ORIGINAL ARTICLE

Surgical Management of Large Acoustic Neuromas: A Review

R Philip, MMed (ORL-HNS)*, N Prepageran, FRCS*, R Raman, MS*, L P H Jennifer, MBBS*, V Waran, FRCS**

*Department of ENT, UMMC, **Department of Neurosurgery, UMMC, Jalan University, Kuala Lumpur, Malaysia

SUMMARY

Acoutic neuromas operated at UMMC from 2001 to 2006 were retrospectively reviewed. There were a total of 27 cases. All tumors were large, measuring more than 2cm. Hearing loss was the most common presenting symptom (63%), followed by headache (52%), dysequilibrium (30%), facial numbness (30%), tinnitus (26%) and gait disturbances (15%). Eleven (41%) of patients had hydrocephalus at the time of presentation, for which a shunt procedure was required. The translabrynthine (TL) approach was used for 12 patients and the retrosigmoid (RS) with or without presigmoid clearance for the remaining 15. Major complications included one mortality and three cerebrovascular accidents (CVA's). The one-year facial nerve outcome was good to acceptable in 62% (House-Brackmann Grade I – IV) of patients. A literature review of current management of acoustic neuromas is presented.

KEY WORDS:
Acoustic neuroma, Vestibular Schwannoma, Translabrynthine approach, Retrosigmoid approach

INTRODUCTION

Acoustic neuromas or vestibular schwannomas account for about 10 per cent of all intracranial tumors and between 75-90% of all cerebellopontine angle tumors[1,2]. Operative mortality and morbidity was initially very high in the early 1900's with mortality figures as high as 78%. Harvey Cushing and Walter Dandy were among the pioneers who surgically treated acoustic neuromas via suboccipital approaches. In the 1960's William House and William Histelberger introduced microsurgical techniques and popularised the translabrynthine approach. These innovations significantly revolutionized the management of acoustic neuromas. In combination with earlier diagnosis from MRI scans, improvement in microsurgical techniques and instrumentation, the mortality and morbidity was greatly reduced. The mortality rate at specialized institutions is now less than 2%[3]. This study reviews the large acoustic neuromas, greater than 2cm in diameter, operated at this institution.

MATERIALS AND METHODS

Retrospective review of case-records of acoustic neuromas operated at UMMC from January 2001 to December 2006. Both the retrosigmoid and translabrynthine approaches were used. The decision on which approach to use was made after discussion between the neurosurgical and ENT teams based on a number of factors; presence of residual hearing, diseased or healthy mastoid cavity, sclerotic or pneumatised mastoid cavities and whether there was a significant intracanalicular portion of the tumor. The aim of the review was to look at the presentation and surgical outcome.

RESULTS

There were a total of 27 patients in this study. The male to female ratio was fairly equal at 12:15. There was an even mix of the three major races in the country with the Malay: Chinese: Indian ratio at 9:10:8.

Table I shows the age distribution. The majority, 74.1% were above the age of 50 years. The youngest patient was 25 years and the oldest was 78 years. The mean age was 56.4 years.

Unilateral hearing loss was the commonest presenting symptom (Table II). This was followed by headache (52%), dysequilibrium (30%), facial numbness (30%), tinnitus (26%) and gait disturbances (15%). Eleven (41%) of patients had

Table I: Age Distribution

Age	No
20 - 29	2
30 - 39	2
40 - 49	2
50 - 59	9
60 - 69	5
70 - 79	6

Table II: Presenting Symptoms

Symptoms	Number(Percentage)
Hearing Loss	17(63%)
Headache	14(52%)
Dysequilibrium	8(30%)
Facial Numbness (Vth CN)	8(30%)
Tinnitus	7(26%)
Gait Disturbances	4(15%)

Table III: Complications

Complications	Number(Percentage)
Post-Operative Hematoma	3(11%)
CSF leak	3(11%)
Hemiparesis	2 (7%)
Post-Operative Hydrocephalus	2 (7%)
Wound Breakdown	2 (7%)
Poor GCS	1 (4%)
Death	1 (4%)

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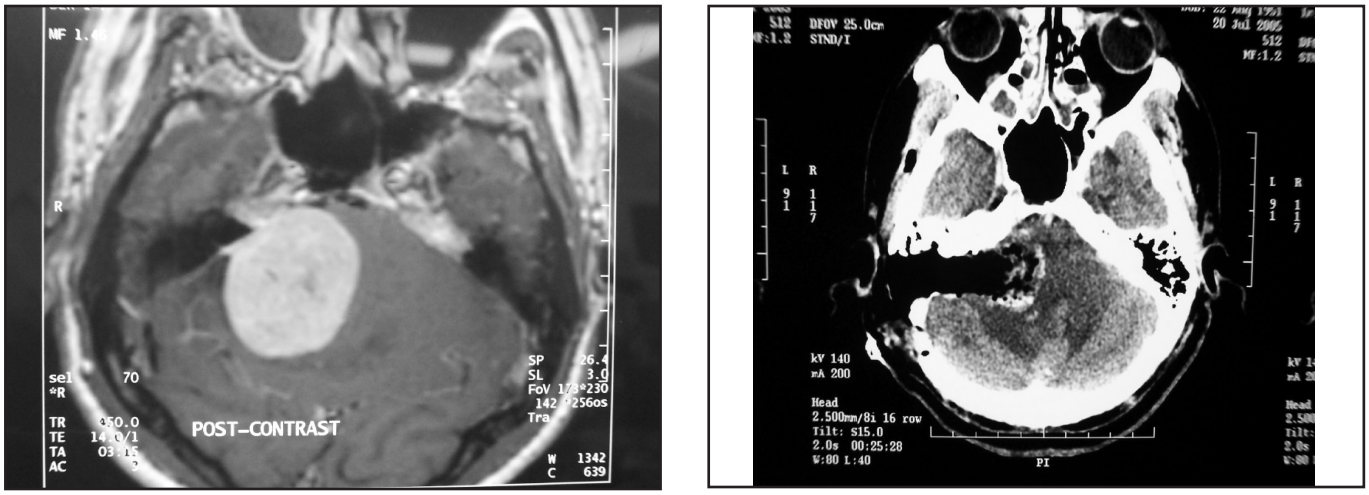
Corresponding Author: Philip Rajan, Department of ENT, Hospital Ipoh, Jalan Hospital, 30990 Ipoh, Perak, Malaysia
Email: prajan333@yahoo.com

Table IV: Facial Nerve Palsy

House-Brackmann Grading	Immediate Post-Operative Outcome	One Year Outcome
Grade I-II	6 (24%)	7 (29%)
Grade III-IV	5 (20%)	8 (33%)
Grade V-VI	14 (56%)	9 (38%)

Table V: Comparison of complications between the TL and RS approaches

Complications	Translabrynthine	Retrosigmoid
Hemiparesis	1	1
Poor GCS		1
Death		1
Hematoma	1	2
CSF Leak	2	1
Post-Op Hydrocephalus		2
Immediate Facial Palsy (Grade V – VI)	5	9



Pre-Operative Post-Operative

Fig. 1: Pre-operative T2 MRI scan and post-operative CT scan showing tumor excision

hydrocephalus at the time of presentation. A VP (ventriculo-peritoneal) shunt was done for six of them. Four had a 3rd ventriculostomy and one an external ventricular drainage (EVD). All the tumors were larger than 2cm. The majority 9 (33.3%) were between 3 – 3.9cm, 7 were between 2-2.9cm, 6 were between 4-4.9cm, and 5 were larger than 5cm.

The surgical approach used was either the translabrynthine 12 (44%) or a retrosigmoid with or without presigmoid extension 15 (56%). The average operating time for TL approach was 8.6 H (6 – 13.5) while it was shorter for the RS approach, 7.6 H (6 – 16). There was one patient in the retrosigmoid group where the surgery took up to 16 hours due to intraoperative tumour bleeding.

Three patients had post-operative hematoma which had to be evacuated (Table III). Cerebrospinal fluid leak occurred in three patients. This was successfully managed with conservative measures. Three patients developed cerebrovascular accidents (CVAs); two with hemiparesis and one poor neurological outcome with a GCS of 9/15. Two patients developed hydrocephalus for which EVD was done. There were two cases of wound breakdown. There was one mortality secondary to a non-surgical cause i.e. atrial fibrillation.

Post-operative facial nerve palsy was the commonest complication. Immediate facial nerve outcome was good to acceptable in 44% of patients (House-Brackmann Grade I – II, good, Grade III – IV, acceptable). At one year this figure improved to 62%. (Table IV)

DISCUSSION

There are numerous options and factors to be considered in the optimal management of patients with acoustic neuromas. The options include microsurgical management, stereotactic radiosurgery and conservative 'wait and scan'. The decision is based on a number of factors which include the age of patient, size of tumor, preservation of hearing and the presence of co-morbid factors.

There are three common surgical approaches for acoustic neuromas; the middle cranial fossa, translabyrinthine and retrosigmoid. The choice of approach chiefly depends on the size of the tumor and whether hearing preservation is attempted. For large acoustic neuromas, hearing preservation is hardly a criterion in the choice of approach as there is rarely serviceable post-operative hearing. Yates *et al.* in their series did not achieve successful hearing preservation in patients with tumor > or = 25mm via the retrosigmoid

approach[4]. The main goal of surgery therefore with large acoustic neuromas is low mortality and an acceptable post-operative quality of life which includes maintaining facial nerve function.

In this study, unilateral hearing loss was the commonest presentation (63%). All patients had large tumors (>2cm) at the time of diagnosis. This explains the relatively high incidence of headaches (52%), dysequilibrium (30%), facial numbness/trigeminal paraesthesia (30%) and ataxia (15%) which are symptoms of brain-stem compression and more common in large acoustic neuromas[3]. Hydrocephalus was diagnosed in 41% of patients at initial presentation for which a shunt procedure or endoscopic 3rd ventriculostomy was required while awaiting definitive surgery.

In this series both the RS and TL approaches have been used for tumor excision. The RS approach is more familiar to the neurosurgeon and offers quick access to the tumor. The TL approach however requires a trained otologist/skull base surgeon in exposing the internal auditory meatus. The duration for exposure is longer and the size of exposure is smaller. The TL approach sacrifices any residual hearing. It can be used for intracanalicular and small tumors with severe to profound hearing loss or for large tumors where hearing preservation is not a primary criterion in the approach[5].

In this study, the total number of complications in the RS group is almost twice that of the TL group. (Table V) but the number of patients in the TL group is smaller than the RS group (12 vs 15). The relatively small number of patients in both groups does not allow any meaningful conclusion as to which approach has a lower morbidity. Some authors report the TL approach is associated with lower morbidity compared to other approaches for large tumors as it offers a direct route to the cerebello-pontine angle and reduces the need for cerebellar retraction[3]. However, large reported series show good outcomes even with the RS approach[7,9]. The outcomes therefore may largely depend on the skill and experience of the surgeon rather than the approach.

The TL approach enables early identification of the facial nerve in the internal auditory canal. Facial nerve preservation has become one of the primary goals in acoustic neuroma surgery as it is associated with better post-operative quality of life[6]. Despite identifying the facial nerve and intra-operative monitoring, post-operative facial palsy still occurred in this series. This is believed to be due disruption of the blood supply to the nerve or arterial spasm, nerve stretch or torsion[7,8]. The one-year facial nerve outcome was good to acceptable in 62.5% (House-Brackmann Grade I – IV) of patients. The one year outcome from other reported series ranges from 70 – 90%[2,5,7,8].

There was one mortality in our series secondary to post-operative atrial fibrillation. Due to the small number of patients, our mortality rate of 4% is higher compared to larger studies, where the average mortality rate is less than 2%[2,5,7,8].

Morbidity, mortality and deterioration in quality of life following microsurgical management have led to considerable interest in stereotactic radiosurgery, a non-invasive form of treatment[10,11]. Stereotactic radiosurgery (SRS) with the Gamma Knife involves targeting the tumor with radiation. Although non-invasive it too is associated with complications which include cranial nerve neuropathies such as facial weakness, trigeminal neuralgia, hearing loss, dysarthria, dysphagia and other complications such as headaches, tinnitus and hydrocephalus[12]. As radiation induces edema, this can be fatal for those with large tumors already having brainstem compression. In young patients there is potential for long term adverse consequences such as secondary neoplasia and vaso-oclusive disease. Unlike microsurgery which is usually definitive, indefinite MRI monitoring is necessary as the tumor is still present[3].

At present SRS is only indicated for patients with tumors less than 3cm diameter or for recurrences. It has shown good tumor control rates with 10 year actuarial control rates of 98.3% (216 patients) and 91%(26 patients)[13,14]. Comparative reviews between microsurgical management and SRS show similar rates of tumor control and better outcomes in terms of complications and quality of life[12,15]. A recent prospective cohort study of 82 patients by Pollock et al. with a mean follow-up of 42 months, showed no difference in tumor control, lower complication rates and better patient outcomes for the radiosurgical group[16]. Their study concluded that radiosurgery should be considered the best management strategy for the majority of acoustic neuroma patients with tumors less than 3cm as they had better early outcomes. However actual long term outcomes and risks of secondary neoplasia remain to be assessed.

CONCLUSION

Acoutic neuromas tend to be diagnosed late in our local setting, with large tumors and compressive symptoms. Microsurgical management is the treatment of choice for these patients, which can be excised via the retrosigmoid or translabrynthine approach.

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