to GKRS, 10 patients (37%) had robust DPOAEs, reflecting good cochlear function. Of those patients, 100% retained serviceable hearing after GKRS. No significant differences in PTA or speech discrimination were present for GR1 patients with present or referred OAEs.

Conclusions

Normal cochlear function, reflected by robust DPOAES, may be an important predictor of hearing outcomes after GKRS in addition to younger age, GR1 hearing and high speech discrimination scores. DPOAEs may provide useful information about the potential impact of GKRS on hearing and should be included in the audiological evaluation of VS patients.

Learning Objectives

By the conclusion of this session, participants will be able to:

1) identify important known predictors of hearing preservation after gamma knife radiosurgery for vestibular schwannomas

2)understand the basics of otoacoustic emissions testing, and its role in measuring cochlear health

3)identify otoacoustic emissions as a novel predictor of hearing outcomes after stereotactic radiosurgery