

Result of the translabyrinthine approach for acoustic neuroma removal

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Isipradit P, Vaewichit K, Taecholarn C, Asawavichianginda S, Aeumjaturapat A. Result of the translabyrinthine approach for acoustic neuroma removal. Chula Med J 2002 Aug; 46(8): 631 - 8

- Objective** : *To study the outcomes of translabyrinthine approach for the removal of acoustic tumor*
- Setting** : *Department of Otolaryngology and Neurosurgical Unit, Department of Surgery, King Chulalongkorn Memorial Hospital*
- Design** : *Retrospective study*
- Materials and Methods** : *All patients who were diagnosed of having acoustic neuroma and surgically removed by translabyrinthine approach from 1986 to 2001 were reviewed. 24 patients were recruited into this study: 6 male and 18 female.*
- Results** : *The mean age was 47.96 years (ranged 13 - 75), the mean duration of symptom was 3.52 years (ranged 1 - 8) and the tumor size measured by high resolution computerized tomography (HRCT) or magnetic resonance imaging (MRI) was 3.21 cm. (ranged 0.7 - 4.5 cm). Postoperative results included facial nerve damage 37.50%(9/24), cerebrospinal fluid leakage 29.17%(7/24), meningitis 12.50%(3/24), and intracranial hematoma 4.17%(1/24). There was no death or recurrence of the tumors.*

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Conclusion : *Translabyrinthine approach for acoustic neuroma removal is a safe procedure with low mortality and morbidity rate. Because of the learning curve period, our study still has high rate of complication when compared to experienced centers.*

Key words : *Translabyrinthine approach, Acoustic neuroma.*

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Received for publication. May 15, 2002.

เพิ่มทรัพย์ อธิปประดิษฐ์, คณะศรี แวรวิจิต, ช่อเพ็ญ เตโชสาร, เสาวรส อัครวิเชียรจินดา, ทรงกลด เอี่ยมจตุรภัทร. ผลการรักษาเนื้องอกของเส้นประสาทสมองคู่ที่ 8 ด้วยวิธีการผ่าตัด Translabyrinthine. จุฬาลงกรณ์เวชสาร 2545 ส.ค; 46(8): 631 - 8

วัตถุประสงค์ : เพื่อศึกษาผลการรักษาเนื้องอกของเส้นประสาทสมองคู่ที่ 8 ด้วยวิธีการผ่าตัด translabyrinthine

สถานที่ทำการศึกษา : ภาควิชาโสต นาสิก ลาริงซ์วิทยา และหน่วยประสาทศัลยศาสตร์
ภาควิชาศัลยศาสตร์ โรงพยาบาลจุฬาลงกรณ์

รูปแบบการศึกษา : การศึกษาแบบย้อนหลัง

วัสดุและวิธีการ : รวบรวมเวชระเบียนของผู้ป่วยที่ได้รับการวินิจฉัยว่าเป็นเนื้องอกของเส้นประสาทสมองคู่ที่ 8 และได้รับการผ่าตัดโดยวิธี translabyrinthine ระหว่างปี พ.ศ. 2529 - 2544 จำนวน 24 ราย ประกอบด้วยเพศชาย 6 ราย และเพศหญิง 18 ราย

ผลการศึกษา : อายุเฉลี่ยของผู้ป่วยคือ 47.96 ปี (13 - 75 ปี) ระยะเวลาเฉลี่ยที่มีอาการก่อนมาปรึกษาแพทย์ 3.52 ปี (1 - 8 ปี) ขนาดของก้อนเนื้องอกวัดจากเอกซเรย์คอมพิวเตอร์ หรือการตรวจคลื่นแม่เหล็กเท่ากับ 3.21 ซม. (0.7 - 4.5 ซม.) ผลของการผ่าตัดคือการขาดของเส้นประสาทสมองคู่ที่ 7 = 37.50% (9/24) น้ำหล่อเลี้ยงสมองและไขสันหลังรั่ว = 29.17% (7/24) เยื่อหุ้มสมองอักเสบ = 12.50% (3/24) ก้อนเลือดภายในกะโหลกศีรษะ = 4.17% (1/24) แต่ไม่มีการเสียชีวิตหลังผ่าตัดและไม่พบการเกิดขึ้นมาใหม่ของก้อนเนื้องอก

สรุป : การผ่าตัดรักษาเนื้องอกของเส้นประสาทสมองคู่ที่ 8 โดยวิธี translabyrinthine เป็นวิธีที่ปลอดภัยและภาวะแทรกซ้อนต่ำ แต่เนื่องจากขณะนี้อยู่ในช่วงการเรียนรู้จึงทำให้พบอุบัติการณ์ของภาวะแทรกซ้อนสูงกว่าผลของการศึกษาอื่น ๆ

คำสำคัญ : การผ่าตัด translabyrinthine, เนื้องอกของเส้นประสาทสมองคู่ที่ 8

Acoustic neuroma or *vestibular schwannoma* is the most common cerebellopontine angle tumor. In a review of temporal bones, the incidence of occult acoustic neuroma is 0.57-1 %, but the yearly incidence is approximately 1 per 100,000 population.⁽¹⁻³⁾ The first reported case of acoustic neuroma was in 1777 by Sandifort, However, it was not until 1894 that Sir Charles Ballance performed the first successful removal of acoustic neuroma. Because the rates of mortality and morbidity were high, Harvey Cushing advocated subtotal resection which subsequently decreased the mortality rate to 11 %. In 1920's, Walter Dandy described modern suboccipital approach and total removal by *intracapsular enucleation*. Translabyrinthine approach was proposed by Panse in 1904. However, Dandy and Cushing criticized the operation (dangerous, facial nerve destruction and incomplete tumor removal). With operating microscope, microsurgical technique and the dental drill, William House reintroduced the translabyrinthine approach in 1964, and reported a mortality rate of 5.4 %⁽¹⁻³⁾ Now there are 3 pathways in the management of acoustic neuroma, namely:⁽²⁻⁴⁾ 1. Microsurgical removal of the tumor; 2. Stereotactic radiosurgery; 3. Observation. The treatment of choice depends on tumor size, age, general condition, compressive symptoms and institute favorable. For surgical management, there are three approaches for tumor removal which are as follows:

1. Middle fossa approach :

This is good for the patients who are under 65, with intracanalicular tumor or it has extended to the cerebellopontine angle less than 1.5 cm and good hearing.

2. Retrosigmoid or suboccipital approach :

This approach is selected for tumor localized within the cerebellopontine angle not extended to the fundus of the internal auditory canal with serviceable hearing.

3. Translabyrinthine approach :

This is proper for any size tumor with unserviceable hearing. It gives a wide exposure to the cerebellopontine angle and bone removal is extradural with limited cerebellar retraction.

The objective of this study is to present our experience in the management of acoustic neuroma with translabyrinthine approach including patients' characteristics, symptomatology and assessing of the postoperative results.

Materials and Methods

The study was designed a retrospective study. All charts of those who had been diagnosed of having acoustic neuroma (*vestibular schwannoma*) and surgically removed by translabyrinthine approach at the Department of Otolaryngology and the Department of Surgery, King Chulalongkorn Memorial Hospital from 1986 to 2001 were reviewed; altogether 24 charts were recruited into this study. Each record was analyzed regarding: sex and age of the patients, the location and size of the tumors, clinical presentation and complications of the procedure.

The size of the tumor was quantified by measuring the maximum surface of the lesion in the axial plane by magnetic resonance imaging (MRI) or high resolution computerized tomography (HRCT), but tumors within the internal auditory canal was not included.^(1,5) In the translabyrinthine approach, the incus was removed and multiple pieces of temporalis muscle and fascia were placed in the middle ear and

aditus ad antrum without opening of posterior tympanotomy. The posterior fossa dural defect was covered and reinforced with abdominal fat graft.^(6,7) Cerebrospinal fluid leakage was defined as either rhinorrhea, wound leakage or combined, characterized by clear fluid draining through the ipsilateral nostril and/or through the incision.^(6,8,9) Meningitis was clinically diagnosed as fever, headache, meningismus and CSF profile (low glucose, high neutrophil count and elevated protein). Facial nerve injury meant it was cut at the time of surgery.

Results

In this series of 24 cases of acoustic neuroma removed via translabyrinthine approach at the King Chulalongkorn Memorial Hospital. Six male and 18 female patients were recruited into the study. There were 13 right and 11 left side tumor. In these 24 cases, 2 cases were neurofibromatosis type II (bilateral acoustic neuroma), recurrence tumor in one case after retrosigmoid approach, another was regrowth tumor after stereotactic radiosurgery.

Age at the time of surgery ranged from 13 to 75 years old, with the mean of 47.96 years and the mean duration of symptom was 3.52 years (ranged 1-8 years). The tumor size was measured at the largest anteroposterior and medial lateral dimensions in axial plane by high resolution computerized tomography (HRCT) or magnetic resonance imaging (MRI) with gadolinium. The mean tumor size was 3.21 cm. (range 0.7-4.5 cm.) (Table 1). The symptoms were sensorineural hearing loss (100 %), tinnitus (45.83 %), dizziness (45.83 %), cerebellar signs (29.17 %), facial numbness (20.83 %), and lower cranial nerve palsies (4.17 %) (Table 2).

Postoperative results showed that there was no death in this series. The facial nerve was transected in 37.5 % (9/24) including 2 cases of neurofibromatosis type II, 1 recurrence after suboccipital approach and 1 regrowth after stereotactic radiosurgery. A CSF leak occurred in 29.17 % (7/24) and all presented with rhinorrhea. 3 patients (12.50 %) were diagnosed as having bacterial meningitis, all of them had concomitant CSF leakage. There was 1 case of intracranial hematoma that occurred within 24 hours postoperatively, but there was no death or recurrence tumor in our series.

Table 1. Patient's characteristic.

	Mean	Range
Age (years)	47.96	13 -75
Duration (years)	3.52	1 - 8
Size (cm.)	3.21	0.7 - 4.5

Table 2. Patient's symptoms.

	N = 24	%
Hearing loss	24	100
Tinnitus	11	45.83
Dizziness	11	45.83
Cerebellar signs	7	29.17
Facial numbness	5	20.83
Lower cranial nerve palsies	1	4.17

Table 3. Postoperative results.

	N = 24	%
Facial nerve damage	9	37.50
CSF leak	7	29.17
Meningitis	3	12.50
Intracranial hematoma	1	4.17
Death	0	0
Recurrence tumor	0	0

Discussion

At present the goals of acoustic neuroma surgery have altered in the last 50 years, the focus of surgery has shifted from prolongation of life to the preservation of cranial nerve function. The mortality rate has fallen from 80 % to less than 1% with the introduction of microsurgical technique and modern anesthesia. Facial nerve is almost always anatomically preserved and now hearing preservation is another goal.^(1,3,4) Sensorineural hearing loss is the most common presenting symptom ranged from 75.5 to 96%.^(1,10,11) In our series, we found 100 % of sensorineural hearing loss because we chose the translabyrinthine approach in case of unserviceable hearing.

Facial nerve damage:

For translabyrinthine approach, the facial nerve can be exposed on either side of the tumor (root entry zone and fundus of internal acoustic canal). In our study, the anatomical preservation rate is 62.5 % (15/24) which is low when compared with other large series.^(2,4,7,10,12-15) In our experience, the translabyrinthine approach was used for only 24 cases in more than 10 years; therefore we are still in the learning curve of acoustic neuroma surgery. In these 9 cases, 2 were neurofibromatosis type II, one recurrence tumor after suboccipital approach and one regrowth after stereotactic radiosurgery. These tumors were more adherent to the nerve than usual. If these cases were excluded the facial nerve was transected in only 25 % (5/20). Hardy reported that facial nerve was sacrificed in 8 of the first 20 cases and Nutik 's study facial nerve was transected in 11 of the first 40 cases.^(10,16,17) Through the gain surgical experience and the use of intraoperative facial nerve monitoring, the facial nerve outcome could be improved.

Cerebrospinal fluid leakage:

CSF leak in many series ranged from 2 to 30 %.^(6-10,12,18) CSF leak occurred in 7 patients (29.17%). It presented as rhinorrhea 100% of the time. They were handled in 3 different ways: 1. conservative method, with application of pressure dressing and bed rest; 2. with lumbar drain placement; and 3. with surgical repair.^(6,8,9,18) Most of our cases (5/7) responded well to pressure dressing, bed rest, head elevation with or without lumbar drainage. Only 2 cases needed surgical exploration and repacking; 1 case CSF leak was via apical cells to the tympanic cavity; the other one is through the opened vestibule and oval window. We plugged the site of the leakage with temporalis muscle and fascia, repacked the middle ear and the mastoid antrum and used strips of abdominal fat to plug the dural defect and obliterate the mastoid cavity; then the wound was closed layer by layer as well as carefully placement of a mastoid dressing. The potential pathway of CSF rhinorrhea via the Eustachian tube are summarized by many authors.^(8,18) 1. apical cells to the tympanic cavity and the Eustachian tube where it may be opened while drilling the internal acoustic canal wall 2 opened vestibule and oval window which is only 2-3 mm. away 3. perilyabyrinthine cells and tracts to the mastoid antrum 4. opened mastoid air cells at the lateral side of the cranio tomy. For translabyrinthine approach, the first three pathways are possible, therefore these points had to be checked carefully after tumor removal.^(7,10,12)

Meningitis:

Meningitis developed postoperatively in 3/24 (12.50 %) of cases in this study and all of them had concomitant CSF leak. Antibiotic therapy produced a clinical and laboratory response in all patients. These

numbers are not large enough to draw statistical association between CSF leakage and meningitis. However, other authors concluded that both CSF leakage and meningitis might be the result of an excessive dissection.

Most importantly, there was no death in this study. There was one significant neurovascular complication, intracranial hematoma. The patient had severe headache and alteration of conscious and the CT scan showed hematoma. Surgical exploration and clotted removal was done. Fortunately he had no permanent neurological deficit. There has been no case of tumor recurrence during a follow-up period. Although the translabyrinthine approach is a safe procedure for acoustic neuroma removal with low morbidity and mortality rate, but our study still has high rate of complications when compared to experienced centers. Welling DB stated that at least 20 acoustic neuroma removal was necessary for a new surgical team to achieve facial nerve function and decrease the rate of CSF leak similar to other experienced centers.⁽¹⁶⁾

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