DOI: 10.7860/JCDR/2019/38207.12876

Case Report

Ear, Nose and Throat Section

Facial Nerve Paralysis Due to Aviation Barotrauma in a Child: A Case Report

GRANT L HOM[1], SAMANTHA ANNE[2], A DAVID ROTHNER[3]

ABSTRACT

Facial nerve paralysis due to aviation barotrauma is a rare occurrence that has previously only been seen in adults. This case report describes the presentation of baroparesis in a female child, which posed unique challenges due to the transient nature of the occurrence. The majority of the child's symptoms resolved during the flight, but she reported an aural fullness persisting for 12 days. She was referred to paediatric neurology and paediatric otolaryngology for a systematic review of the possible causes of her episode. Possible preventive measures are proposed for this type of episode.

Keywords: Baroparesis, Facial paralysis, Neurology

CASE REPORT

A 10-year-old female was referred for the inability to move the left-side of her face after a 2.5 hour flight. She had clear rhinorrhea before the flight. Forty-five minutes after the flight began; she experienced inability to move left lip and the sensation of numbness and left otalgia followed by an inability to close her left eye and an abnormal smile. The lip numbness sensation and movement began to resume 40 minutes after onset of symptoms, followed by increased function of eyelids, and reduced otalgia. No hearing loss, vertigo, or tinnitus was noted. Two days after the flight, she presented to the emergency room and reported aural fullness that persisted for 12 days, but had a normal exam. Computed tomography (CT) scan of her brain was normal. Amoxicillin/clavulanate was prescribed by emergency room physician empirically. This patient reported to us 15 days after the episode.

Her medical history was unremarkable. She had no history of head injury. Patient has occasional non-migrainous headaches attributed to stress from school related exams and activities, She was not on any medications and had no known drug allergies. Her family history was unremarkable with no history of Bell's palsy.

Patient was referred to otolaryngology for further evaluation. Computed Tomography dedicated to temporal bones was completed to make sure that there were no intracranial tumours or lesions that may have caused the transient paralysis. The diagnosis was that the CT brain was initially normal because it showed no abnormality on left side, specifically, no bony dehiscence of facial canal in the tympanic segment. Antibiotics were given by emergency room physician empirically due to alarming symptoms and concern for possible early presentation otitis media. Magnetic Resonance Imaging (MRI) was done in an outpatient clinic nearly a month after CT was completed. The time interval between the imaging studies was due to scheduling and travelling conflicts and added time to get imaging study scheduled. MRI showed new finding of opacified petrous apex cells. Findings were incidental and unrelated to recent facial paralysis. Audiological evaluation for both ears was normal. Examination of middle ears was unremarkable. The patient was prescribed antibiotics for acute otitis media. On follow-up at 3-6 months, her facial paralysis has completely resolved and she had no residual symptomatology.

DISCUSSION

This is the first reported case of aviation barotrauma causing facial paralysis in a paediatric patient. Head trauma, herpes simplex virus infection, and surgical complications are among known aetiologies for facial palsy [1]. Eighteen previous aeroplane or high altitude facial palsy cases have been reported since the year 2012 [2,3]. The hypothesis for high altitude related facial palsy involves ischaemic neuropraxia and can be explained with Boyle's law. When planes ascend, Boyle's law suggests that the volume within the middle ear increases as atmospheric pressure decreases [2]. The Eustachian tube minimises pressure differences between the middle ear and atmosphere and reduces high-pressure build-up through the nasopharynx [4]. This passive process usually relieves pressure damage. A dysfunctional Eustachian tube allows pressure build-up at the medial wall of the middle ear, which presses against and impairs the 7th cranial facial nerve. Only the thin bony covering of the Fallopian tube at this location separates the medial wall from the cranial nerve, making this a likely location of dehiscence and neuropraxia.

Congenital or traumatic malformations to the teeth, jaw, and nasal skeleton have also been previously recognised to affect Eustachian tube functioning [5]. Additionally, oedema within the tubal membrane caused by congestion can impair the tube's ability to open [4,6]. Rhinitis is a reported factor that co-exists with baroparesis episodes [2]. This was possibly significant for the present patient who had rhinorrhea as sole symptom with subsequent evaluation that showed no malformations or abnormalities. Facial paralysis in barotrauma is likely multifactorial, however, since numerous people with rhinitis have ascended in an aeroplane without experiencing facial palsy. The majority of reported aviation baroparesis episodes do not report notable rhinitis. Aeroplane descent, Eustachian tube opening, and myringotomy can relieve middle ear pressure and restore nerve function. However, pressure for three hours or more can possibly permanently damage structures within the nerve beyond normal recovery [1].

Divers have developed a number of techniques that can possibly equilibrate the ears at onset of paresis [Table/Fig-1] [6,7]. The Toynbee, Valsalva, Otrovent, and Lowry maneuvers were developed to open the Eustachian tube, but these maneuvers have not been well tested before, within high-altitude settings. Hidir Y et al., study suggest that the Valsalva and Toynbee maneuvers produce similar success rates of equalisation of middle ear pressure [5]. Patients who suffer partial palsy can possibly yawn or swallow to relieve pressure within the Eustachian Tube, but these techniques are generally not well-known among air travellers [6].

Technique Name	Description
Valsalva Maneuver	Involves pinching the nostrils closed and exhaling gently through the nose.
Toynbee Maneuver	Pinch the nostrils and swallow.
Lowry Maneuver	While pinching the nostrils, blow through the nose and swallow at the same time. This is considered the most challenging technique.
Otrovent Maneuver	Blow in air with one nostril of the nose, close that nostril, and blow into a balloon with the other nostril.

[Table/Fig-1]: Possible equilibration techniques.
Maneuvers used to equilibrate ear pressure while diving [6,7].

Aviation facial baroparesis episodes generally self-resolve and do not need immediate medical attention. Decongestants such as oral pseudoephedrine and xylomethazoline nasal spray have been recommended for prevention and treatment [2,8]. However, the effectiveness of pseudoephedrine for aviation-related ear problem prevention is unclear in children [9]. Antihistamines can prevent congestion for those with allergies [4]. The evidence for using nasal balloon inflation, pressure-equalisation tubes, or pressure-equalising earplugs for prevention is not conclusive [8,10]. An audiological exam should be conducted as some cases of barotrauma have caused hearing loss.

Cases reported in the literature seem to involve multiple, intermittent episodes of facial barotrauma [2,3]. In future flights, the patient should be made aware of possible pressure equalisation techniques and decongestants to avoid facial barotrauma.

CONCLUSION

Facial paralysis from aviation barotrauma is rare and can occur in children with normal neurological function. A patient who suffers facial baroparesis should be evaluated by a neurologist and otolaryngologist to check for both cranial and otologic causes. Physicians should inform patients of the transient nature of a facial palsy episode to relieve concerns and educate them about decongestants and pressure equilibration techniques that can possibly prevent added recurrences.

REFERENCES

[1] Evans AK, Licameli G, Brietzke S, Whittemore K, Kenna M. Paediatric facial nerve paralysis: patients, management and outcomes. Int J Pediatr Otorhinolaryngol. 2005;69(11):1521-28.
[2] Rutten M, Kunst H. Facial nerve palsy in aviation facial baroparesis. Int Adv Otol. 2010;6(2):277-81.
[3] Ah-See KL, Shakeel M, Maini SK, Hussain SM. Facial paralysis during air travel: case series and literature review. J Laryngol Otol. 2012;126(10):1063-65.
[4] Mirza S, Richardson H. Otic barotrauma from air travel. J Laryngol Otol. 2005;119(5):366-70.
[5] Hidir Y, Ulus S, Karahatay S, Satar B. A comparative study on efficiency of middle ear pressure equalization techniques in healthy volunteers. Auris Nasus Larynx. 2011;38(4):450-55.
[6] Mitchell-Innes A, Young E, Vasiljevic A, Rashid M. Air travellers' awareness of the preventability of otic barotrauma. J Laryngol Otol. 2014;128(06):494-98.
[7] Uzun C. Evaluation of predive parameters related to eustachian tube dysfunction for symptomatic middle ear barotrauma in divers. Otol Neurotol. 2005;26(1):59-64.
[8] Ryan P, Treble A, Patel N, Jufas N. Prevention of otic barotrauma in aviation. Otol Neurotol. 2018;39(5):539-49.
[9] Buchanan BJ, Hoagland J, Fischer PR. Pseudoephedrine and air travel-associated ear pain in children. Arch Pediatr Adolesc Med. 1999;153(5):466-68.
[10] Wright T. Middle-ear pain and trauma during air travel. BMJ Clin Evid. 2015;2015:0501. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4298289/

PARTICULARS OF CONTRIBUTORS:
1. Department of Paediatric Neurology, Cleveland Clinic Foundation, Cleveland, Ohio, USA.
2. Department of Otolaryngology, Cleveland Clinic Foundation, Cleveland, Ohio, USA.
3. Department of Paediatric Neurology, Cleveland Clinic Foundation, Cleveland, Ohio, USA.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
A David Rothner,
9500 Euclid Ave S60, Cleveland-44195, Ohio, USA.
E-mail: rothned@ccf.org

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Aug 14, 2018**
Date of Peer Review: **Sep 14, 2018**
Date of Acceptance: **Nov 14, 2018**
Date of Publishing: **May 01, 2019**