Stereotactic Radiosurgery for Glomus Jugulare Tumors: Tumor Control and Complications

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INTRODUCTION

The use of single-fraction stereotactic radiosurgery for the treatment of glomus jugulare tumors (GJT) has been steadily increasing to avoid the morbidity associated with surgery and traditional external beam radiotherapy (References 1-2). This is particularly so in patients too ill or elderly for surgery, and in patients with unresectable or recurrent disease.

STUDY OBJECTIVE

A retrospective consecutive case review was performed to identify patients diagnosed with glomus jugulare tumors who had undergone Gamma Knife Radiosurgery (GKS). These patients were examined for post-treatment changes in symptoms, cranial nerve examinations and radiological findings.

MATERIALS AND METHODS

Seven patients (5 females, 2 males) diagnosed with glomus jugulare tumors underwent Gamma Knife Radiosurgery between January 2007 through July 2008. Ages ranged from 24 to 84, with a median age of 68. Five patients had undergone prior subtotal and total resections and two had no history of prior surgery. Three of the seven patients had no cranial nerve deficits prior to GKS treatment (Figure 1). All of the patients complained of a variety of symptoms prior to treatment (Figure 2).

All of the patients were treated on a single machine (Figure 3) and underwent standardized treatment planning (Figure 4), which included:

-Leksell head frame placement at the C2 level,

-Pre-treatment computed tomography and magnetic resonance imaging of the head after head frame placement,

-Tumor mapping and treatment planning

The dosimetric features were as follows:

-Mean/Median tumor treatment volume: 5.1 / 4.2 cc

-Mean/Median tumor dose at the 50% isodose line: 13.8 / 14.0 Gy

-Gamma Knife treatment isocenters: 8 to 20

-Mean dose to cochlea/vestibule: <5 Gy

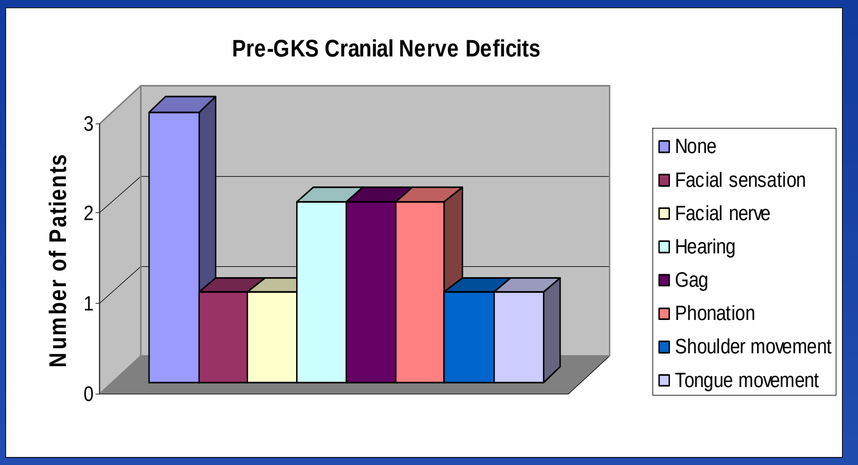

Figure 1: Pre- Gamma Knife treatment cranial nerve deficits

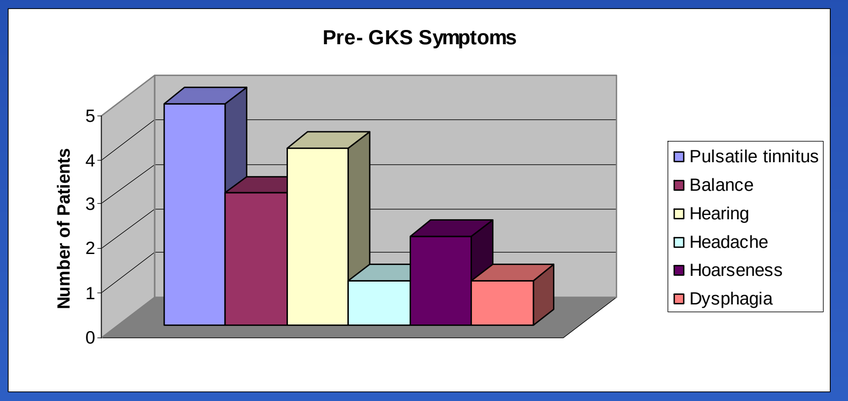

Figure 2: Pre- Gamma Knife treatment symptoms

Figure 3: Gamma Knife Radiotherapy patient set-up

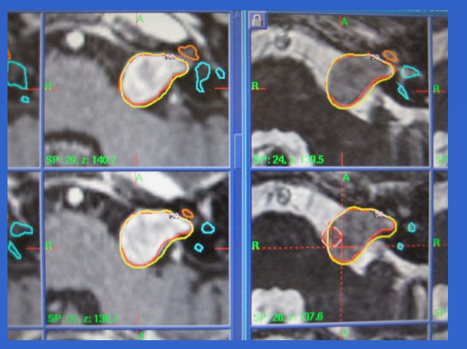

Figure 4: Gamma Knife Radiotherapy sample treatment plan

RESULTS

The median follow-up time was 14 months, with a range of 5 to 16 months.

No new cranial nerve deficits were observed in any of the patients, and those with baseline deficits did not have further worsening.

Two patients noted improvement in their tinnitus, while one reported a return of tinnitus. One of the patients felt that his dysphagia had improved, but that his dysphonia had worsened.

None of the patients demonstrated an increase in tumor size on post-GKS magnetic resonance imaging. One patient had a 25% decrease in tumor volume at 14 months (Figure 5).

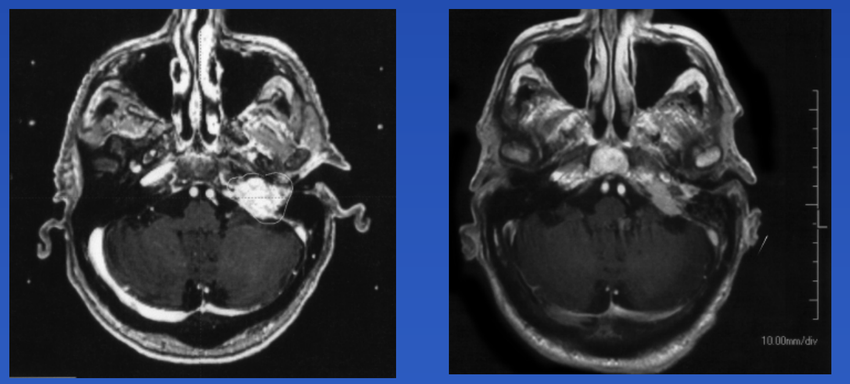

Figure 5: Pre- and post- GKS treatment of left GJT at 14 months

CONCLUSION

Although the vast majority of glomus tumors are benign and slow-growing, their critical location makes surgical excision considerably morbid. Surgical excision and conventional radiotherapy are associated with known complications including lower cranial nerve deficits, and bone and brain necrosis (Ref 3).

GKS is a promising non-invasive, alternative treatment modality for achieving short-term tumor control of GJTs with minimal clinical morbidity and post-treatment sequelae. Longer follow-up periods and larger subject numbers are required to demonstrate its long-term effects.

REFERENCES

1. Poznanovic SA, Cass S, Kavanagh BD. Short-term tumor control and acute toxicity after stereotactic radiosurgery for glomus jugulare tumors. Otolarng Head Neck Surg 134:437-442, 2006.
2. Wowra B, Muacevic A, Jess-Hempen A, et al. Outpatient gamma knife surgery for vestibular schwannoma: definition of the therapeutic profile based on a 10-year experience. J Neurosurg (Suppl) 102:114-118, 2005.
3. Ganz JC. Gamma knife radiosurgery and its possible relationship to malignancy. J Neurosurg 97:644-652, 2000.