Post-operative CSF Fistulae and the Translabyrinthine Approach for Acoustic Neuroma Resection

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ABSTRACT

Objective: To determine the rate of cerebrospinal fluid (CSF) leak after translabyrinthine craniotomy for the removal of vestibular schwannoma. Secondarily, to assess associated risk factors and techniques in the perioperative management that may prevent its occurrence.

Study Design: Retrospective study

Methods: Patients presenting to the Michigan Ear Institute who underwent translabyrinthine craniotomy for removal of vestibular schwannoma from January 2009 to October 2014 were eligible for inclusion. The main outcome variables were post-operative CSF leak, age, gender, BMI, and the need for additional surgeries or medical interventions.

Results: 82 patients, of 4 different surgeons, met inclusion criteria. A female to male ratio of 1.7 was observed. Five patients developed a post-operative CSF fistula (6%). Advanced age was the only associated risk factor, p=.048. There was no significant difference in BMI between the two groups. None of the CSF fistulae patients developed meningitis. All five were readmitted, but there was no significant difference in length of stay between the two groups. 4/5 failed conservative management, requiring lumbar drain placement, and wound exploration with closure of the fistula.

Conclusions: CSF leak is a rare complication in the translabyrinthine approach for resection of vestibular schwannoma. Advanced age was the only associated risk factor. Perioperative diuretics and placement of a lumbar drain is not necessary for the prevention of CSF leak. Removing the incus and packing the middle ear, eustachian tube, and mastoid defect are critical steps in preventing post-operative CSF leak.

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INTRODUCTION

Cerebrospinal fluid (CSF) fistula is a known post-operative complication of the translabyrinthine craniotomy approach for vestibular schwannoma resection. Reported rates in the literature are variable, ranging from 0-30%.[1] Patients who suffer from CSF fistulae are at greater risk for meningitis, the need for revision surgery, and may experience a prolonged hospital stay.[2] The identification of associated risk factors may influence future perioperative management. Unfortunately, there is a paucity of data in the current literature in this regard.

We have maintained a simple closure technique with the avoidance of lumbar drainage and foreign material in the craniotomy reconstruction. In the current study, we present the rate of post-operative CSF fistulae after translabyrinthine craniotomy for the removal of vestibular schwannoma at a major skull base surgery referral center over a 3-year period. We also describe the details of our closure technique and perioperative protocol that have been effective in preventing its occurrence.

METHODS AND MATERIALS

A retrospective chart review of all individuals who underwent translabyrinthine craniotomy for the removal of vestibular schwannoma from December 2011 to October 2014 was performed. Tumors of the facial, glossopharyngeal, or vagus nerve were excluded, as well as other masses of the cerebellopontine angle. Cases that involved a combined approach, staged resection, or prior treatment with stereotactic radiosurgery were also excluded.

The main outcome variables were the presence of CSF leak, the association with age, gender, BMI, and the need for additional surgeries or medical interventions. Those patients with CSF leak were compared to those without using the Student t test. The qualitative data was analyzed using the x^2 test with Yates correlation.

RESULTS

82 patients, of 4 different surgeons, met inclusion criteria. Five patients were noted to have a post-operative CSF fistula (6%). The average age of those patients with postoperative CSF fistulae (63.4 + 9.71) was significantly higher than the remaining patients (51.96 + 12.49) p=.048. There was no significant difference in BMI between the two groups. None of the CSF fistulae patients developed meningitis. All five of the CSF fistulae patients were readmitted, but there was no significant difference in length of stay between the two groups. Four of the five failed conservative management and required lumbar drain placement. Four patients were taken for wound exploration and closure of the fistula.

SURGICAL TECHNIQUE

Critical Steps in surgical technique:

1.The epitympanum is opened, the incus and head of the malleus are removed (Fig. 1).
2.The tendon of the tensor tympani is cut (Fig. 2).
3.The eustachian tube and middle ear are packed with periosteum (Fig. 3).
4.A large fascia graft is draped over the antrum.
5.Any exposed air cells are packed with bone wax.
6.An abdominal fat graft is soaked in bacitracin and then placed to fill the IAC defect (Fig. 4).
7.A cat's cradle of 2.0-vicryl suture is made to retain the fat in the defect. The periosteal tissue is closed with interrupted 2.0-vicryl sutures. The subcutaneous tissue and skin is closed in a standard fashion.

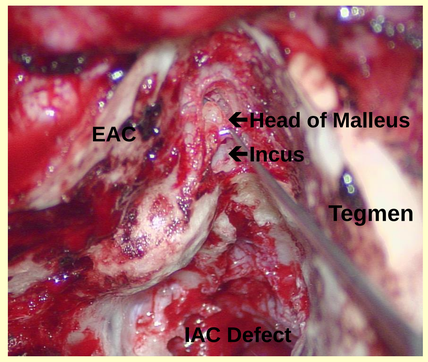

Figure 1. Removing the incus.

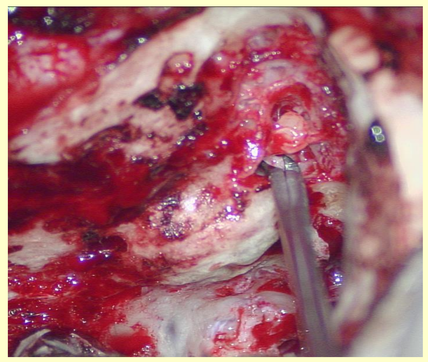

Figure 2. Cutting the tensor tendon.

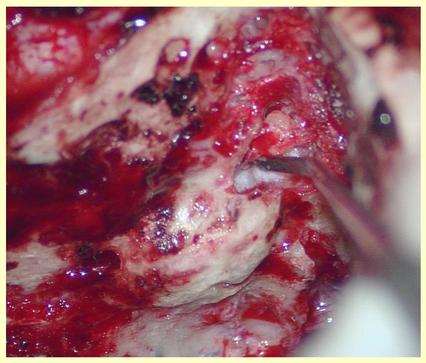

Figure 3. Packing the middle ear

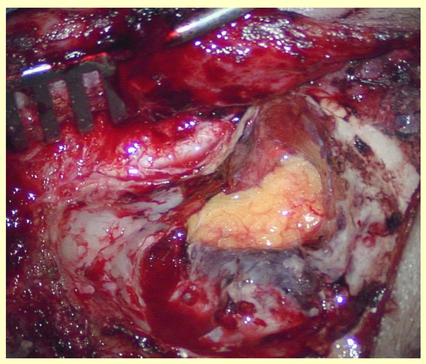

Figure 4. Abdominal fat graft filling the IAC defect. External Auditory Canal (EAC).

DISCUSSION

Diligence in surgical technique is critical to prevent the occurrence of post-operative CSF leak. The technique was the same for the patients who leaked other than the use of bone wax. Bone wax was only used in two of the five fistulae patients, suggesting that this is a critical step in closure.

Obesity is a known risk factor for spontaneous CSF fistulae and is thought to result from ectopically positioned arachnoid granulations along the middle fossa dura, along with increased intracranial pressure, that induce bony erosion and dehiscence of the middle cranial fossa floor.[3] This pathophysiology would lead one to believe that obese patients would also be at risk for post-operative CSF fistulae. Copeland et al described 45 patients with post-operative CSF leak. They observed that elevated BMI, the translabyrinthine approach, and prolonged operative time were risk factors for CSF leak.[4] Anandon et al, similarly studied twenty patients and found no correlation of post-operative CSF leak with BMI.[5] Our sample size is small, but is in agreement with Anandon, as we found no significant difference in BMI between the CSF fistula group and those patients who did not develop a leak. Multiple studies have shown advanced age to be unrelated.[2,4] However, the average age of those patients with postoperative CSF fistulae was significantly higher in our cohort.

The main limitation of this study is the small sample size, but with further data collection, we plan to re-evaluate post-operative steroids, obesity, DM, and OSA as risk factors for post-operative CSF fistulae.

CONCLUSIONS

Post-operative CSF fistula is a rare occurrence after translabyrinthine craniotomy for resection of a vestibular schwannoma in our practice. Our simple closure technique, without the routine use of post-operative diuretics or the perioperative placement of a lumbar drain, is sufficient for the prevention of post-operative CSF fistulae. The only risk factor determined to be of significance was increased age. We predicted that increased BMI, diabetes mellitus and obstructive sleep apnea would be associated with a greater risk for post-operative CSF leak; however, this was not the case.

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