Meningitis and CSF Rhinorrhea from Air Travel after Intracranial Surgery: A Case Report

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Abstract

This is a unique case of a 14-year-old young girl presented with rare, rapidly progressive, locally aggressive clival chordoma, status post partial resection twice in Beijing, China. The second surgery was complicated by CSF leak and meningitis resolved via lumbar drainage. One week after the last surgery, she traveled to the USA on flight for further treatment after which new onset of high fever, severe head and neck pain, nausea, vomiting and rhinorrhea, which later proved to be CSF leak, occurred. Patient was treated with antibiotics and CSF leak repair surgery before proton beam therapy. The possible mechanism is due to the atmospheric pressure changes during flight takeoff and landing, leading to dura tear. There has not been an updated consensus upon for how long should a patient after neurosurgery wait before going on an airliner. An updated version of air travel guidelines is crucial due to the serious complications and the emergent need of these patients for air travel.

Keywords: air travel, intracranial surgery, CSF leak, meningitis

Case Presentation

The patient is a 14-year-old Chinese girl who suffered from neck, skull base and back of head pain for one year. She presented to one of the Beijing's largest medical center and where CT showed a large skull base lesion. Partial transphenoidal resection with biopsy resulted as a chordoma. Given that chordoma typically grows slowly in adults, though can be more aggressive in children, the lesion was monitored at that time rather than undergone more therapy. However, in a month, the patient developed dysarthria and dysphagia indicating CN

XII palsy. Therefore, she had a second resection with right suboccipital approach which was complicated by nasopharyngeal CSF leak and meningitis, resolved later via lumbar shunt for one week. Because no further treatment could be offered in China, the patient's family contacted a radio-oncologist at MGH, who invited them to Boston for proton beam therapy. One week after lumbar shunt surgery, patient traveled to the USA on an 18 hours flight with sitting position.

On arrival, the patient experienced severe headache. The next day she had fever up to 38.7'C, nausea, vomiting, productive cough, and production of thick, clear mucus from nose. She denied diarrhea, constipation, urinary incontinence, urgency, or burning sensation while urinating. She had no sick contacts. Due to the above situation, she was bought to MGH ED for work up. At ED, patient was alert and oriented, with fever up to 38.4'C, normal heart and lung exams, non-tender abdomen. Lab data showed elevated CRP without leukocytosis, normocytic anemia. Chest AP view showed no evidence of pneumonia or pulmonary edema. Head CT without intravenous contrast revealed soft tissue clival mass extending into the nasopharynx and resulting in osteolysis of the superior odontoid process, consistent with the patient's known history of residual chordoma. There was no evidence for acute intracranial hemorrhage, infarct, hydrocephalus or brain abscess. Under the impression of viral illness, she was given Ceftriaxone 2g Q24H IV and admitted to PICU for further survey of her painful symptoms.

After 48 hours, viral panel continued to be negative. However, nasal drainage was positive for tau protein confirming CSF rhinorrhea. CSF analysis showed total nucleated cells 6563/ul with 54% neutrophils and 26% lymphocytes revealing meningitis. Her medication was shifted to treat meningitis: Ceftriaxone titrated to BID, adding Vancomycin 1150mg Q6H IV. Neurosurgeon, ENT were consulted for CSF leak repair. Possibility of starting Proton Beam therapy would be reevaluated after resolution of this infectious episode and leak repair.

Discussions

Chordomas are generally considered as slow-growing, locally aggressive neoplasms of bone arising from embryonic remnants of the notochord. However, in this case, within 4

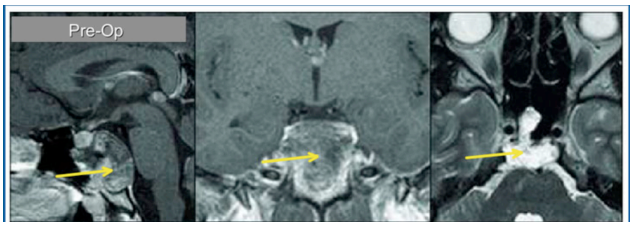

Fig. 1 Clival Chordoma under MRI. Source: brain-tumor.org

weeks after first partial resection of the tumor, the patient developed dysarthria and dysphagia indicating CN XII invasion. When she presented to the MGH PICU team two weeks after the second surgery, decreased palatal elevation, atrophic tongue and cranial nerve IX and XII were noted.

Air travel-induced meningitis following intracranial surgery

One major risk factor for the patient developing meningitis is that she never got her dural tear repaired in China before her air traveling. Her symptoms of meningitis and CSF leak resolved via lumbar drainage and bed resting, which reduce the hydrostatic pressure of the CSF and the tear becomes watertight. However, the atmospheric changes during a flight might cause the weak point to break again.

Air travel is for most healthy people, safe and comfortable given the modern commercial aircrafts. However, the in-flight environment consists of a relatively low barometric pressure, and low humidity, which could put a high-risk patient to danger. International aircrafts fly at an altitude ot 9750 to 11580 meters and domestic airlines fly at 8530 to 8840 meters. During flight, the cabin is maintained at a pressure equivalent to the altitude of 1520 to 2440 meters, about 536 to 611 mm Hg. Gas in the cabin has been shown to expand its volume by 25-30% during flights[4].

Callanan V et al. in 1996 reported two cases of air travel-induced meningitis following Schwannoma surgery[3]. The proposed mechanism was that during takeoff, the atmospheric pressure in the aircraft cabin decreases, causing gaseous expansion in the middle ear, creating potential communication between the CSF and the middle ear. During landing, the middle ear gas volume decreases as the atmospheric pressure increases, forcing secretions from the nasopharynx into the subarachnoid space. The bacteria entered CSF following this route leading to meningitis. In the same way, it was possible that with the initial weakness of the dura, the patient had dura tear again upon landing.

Beside meningitis, pheumocephalus and deep vein thrombosis are also concerns for air travel following intracranial surgery. Despite of these serious complications, there has not a established guidelines and clear evidence in the literature regarding how long after intracranial surgery is it safe to have air travel. Amoto-Watkins A et al. tried to shed light on

this issue by having 66 neurosurgeons in the UK fill out questionnaires. 61 out of 66 surgeons advised patients not to fly for a period of time postoperatively, while 5 did not advise patients against flying independent of the type of surgery. 26 out of the 61 surgeons suggested that patients with complex surgical procedures should not fly for a longer period. The other 35 out of the 61 surgeons advised a fixed post-operative timescale against flying irrespectively of the type of surgeries[5].

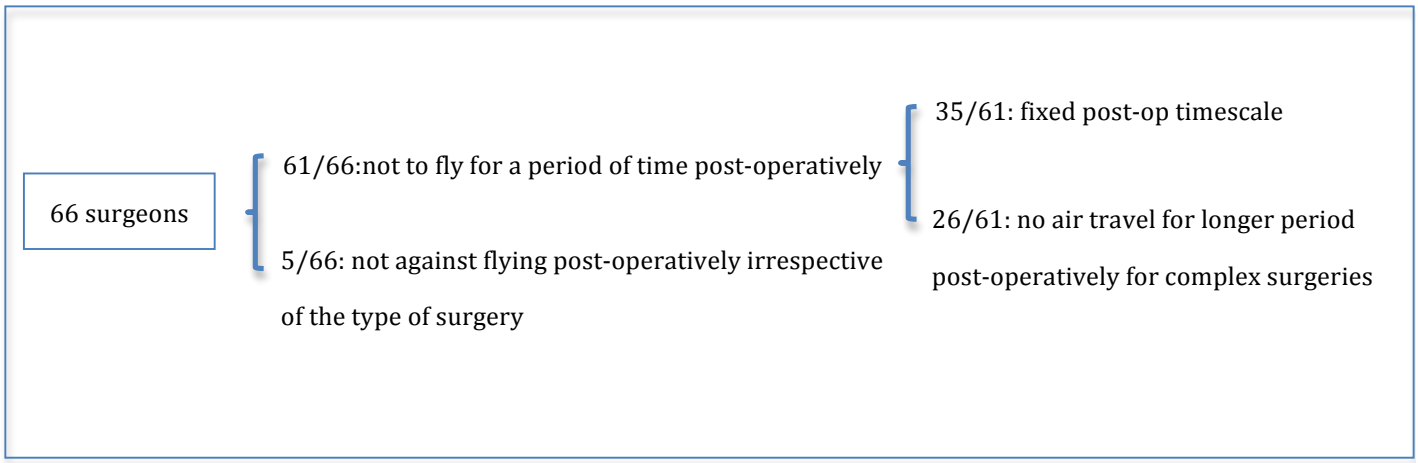

Fig. 2 Survey of advice on air travel after intracranial surgery given by 66 consultant neurosurgeons in the UK

Before an updated consensus about air travel coming up, the medical guideline in 2003 may still serve as standards considering the safety of patients after neurosurgery[7]. Waiting for a minimal of 7 days is recommended after a transcranial procedure that introduced gas into the skull without reliable evidence from neuroimaging that no air is present. Moreover, patients with CSF leak from any cause should not fly due to the risk of a backflow of air and microbial contamination. Given this, the presented case, after dura repair, hopefully will face less risk returning back to China via air travel.

Consent

This case report was done under consent from the medical team for educational use only and not for publishing.

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