Case reports

Maxillary sinus barotrauma with infraorbital nerve paraesthesia after breath-hold diving

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Abstract

(Canarslan Demir K, Yücel Z. Maxillary sinus barotrauma with infraorbital nerve paraesthesia after breath-hold diving. Diving and Hyperbaric Medicine. 2024 30 September;54(3):230–232. doi: 10.28920/dhm54.3.230-232. PMID: 39288929.) Barosinusitis, or sinus barotrauma, is a sinonasal injury and/or inflammation that results when the aerated spaces of the nose and sinuses are exposed to an uncompensated change in ambient pressure. We describe a 19-year-old male diver who presented to our clinic on the fourth day following a breath-hold diving session. During descent on a constant weight monofin dive at the South Cyprus World Championship he began to experience symptoms due to the inability to equalise the pressure, particularly in the Eustachian tubes and middle ear cavities. He felt pain and pressure in the upper left half of his face, left upper molars, and under his left eye at 60 metres, and he continued diving down to 74 metres. At presentation to our clinic, he still had ecchymosis under his right eye and pain in his upper right teeth, half of his face, and ear. He also described tingling in the lower left half of his nose and the left half of his upper lip. He received decongestants, B vitamins, and underwent endoscopic sinus drainage which alleviated his symptoms alleviated over time. The diver reported complete resolution of tingling, numbness, and pain after three months. It should not be forgotten that if appropriate treatment is delayed, permanent changes may occur as a result of long-term compression of the nerve, and therefore patients should be monitored closely.

Introduction

Barosinusitis, or sinus barotrauma, is a condition that describes the varying degrees of sinonasal injury and/or inflammation that result when the aerated spaces of the nose and sinuses are exposed to an uncompensated change in ambient pressure.[1] This causes mucosal injury, which most frequently manifests as headache, odontalgia, cloudy mucus, facial pain or pressure over the afflicted sinuses , and, more seriously, epistaxis. The paired frontal sinuses are the most frequently affected paranasal sinuses, followed in frequency by the maxillary sinuses and, less frequently, the sphenoid sinuses.[1,2] A small number of the more dramatic cases have some additional symptoms.These include nausea or vomiting, a sensation of impending syncope, and disorientation at the time of injury.[3]

Neurological symptoms are not common in sinus barotrauma. Maxillary sinus involvement has been reported less frequently than other sinuses. It was noted that the trigeminal nerve was impacted in certain instances. Pain was attributed to the upper teeth on the side of the maxillary sinus impacted in 4% of cases of maxillary sinus barotrauma. Most likely, the anterior superior alveolar nerve was involved in this. The remaining 4% experienced numbness on the same side of their cheeks due to involvement of the infraorbital nerve.[3–5]

We describe a diver who presented to our clinic with unilateral numbness in the lips and lower half of the nose secondary to sinus barotrauma after breath-hold diving (‘freediving’) to 74 metres.

Case report

The diver provided written consent for publication of his case history and imaging.

A 19-year-old male diver presented to our clinic on the fourth day following a freediving session. The diver experienced symptoms during a constant weight monofin free dive at the South Cyprus World Championship. As he descended to 50 metres of seawater (msw), he began to experience

symptoms due to the inability to equalise the pressure, particularly in the Eustachian tubes and middle ear cavities resulting in pressure difference between the middle ear and surrounding tissue. At 60 msw he felt pain and pressure in the upper left half of his face, left upper molars, and under his left eye, but he nevertheless continued down to 74 msw. The pain was relieved upon resurfacing. The diver had two episodes of epistaxis; immediately after the dive and then when he returned to the hotel one hour later. Tooth and ear pain started again and peaked after 5–6 hours. He took one 50 mg tablet of diclofenac sodium followed one hour later by one 500 mg tablet of paracetamol, and two hours later, another 50 mg tablet of diclofenac sodium. The day after the dive, ecchymosis occurred under the right eye.

The diver had dived for training on the same day or the previous days, but did not experience such symptoms. He had no colds, allergic symptoms, or signs and symptoms of acute or chronic sinusitis in the previous days and weeks.

When the diver presented to our clinic, he still had ecchymosis under his right eye and had pain in his upper right teeth, half of his face, and ear (Figure 1). He also described tingling in the lower left half of his nose and only the left half of his upper lip. Neurological examination revealed paresthesiae in a circular area of 2 cm in diameter including the lower left half of the nose and the upper left half of the upper lip. Light touch, two-point and hot-cold discrimination were not affected.

Complete blood count, erythrocyte sedimentation rate, and C-reactive protein were within normal limits. Paranasal computed tomography (CT) showed soft tissue density that filled the right maxilla and caused a total loss of aeration. The right ostiomeatal unit was found to be obliterated (Figure 2).

The diver was given a decongestant and vitamin B treatment. It was learned that the diver presented to the ear, nose and throat clinic at another hospital as his complaints did not improve, and endoscopic sinus drainage was performed. Although we could not access the report from the hospital, the diver stated that they eluted red-brown liquid. Following the procedure, the diver was given anti-inflammatory and antibiotic treatment. In our later interviews with the diver, he remarked that his symptoms gradually decreased after the surgical treatment and that the tingling, numbness and pain completely disappeared after three months.

Discussion

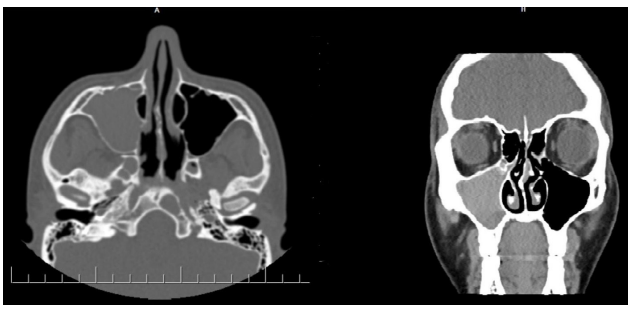
The paranasal sinuses are complex air-filled chambers enclosed by sturdy outer bony walls and delicate internal walls. Normally, the air pressure inside these sinuses adjusts to match the pressure in the nearby nasal passages via small openings called sinus ostia. In individuals experiencing barosinusitis, the sinus ostia can either be naturally smaller due to slight shifts in wall positions or become constricted and blocked due to local inflammation, swelling, or injury. This hinders the ostia's ability to adjust and support efficient air exchange. The uncompensated changes in intrasinus pressure can result in the mucosal injuries observed in barosinusitis.[6–8]

Risk factors for sinus barotrauma include inflammation of the mucosa, nasal or sinus polyps, significant nasal septum curvature and nasal turbinate hypertrophy.[7,9] Our diver did not have the above risk factors, but he admitted continuing the descent despite the inability to equalise the pressure, particularly in the Eustachian tubes and middle ear cavities to break the record.

Neurological symptoms such as headache and paresthesia in the region innervated by the infraorbital nerve, a branch of the trigeminal nerve, may occur secondary to paranasal sinus barotrauma, especially frontal or maxillary.[10,11] Barotrauma can occur both during descent (as described above), or during ascent due to a relative increase in pressure inside

Figure 1
Ecchymosis under the right eye (arrow) on the 4th day after diving

Figure 2
Soft tissue density that completely fills the right maxilla and causes total loss of aeration



the sinus if there is an obstruction to the free outward flow of gas via the antrum.

In 4% of maxillary sinus barotrauma, the pain was referred to the upper teeth on the affected side.[3] This is probably due to anterior superior alveolar nerve involvement. The infraorbital nerve and its branches, which branch from the maxillary branch of the trigeminal nerve and may be affected as they travel along the maxillary sinus wall.[3–5] Involvement of these nerves causes numbness or paresthesiae in the cheek, and numbness of the upper teeth, gums and mucosa on the ipsilateral side. In some cases, pain and hypersensitivity may occur. Problems with neuropraxias are more common following barotrauma of ascent rather than descent; this suggests that circulatory dysfunction or nerve compression is more important than intrasinus haemorrhage as the basis of the pathology.

Our diver had pain and numbness in the right upper teeth and paresthesia on the right half of the lip and at the edge of the nose. The diver's paranasal sinus CT showed congestion in the maxillary sinus and brown fluid during sinus drainage suggested that the diver had bleeding in the right maxillary sinus as a result of sinus barotrauma. The neurological symptoms suggest involvement of the infraorbital nerve and the anterior superior alveolar nerve; perhaps being affected by this bleeding. Even though we don't have definitive evidence. The recovery of the patient could be the result of the anti-inflammatory, the antibiotic, the surgical, or the other treatments or several combinations of them. There are a few related cases in the literature which were primarily treated conservatively, and maxillary sinus drainage was applied in patients who did not improve.[11] Similarly, our patient received initial conservative treatment followed by maxillary sinus drainage. Due to the small number of cases, it remains unclear how long to wait for the response of conservative treatment and when to decide on surgery.

It should not be forgotten that if appropriate treatment is delayed, permanent changes may occur as a result of long-term compression of the nerve, and therefore patients should be closely monitored. Maxillary sinus barotrauma with neurological complications is rarely reported. This case adds to the experience reported in the literature.

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