

CASE REPORT : CHRONIC SUBDURAL HEMATOMA FROM BREATH HOLD DIVING

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Abstract

Chronic subdural hematoma (cSDH) is a collection of blood in the subdural space between the duramater and the arachnoid caused by a bridging vein rupture. One of the risk factors that can occur but rarely found is diving. Here we report a case of 20 year old patient with chronic subdural hematoma after breath-hold diving. the main complaint from this patient is headache that getting worse and he cannot do his daily activities. The patient had a history of diving 2 weeks before complaining of a headache. The CT scan of the head without contrast found that, right temporal chronic subdural hematoma, right temporal arachnoid cyst. Intracranial hemorrhage after diving was caused by barotrauma, which would cause rupture of the blood vessel due to an increase intracranial pressure. Beside that, intracranial hemorrhage can be caused by rupture arachnoid cyst.

Keyword : headache, chronic SDH, arachnoid cyst, diving

Introduction

Chronic subdural hematoma (cSDH) is a collection of blood in the subdural space between the duramater and the arachnoid caused by bridging vein rupture. Manifestation from cSDH appear more than 20 days after trauma. There are several risk factors can caused cSDH. One of the risk factor that can occur but rarely found is diving¹. However, there is no literature regarding the development of a cSDH from diving. Here we report a case of 20 years old patient with chronic subdural hematoma after breath-hold diving.

Case report

A 20-year-old young man was referred to the emergency room of RSUDP NTB with a diagnosis of cephalgia. The main complaint from this patient is headache, which has been felt since 1 month ago. The headache feels like being stabbed. At first, this complaint is usually resolved with the administration of simple analgesia and the patient can do his daily activities. However, in the last 1 week, the headache getting worse and he cannot do his daily activities. Other complaints include nausea and vomiting. The patient had a history of diving 2 weeks before complaining of a headache. The patient dives at a depth of about 10 meters for 25 minutes without an assistive device.

The general physical and neurological examination is within normal limits. The CT scan of the head without contrast found that, right temporal chronic subdural hematoma, right temporal arachnoid cyst. The management for this patient is surgery.

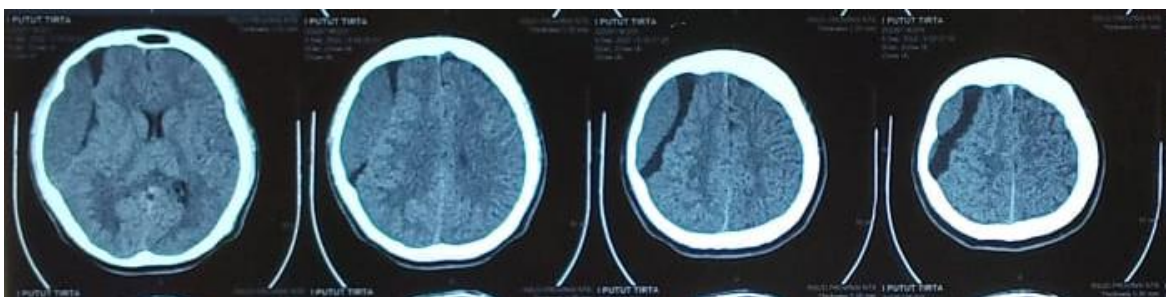


Fig 1. Ct scan : right temporal chronic subdural hematoma, right temporal arachnoid cyst.

Discussion

Chronic subdural hematoma (cSDH) is a collection of blood in the subdural space between the duramater and the arachnoid caused by bridging vein rupture. Manifestation from cSDH appear more than 20 days after trauma. SDH is more common in older patients because cerebral atrophy stretches cortical veins bridging the subdural space, rendering them more susceptible to a laceration from shearing injury or spontaneous rupture. In young patients, the most common is caused by trauma. There are risk factors for spontaneous SDH in young patients, including hypertension, vascular malformation, neoplasia, infection, coagulopathies, alcohol, steroid, and intracranial hypotension^{2,3}. On another side, cSDH can be caused by diving. There are some case reports that discuss intracranial hemorrhage like SDH after diving⁴.

Diving is a human activity that goes below the surface of the water. There are various methods of diving, one of them is breath-hold diving. breath-hold diving is the combination of voluntary apnea and immersion. In breath-hold diving, two main factors affect the physiological changes of human body: the time of breath suspension and the depth of submersion. Various factors affect the diving process, namely water immersion, pulmonary compression, blood changes, respiratory changes, which can trigger an autonomic response. Diving can cause complications such as barotrauma, pulmonary edema, neurological disorders, and musculoskeletal disorders which can be caused by the formation of nitrogen bubbles^{5,6}.

Barotrauma can cause intracranial hemorrhage. Barotrauma is an injury caused by a difference in pressure between a gas inside, in contact with, or outside the body and the pressure of the surrounding gas or fluid. Barotrauma can occur during the ascent or descent process. The pathophysiology of this pressure change is based on Boyle and Henry's laws. The Boyle law states, "for any gas at a constant temperature, the volume of the gas will vary inversely with the pressure, or $P_1 \times V_1 = P_2 \times V_2$ ". Another law is Henry's law which states "the solubility of a gas in a liquid is directly proportional to the pressure exerted upon the gas and liquid"⁷. Until now, only a few literatures that discuss intracranial hemorrhage after diving. In a case report by Reichard et al, it was stated that intracranial hemorrhage after diving was caused by barotrauma, which would cause rupture of the blood vessel due to an increase intracranial pressure every 10 meters descent. It is associated with pneumocephalus originating from sinus rupture or tegmen tympani^{8,9}. A case report by Tremolizzo et al mentioned that extra-axial hemorrhage could be caused by barotrauma to the middle ear due to failure to adjust the pressure between the middle ear and the surrounding pressure during descent (or ascent)⁴.

This patient has a history of diving at a depth of about 10 meters for 25 minutes without an assistive device. Two weeks later, this patient complained headache. Other complaints include nausea and vomiting. The CT scan of the head without contrast found chronic subdural hematoma. Therefore, this patient's chronic SDH may be due to the patient's previous diving activities. However, the mechanism of chronic SDH in this patient did not match the mechanism that described by Reichard et al or Tremolizzo et al because there was no hearing loss.

Besides being affected by barotrauma, chronic SDH can be caused by ruptured arachnoid cysts. An Arachnoid cyst is a congenital lesion that is usually benign. The clinical manifestations of an arachnoid cyst depend on the location and size of the cyst, but are often asymptomatic and discovered incidentally due to other etiologies. The incidence of chronic SDH is often found in cases of arachnoid cysts, especially temporal arachnoid cysts. This case is often found in young patients. The most frequent complaints of chronic SDH patients with arachnoid cysts are headache and paresis. Minor head trauma is one of the predisposing factors that often cause arachnoid cyst rupture resulting in chronic SDH. In addition to trauma, ruptured arachnoid cysts can be caused by diving. When diving, there are changes in atmosphere pressure that cause barotrauma. Barotrauma can cause vascular damage to the arachnoid cyst, which will cause a tear in the bridging vein that crosses the cyst, resulting in chronic SDH^{10,11,12}. This patient had a congenital and asymptomatic arachnoid cyst. The presence of barotrauma during diving caused the arachnoid cyst in this patient rupture and cause SDH.

If there is a chronic SDH with arachnoid cysts, the first treatment is craniotomy with partial removal of the hematoma membrane and arachnoid cyst, then drainage of the hematoma with a burr hole. However, until now the management of chronic SDH with arachnoid cysts is still controversial. In a recent study, burr hole irrigation was suggested as the first treatment. If it recurrence after a burr hole, removal of the membranes of the arachnoid cyst through a craniotomy is necessary¹². In this patient, a burr hole procedure was performed.

Conclusion

Cases of intracranial hemorrhage are rare in divers. Intracranial hemorrhage caused by barotrauma while diving. Intracranial hemorrhage can be either intra- or extra-axial bleeding. Extra-axial hemorrhage in the form of epidural hematoma, subdural hematoma, and subarachnoid hemorrhage. In addition to being directly affected by barotrauma, chronic SDH after diving can be caused by a ruptured arachnoid cyst.

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