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A fatal case of high-altitude cerebral oedema on a climbing expedition to Karakoram

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1. Case presentation

During a two-person expedition to the six-thousander peak (6340 m above sea level) in Karakoram, at an altitude of 6100 m above sea level, a 30-year-old man started growing weaker and his gait becoming noticeably slower. There were no previous complaints from him about any symptoms. The climbers decided to continue their summit attempt the following day. This unplanned stop was their first night at such a high altitude, it means 650 m higher than their last camp (Fig. 1a). Soon, there was a decrease in the sensation of the sick climber's feet, as well as their significant swelling. In the following hours, there was an increase in his lassitude and he developed a state of confusion and auditory hallucinations.

A helicopter attempted rescue of the two men three times the following day. Since the sick climber could not manage to move, the helicopter left without the two alpinists. The man's companion gave him 4 mg of dexamethasone orally - with no effect. While waiting for the rescuers, the man's lethargy increased, his pupils dilated significantly and he developed bilateral exophthalmos. His breathing grew thinner and shallower. Soon, the man lost consciousness and the following night his companion noticed that the man's vital functions had stopped. The second climber carried out resuscitation, but the man died and his body was left in the camp at 6000 m above sea level (Fig. 1b).

All data, including symptoms, was obtained from the climber who descended a mountain alone after the sick alpinist died.

2. Discussion

Above is described a fatal case of high-altitude cerebral oedema (HACE) - an uncommon, severe and potentially fatal condition that can occur in approximately 0.5–1% of high-altitude sojourners [1]. Any person moving to a high altitude, regardless of age, medical history, physical fitness or a previous experience in being at such altitudes, has a risk of developing HACE. This condition is usually preceded by acute mountain sickness (AMS) with experiencing headache, lack of appetite, nausea, vomiting, dizziness or fatigue, although at extreme altitudes HACE may occur suddenly, without any preceding abnormalities. Initial symptoms of HACE commonly include confusion, severe lassitude, changes in behavior and ataxia [2]. The basic treatment of HACE is to terminate climbing and descend quickly to below symptomatic altitude. Supportive care can be given in the form of oxygen and pharmacological agents, such as dexamethasone. A hyperbaric bag therapy can also be administered [3].

The differential diagnosis of HACE includes other causes of encephalopathy, such as hypertensive crisis, severe cerebral hypoxia secondary to high-altitude pulmonary oedema, carbon monoxide poisoning, hypoglycaemia, hypothermia or intracranial infection [4].

Under the circumstances described, it was a challenge to properly diagnose the sick climber and help him. The presented case clearly shows how dangerous it is to stay overnight at an altitude to which the climber is not acclimatized, especially when it concerns extreme altitudes on technically difficult climbing routes, from which it is impossible to descend easily. Being at a high altitude, it is very important to

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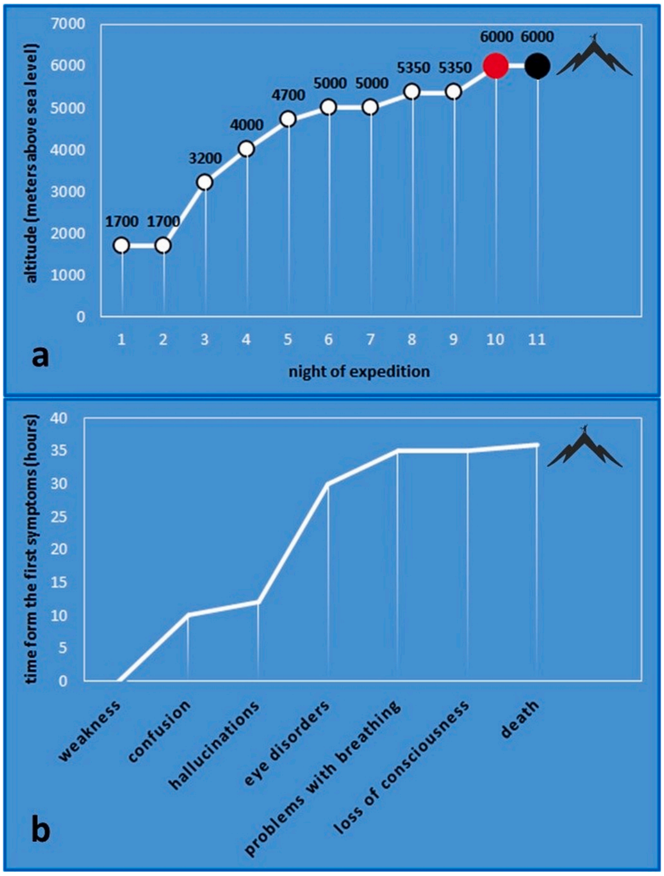

Fig. 1. *a)* Rate of changes of sleeping altitudes of the described patient.Legend: white circle-sleeping altitude without any symptoms; red circle-the first night with some symptoms; black circle-death.
b) Order of appearance of the described symptoms. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

follow the recommended acclimatization guidelines (maximum 500 m of daily altitude gain), take prophylactic acetazolamide in case of too fast ascent profile, carry a portable hyperbaric chamber or emergency oxygen, have access to intramuscular dexamethasone, do not ignore early symptoms of AMS or HACE and descent with symptoms as rapid development of illness might lead to fatal consequences [3].

Patients consent

The patient's parents provided written consent for the publication of this report.

Authors' contributions

M.S. and R.S. equally contributed to acquisition of data and drafting of the manuscript.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] Jensen JD, Vincent AL. High altitude cerebral edema. In: StatPearls [internet]. Treasure Island (FL: StatPearls Publishing; 2022. PMID: 28613666.

[2] Hackett PH, Roach RC. High altitude cerebral edema. High Alt Med Biol 2004;5: 136–46. https://doi.org/10.1089/152702904135205422.

[3] Luks AM, Auerbach PS, Freer L, Grissom CK, Keyes LE, McIntosh SE, et al. Wilderness medical society clinical practice guidelines for the prevention and treatment of acute altitude illness: 2019 update, wilderness environ med, vol. 30; 2019. p. 3–18. https://doi.org/10.1016/j.wem.2019.04.006.

[4] Küpper Th, Gieseler U, Angelini C, Hillebrandt D, Milledge J. Consensus statement of the UIAA medical commission vol:2, emergency field management of acute mountain sickness, high altitude pulmonary edema, and high altitude cerebral edema. 2012. p. 10–2.