Original Article

Immunisation patterns amongst Australian otolaryngologists in cases of cerebrospinal fluid middle ear effusions

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Background: There is a paucity of high-level evidence to guide evidence-based management of adults presenting with spontaneous cerebrospinal fluid (CSF) middle ear effusions. Clinical practice guidelines are therefore limited and global management of this entity is variable with a lack of consensus among clinicians that manage patients with middle ear CSF effusion.

Methods: Members of the Australian Society of Otolaryngology Head and Neck Surgery (ASOHNS) were invited to participate in an online survey regarding their immunisation practices in patients presenting with clinical evidence of a CSF middle ear effusion.

Results: One hundred and three consultant otolaryngologists responded to the survey. A quarter of respondents always vaccinate patients diagnosed with a CSF middle ear effusion. Fifty-nine percent of respondents never vaccinate this patient group and the minority vaccinate in certain clinical scenarios. Of those that do vaccinate, all vaccinate against *Streptococcus pneumoniae*, with Pneumovax 23® the most commonly administered vaccination.

Conclusions: This is the first survey examining immunisation practices in cases of suspected CSF middle ear effusion. More research is needed to elucidate the best management for these patients including the efficacy of immunisation in reducing the risk of meningitis.

Keywords: Cerebrospinal fluid otorrhea (CSF otorrhea); meningitis; middle ear effusion; immunisation

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Introduction

Spontaneous cerebrospinal fluid (CSF) leak resulting in a middle ear effusion is an emerging clinical entity. Hendriks *et al.* describe the largest series of patients with CSF otorrhoea in Australia (1). There is a lack of high-level evidence in the literature to guide management of this condition and a widely accepted evidence-based management algorithm is yet to be elucidated.

The primary goal of management of these patients is to reduce the risk of life-threatening sequelae of a CSF middle ear effusion, specifically meningitis and associated intracranial complications. The incidence of meningitis in patients with a CSF middle ear effusion is unknown. Vaccination is used by some otolaryngologists with the theoretical aim of reducing the risk of ascending meningitis. While some national health authorities have published guidelines in relation to vaccination of patients with CSF leak there are no widely accepted protocols.

The aim of this paper is to present the results of a survey of the immunisation practices of Australian otolaryngologists in their management of patients presenting with CSF middle ear effusion.

Table 1 Responses to "Do you vaccinate patients with a diagnosed 'CSF middle ear effusion?'"

Response	Number (n=83)
Yes—all the time	22 (26.51%)
Yes—if they are not planned for surgery to repair the CSF leak	5 (6.02%)
Yes—if they are planned for surgery to repair the CSF leak	2 (2.41%)
Yes—if they are immunocompromised and not planned for surgery to repair the CSF leak	3 (3.61%)
Yes—if they are immunocompromised and planned for surgery to repair the CSF leak	3 (3.61%)
Yes—if they have had a clinical presentation consistent with and/or diagnosis of meningitis	5 (6.02%)
No, never	49 (59.04%)

CSF, cerebrospinal fluid.

Methods

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013), and approved by the South Metropolitan Health Service Human Research Ethics Committee (RGS0000003884).

An online survey comprising of 9 questions was sent to all members of the Australian Society of Otolaryngology Head and Neck Surgery (ASOHNS), the representative organisation for Ear, Nose and Throat, Head and Neck Surgeons in Australia, using SurveyMonkey (2). The survey was sent on two occasions, 10 days apart.

For the purposes of the survey, a 'CSF middle ear effusion' was defined as the clinical scenario whereby a patient presents with all of the following: (I) a middle ear effusion; (II) computerised tomography scan demonstrating tegmen tympani and/or tegmen mastoideum defects; and (III) a middle ear aspirate sample with a beta trace protein or beta 2 transferrin level above the normal range.

Results are described using percentages of the total number of responders. The number of non-response errors are indicated in the reporting of responses.

Results

Demographics of respondents and clinical practice

The survey was sent to 488 ASOHNS members, 103 members completed the online survey (21% response rate).

When asked their area of speciality, 45% of respondents practice in General ENT, 21% in Otology/Neurotology and 16% in Head and Neck. Forty-two respondents (41%) have been an otolaryngologist for more than 20 years, 30 respondents (29%) have practised for 11–20 years and 31 (30%) for ten years or less.

A quarter of respondents stated that otology made up more than 50% of their case load, with 4% of total respondents having otology comprise more than 75% of their case load.

Diagnosing a CSF middle ear effusion

The majority of respondents (68%) use beta 2 transferrin to identify the presence of CSF within middle ear fluid.

When asked "How has the number of patients/year you diagnose with a 'CSF middle ear effusion' changed over the last 5 years?", of the 81% who responded, the majority (72%) reported no change; 18% of respondents reported an increase. The remaining 10% reported a decrease. Five of the twenty-two (23%) respondents who identified as specialist otologist/neurotologists reported an increase in this clinical presentation.

Vaccinations

Just over a quarter of respondents vaccinate patients diagnosed with a CSF middle ear effusion 'all the time'. Fifty-nine percent of respondents never vaccinate this patient group. The remainder vaccinate patients in some circumstances (*Table 1*).

Thirty-three respondents answered the question 'If you do vaccinate—which vaccines do you administer?' A further two indicated they do not personally decide, they refer to an otology colleague. Of the 30 responders, 100% indicated that they vaccinate against *Streptococcus pneumoniae*. The most commonly administered vaccine was Pneumovax 23®, a 23-valent pneumococcal polysaccharide vaccine (*Table 2*). In addition to this, 66% of responders vaccinate against *Neisseria meningitidis* and 58% vaccinate against

Table 2 Responses to 'If you do vaccinate—which vaccines do you administer?'

Response	Number (n=30)
Pneumococcus; 23-valent pneumococcal polysaccharide vaccine (23vPPV): Pneumovax 23®	22 (73.33%)
Pneumococcus; 13-valent pneumococcal conjugate vaccine (13vPCV): Prevenar 13®	7 (23.33%)
Meningococcus; Recombinant meningococcal B (MenB) vaccines: Bexsero®, Trumenba®	8 (26.67%)
Meningococcus; Quadrivalent (A, C, W, Y) meningococcal (MenACWY) conjugate vaccines: Menactra®, Menveo®, Nimenrix®	11 (36.67%)
Meningococcus; Meningococcal C (MenC) conjugate vaccine: NeisVac-C®	3 (10.00%)
Haemophilus influenza type B (*HiB*); Monovalent HiB PRP-T vaccines: Act-Hib®, Hiberix®	9 (30.00%)
Haemophilus influenza type B (*HiB*); Combination HiB vaccines: (DTPa-HepB-IPV-Hib): Infanrix hexa®, Hexaxim®	3 (10.00%)
Combination vaccine; Meningococcal C (MenC) conjugate vaccine + Hib PRP-T: Menitorix®	6 (20.00%)

haemophilus influenza. One responder vaccinates against influenza virus.

Discussion

This is the only survey of immunisation practices of otolaryngologists in patients presenting with clinical evidence of a CSF middle ear effusion. Immunisation is currently recommended by some otolaryngologists with the aim of reducing the risk of ascending meningitis.

The small number of responders who indicated which organisms they vaccinate against immunise against *Streptococcus pneumoniae*, which is in keeping with local and international guidelines. The Australian Immunisation Handbook recommends the pneumococcal vaccine for patients with 'at risk conditions' for invasive pneumococcal disease including proven or presumptive CSF leak, cochlear implants and intracranial shunts (3). The efficacy of pneumococcal vaccination for prevention of meningitis in cochlear implant recipients has been demonstrated in animal models (4) and pneumococcal vaccination is recommended for cochlear implant recipients in the United States of America, United Kingdom and Australia (3,5,6). The U.S. Department of Health and Human Services Centers for Disease Control and Prevention (CDC) (7) and the National Health Service (NHS) (5) in the UK also recommend pneumococcal vaccination for patients with CSF leak, with the CDC recommending that pneumococcal vaccine naïve patients have the 13-valent vaccine followed by the 23-valent vaccine 8 weeks later (8). No other vaccinations are recommended for patients with a CSF leak by these organisations.

It is arguable that pneumococcal vaccination in isolation may be insufficient, given that other upper aerodigestive tract pathogens are recognised to cause meningitis. These include *Neisseria meningitidis* and *Haemophilus influenzae*. Ter Horst *et al.* prospectively reviewed a series of over 2,000 cases of community-acquired bacterial meningitis in the Netherlands. They found that 3% of episodes were associated with a CSF leak, as identified by treating physicians and diagnosed radiologically and/or biochemically (9). *Streptococcus pneumoniae* was identified as the causative organism in 51% of episodes and *Haemophilus influenzae* was identified in 17% of cases. The most commonly identified aetiology for the CSF leak was ENT surgery. The second most common aetiology was previous head trauma. Spontaneous CSF middle ear effusion was not mentioned in the paper, however the cause of CSF leak was unknown in 25% of the cases and these could potentially represent spontaneous CSF leak. Otitis media was identified as a predisposing factor in 12% of cases. Interestingly, of those with the first episode of meningitis, the leak was identified pre-morbidly in 37% of cases. Further details of these cases were not provided.

There is a paucity of high-level evidence in the literature to guide management of CSF middle ear effusion and a widely accepted evidence-based management algorithm is yet to be elucidated. The predominant treatment strategy for confirmed lateral skull base CSF leak as described in contemporary published case series appears to be surgical repair (10-12). These procedures are not without their own risks and complications (13). The risk of developing

meningitis in the presence of a middle ear CSF leak is unknown. Rao *et al.* describe two interesting clinical scenarios in their case series (14): (I) patients presenting with a long history of symptoms of a middle ear effusion, that is subsequently proven to be CSF, who have never developed meningitis and; (II) patients with middle ear and mastoid disease, who intra-operatively are identified to have tegmen defects with dura in contact with infected material, who have not developed meningitis. These two scenarios indicate that in some cases the risk of meningitis risk may be low and this may bring to question the appropriateness of the predominantly published treatment strategy of surgical repair.

In patients with non-traumatic anterior cranial fossa CSF leaks, Eljamel *et al.* reported a 10% risk of meningitis per year (15). Rimmer *et al.* identified a lack of guidelines for the use of antibiotics and/or immunisations in patients with an active anterior skull base CSF leak (16). In a survey of UK rhinologists, 35% immunised patients with an anterior skull base CSF leak, including vaccination against *Streptococcus pneumoniae* (87%), *Neisseria meningitidis* (60%) and *Haemophilus influenzae* (47%). The authors concluded that vaccination against all three organisms was appropriate in patients with an anterior skull base CSF leak. This proposition could arguably be extended to patients with a middle cranial fossa/middle ear CSF leak since the middle ear cleft is in communication with the nasopharynx through the eustachian tube.

Interpretation of the results of this survey is limited by the survey response rate of 21%, which may have failed to capture the true immunisation practices of Australian otolaryngologists as a whole.

The external validity of the study findings outside Australia will be limited due to a lack of consensus within the international otolaryngology community in regards to diagnostic criteria and management of this group of patients, as well as access to different vaccines in different countries.

Conclusions

In summary, literature surrounding the management of spontaneous CSF otorrhea in the adult population is currently limited to case series and further research is needed to better understand the best way to manage this cohort of patients (14,17-19). Published case series identify surgical repair as the currently recommended treatment, but do not discuss current vaccination practices. The benefit of vaccination against organisms that are responsible for meningitis in patients who decline or are not appropriate for surgical repair, as well as those patients planned for surgical repair, is at present unknown.

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Footnote

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Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at https://www.theajo.com/article/view/10.21037/ajo-22-2/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of this work and ensure that questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013), and approved by the South Metropolitan Health Service Human Research Ethics Committee (RGS0000003884).

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