Vestibular Schwannoma: Techniques of resection by retrosigmoid approach

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Treatment goal

- Avoidance of tumor or treatment related mortality, maintaining regional cranial nerve function, maintaining quality of life & employment and reducing treatment related cost
Epiarachnoid or subarachnoid
Subarachnoid tumor
In cranial nerves, there is no thick epineurium.

- **Cranial nerve**
- **Tumor Capsule**
- **Tumor**
- **Neurilemma**
- **Endoneurium**
- **Schwann cell cylinders with axons**
- **Perineurium**
Feb 1998 to 29\textsuperscript{th} March 31\textsuperscript{st} 2015

755 consecutive patients of vestibular schwannoma operated by retrosigmoid – transmeatal approach by the author

operative mortality 8/755 (1.06\%)
Monitoring of the facial nerve in vestibular schwannoma operations

- Monopolar, constant voltage stimulation
- Facial EMG
Surgical technique

- Internal decompression using CUSA
- Tumor removal by working around the tumor by stripping the arachnoid of the capsule
- If capsule is thin and cannot be held, onion-skin technique as advocated by Prof. Samii: each layer of schwannoma removed from inner to outer layer until the outermost layer is reached & removed piecemeal
- Use of bipolar coagulation kept to a minimum
DTI based fiber tracking for prediction of the position of the facial nerve in relation to large vestibular schwannomas

- Increased tumor size and flattening of the facial nerve make visualization of the intervening segment difficult using T2WI/CISS

- Diffusion Tensor Imaging–based fiber tracking of the facial nerve
Maryumma
video
Mariyakutty video
Mariya - VS with preserved facial
Catherine Video

Cystic
SUDHAKUMARI VIDEO
Facial-hypoglossal end to end anastomosis. Follow up at 1 year
Plastic surgical procedures

- may be used to enhance the results of nerve regeneration or
- May be the only rehabilitative measures
  improves facial symmetry & eye closure
Desired surgical mortality

- Should be below 1% (Samii)
- Current operative mortality rate is between 1 to 2%
- Nair S (Feb 1998 to 31st March 2015) – 8/755 (1.06%)

Patients at high risk:
- Elderly patients (physiological age important than chronological age)
- Post-operative 10th nerve complete palsy
- Cystic tumors
SCTIMST experience: results of 100 consecutive cases of author

- Giant ( > 4.5 cms ) - 25%
- Large ( 2.5 to 4.5 cm) - 72%
- Small ( < 2.5 cm ) - 3%
Size based differences in presentation of acoustic neurinomas

**Sensory V nerve**

- <4.5 cm: 84%
- >4.5 cm: 96%

**Preoperative hearing loss > 50 dB**

- <4.5 cm: 80%
- >4.5 cm: 73.3%

**Pre-operative lower cranial nerve palsy**

- <4.5 cm: 8%
- >4.5 cm: 20%

**VII nerve involvement**

- <4.5 cm: 54%
- >4.5 cm: 56%

**Number of patients with preoperative hydrocephalus**

- <4.5 cm: 58.6%
- >4.5 cm: 92%

**Preoperative cerebellar signs**

- <4.5 cm: 76%
- >4.5 cm: 92%

**Features of raised ICP**

- <4.5 cm: 68%
- >4.5 cm: 76%
Pre-operative House-Brackmann grading of VII nerve paresis

< 4.5 CM (41 patients)  > 4.5 CM (14 patients)
<table>
<thead>
<tr>
<th>Procedure</th>
<th>&lt; 4.5 cm (75 patients)</th>
<th>&gt;4.5 cm (25 patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>69 (92%)</td>
<td>22 (88%)</td>
</tr>
<tr>
<td>Near total</td>
<td>6 (8%)</td>
<td>3 (12%)</td>
</tr>
</tbody>
</table>

Anatomical preservation of 7th nerve – 90% of large & 60% giant tumors
Histopathology

Admixture of Antoni A & B in most cases with cyst wall having haemosiderin laden macrophages and numerous vascular channels
Postoperative findings

Anatomical preservation of VII nerve
$\chi^2 = 8.335$ (significant)

- 86.6% (65) < 4.5 cm
- 60% (15) > 4.5 cm

Duration of hospital stay

- 15.3 days < 4.5 cm
- 18.2 days > 4.5 cm

Fresh postoperative VII nerve palsy

- 54.8% (17) < 4.5 cm
- 100% (11) > 4.5 cm

Postoperative lower cranial nerve palsy
$\chi^2 = 6.29$ (significant)

- 5.79% (4) < 4.5 cm
- 25% (5) > 4.5 cm
Postoperative House Brackmann grading in patients with no preoperative VII nerve involvement

- < 4.5 cm (17 patients)
- > 4.5 cm (11 patients)
Results of 100 consecutive cases

- Incidence of preoperative hearing loss, 5th nerve & cerebellar involvement almost identical in giant & large groups

- Incidence of facial paresis, LCN involvement & hydrocephalus significantly more in giant group
- cochlear nerve preserved in 72

A retrospective analysis to quantify retained hearing and to assess quality of post-op hearing in 27 of these patients.
## PTA pre and post op of 27 patients

<table>
<thead>
<tr>
<th>Size (n)</th>
<th>PTA Preop</th>
<th>PTA Postop</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>&lt;2 cm (1)</td>
<td>31-50 db</td>
<td>51-90 db</td>
<td>1</td>
</tr>
<tr>
<td>&gt;4 cm (14)</td>
<td>0-30 db</td>
<td>51-90 db</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>31-50 db</td>
<td>51-90 db</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>51-90 db</td>
<td>No hearing</td>
<td>5</td>
</tr>
<tr>
<td>2-4 cm (12)</td>
<td>0-30 db</td>
<td>No hearing</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>31-50 db</td>
<td>51-90 db</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>51-90 db</td>
<td>No hearing</td>
<td>3</td>
</tr>
</tbody>
</table>
Pre & Post op PTA

Size and Preop PTA

Post op PTA

- 51-90 db
- No hearing

<table>
<thead>
<tr>
<th>Size</th>
<th>Preop PTA</th>
<th>Postop PTA</th>
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</thead>
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<tr>
<td>&lt;2 cm (1)</td>
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<tr>
<td>&gt;4 cm (14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size (n)</td>
<td>SD Preop</td>
<td>SD Postop</td>
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<tr>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
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<td>&gt;4 cm (10)</td>
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<td></td>
<td>70-100</td>
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<td>No SD</td>
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<tr>
<td>2-4 cm (9)</td>
<td>50-69</td>
<td>5-49</td>
</tr>
<tr>
<td></td>
<td>70-100</td>
<td>5-49</td>
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<tr>
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<td>No SD</td>
<td>No SD</td>
</tr>
<tr>
<td></td>
<td>No SD</td>
<td>50-69</td>
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# Audiometry of 7 patients with serviceable hearing preop

<table>
<thead>
<tr>
<th>Size</th>
<th>PTA Preop</th>
<th>SD Preop</th>
<th>PTA Postop</th>
<th>SD Postop</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>&gt;4 cm</td>
<td>0-30 db</td>
<td>70-100</td>
<td>51-90 db</td>
<td>70-100</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>31-50 db</td>
<td>70-100</td>
<td>51-90 db</td>
<td>50-69</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0-30 db</td>
<td>50-69</td>
<td>No hearing</td>
<td>No SD</td>
<td>1</td>
</tr>
<tr>
<td>2-4 cm</td>
<td>31-50 db</td>
<td>70-100</td>
<td>51-90 db</td>
<td>5-49</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No hearing</td>
<td>No SD</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No hearing</td>
<td>No SD</td>
<td>2</td>
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</table>
Conclusions of our study

- None of the patients in our study has postoperative useful hearing.
- It is very unlikely that hearing will improve following surgery for acoustic tumour more than 2cm.
- No significant difference in hearing outcome of patients in >4cm and 2–4cm groups.
- The chance of anatomically preserving VII\textsuperscript{th} nerve are high when one attempts to preserve VIII\textsuperscript{th} nerve as was seen in 26 out of 27 patients in this study group.
Principles

- Arachnoid peeling
- Intratumoral decompression
- No coagulation over tumor surface
- Correct plane of dissection
- Circumferential dissection with stimulation of capsule for facial nerve
- Intrameatal removal
- Meticulous haemostasis
Surgery: Maximizing results

- Learning curve
- One should work in an environment that has developed referral sources
- Sharp dissection with forceps, scissors, knives or hooks
- 3 cues while dealing with nerves: nerve must remain slack, wet and vascularized
- Dissection that minimizes traction, resistance to the use of bipolar, cranial nerve monitoring
Thank you