Barotraumatic orbital emphysema of rhinogenic origin in a breath-hold diver: A case report.

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A. BOLOGNINI, E. DELEHAYE, M. CAU, L. COSSO

Sardinian Institute of Hyperbaric and Subaquatic Medicine, Sassari, Italy

Bolognini A, Delehaye D, Cau M, Cosso L. Barotraumatic orbital emphysema of rhinogenic origin in a breath-hold diver: A case report. Undersea Hyperb Med 2008 35(3):163-167. Orbital emphysema is a well-recognized complication of fractures involving the orbit. Commonly, it occurs when high pressure develops in nasal cavity as during nose blowing, coughing or Valsalva’s maneuver and usually occurs in the subcutaneous tissues. We report the case of a young breath-hold diver who developed spontaneous, non compressive orbital emphysema during underwater fishing, with a maximal depth of 25-30 meters in the Sardinian sea. He was otherwise healthy, without previous cranio-facial trauma and nasosinusal diseases or surgery were not present in the history. When he was referred to our attention the patient presented right eyelid ptosis but diplopia and vision impairment were absent. Computer tomography scans showed subcutaneous air in the right upper eyelid and around the eyeball, particularly near the orbit’s roof but optic nerve area, intraconal, was free of air. A dehiscence in lamina papyracea was evident. In our opinion, this has been the point of air entry into the orbit. A supportive therapy was advised and two weeks later the emphysema was recovered completely and the subject was symptoms free. The literature has been revised and to our knowledge no previous cases of barotraumatic orbital emphysema, in a breath-hold diver, are referred.

INTRODUCTION

Cervicofacial emphysema is the abnormal presence of air within the fascial planes of the head and neck (1). Orbital fractures or bony dehiscences adjacent to the paranasal sinuses can allow the passage of air through sinus mucosal lacerations into the orbital space and orbital soft tissues (2). This condition is quite always characterized by a sudden onset and may lead to a globe proptosis and to a dangerous elevation of the intraorbital and intraocular pressure.

Most of the cases are benign and treated by supportive measures. Rarely is orbital emphysema so extensive as to cause an acute orbital compartment syndrome with central retinal artery occlusion and optic nerve
neuropathy. However, patients must be followed closely for potential complications (3,4).

The aim of this article was to present an unusual case of orbital emphysema in a breath-hold diver.

CASE REPORT

A 26-year-old caucasian male, breath-hold diver, during underwater fishing in autumn reached a maximal depth of 25-30 meters in the Sardinian sea for about thirty times, wearing a mask covering his nose and eyes. During the last descents, he reported a slight difficulty to compensate the different pressure in his right ear and the presence of tinnitus, so he repeated the Valsalva’s maneuver many times to equalize the pressure. Therefore he decided to stop his immersion. When he was reemerged in surface he noted his superior eyelid swollen and turgid without pain, epistaxis or other symptoms. Next day he was referred to our attention, he presented only with right ptosis in the absence of diplopia, proptosis, vision impairment or frontal headache.

He was otherwise healthy, he had never smoked and he had no other medical conditions, nor history of previous diseases or surgery in rhinosinusal area.

Patient examination disclosed crepitant swelling and ptosis of the right upper eyelid. During ear, nose and throat evaluation, a nasal study by means a rigid fiberoptic endoscope was conducted, all endoscopic findings were normal. In particularly there was not evidence of bleeding or inflammatory processes.

An ophthalmological opinion was sought. Proptosis was not present. On ophthalmological examination, the visual acuity was normal for both eyes. Biomicroscopic evaluation not showed subconjunctival emphysema. The ocular movements were conserved in all directions of gaze bilaterally. The intraocular pressure was normal and the sclera, cornea, lens, vitreous, and the optic disc were all normal in both eyes. There were no retinal breaks or detachment. Neurological examination was normal.

A high resolution computed tomographic (CT) scan of the orbits and nasosinusal structures was performed, axial and coronal images were obtained with 1-mm slice thickness. Extensive soft tissue swelling in the right orbit region was evident with an important subcutaneous emphysema (Fig. 1). Around the right optic nerve and the central retinal artery the air was completely absent and the eyeball was not compressed (Fig. 2). CT scan showed an air storage in the right orbital cavity particularly evident near the roof and near the lateral wall (Fig. 3). Bony fractures of the orbits and paranasal sinuses were not present but only a small dehiscence just in the medial wall of the right orbit, lamina papyracea near the anterior ethmoid was interrupted (Fig.3). The orbital wall near the defect appeared more thin compare to its upper portion and in correspondence of dehiscence the bone was not evident.

We have hypothesized that the bone defect was pre-existing and the high pressure produced in this area, during many forced Valsalva’s maneuvers, led to a laceration in a minor resistance area creating an easy way for the air toward the intraorbital space, between periorbital sheet and orbital wall.

The patient was given oral prophylactic antibiotics, nasal spray decongestants. On reexamination after 3 and 7 days, most of the periorbital air was absorbed. Two weeks later the external emphysema was recovered completely, whereas probably some amount of air persisted in the orbit for a few days again. He was completely free for symptoms during last clinical evaluation.

Diver was an underwater operator so he continued his activity with respect of some...
important guidances that we advised to avoid hazarding conditions during descents. He has never more experienced any problems.

**DISCUSSION**

Middle ear, paranasal sinuses, lung and sometimes the teeth or bowel, are the most common sites of barotrauma in scuba diving. To our knowledge this is the first case of barotraumatic orbital emphysema described in a breath-hold diver.

Orbital trauma is the most frequent cause (5,6), but this condition can appear as a complication of pulmonary barotrauma or rhinosinusal infection and operation.

Orbital emphysema may also occur spontaneously for a nasal pressure increasing after nose-blowing, coughing or vomiting and generally when airway hyperpressure episodes in nasal cavities are repeated, as in scuba activity, when an area of less resistance promoting the process.

The diagnosis of orbital emphysema is usually made by history alone, supported by results of external examination and confirmed with orbital CT.
Most cases resolve without treatment (3,4). The sudden presentation of facial swelling and closing of the eyelids on the affected side are clinical symptoms of the extraorbital subcutaneous emphysema. Subconjunctival ecchymosis, crepitation, tenderness, and pain can also be present (7).

Clinical characteristics of an intraorbital emphysema may be similar to those seen for a posttraumatic retrobulbar hemorrhage (8). The delayed appearance of globe proptosis is uncommon, although some authors reported an orbital emphysema 7 years after an orbital floor fracture (9). Currently, there is a long discussion on whether surgical treatment must be the first choice when symptoms are caused only by air (10,11).

In the simple entrance of air masses subcutaneously or/and intraconally (intraorbital), with slight clinical and radiographical signs, no treatment is indicated. Observation is also the choice when patients appear with diplopia but no other visual problems. In all other cases, with reduction or loss of vision and ophthalmoplegia, surgical intervention is indicated for immediate decompression of the valve mechanism that leads to trapping of air in the orbit. In any case of orbital emphysema, prophylactic antibiotics should be given because it is considered a contaminated trauma.

Ophthalmoplegia cases presenting with an high intraorbital pressure could be treated with steroids (12). Anyway the decision to initiate this treatment remains controversial and the supporting evidence is weak. Each case therefore needs to be assessed on an individual basis and proper informed consent is paramount (13).

The management depends on the emphysema extent and the severity of the symptoms. In all cases instructions must be given to patient against nose blowing, sneezing, and sometimes can be valuable to prevent nasal mucosal congestion to avoid a dangerous increase of pressure by means topic epinephrine or similar drugs. Patients should be always instructed to refrain from performing a Valsalva’s maneuver for 7 to 10 days. Although it usually regresses without treatment, it can lead to situations that are dangerous for the patient.

In the case presented in this article a lamina papyracea dehiscence, without major symptoms or signs of an acute orbital compartment syndrome, was evident on CT scans.

We hypothesized that the increased upper airways pressure, during repeated and forced Valsalva’s maneuvers, pushed the air from the anterior ethmoid sinus into the orbital cavity through a preexistent bony defect in the lamina papyracea.

This lamina is the most common site of bony defect in this area and point of air entry into the orbit. The posterior limit of the dehiscence is always the basal lamella. The anterior limit is variable [14]. In our case a ball-valve effect hypothesis is not supportable on the basis of clinical characteristics and CT findings.

Whatever the mechanism of air entry into the orbit, the appearance of symptoms and signs warrants urgent investigation and treatment. Clearly, when an increased orbital pressure is present, decompression is the appropriate course of action.

REFERENCES
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