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Vaccination – A Vital Protection

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Abstract

Aims
Sudden sensorineural hearing loss (SSNHL) is a significant complication of mumps infection. Ireland is currently experiencing a mumps outbreak with over 2500 infections reported in the past year. Our aim was to evaluate patients presenting with mumps-related SSNHL over a one-year period during this outbreak.

Methods
This retrospective review analysed patients presenting with mumps-related SSNHL from July 2018 to July 2019. We utilised "Nomura" diagnostic criteria for mumps-related SSNHL and graded hearing loss according to severity. Patient characteristics were recorded.

Results
Forty patients presented with SSNHL during this period. Six (15%) had mumps-related unilateral SSNHL. Mean time to presentation was 14 days. Hearing loss ranged from severe to profound. All received oral corticosteroids. Mean follow-up was 3 months with none showing improvement on repeat audiogram.

Conclusion
Unilateral profound SSNHL is a debilitating complication of mumps and is refractory to treatment. The importance of prophylaxis by vaccination should be emphasized by the ENT community.

Introduction

Sudden sensorineural hearing loss (SSNHL) is a significant complication of mumps infection occurring in 1 per 1000 to 1 per 20,000 mumps cases.

At present, Ireland is in the midst of a mumps outbreak with over 2500 infections reported between January and December 2019, a five-fold increase compared with 2018. The latter half of the year demonstrated a sharp increase in the number of reported cases, coinciding with the reopening of schools and colleges, and with over 100 cases a week reported in December, this outbreak appears set to continue. Dublin is the worst affected area with the majority of cases occurring in 15 to 24-year-olds[1, 2]. This outbreak is the second largest outbreak in Ireland since the introduction of the Measles-Mumps-Rubella (MMR) Vaccine in 1988, with the highest annual number of cases reported since 2009[2, 3].

The current immunisation schedule in Ireland includes one dose of the MMR vaccine recommended for children at 12 months, followed by a second booster dose given at age 4 to 5[3]. At present in Ireland, the overall uptake of the vaccine is approximately 91.5%[4]. This however, falls short of the 95% target figure recommended by the World Health

Organisation in order to protect individuals who remain unvaccinated. The efficacy of the MMR vaccine in prevention of mumps is 88% after the recommended two doses, and 78% after a single dose[5].

The aim of our study was to evaluate patients presenting with Mumps related Sudden Sensorineural Hearing Loss (SSNHL) to a dedicated ENT Emergency Department over a one-year period during the current outbreak of the virus.

Methods

This was a retrospective study of all patients presenting to a dedicated ENT Emergency Department with sudden sensorineural hearing loss over a one-year period from July 2018 to June 2019. All patients presenting with SSNHL confirmed on Pure Tone Audiometry were included. The diagnosis of Mumps related SNHL was made based on the Nomura Diagnostic Criteria for Mumps Deafness. This criteria considers 'definite' Mumps related hearing loss in patients either with clinical signs of mumps, such as parotid or submandibular swelling, who develop an acute hearing loss from 4 days before to 18 days after the onset of swelling, or in patients without clinical signs of mumps, who have IgM antibodies against mumps detected within 3 months of onset of hearing loss.[6]

Hearing loss was graded by severity based on Pure Tone Average on initial audiogram as follows: Grade 1 or mild hearing loss (20-40db), Grade 2 or moderate hearing loss (40-70db), Grade 3 or severe hearing loss (70-90db) and Grade 4 or profound hearing loss (>90db).

Patient data was collected using clinical records, to include patient characteristics, audiometric findings, and treatment received. The main outcome of interest in our study was hearing recovery or improvement. All patients were followed up in the clinic setting with repeat pure tone audiogram following treatment.

Results

Forty patients presented with Sudden Sensorineural Hearing Loss during the study period. Six (15%) of these patients were found to have mumps related unilateral SSNHL diagnosed according to Nomura Criteria. The mean time to presentation following onset of acute hearing loss was 14 days. 50% presented within 7 days of onset of parotid swelling. All 6 had been referred to the Emergency Department by their General Practitioner.

Based on initial audiometric findings, all six patients were found to have a severe to profound (Grade 3-4) unilateral hearing loss.

All patients were treated with high dose steroids as per protocol in our unit. This protocol comprises a tapering course of oral steroids beginning with 60mg of prednisolone over a period of 14 days.

Table 1. Department Protocol for treatment of Sudden Sensorineural Hearing Loss with Tapering Dose Steroids

Day	Dose of Prednisolone
Day 1-9	**60mg**
Day 10	**40mg**
Day 11	**30mg**
Day 12	**20mg**
Day 13	**10mg**
Day 14	**5mg**

All patients were followed up with clinical visit and repeat pure tone audiometry. The mean duration of follow-up after completion of treatment was 3 months. No patient showed improvement in hearing thresholds on repeat audiogram.

Discussion

Mumps is an acute viral illness, caused by a single stranded RNA paramyxovirus, and spread by respiratory droplets. Parotitis is the most common clinical manifestation, usually preceded by flu-like symptoms. While fatalities from the

mumps virus are rare, infection can lead to a number of significant complications, such as orchitis, pancreatitis, aseptic meningitis and encephalitis[7]. Sudden sensorineural hearing loss is a significant complication of mumps infection, occurring in 1 per 1000 to 1 per 20,000 mumps cases.

Overall, our study shows that mumps-related hearing loss tends to present as unilateral profound sensorineural hearing loss, and is refractory to conventional treatments recommended for sudden sensorineural hearing loss.

These findings are consistent with previous studies on the condition. Morita et al [8], in a retrospective multi-centre Japanese study identified 67 patients with Mumps related hearing loss, of which 91.5% had developed a profound hearing deficit, and none of whom showed any hearing recovery on repeat PTA. Meanwhile, Hashimoto et al[9], likewise reported on 7 children, all of whom had a profound permanent unilateral hearing loss related to mumps infection. Likewise, Kawashima et al[10], report that the majority of their cases of mumps-related hearing loss had a total or profound hearing deficit which failed to recover.

Table 2. Comparison of Published Studies on Cases of Mumps-Related Hearing Loss

	Severe to Profound Hearing Loss (% of Total Number of Cases)	Number Recovering
Our Study	6 (100%)	0
Morita (2017)	65 (91.5%)	0
Hashimoto (2009)	7 (100%)	0

By contrast, up to two-thirds of patients with idiopathic SSNHL have been found to recover following treatment[11,12]. The degree of hearing loss does impact on hearing recovery prognosis with only approximately one-third of those with idiopathic profound sensorineural hearing loss showing some degree of recovery[13].

For the majority of reported Mumps infections in Ireland in 2019, MMR vaccination status was unknown[2]. However, previous studies of patients with mumps-related hearing loss, found a high proportion of those affected were not previously vaccinated against the virus. Morita et al[8], reported that of the 67 patients included in the study, only 3 (4.4%) were confirmed to have received any previous mumps vaccination, with 57% unvaccinated, and the remainder of unknown vaccination status. Likewise, Hashimoto et al [9] report that none of the patients included in their study had previously been vaccinated against the mumps virus. Kawashima et al[10], conducted a nationwide epidemiological study of mumps related hearing loss in Japan in 1987, 1993 and 2001. In Japan, routine vaccination with the MMR vaccine was suspended in 1993. In this study, it was noted that, of the 146 patients with mumps related hearing loss surveyed in 2001, only 4 (2.7%) had been vaccinated.

They also noted that, in 2001, since the cessation of routine vaccination, the annual number of cases of mumps-related hearing loss cases had more than doubled compared with the earlier years.

Hearing loss can have devastating psychological and social impact on patients. A number of studies have found that individuals with even moderate hearing loss have lower levels of educational attainment, lower incomes and higher rates of unemployment[14,15]. Permanent unilateral hearing loss also significantly impacts quality of life[16], and those with permanent hearing impairment report higher rates of psychological disorders such as depression and anxiety[17].

In conclusion, unilateral profound sudden sensorineural hearing loss is a severely debilitating complication of mumps infection which tends to be refractory to conventional treatment. The MMR Vaccine is safe and effective in protecting against the mumps virus and its complications, and therefore we believe the importance of prophylaxis by vaccination should be emphasized by the ENT community at large.

Declaration of Conflicts of Interest:
The authors have no conflicts of interest to declare.

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