Cochlear Implantation in Patients with Chronic Otitis Media
Rie Kanai, M.D., Shin-ichi Kanemaru, M.D., Ph.D., Akiko Nishida, M.D., Ph.D.
Takuya Tsuji, M.D., Misaki Yamamoto, M.D., Fumiko Kuboshima, M.D.
Masaru Yamashita, M.D., Ph.D., Toshiki Maetani, M.D., Ph.D.
Department of Otolaryngology – Head and Neck Surgery, Kitano Hospital
The Tazuke Kofukai Medical Research Institute, Osaka, JAPAN

Abstract
Purpose:
Cochlear implantation (CI) for patients with chronic otitis media (COM) is not performed commonly because of the risks of complication, meningitis or extrusion of electrode.

We have experienced 11 CI cases with COM. The purpose of this report is to introduce our management strategy for CI cases with COM.

Study Design:
- Retrospective medical chart review.

Eleven cases (M: F = 8:3; mean age: 72.6) were enrolled in this study. All cases had COM and were under went CI between January 2009 and February 2013.

Four cases, who had actively infected ears, underwent staged operations. We performed canal wall up tympano-mastoidectomy (N=3) and subtotal-petrosectomy (N=1) to control infection, followed by CI operations 6 months after the initial surgeries.

Other seven cases without active inflammation had CI at first-staged or second-staged surgery. Five cases had radical mastoid cavity or cavity after tympanomastoidectomy. These cases required additional procedure to prevent electrode extrusion toward external auditory canal. A groove for electrode array and our electrode fixation technique will be introduced. Fat obliteration for mastoid cavity was not chosen in any case for easy identification of recurrent cholesteatoma or infection.

Summary of Results:
Nine cases were uneventful postoperatively. Cholesteatoma was occurred in one case and was removed successfully without exposing implanted CI. In one case, wound dehiscence was observed, but the wound was managed by local treatments. All cases continue to use CI without serious complication.

Conclusions:
COM are not contraindication for CI, however, infection control by middle ear surgery is important before. Also, stabilization of electrode array is essential to ears with open cavity.

Introduction
Cochlear implantation (CI) for patients with chronic otitis media (COM) is not performed commonly because of the risks of complication, i.e. meningitis, electrode extrusion. On the other hand, COM patients sometimes suffer from severe sensorineural hearing loss due to long-term inflammation. If hearing aids are not effective for these cases, CI is the only way for them to restore hearing ability. We here introduce our experience of 11 CI cases with COM and our management strategy for CI cases with COM.

Study Design
- Retrospective medical chart review (N=11).
- Cases with COM underwent CI between January 2009 and February 2013 by one surgeon.
- The percentage of CI surgeries for cases with COM was 25.0% out of total CI cases (11/44).
- Male : Female = 8 : 3, Mean age: 72.6 years old.
- Follow up period: 1 to 48 months.
- Medical history, operative procedure and postoperative complications were investigated according to medical charts and operation records.

Our Strategy of CI for Cases with COM
Operations were performed according to the following algorithm (Fig. 1).

Infection Management (when active inflammation presents)
- Tympanomastoidectomy is performed before CI to eradicate inflammation in ear with active infection (ototrauma, perforation of tympanum etc.). Then, CI will be performed after 6 months’ observation period to confirm no inflammation is residual.

Surgical technique
- In the initial tympanomastoidectomy, posterior canal wall should be kept intact as much as possible to avoid electrode extrusion toward external ear canal after CI.
- Figure 2 indicates how we fix CI electrode array for prevention from electrode extrusion toward external ear canal when encountering case with radical mastoid cavity operated years ago.

Results Table 1. Summary of cases

<table>
<thead>
<tr>
<th>Case #</th>
<th>Age / Sex</th>
<th>Situation of middle ear</th>
<th>History of Operation</th>
<th>Active Infection</th>
<th>Hearing Level (dB)</th>
<th>First-stage</th>
<th>Second-stage</th>
<th>Complication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>69F</td>
<td>Lt. Post-tympanomastoidectomy</td>
<td>Bil.</td>
<td>Lt. +</td>
<td>5.0 / 97</td>
<td>Rt. CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>70F</td>
<td>Bil. Radical cavity</td>
<td>Bil.</td>
<td>107 / 109</td>
<td>Lt. CI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>71M</td>
<td>Lt. Radical cavity</td>
<td>Lt.</td>
<td>89 / 105</td>
<td>Lt. CI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>74M</td>
<td>Rt. Modified Radical Cavity</td>
<td>Bil.</td>
<td>S.0 / 92</td>
<td>Rt. CI</td>
<td>Cholesteatoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>80F</td>
<td>Rt. Modified Radical Cavity</td>
<td>Bil.</td>
<td>S.0 / 101</td>
<td>Rt. CI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>83M</td>
<td>Rt. Post-myringoplasty</td>
<td>Rt.</td>
<td>S.0 / S.0</td>
<td>Rt. CI</td>
<td>wound dehiscence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>81M</td>
<td>Rt. Radical cavity</td>
<td>Rt.</td>
<td>S.0 / S.0</td>
<td>Lt. TM(CWU) + CI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>59M</td>
<td>Bil. Adhesive otitis media</td>
<td>Bil.</td>
<td>S.0 / S.0</td>
<td>Lt. TM(CWU)</td>
<td>Lt. CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>70M</td>
<td>Bil. COM</td>
<td>Bil.</td>
<td>S.0 / S.0</td>
<td>Lt. TM(CWU)</td>
<td>Lt. CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>80M</td>
<td>Rt. COM</td>
<td>Bil.</td>
<td>S.0 / S.0</td>
<td>Lt. TM(CWU)</td>
<td>Lt. CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>67M</td>
<td>Bil. Radical cavity</td>
<td>Bil.</td>
<td>S.0 / S.0</td>
<td>Lt. STP + blind sac closure</td>
<td>Lt. CI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bil.: bilateral, S.O.: scale out, TM(CWU): tympanomastoidectomy (canal wall up), STP: subtotalpetrosectomy, *TM was performed twice in this case

Figure 2. Our fixation procedure for CI electrode in pre-existing radical cavity (left ear)

ii. Making a groove on the surface of mastoid cavity by drilling.
iii. Electrode insertion to inner ear.
iv. Electrode housed in the groove.
v. Electrode covered with bone tips and/or cartilage in places.
vi. Electrode covered with bone putty and fibrin glue.

Conclusions
- We performed 11 CI cases with COM.
- No patient had serious complication which requires CI removal. All patients continue to use CI.
- Cholesteatoma occurred in case #4. Cholesteatoma was removed successfully without exposing electrode.
- Wound infection from Methicillin-resistant Staphylococcus aureus occurred in case #6. It was controlled by wound irrigation and administration of antibiotics.
- One case (#10) required second tympanomastoidectomy* because his middle ear infection was very serious from Pseudomonas aeruginosa.

Rie Kanai, M.D.
Department of Otolaryngology – Head and Neck Surgery
Kitano Hospital, The Tazuke Kofukai Medical Research Institute, Osaka, JAPAN
Email: r-kanai@kitano-hp.or.jp
Phone: +81-6-6312-8831
Website: http://www.kitano-hp.or.jp/en