CASE REPORT

Dural Tear Post Mastoidectomy Repaired with Dura Gen

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Summary

Dural exposure may occur during the course of thinning the tegmen tympani and tegmen mastoideum in mastoid procedure. If large area of dura is exposed or lacerated, cerebrospinal fluid and brain herniation may enter the mastoid cavity. We report a case of a patient with injured dura mater and tegmen mastoideum during mastoidectomy for chronic suppurative otitis media with cholesteatoma managed by using DuraGen. The dura mater and tegmen defect healed totally showing the success of the procedure. A collagen matrix like DuraGen is an option for repairing dural tear in mastoid region.

KEY WORDS:
mastoid, dura mater, injuries

Introduction

Dural exposure may occur during the course of thinning the tegmen tympani and tegmen mastoideum in mastoid procedure. If large area of dura is exposed or lacerated, cerebrospinal fluid (CSF) and brain herniation may enter the mastoid cavity. Therefore repair of the defect is a necessity. There are multiple methods in repairing dural defect. In this case, repair of the dural defect using DuraGen is described.

Case Summary

A 16 years old young gentleman presented with bilateral ear discharge for 4 years. The discharge was foul smelling, scanty, persistent but not blood stained. He had also reduced in hearing which is progressively worsening associated with occasional tinnitus. He denied of any history of vertigo or imbalance. There was no headache, nausea or vomiting.

On examination revealed a well built, comfortable young gentleman with stable vital sign .Bilateral ear were moist with pus in the external auditory canal. Ears toilet were done and attic perforation was noted on bilateral tympanic membrane. No facial asymmetry and cranial nerves were intact. Tuning forks test showed negative Rinne's test in both ears and weber's test was central. Pure tone audiometry revealed patient was having 60 dB conductive hearing loss on the right ear while 30 dB conductive hearing loss on the left. Computerized Tomography showed bilateral sclerotic mastoid with opacity and eroded ossicles over right middle ear.

The patient was diagnosed to have bilateral ears cholesteatoma. In view of severity of right ear disease, he was arranged for right ear mastoidectomy. Intra –operatively, tegmen mastoideum was breached. The size of breached tegmen plate was around 1cm. Dural abrasion with part of the brain herniated and cerebrospinal fiuld leak were noted. In order to establish the dural margin to repair the defect, part of the normal tegmen mastoideum which covered the dural was drilled. The tegmen defect was closed using underlay extradural method by applying DuraGen and tissue glue. No CSF leak was noted post repaired and Valsalva maneuvre. Modified radical mastoidectomy and tympanoplasty type III were performed. Post surgery, the patient was covered with prophylaxis intravenous antibiotics and advises of bed rest and avoids straining were given. Minimal CSF leak was still noted for few days post surgery but completely resolved after one week. The patient had no sign and symptoms of meningitis during the one week observation. He was reviewed weekly in Otorhinolaryngology clinic for one month after discharged from the ward, then three monthly for six months. Post-operative pure tone audiometry demonstrated 60dB conductive hearing loss. He had been followed up for 12 months and no symptom and sign of CSF leak or infection was noted. Surgical intervention for left ear cholesteatoma is planned after discussion with the patient and his parents.

Discussion

Exposure of dura and CSF leak are the known complications in mastoid surgery. It is able to be avoided by carrying out meticulous surgery using diamond burr while drilling the tegmen plate. However, sometimes the disease itself (cholesteatoma) may thin out the tegmen plate. Volume reduction in sclerosed mastoid air cells may lead to inferior displacement of temporal lobe.[1] All these factors will increase the risk of tegmen plate injury.

From the literature review, iatrogenic tegmen breach is not uncommon. In a retrospective study, Bodenez et al. reported that 31% of tegmen breach in otological surgery were noted not directly related to the site of cholesteatoma lesion.[2] A tegmen breach cannot induce meningeal or meningoencephalic herniation unless it is associated with dural involvement as it is a tough structure. Some researchers advocated that any type of tegmen breaches more than 5mm should be repaired to avoid further risk of dura mater rupture and cerebral infection.[2,3] As for dura tear or abrasion, with or without CSF leak requires sealing immediately as it leads to dangerous consequences of CSF leak, meningitis, encephalocele, meningoencephalocele, cerebral abscess and pneumocepalocele.[2]

Throughout the history of dural plasty, watertight approach which involved in using sutures with or without dural substitute

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was traditionally practised. However there were limitations in this method such as pinholes which caused by the sutures lead to further CSF leak. Secondly, deep seated defects (such as skull base procedures, transphenoid approach) may hinder the usage of sutures and knots. Hence, non-watertight and sutureless technique was advocated in which absorbable substitiute was being used.[4]

The dural substitutes can be categorized into autografts (i.e fascia latae, temporalis fascia), allografts (i.e amniotic and placenta membrane, pericardiu, fascia, lyophilized dura), Xenografts (i.e bovine or porcine pericardium, peritoneum, dermis) and synthetic materials (polytetrafluoroethylene [PTFE], polyester urethane).[4] Unfortunately, adverse reactions such as graft dislocation, immunoallergic reaction, transmission disease (Creutzfeldt-Jakob disease), foreign body reaction and adhesion formation have been reported when the above materials were used.[4] Therefore the effort of searching for an ideal dural substitute which has the characteristics of easy handling, integrated into natural tissues, applied without suture, watertight closure was carried out.

Hence, collagen matrix such as DuraGen which is made up of type I collagen was produced. DuraGen is synthesized from bovine Achilles tendon. It provides a low-pressure absorptive surface to diffuse CSF and attaches to the dural surface via surface tension. It also helps clot formation by the platelets depositing themselves on the collagen, which then disintegrate and release clotting factors, ultimately facilitating fibrin formation.[4] The fibroblasts use the pores on the matrix to lay down endogenous collagen. By 6-8 weeks, the collagen matrix is resorbed and is integrated to the endogenous dura.[4] Furthermore, the collagen matrix could be applied with onlay method without suture.

Underlay and onlay surgical techniques had been described by Draf and Shick in anterior skull base duraplasty.[5] They divided underlay method into intradural in which a graft is placed onto the top of dural defect whereas in extradural, a graft was positioned in between the dural and the bony defect. The intradural underlay graft is usually applied in cases when high CSF is expected. Comparing the underlay and the onlay techniques, the underlay technique provides a stable and watertight graft to the defect site but it might further injure the dura mater and the brain. The onlay method might has higher risk of displaced but it could be applied in subcentimeter defect with low CSF pressure.

In this reported case, as the defect is 1cm the tegmen mastoideum was drilled to establish the dural margin. DuraGen was placed with underlay extradural method then reinforced by tissue glue. The Patient recovered well and no CSF leak or sign and symptoms of meningitis were noted during follow up. We conclude that small defect of dural less than 1cm in the mastoid region can be successfully repair by single-layer, using non watertight collagen matrix (DuraGen).

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