PHYSIOLOGICAL ASPECTS OF PANIC IN WATER-RELATED ACCIDENTS

Michael B Strauss, MD.
Associate Director, Baromedical Department,
Hospital Medical Center, Long Beach, California, 90801.

INTRODUCTION

Close inspection of fatal water-related accidents indicate that a problem other than equipment failure, absence of floatation gear, inordinate distances from safety, or diving problems such as the bends or air embolism leads to the victim's demise. This problem is panic. Since panic has a definite constellation of symptoms and effects on the body, but not always a clearly identified cause, it might appropriately be labelled THE PANIC SYNDROME. This paper discusses the subject of panic in water-related activities and proposes a mechanism to account for its presence. Suggestions for prevention, emergency care and definitive treatment of this condition are given.

"Panic, by definition, implies a loss of control ..."; a fear that the individual "... is not in control of the situation in which he finds himself.[1] The common denominators are the loss of control (ie. loses one's 'cool') and the irrational actions that follow. The psychological effects of losing control in water, an unnatural environment for the individual, accelerate the panic action.

Panic is not an unfamiliar subject. Components of panic are observed in the biological stress/ general adaptation syndrome.[2] It is seen in the acute asthmatic attack, the hysteric hyperventilating to the point of collapse, the frightened apprehensive child, and in a variety of other conditions. Voodoo deaths are believed to be another manifestation of panic.

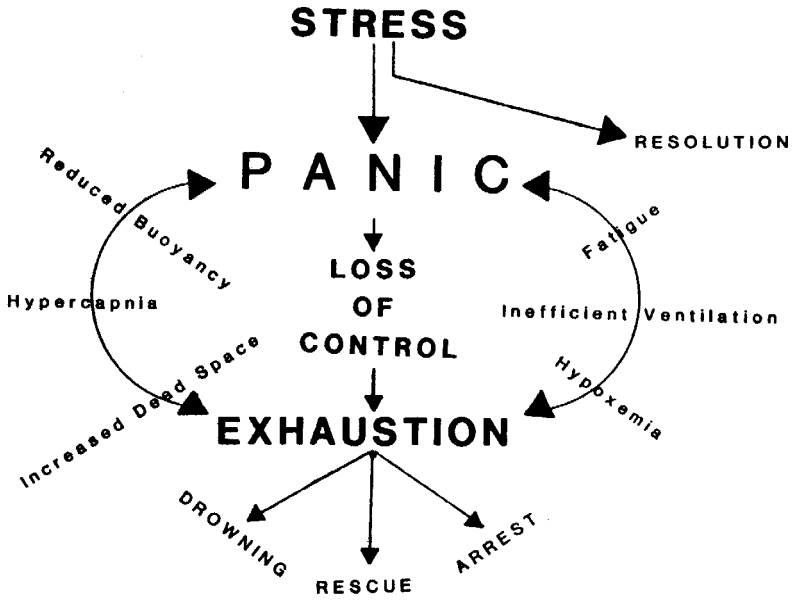
In the laboratory, studies disclose that rats drown much faster if their whiskers are shaved than if they remain intact. The whiskers do not aid in swimming. They act as tactile receptors. Apparently, the constant sensory input via the whiskers keep the rats from panicking.[3]

The unifying factor in all these situations is that once the stress reaction is initiated, the victim will continue to decompensate even if the cause is removed. This is due to a positive feedback mechanism commonly referred to as a "vicious circle".

In water-related accidents the mechanism is analogous. However, two important differences exist. First, the three components of the stress reaction (alarm, resistance, and exhaustion) occur so rapidly that the victim is often unable to make suitable adaptations during the state of resistance. Second, the consequence of exhaustion in the water is drowning whereas on land the consequences may merely be collapse and unwillingness to continue the resistance stage.

TABLE 1 PROBLEMS ASSOCIATED WITH PANIC IN WATER-RELATED ACCIDENTS

PROBLEMS	UNDERLYING STRESSES
HYPOXIA, ANOXIA	Difficulty with breathing equipment; insufficient air supply through snorkel or regulator; gulping of water; forced submersion.
FATIGUE AND EXHAUSTION	Inability to cope with surf, tides, or currents; markedly negative buoyancy from equipment; prolonged swimming.
HYPOTHERMIA	Prolonged exposure (even in relatively warm waters); diving or immersion in frigid waters.
INJURIES	Encounters with marine animals; trauma from boats, surf, etc.
FRIGHT/FEAR	Sighting sharks, etc.; flooding of mask; aspiration of water; loss of vision due to water turbidity; separation from swimming or diving buddy.
MISCELLANEOUS	Entanglement in kelp; loss of equilibrium sense due to ruptured tympanic membrane, etc.



THE PANIC SYNDROME

FIGURE 1

AETIOLOGY

There is no specific cause of the panic syndrome. Virtually any situation that requires extra effort or is strange to the individual can lead to panic. In essence, panic results from the addition of a stress, be it physical or psychological, to the victim's status-quo condition. Failure to resolve the stress adequately during the stage of resistance can result in panic. Table 1 summarizes commonly observed problems and their underlying stresses associated with panic in water-related activities. It is likely that several of these factors, not always clearly defined, interact in the genesis of THE PANIC SYNDROME.

PHYSIOLOGICAL ASPECTS

Panic leads to a series of predictable responses. Fatigue rapidly develops because of the increased energy demands associated with struggling during the resistance stage of the biological stress reaction. Ventilation may become inefficient because of the increased respiratory rate and decreased tidal volume associated with the victims "loss of control".

A rapid, shallow breathing pattern develops. The result is a relative increase in the respiratory tree dead space. Hypoxemia, hypercapnia, and dyspnoea, occur. These contribute to the victim's fatigue state and intensifies the state of panic. A secondary consequence is a reduction in buoyancy because the lungs are no longer maximally inflated with each inspiration. Swimming movements become inefficient due to fatigue and loss of control. When working at maximum energy levels, exhaustion occurs in only a few seconds, even in the well conditioned individual.

In summary, an unresolved stress leads to panic. The resistance stage of the biological stress reaction rapidly leads to exhaustion especially in the water. Indirectly, an inefficient ventilatory pattern develops with several secondary consequences. This leads to the positive feed back mechanism, ie. the vicious circle depicted in Figure 1.

CONSEQUENCES OF PANIC

If the process continues, one of three alternatives occur. The victim may become so exhausted that he can no longer maintain his head above water in order to breathe air or, if diving, keep the regulator or snorkel mouth piece in place. Aspiration of one mouthful of water at this stage may lead to unconsciousness since the brain's oxygen supply is already marginal due to hypoxaemia. One need only recall the Strokes-Adam Syndrome or vasovagal syncope episode to appreciate how significant a moment's interruption, in the brain's oxygen supply can be. Once the diver loses consciousness, aspiration of water and drowning occur unless the brain's oxygen supply is restored.

Second, the extreme energy output during the resistance stage of the stress reaction may lead to cardiac arrest. This is especially true in the poorly conditioned individual and/or the person with underlying cardiovascular disease.

Third, should the victim be resuscitated or the vicious circle interrupted, survival ensues.

SYMPTOMS

The symptoms associated with panic are those of sympathetic nervous system activation - ie. a "fight or flight" response. They usually appear precipitously since exhaustion can occur in a matter of seconds in the individual forced to exert himself at a maximal effort. Symptoms include a rapid, shallow breathing pattern, dilated pupils, facial pallor, and terror stricken faces. Swim movements are feeble as the victim often struggles to climb out of the water as a drowning man grasps at a straw. At this point the victim has lost all control. Actions are irrational. Such simple corrective procedures as floating, utilizing buoyancy control devices, or even slowing the breathing rate are overlooked.

CASE REPORTS

The following case reports exemplify the variety of situations in which panic can occur in water-related activities:

Case 1

A novice diver experienced difficulty making her first surf passage with SCUBA gear. She panicked when a wave crested over her head. Immediately, she pulled off her mouthpiece and struggled hysterically to keep her head above water. When the instructor reached her, the victim was exhausted and unable to talk. Her pupils were widely dilated, and she looked terror stricken. The instructor inflated her vest and towed her out of the surf zone without incident.

Case 2

A strong swimmer, but relatively inexperienced SCUBA diver was making his first deep dive. Buoyancy was adjusted so that he was neutral on the surface. After an uneventful descent to the bottom (100 feet) the diver found himself "very heavy". His attempts to swim directly upward were futile and he began to struggle. He inflated his life vest without any noticeable lifting effect. He panicked. His partner recognized the impending disaster, released the diver's weight belt and initiated a gradual swimming ascent.

Case 3

An experienced Navy diver made a bounce dive to investigate the bottom in 30 feet of water. After his findings were reported, the boat was moved to another area. Rather than climb aboard the small craft, the diver held onto a bowline while the craft moved at slow speeds to another site. To conserve air, he replaced the regulator with his snorkel. The manifold of the SCUBA tank became entangled in kelp and the diver was pulled downward. Before he could signal for help or replace the regulator, the diver was so entangled in kelp that he could not free himself. He was exhausted in a matter of seconds from struggling and so entangled that he was barely able to hold the bowline and raise his head to breathe. A dive partner aboard the boat recognized the difficulty, freed the regulator mouthpiece and repositioned it in the diver's mouth. With his self-contained air supply now operational he let go of the bowline. The tension of the kelp pulled the diver ten feet under water. Instead of struggling he relaxed since he now had an air supply and floated uneventfully to the surface as the tensions on the kelp were eliminated.

Analyses of reports disclose that a full blown panic syndrome can manifest itself in a matter of seconds. In these examples, had the interception of the vicious circle by the divers' partners not occurred, the outcomes could have been tragic.

PREVENTION

THE PANIC SYNDROME does not lend itself well to emergency treatment, for it may only be a matter of a few seconds before the victim loses consciousness and drowns or suffers a cardiac arrest. This disorder must be prevented. There are no substitutes for safety, conditioning, and co-operation in water-related activities.

However, there is always that event which is unforeseen. When this occurs the vicious circle of THE PANIC SYNDROME must be interrupted before the victim's life is jeopardized. Merely thinking that something is wrong is sufficient reason to curtail activities, rest, and re-evaluate the situation. The following suggestions are offered:

1. HYPERVENTILATE - Breathe deeply in a controlled and deliberate pattern.

2. IMPROVE BUOYANCY - Release the weight belt, drop the catch bag, inflate the buoyancy compensator.

3. REST - Float on your back with your head out of the water; breathe the surface air directly.

4. RE-EVALUATE THE SITUATION - Determine why panic occurred, how it can be prevented, and a plan for completing the remainder of the water activity safely.

5. REASSURE YOUR PARTNER - The calming and confidence instilling effects of this cannot be over-emphasized.

TREATMENT

Appropriate emergency medical treatment for the panic syndrome victim who presents as a near drowning includes careful monitoring of vital signs. If hypoxaemia is present, administration of 100% oxygen and positive end expiratory pressure is indicated. Blood gas and central venous pressure monitoring are important. Serial electrocardiograms and chest x-rays are required.

Follow-up observations to rule out late complications such as aspiration pneumonitis and atelectasis must not be overlooked.

Finally, one should attempt to identify the events leading to the vicious circle and discuss them with the patient. Providing the patient with an understanding of THE PANIC SYNDROME and how it can be avoided in future water-related activities may be the physician's most important contribution.

SIGNIFICANCE

Water-related problems are significant to any physician dealing with emergency care of patients.[4] Virtually any person in the United States can be associated with a water-related accident by virtue of recreation interests, competition, swimming or diving. The following list of disorders associated with water activities can lead to unconsciousness in the water and may result in near drowning, drowning, and/or cardiac arrest.

TABLE 2

WATER-RELATED DISORDERS THAT CAN LEAD TO UNCONSCIOUSNESS

1. THE PANIC SYNDROME
2. SHALLOW WATER BLACKOUT
3. HYPOTHERMIA
4. INJURIES FROM MARINE ANIMALS
5. THORACIC SQUEEZE
6. NITROGEN NARCOSIS
7. OXYGEN TOXICITY
8. ANOXIA
9. CARBON DIOXIDE TOXICITY
10. CARBON MONOXIDE POISONING
11. AIR EMBOLISM
12. DECOMPRESSION SICKNESS

Drowning and near drowning are complications of one or more of these underlying problems:

THE PANIC SYNDROME is gradually obtaining the attention it deserves. It is probably the underlying cause of more deaths in water-related activities than all others combined. For example, panic was implicated as the significant factor in over 80% of the SCUBA diving fatalities surveyed in Los Angeles County in 1970.[1] In the Rhode Island reports panic appeared to be a factor associated with approximately half the SCUBA diving fatalities.[5]

The actual incidence of THE PANIC SYNDROME is not known for several reasons. First, there are no requirements to report non-fatal water-related problems. Since the victim usually recovers without residual medical problems or does not even seek medical attention, there is no way of knowing the frequency of non-fatal panic episodes. Second, fatalities associated with water-related activities are usually signed out as drowning, rather than as the underlying problem which led to drowning. As sophistication in reporting water-related accidents improves, the true significance of panic will be forthcoming.

CONCLUSIONS

Panic as a problem associated with water-related activities is becoming increasingly well recognised.

The panic syndrome conforms well to the biological stress reaction.

The consequences of panic in the aquatic environment are drowning, near drowning, and/or cardiac arrest.

Emergency medical treatment for panic is directed at controlling its complications.

Hence, the only real method of dealing with panic is to prevent its appearance or interrupt its vicious circle before the stage of exhaustion leads to irreversible damage.

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PROXMIRE'S GOLDEN FLEECE FOR "POT" DIVERS

US Senator William Proxmire awarded his "Golden Fleece" monthly citation late last year to the US Department of Commerce because they had spent about US$ 5,250 on a study to find out if smoking cannabis had a particular effect on divers.

It had been concluded that such smoking was "not good" for divers.

Presumably somebody in the Department of Commerce believed that those who smoke "pot" were open to reasoned discussion concerning risks; or it may be that so many US divers are taking "pot" that its effects need to be scientifically established.

Uninfluenced by such possibilities the Senator has again demonstrated his skill for drawing attention to more-in-it-than-meets-the-eye projects.