

CASE REPORT**PATHOLOGY/BIOLOGY**

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A Fatal Case of Anaphylactic Shock During Paragliding

ABSTRACT: The growth in popularity of flying ultralight aircraft and paragliding has been associated with an increased involvement of Emergency Medical Services because of various types of trauma suffered from both inexperienced and skilled individuals. This case presentation reports on a paraglider pilot, who was seen spinning “unusually” rapidly toward the ground, without visible attempts to regain control of the aircraft. Besides the bilateral mydriasis and the absence of any ECG activity, there was a significant swelling of face, lips, neck, and tongue. Upon opening the mouth, a dead bee was found over the tongue, underneath the palate. A fatal anaphylactic shock was the likely cause of death of the pilot while still “in mid-air.” This case is certainly different from the commonly reported accidents during paragliding. An updated review of the medical literature shows no reported cases of fatal anaphylactic shock during the practice of paragliding.

KEYWORDS: forensic science, anaphylactic shock, venom allergy, vertical deceleration injuries, fall from heights

Flying ultralight aircraft, paragliding, hang gliding, parachuting, etc., are recreational and competitive sports that are increasingly being practiced throughout the world. Paragliding, in particular, is a relatively cheap way of flying, which is experiencing growing popularity. With increased flight frequency, the number of paragliding accidents has increased as well, even though major improvements have been made in the recent years in training, equipment, meteorological knowledge, and both passive and active safety precautions (1). Injuries associated with this sport are usually the result of pilot errors, precipitation, mid-air collision between paragliders, collision with obstacles, trees, power lines, or incorrect crash-landings. Occasional “contacts” with insects do occur, mainly in the summer season, but they do not usually impede the pilot in steering properly. Unexpected pilot health problems while “in mid-air” may provoke temporary or permanent inability to correctly maneuver the “aircraft” and land safely, but this is very rare. In general, ankle and/or calcaneus fractures are frequently reported in cases of incorrect landing, whereas trauma induced by high-energy mechanism is responsible for severe or fatal injuries (2).

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Case Report

In the mid-afternoon of a sunny day in July, a paraglider pilot was seen to fall abruptly by a colleague who was exercising quite far away from him. The person who witnessed the accident could only see the final phase of precipitation and reported that the pilot was spinning rapidly toward the ground from an approximate altitude of 300 m, without visible attempts to change direction or to regain control of the aircraft. The way the rate and modality of descent occurred strongly suggested that something had happened to the pilot during the flight, thus making him unable to adjust speed, steer properly, or safely reduce altitude. Unfortunately, the witness was flying at a significant distance from the victim and did not know the area well. Therefore, when he alerted the rescuers, he was unable to give details to locate the target. Five to eight minutes later, a second call from a flight instructor arrived to the Emergency Medical Service (EMS); the instructor clarified the position of the victim and informed them that resuscitation procedures had already been started by two paraglider pilots who had rapidly landed nearby. After this second dispatch, the Rescue Helicopter Medical Service took off and reached the valley in about 15 min. Following a rather “complicated” approach, the Helicopter Rescue Team discovered the victim lying in a supine position on a slope, with the backpack harness of the glider still fastened, while two paragliding pilots were continuing the basic cardiovascular resuscitation (basic life support). Physical examination on arrival revealed that the victim was already dead: no peripheral pulse, bilateral mydriasis, and absence of any electrical activity on ECG. Curiously enough, there was a significant swelling of face, neck, eyelids, lips, and tongue (Fig. 1). On closer examination, there was a red and black spot on the upper surface of the visible protrudent swollen tongue. Upon opening the mouth, a dead bee was found over the tongue, underneath the palate.



FIG. 1—Swelling of face, neck, eyelids, lips, and tongue at arrival of the Helicopter Rescue Team.

This individual was a 45-year-old man with a medical history of serious allergies. His wife referred to an anaphylactic reaction that had occurred 10 years before with severe pruritus, urticaria, bronchospasm, and signs of shock, after a bee/wasp sting. This serious episode could only be controlled with the administration of epinephrine and oxygen.

At autopsy, the subject had light facial swelling and tongue edema along with soft glottis edema. No bronchial obstruction, pulmonary emboli, coronary artery disease, or specific pulmonary edema was detected. There were three left rib fractures, fractures of the sternum, pelvis and right leg, pulmonary contusions in the ventral part of diaphragmatic lobes, kidney ecchymosis, and no hepatic lacerations.

The autoptic investigation led to the conclusion that the injuries in “vital organs” were likely not severe enough to suggest a death by falling.

Discussion

Paragliding is a recreational and competitive flying sport. A paraglider is a free-flying, foot-launched glider aircraft. The paraglider pilot sits in a harness suspended below a fabric wing, whose shape is formed by its suspension lines and the pressure of air entering vents air entering in the front of the wing. Controls held in each of the pilot’s hands connect to the trailing edge of the left and right sides of the wing. By skillful exploitation of sources of lift, the pilot may gain height, often climbing to a few kilometers over the surrounding countryside. Paragliding fatalities are rare but do occur from time to time. The relevant accidents most often occurred when pilots were taking risks. Falls from a height and in particular vertical deceleration injuries represent a form of blunt trauma that results in considerable morbidity and mortality (3). Safety of paragliding is directly influenced by the pilot’s experience, skill, reaction time, and whether or not the paraglider is flying at an altitude where the emergency reserve parachute might possibly have time to open in the event of an unrecoverable collapse or spiral drive. In this case, no technical problems or adverse weather conditions were the causes of the dramatic event. The weather of that day was pleasant, with good visibility and without reported strong winds that could have led to the precipitation. At first inspection, no major rents, nor evident wound or exposed fractures were

recognized. Evident findings included a swollen skin of the face and neck, and the extremely edematous lips, tongue, and eyelids; these clinical manifestations immediately raised the suspicion of a severe allergic reaction (Fig. 1). Sudden laryngeal edema with bronchial obstruction along with rapid onset severe anaphylactic shock likely caused an asphyctic situation. This was responsible for marked brain hypoxia, loss of consciousness, and then complete lack of paraglider control. The altitude at which the bee sting occurred was not estimated, as the witnessing flyer only reported he had seen the victim spinning rapidly to the ground. No shouts were heard nor were gesticulation or attempts to call for help seen. No radio or phone call was captured from him. Despite the fact that two paraglider pilots, who were alerted by the first witness, landed in a few minutes and approached the area, their effort at basic cardiopulmonary resuscitation might have been in vain because of the massive glottis edema that did not allow for any air entrance even following forced mouth-to-mouth insufflation. It is known that anaphylaxis may begin with severe itching of the eyes or face and, within minutes, progress to more serious symptoms. A sting in the mouth of an “allergic” individual may have determined immediate swallowing and breathing difficulties with a drop in blood pressure, sudden weakness, shock, and ultimately death. Medical rescue operations proved quite delayed because of communication hurdles during the dispatch; the pilot who called for help, completely unaware of the geographical area, was unable to give detailed information on the correct location of the victim. In addition, both the first rescuers and the helicopter team had to reach a wooded area, with steep cliffs and ravines. In association with the severe shock and airway edema, a blunt trauma of precipitation was suspected by the rescue team as a concomitant cause of death. However, the autoptic findings did not reveal lesions in “vital organs” severe enough “per se” to result in immediate death. The dynamic of accidents and crashes seen in paragliding are usually related to a high-energy mechanism of injury, which were not found in our patient. In forensic medicine, postmortem diagnosis of anaphylactic shock is usually difficult, depending on the time medical inspection occurs, and the presence or not of “visible” signs; most often, it is an exclusion diagnosis. Medico-legal investigation in this case only briefly dwelt upon the effect of impact velocity. The presence of the cutaneous signs oriented the diagnosis, which was rapidly confirmed by the discovery of a bee into the mouth. The history of a previous episode of severe allergic reaction following a wasp/bee puncture reinforced the feeling that airway obstruction might have been extremely tightened, because of local sting-induced oral edema.

During paragliding in the summer season, there are potential occasions to come into contact with wasps or bees, but these insects are generally not very aggressive, and the effect of stings is usually characterized by unpleasant local consequences, even when they occur in the head, face, and neck. However, a variable population of individuals is extremely susceptible to *Hymenoptera*—honeybee or vespid venom—with immediate hypersensitivity reaction. This reaction, mediated by vasoactive amines released from mast cells and basophils sensitized by immunoglobulin E, involves various organ systems: skin and mucosae (generalized hives and swollen lips-tongue-uvula), cardiovascular (hypotension shock), respiratory tract (laryngeal edema, bronchospasm, and stridor), gastrointestinal (vomiting, diarrhea, and abdominal cramps), etc. (4,5). At high altitude, a sudden onset of this dramatic condition rapidly led to brain hypoxia and likely impeded any possibility to call for help. Several studies have identified unique characteristics of the flying of ultralight aircraft, or paragliding, including the rates of comorbidities and mortality (6). This case

certainly differs from the commonly reported accidents, which mainly involve injuries after falling from heights, or various other types of serious impacts, or collisions between paragliders. An updated review of the medical literature does not report cases of Hymenoptera venom-induced fatal anaphylaxis occurred during the practice of paragliding.

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