ICP, BMI, surgical repair and CSF diversion in patients presenting with spontaneous CSF otorrhea

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Presenter Disclosure Information

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The following relationships exist related to this presentation:

No relationships to disclose
Introduction: Etiology of CSF Otorrhea

- Head injury and temporal bone fracture
- Iatrogenic injury
- Erosive changes from chronic otomastoiditis or neoplastic process
- Spontaneous or idiopathic CSF otorrhea
Spontaneous CSF Otorrhea-
pathophysiology

- Not well understood
  - Arachnoid granulations
  - Congenital defects
  - Chronic intracranial hypertension
Introduction

- Two distinct populations are primarily affected with spontaneous CSF otorrhea, young children and middle aged adults.

- Adults with spontaneous CSF otorrhea tend to present with complaints of aural fullness or hearing loss.
Introduction

- Chronic intracranial hypertension, such as that seen with benign or idiopathic intracranial hypertension (IIH), is known to predispose to CSF leaks, including CSF otorrhea.
- This syndrome is particularly prominent in:
  - obese
  - middle aged women
  - associated with headache, pulsatile tinnitus and visual changes
Introduction

- Numerous publications have reported on the association between spontaneous CSF otorrhea, obesity and increased ICP
- Surgical management entails middle fossa or transmastoid repairs of tegmen defects
- Long term management of intracranial hypertension in these patients is not well established
Objective

- To report our experience in treating patients with spontaneous CSF otorrhea
- Assess BMI and ICP, but also report on our long term management of patients found to have elevated ICP
- Specifically, in regards to the use of CSF diversion procedures such as ventriculo-peritoneal (V-P) or lumbo-peritoneal (L-P) shunts
Methods

- Institutional review board approval was obtained from the University of Pittsburgh

- A retrospective chart review was performed on patients treated for CSF otorrhea between 2004 and 2013
Methods

- Patients with a history of chronic ear disease, cholesteatoma, prior mastoid surgery, head trauma, neoplastic process or iatrogenic injury were excluded.
## Demographics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of patients</td>
<td>32</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>10 (31)</td>
</tr>
<tr>
<td>Female</td>
<td>22 (69)</td>
</tr>
<tr>
<td>Average Age</td>
<td>56 yrs (range 9-82yrs)</td>
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<tr>
<td>Average Follow up</td>
<td>23 months (range 1-93 months)</td>
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</tbody>
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Presenting signs and symptoms

- 78% (Pneumocephalus and AMS)
- 16% (Otorrhea)
- 3% (CHL)
- 3% (Mixed HL)
- 4 (12.5%) patients had a history of meningitis
Results:

- Thirty-two patients underwent 37 operations.
- Three patients had bilateral defects.
- There were 21 repairs on the left and 16 on the right.
- The majority underwent a middle fossa craniotomy for repair (27/32).
Results:

- Three patients (8%) underwent revision surgery
  - Two had untreated intracranial hypertension (ICP 24.5 and 24 cm H2O)
  - Two failed after a MCF repair and the other had undergone a transmastoid repair
Surgical Repair:

- Middle fossa craniotomy is the preferred approach for repair of:
  - tegmen tympani defects
  - large tegmen mastoideum defects
  - multiple tegmen defects
  - Surgeon preference
Surgical Technique: Middle Cranial Fossa Approach
Surgical Technique: Middle Cranial Fossa Approach
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Surgical Technique:

- Dural defects repaired with
  - duragen inlay
  - muscle plug
  - primary closure

- Lumbar drains placed intra-operatively and left for 3 days
Results: BMI

- Average BMI was in the obese range at 35.0 kg/m² (range 18.7-53.2 kg/m²)

- 19% of patients were overweight (BMI 25-30 kg/m²)

- 66% of patients were obese (BMI >30 kg/m²)
Results: ICP

- Opening pressures were measured at time of surgical repair during the placement of an intraoperative lumbar drain or within a month after surgical repair
Results: ICP

- The mean ICP was 23.4 cm H₂O (median 24, range of 13-36 cm H₂O)
- Twenty patients (63%) had ICP >20 cm H₂O
- Thirteen (41%) had an ICP ≥25 cm H₂O
Results: CSF diversion

- Seventeen patients (53%) were treated with CSF diversion
  - Sixteen with a V-P (ventriculoperitoneal) shunt and one with an L-P (lumboperitoneal) shunt
Results: BMI and CSF diversion

- The average BMI in this group was 37 kg/m² (range 18.7-53.2 kg/m²)

- Average BMI in the non-shunted group was 33 kg/m² (range 20-53 kg/m²)

- Difference was not significant (p=0.25)
Results

BMI and CSF Diversion

Average BMI in CSF diversion: 37
Average BMI in non-CSF diversion: 33

p=0.25
Results: ICP and CSF Diversion

- The average ICP in patients who underwent CSF diversion was 26.2 cm H2O (median 26cm H2O)

- The average ICP in those without CSF diversion was 19.6cm H2O (median was 18.8 cm H2O)
Results:

ICP and CSF Diversion

- ICP and CSF Diversion: 26 cm H2O
- ICP in non-CSF Diversion: 20 cm H2O

p = 0.002
Results: ICP and BMI

ICP in Obese and Overweight patients

- **Overweight**: 25 - <30 Kg/m²
- **Obese**: ≥30 Kg/m²

ICP in Obese patients = 25 cm H₂O

ICP in Overweight patients = 21 cm H₂O

p = 0.097
Summary

- Sixty-nine percent of patients were female.
- Eighty-five percent were overweight or obese.
- Average BMI was greater in the group that underwent CSF diversion, although not statistically significant.
- The correlation coefficient between BMI and ICP was 0.33 suggesting these variables are moderately correlated.
Summary

- Sixty-three percent of our patients had an ICP greater than >20 cm H20
- Forty-one percent had an ICP ≥25 cm H20
- Patients with an untreated ICP over 20 showed a strong trend toward recurrent CSF leaks (p=0.054)
The majority of our patients, 53%, required CSF diversion.

We proceed with CSF diversion when:
- ICP ≥25 cm H2O
- Recurrent CSF leak
- CSF otorrhea with existing diagnosis of pseudotumor cerebri

ICP in high teens to low twenties; proceed with a trial of Diamox.
Conclusion

- As with IIH, patients with spontaneous CSF otorrhea tend to be obese middle aged females
- Patients with spontaneous CSF otorrhea should have ICP measured
- Patients with spontaneous CSF otorrhea and intracranial hypertension may need to be managed aggressively with CSF diversion procedures
Conclusion

- We believe that having a vascularized flap as part of a multilayered reconstruction offers an advantage in the healing process and long term integrity of the repair.
Thank you