A Management Algorithm for CSF leaks in Complex Temporal Bone Pathology

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INTRODUCTION

- Defects in the bony floor of the lateral skull base, can lead to CSF leak, meningoencephaloceles and meningitis.
- CSF otorrhea / paradoxical otorhinorrhoea is potentially life threatening and requires thorough and timely intervention.
- Our experience with repairing CSF leaks in complex temporal bone pathology is reflected in these interesting cases highlighted below;

CASE 1

- A 23-yr male presented with post-RTA watery rhinorrhoea from left nose along with right side House Brackmann Grade-V facial palsy and bilateral profound hearing loss.
- CT temporal bone revealed a complex fracture of the skullbase extending into both temporal bones - # involved the vestibule, lateral semi-circular canal, middle ear cavity and horizontal facial nerve canal on the right side, while on the left a cochlear # with CSF leak through the ET tube was noted (Fig 1).
- Surgery – Transcochlear approach for CSF leak repair (Fig 2). CSF leak was seen from the round & oval windows and was repaired with temporalis muscle, fascia, fascia lata and fibrin glue in layers. Eustachian tube was plugged and blind sac closure done (Fig 3).
- As a staged procedure, facial N decompression was done on the right side with the patient due to have a right cochlear implant soon.

Fig 1

Fig 2

Fig 3

CASE 2

- A 77yr old man presented with left ear discharge, tinnitus & headache in the left temporal region, with giddiness and profound hearing loss. He had undergone 5 mastoid surgeries in this ear earlier for similar complaints.
- HRCT showed soft tissue mass within the middle ear cavity, extending into the external auditory canal with bony erosion of attic wall, all three semi-circular canals and horizontal facial nerve. Erosion of tegmen and posterior fossa dura were also noted (Fig 4).
- Surgery- Transmastoid approach to expose cholesteatoma filling the entire tympanomastoid cavity and extending into the dura of the posterior and middle fossa. All dural matrix was cleared and CSF leaks were repaired in a systematic way with multilayered water-tight closure (Fig 5 & 6). Blind sac closure was done & ET plugged.
- Facial N preserved in anatomical continuity and recovered to Gr-III.

Fig 1

Fig 2

Fig 3

CASE 3

- A 23 year lady with intermittent watery discharge from the left ear for the past 3 years associated with headache and h/o multiple episodes of meningitis in 2014-2015.
- She had a dead ear and had undergone surgery for CSF leak which failed.
- Examination revealed recurrent CSF leak from left ear. Lumbar puncture was found to be turbid with cell counts were high.
- She was taken up for surgery after the infection had subsided.
- CT scan showed a left Cochleo-vestibular dysplasia (IP-II Mondini deformity with cystic semicircular canal) with dehiscence of labyrinthine part of facial nerve (Fig 7).

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- T2 MRI showed hyperintensity in mastoid and middle ear, suggestive of fluid (CSF) collection (Fig 8). CT Cisternography showed leak around oval and round windows.
- Surgery- Transotic approach was used. CSF leak was visualized in superior aspect of oval window and round window (Fig 9). The cochlea was drilled and multilayered packing done. Eustachian tube plugged with muscle. The leak was sealed with fibrin glue followed by blind sac closure (Fig 10).

Fig 7

Fig 8

Fig 9

DISCUSSION

- Spontaneous CSF leaks and fistulas are usually caused by developmental anomalies of the labyrinth such as monodini-type defect or wide vestibular / cochlear aqueducts, patent fallopian canal and tympanomeningeal fissure of Hyrtl.
- CSF leak occurs in 15-20% of all temporal bone fractures. Surgical repair is recommended for those cases that persist 7-10 days after an injury.
- Chronic otitis media with cholesteatoma has the potential to thin out the dura and can lead to the formation of meningocele or meningoencephalocele or temporal lobe herniation and has risk of intra-op CSF otorrhea.
- Surgical approaches include, transmastoid, middle cranial fossa and combined approaches. Surgical repair should address the osseous and dural defects and underlying intracranial benign hypertension. All defects need to be repaired in a multilayered fashion using autologous tissue as well as allogenic materials to achieve a water-tight seal.
- Ventriculoperitoneal shunting may be required in some patients to aid in better wound healing without CSF pressure influences.
- Based on our above experience, a management algorithm is proposed here for CSF leaks in Temporal Bone.

CONCLUSION

Surgery for Temporal Bone CSF leaks is challenging but successful when performed in high volume tertiary referral centres by a dedicated multidisciplinary skullbase team.

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