

# Expert Opinion

CME

## Airplane Descent Headaches

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Headaches occurring during commercial airplane descent with normal examinations and imaging have been rarely reported. Four cases of airplane descent headaches are described, 3 with new features.

### CLINICAL HISTORY

**Case 1.**—A 22-year-old male reports headache triggered by descent to land on commercial jet airplanes. The first was 2 years previously where he had identical headaches on descent on the departure and returning flights which were both the same as the most recent. Two weeks previously, he was descending to land when he developed a sudden, shooting, bursting pain in the left temple with a 10/10 intensity at onset without associated nausea, light, or noise sensitivity. There was no ear pressure, popping, or change in hearing. The headache was a 10/10 for about 25 minutes. Upon landing, he took ibuprofen and then the headache was mild with a 5/5 intensity for another 30 minutes. In addition, from the onset of the headache, the neck was very stiff and painful to move for about 15–25 minutes.

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Then on the plane trip back, he took an ibuprofen 200 mg just before departing. On descent, he developed a mild headache which was a bitemporal pain with mild neck stiffness with a 6/10 intensity which resolved after about 1 hour from onset. On another occasion, he took ibuprofen before departure and did not get the headache. He had been on no other plane trips except 1 at the age of 15 where he recalls having no headache.

He also described a 10-year history of other headaches which had been occurring about two to three times per week for the prior 5 to 6 years. He described a left or right temple or a bitemporal pressure or sharp pain which could be a 10/10 in intensity associated with nausea, light and noise sensitivity, and sometimes blurred vision and occasional vomiting, which could last 4 to 24 hours. He would take 4 ibuprofen 200-mg, which might help. Triggers included lack of sleep, oversleeping, stress, not eating, and strong smells. He stated that a CT scan of the head at the age of 15 was normal.

Past medical history of seasonal allergy. He was a nonsmoker. Neurological examination was normal. He declined to have an MRI of the brain.

**Case 2.**—A 23-year-old female was descending on a commercial jet airplane to land when she had a sudden, severe, continuous, stabbing pain in her head on the vertex, radiating to both parietal regions for 15 minutes. She reported some blurred vision but no other

associated symptoms. There was no history of other headaches.

Past medical history of a couple of recent brief presyncopal attacks with some blurred vision and feeling faint in the shower without associated headache, nausea or vomiting, light or sound sensitivity, loss of consciousness, neck or other discomfort. She is a non-smoker?

Neurological examination was normal. A CT scan in the Emergency Department on the day of the headache was normal. A lumbar puncture was not performed. An MRI of the brain and MRA of the brain was normal.

**Case 3.**—A 32-year-old woman was seen 14 months after starting a job requiring commercial jet airplane travel with 6 flights per week. From the first flight, as she recalled, she noted that with each flight on descent, she would have a right parietal pressure headache with an intensity of 2 to 5/10, which could last 4 to 12 hours with noise sensitivity and sometimes blurred vision. She would take up to 1,200 mg of ibuprofen without any help. She would also try 800 mg of ibuprofen 1 hour before descent without any effect.

For the prior 2 months, she reported a constant headache, a right parietal pressure with an average intensity of 7 to 10/10 with noise sensitivity and sometimes blurred vision but not nausea, tearing or redness of the eye, or nares drainage or congestion. The headache would become a 10/10 on airplane descent for 6 to 8 hours. She had been taking up to 12 ibuprofen 200 mg per day without any benefit. The headache was not better supine.

At the age of 14, she had developed constant biparietal and vertex headaches which were constant. The headaches were better supine and were increased with exercise. She was found to have a right frontoparietal bony lesion for which she underwent a craniotomy. The pathologist reported a bony osteoblastoma.

The patient had no further headaches or problems postoperatively except for occasional bifrontal aching headaches with an intensity of 1 to 3/10 without associated symptoms relieved by ibuprofen in about an hour.

Past medical history was negative. She did not smoke. Neurological examination was normal.

She had CT and MRI scans of the brain with and without contrast which showed postoperative changes only. She was advised to stop flying pending evaluation and treatment. Evaluation by an ENT physician was normal. A neurosurgeon reviewed the MRI and could not identify the etiology of the headaches. Ibuprofen was discontinued. Topiramate was started but discontinued due to side effects. A trial of indomethacin was suggested but she did not return for follow-up.

**Case 4.**—A 26-year-old male fourth-year medical student was on a commercial jet airplane traveling for neurology residency interviews. Approximately 25 minutes prior to landing, he had the sudden onset of severe, piercing pain in the superomedial aspect of left orbit, in the region of the left ethmoid sinus. The pain was 10/10 in severity, nonpulsatile, and near-maximum intensity at onset. There was associated tearing in the left eye, but no stimulus sensitivity, ear popping, nausea, dizziness, or other associated symptoms. The pain remained localized to the left ethmoid region and persisted in a continuous and severe fashion until landing, and then slowly dissipated over the ensuing 30 minutes. He was a nonsmoker. There was no antecedent history of headache, nor any significant headaches during the 7 years since including no further headaches on subsequent airplane flights. He attributed the episode to the effects of airplane cabin pressure and did not seek further medical attention at the time.

**Questions.**—What types of headaches are associated with airplane travel? What might be the cause of these headaches?

**Expert Opinion.**—Migraines may be triggered by airplane travel. In a 3-month prospective study of 385 migraineurs, 8% reported that travel in a train or plane could precipitate a migraine.<sup>1</sup> The cause is not certain. As migraines may be triggered by high altitude,<sup>2</sup> one possibility is an acute trigger as commercial jet airplanes are pressurized at cruising altitude to simulate the air variably from 7,000 to 8,000 feet of altitude.<sup>3</sup> Alternatively, lack of sleep and stress associated with travel may be responsible. Secondary etiologies of “airplane headache” have also been reported.

Sinonasal barotraumas can cause headaches. For example, a submucosal hematoma in the right frontal

sinus was the cause of a severe right sided frontal headache lasting a few hours with onset on airplane descent.<sup>4</sup> Barotrauma may also involve the sphenoid<sup>5</sup> and maxillary<sup>6</sup> sinuses on descent. The most common mechanism of barotrauma may occur during airplane descent when there is a rapid increase in ambient pressure.<sup>4</sup> The pressure in the obstructed sinus remains relatively low which results in a vacuum effect “the squeeze”). This vacuum effect injures the sinus mucosal lining resulting in mucosal edema, serosanguineous exudate, and submucosal hematoma. Pain, which may be abrupt and severe may occur and possibly epistaxis. Referred pain and numbness may occur as a result of pressure on branches of the trigeminal nerve.

An uncommon cause of sinus barotrauma is airplane ascent which results in a decrease in ambient pressure but a relatively high pressure inside the affected sinus (the “reversed squeeze”). When a defect in the sinus wall exists, the positive pressure may result in pneumocephalus, periorbital or orbital emphysema, and, rarely, meningitis. Mucosal edema and some bleeding may also occur.

Jensen and Adams reported a case of pneumocephalus.<sup>7</sup> A 60-year-old man reported a rushing sound in both ears on landing. Three months later, he was evaluated when he had a presyncopal episode. He reported a mild retroorbital headache and bilateral tinnitus. A CT scan and MRI of the brain revealed air in both lateral ventricles and fluid in the right mastoid air cells. CT with thin slices through the skull base was suggestive of small defects in the roof of the right mastoid air cells. He underwent repair of the right tegmen dehiscence. The authors believe that a CSF fistula formed during the flight, with slow evolution of pneumocephalus, perhaps by a valvelike mechanism involving air entry during inspiration and CSF leak during exhalation. (Pneumocephalus has also been reported as a cause of confusion without headache due to Valsalva maneuvers to unblock the nose during flight.<sup>8</sup>) Another patient developed headache and confusion due to an acute right frontal intraparenchymal pneumatocele on descent.<sup>9</sup> Imaging studies revealed a large right frontal lobe pneumatocele and an associated ethmoid sinus osteoma which had eroded upward through the dura into the frontal lobe.

Cerebral venous thrombosis, which can cause isolated headaches, may be associated with air travel.<sup>10</sup> Pravastatin use was reported as associated with migraine like headaches occurring on ascent in an airline captain.<sup>11</sup> In military aviation, those involved in high altitude airdrops, unpressurized flight (eg, CV-22), and high altitude flight (eg, U-2 and F-22) are rarely at risk for headaches due to decompression sickness.<sup>12</sup> When a headache is localized to the area of a cranial suture and is the only neurological manifestation of decompression sickness, Bryce et al suggest that nitrogen bubbles in cranial sutures may be the cause.<sup>13</sup>

Seven patients have been reported with severe sudden headaches with a duration of about 15 to 20 minutes occurring during airplane travel with normal examinations and scans. Atkinson and Lee<sup>14</sup> reported a 28-year-old man with the dramatic onset of a severe headache within 10 minutes of the plane ascending described as a sharp jabbing pain over the forehead and between the eyes without associated symptoms lasted for about 20 minutes. The identical headache recurred when the plane began its descent and resolved again with landing. He had similar headache for 1 to 2 flights yearly over an 8-year period. An MRI of the brain was normal. They attribute the headaches to rapid changes in altitude.

Berilgen and colleagues<sup>15</sup> reported 6 males (aged 33 to 42 years) with headaches associated with airplane travel, 5 appearing on landing and 1 on take-off. The patients had severe headaches during some flights with a unilateral and generally orbital and/or supraorbital localization. The attacks lasted between 15 and 20 minutes on average and recovered spontaneously without any accompanying sign. Two had a history of migraine, 1 exercise headache, and 3 no other headaches. In all cases, neurological, ophthalmological and ENT examinations were normal. Routine blood analyses, MRI scans of the brain, and paranasal sinus tomograms were normal. They hypothesize that barotrauma caused by pressure changes in the cabin during takeoff and landing could affect ethmoidal nerves (branching from the ophthalmic branch of the trigeminal nerve) that carry the sensation from the mucosa on the inner surface of the paranasal sinuses and/or nociceptors in ethmoidal arteries resulting in activation of the trigeminovascular system and leading to

headache. Three had a long history of smoking which the authors suggest might be a risk factor for the headaches by resulting in inflammation and edema in the involved paranasal sinuses. A treatment was not suggested. Nonsmoking case 4 was similar to the descent cases. Interestingly, at a migraine lecture given by co-author Evans where he mentioned airplane descent headaches, co-author Goodman described his own history which is case 4. Evans had previously contacted co-author Purdy to query whether he had seen any similar cases and he provided case 2. We suspect that airplane descent headache may not be all that rare but just rarely reported.

These 3 descent headaches are different in some ways than Berligen and colleagues. Two out of 3 are females and all 3 are nonsmokers. The distribution of their pain is also different than the other series with 1 left temple, 1 right parietal, and the third vertex and bilateral parietal in contrast to the unilateral orbital and/or supraorbital location. The duration of pain was similar for cases 1 and 2 but much longer in case 3.

The cause of the patients' headaches is not certain. Case 3 might be consistent initially with probable migraine triggered by descent and later with chronic daily headache with medication overuse. Repetitive sinus barotrauma might be an explanation for the other 2 cases since the maxillary, ethmoid, and sphenoid sinuses can refer pain to the temple and the ethmoid and sphenoid sinuses can refer pain to the parietal/occipital area.<sup>16</sup> Consideration might be given to including airplane descent headache as a new category in the International Headache Society Classification of Headaches III edition or at the least in the appendix as a headache type for further study.

For the patient presenting with the first episode of sudden severe headache during an airplane flight, the usual complete evaluation for the "first or worst" headache<sup>17</sup> is indicated which should include looking for evidence of barotrauma. For those with repeated episodes, evaluation by an ENT physician for treatable pathology resulting in barotrauma may also be helpful. Empirical treatment with an antihistamine, pseudoephedrine, and a nasal decongestant spray (oxymetazoline) might be considered before the flight for those with normal evaluations and

repeated episodes where sinonasal barotrauma is a consideration.

*Conflict of Interest:* None

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