TABLE 2

TEN COMMANDMANTS OF FIRST AID FOR DIVERS

1	Do NOT place yourself in DANGER and KEEP CALM.
2	BASIC LIFE SUPPORT - Airway, Breathing, Circulation.
3	POSTURE - recovery position, control bleeding, immobilisation.
4	OXYGEN - in every case.
5	REST and PROTECT - from the elements, further injury, spread of toxins etc.
6	OBSERVE and RECORD - the diver's condition repeatedly and without bias.
7	CONSULT - Emergency Services, medical advice (e.g. DES/DAN).
8	SPECIFIC CARE - Fluids, marine stings and bites, Advanced Life Support.
9	EVACUATE - Hospital/Hyperbaric Centre etc.
10	SECURE EQUIPMENT and DOCUMENT the accident fully.

What replaces disease-orientated diagnosis in the immediate First Aid management of diving accidents is condition recognition. That is, the establishment of priorities in immediate care. For instance, there is little point treating shock only with intravenous fluids if the real cause of the shock is severe hypoxia from upper airway obstruction due to head trauma from an outboard propeller blade and not the haemorrhage from the scalp wound!

Therefore, the question is largely rhetorical. Of course diagnosis is important, but primarily to identify and decide priorities for immediate life-threatening problems such as airway obstruction, rather than to determine a disease label.

Principals 1-6 in Table 2 do not require disease recognition and it is only for 8, often combined with 7, that this becomes necessary.

Figure 1 is a flowchart (algorithm) used by the author for many years for teaching diving accident management.

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DIVER LOCATION DEVICES

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Abstract

Much has been written about the first aid and medical management of the injured diver, but the initial step in this management is to remove the diver from the source of injury, and this requires that first the diver must be found. There is little on this subject in the diving literature so most of the information needs to be gleaned from other sources.

All too frequently divers become separated on the surface from either their companions or the dive boat. Many survivors later report that, although they could see the boat, they were unable to attract its attention. Numerous devices have been used in the past to rectify this situation including a torch, camera strobe, flares, coloured dye, the Safety Sausage, a whistle and a sonic beacon. All have proved of limited value.

This paper classifies and compares some of these devices and makes suggestions for two cheap alternatives which should become part of a diver's routine equipment and enable rescuers to locate a lost diver more rapidly.

Key Words

Equipment, safety.

Introduction

A short time before the last SPUMS meeting in Palau (1993), a group of Japanese divers and their dive guide was swept off Peleliu Corner by unexpected currents.[1] Despite intensive air and sea searches, the divers were not found for five days, by which time they had succumbed to exposure. A diary of the event, kept by one of the divers until she died, recorded that rescue craft had passed within two

hundred metres of them but had failed to see them in the choppy conditions. It also recorded that they had tried to attract attention with torches and whistles, all to no avail.

A similar group was swept away in the same area while SPUMS was at Palau and they were rescued some hours later, at dusk, when the flashes from the camera strobe became visible. Again, whistles and torches were of no value in attracting attention. One SPUMS group at this time also had a near miss but their very experienced boatman had the foresight to follow their bubbles during decompression and be close at hand when they surfaced well offshore.

Divers can become separated from the dive boat for a number of reasons which may include the dive boat dragging its anchor, inattention by the boat crew or no person being left on watch in the boat, failure to record divers into and out of the water by the dive master, unexpected currents or current strength and deteriorating surface conditions during the course of the dive.

Auditory devices

WHISTLE

The transmission of sound across water is unreliable and depends very much on atmospheric conditions. The blast of a whistle can be more penetrating than a shout and may be heard at 100-150 m down wind but only 50 m upwind. This will be less audible with interference from the boat's engine noise and will, of course, be totally inaudible in an aircraft. A whistle is cheap, reliable and easy to use and is often standard issue with a buoyancy compensator. The whistle requires little energy and can be very useful when the voice is failing. It may be more useful for maintaining contact between divers on the surface than for attracting the attention of a boat with a noisy outboard motor.

SONIC BEACON

A sonic beacon, driven by the compressed air feed to the buoyancy compensator, emits a louder noise with a slightly greater range but becomes ineffective when the gas supply fails. This device is more expensive than a simple whistle and its increased sound intensity serves to deafen its user.

Visual devices

DYE

Any device which increases a divers visibility on the surface will be of value. A coloured dye tipped into the water will diffuse rapidly over quite a large but discrete area and be readily visible, especially from the air. It has been found that in choppy conditions such dyes dissipate rapidly and lose their effectiveness over three to six hours. Accordingly they should only be used when the searching vessels and aircraft are actually in the vicinity. They are useful only during the day.

SAFETY SAUSAGE

Especially among SPUMS members, the Safety Sausage has become almost standard issue. This two metre long red plastic cylinder, which is cheap to buy and occupies almost no space in the BC pocket, can be inflated by mouth or by compressed air and, when turgid, will stand vertically above the water surface. At night it can be illuminated from the inside by a torch, whereupon it becomes a glowing beacon readily visible at several hundred metres. Its length is such that it will show above wave height except in the most unpleasant conditions. Partly inflated it will lie on the water surface and still be visible from the air.

A variation of this is a smaller version attached to a fine cord that can be inflated during the in water decompression stop and allowed to ascend to the surface. This indicates to other surface vessels that divers are below and to the dive boat that the divers are about to surface.

CYALUME STICK

Cyalume sticks generate a chemiluminescent glow of varying colours that is visible only at fairly close range. The emitted light will last, with gradually waning intensity, for about 12 hours. These single use sticks are readily available, cheap, come in a variety of colours for the fashion conscious and can be clipped onto the BC.

REFLECTORS

Life jackets found on aircraft, life rafts and commercial shipping all have reflective patches sewn on, back and front, at shoulder level. These are flexible and highly effective, making the wearer readily visible in the beam of a torch or search light from a rescue vessel. The author feels strongly that these patches should be fixed on all buoyancy compensators. Such an addition would not detract from the design or appearance of the BC nor should it increase the cost of manufacture or cost to the customer.

TORCH

Many divers already carry a torch for looking under ledges and in caves. Torches vary in size, weight and battery capacity and can be very useful at night for attracting attention from passing boats. Most have a limited battery capacity and need to be used sparingly, especially if they have been used extensively during the dive. During daylight hours even the most powerful have very limited effectiveness.

STROBE

Some divers carry a small battery powered strobe which, when activated, emits short flashes of intense light. Held above the head it can help to make a diver readily visible as such flashes usually indicate a variation from the norm and require investigation. Strobes have the

disadvantage that they are yet another piece of equipment to carry, drop, lose, supply with batteries and to fail when most needed. In an emergency, the flash strobe from an underwater camera can and has been used for this purpose. Again, it is more useful during periods of reduced ambient light.

FLARES

In the UK especially, many divers carry flares. These are single use only, bulky, very unreliable once they have been immersed, especially at pressure, cannot be carried in aircraft and have a limited lifespan. Once their lifespan has been exceeded they are then difficult to dispose of safely and legally. They have been known to burn the hand that ignites them. Light and parachute flares have limited visibility during the day whereas coloured smoke can be used only during the day. Parachute flares which rise to a height of about 300 m and burn for several minutes are readily visible for many kilometres.

HELIOGRAPH

Last year, a yacht in distress in the North Atlantic successfully used a heliograph mirror to signal to a commercial aircraft flying at over 30,000 ft. More recently, in the Kimberley region of WA, the pilot of a crashed aeroplane used one to guide rescuers to his location. It has been reported that the flash from a heliograph has been visible at a distance of 30 km.

The heliograph mirror is a cheap, compact, neutrally buoyant device which has been used for signalling over long distances for many years. It was used extensively on the Northwest Frontier from before the Crimean War and until the introduction of the telephone. Anecdotal reports suggest it may have been used in ancient Egypt. The heliograph is standard equipment in aircraft emergency kits and in all lifeboats and life rafts.

The heliograph requires sunlight, or powerful moonlight, but can be used to effect even in lightly overcast conditions. It is simple and reliable to use, maintenance free and needs no batteries. At night it can be used to reflect a searchlight beam. All divers should be encouraged to acquire this device, carry it and learn its use.

Electronic

EMERGENCY POSITION INDICATOR RESCUE BEACON (EPIRB)

This device, when activated, transmits an electronic distress signal detectable by an orbiting satellite and then relayed to a ground control centre which, in turn, initiates an air-sea search and rescue. It was this device which initiated the rescues of yachtsmen Tony Bullimore and Thierry Dubois in the Southern Ocean in early 1997.

These devices are expensive to buy, are too bulky for divers to carry as personal equipment and are not designed to be taken to depth. They should, however, form part of the routine equipment, like flares, life jackets and a marine radio, on all boats that venture more than a few kilometres offshore.

Discussion

Divers often complain that they need to carry too much heavy equipment, and the size of the dive bags that they put on board dive boats indicates that what they do carry is too bulky. To ensure that the maximum enjoyment can be obtained from a dive then a minimum effort should be required to transport the equipment to the dive site.

Any extra equipment should be light, compact, easy to use, clean and maintain and, preferably, cheap to buy or replace. The heliograph mirror and the reflective patches sewn onto the BC both fall into this category.

As the 1998 Annual Scientific Meeting of the Society is scheduled to be held in Palau again, all potential delegates should be aware of the vicissitudes of tidal currents that abound in that region and especially around Peleliu Corner. For their own preservation, it is recommended that delegates should carry and become familiar with the use of the equipment available to facilitate their own rescue should they have the misfortune to become mislaid at this popular dive site.

Acknowledgments

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