

## SOME MEDICO - LEGAL THOUGHTS ON CORONERS' INQUESTS

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### Introduction

The discussion by John Lippmann<sup>1</sup> in the last issue has stimulated us to ask some questions worthy of consideration by those interested in underwater medicine, as well as by those with a commercial involvement in sport diving.

### Deep diving deaths

Two of the deaths investigated by the Coroner occurred diving onto a wreck at approximately 33 m depth located near to the entrance of Port Phillip. Both were experienced divers and adequately qualified to undertake their respective dives. There are some apparent common aspects to the two cases.

In each case the diver who died appeared to be having problems obtaining sufficient air from his demand valve. In each case attempts to share air with the buddy, buddy breathing in one case and the use of an octopus regulator in the other, were unsuccessful. In both instances stress was induced in the divers who died and in their buddies (each of whom survived the ordeal). Both the divers who died started to have difficulties because of insufficiency of air supply. In each case recovery of the tank revealed that there was ample remaining air for safe ascent. The problem for both divers was the failure of their regulators to deliver sufficient air.

In one case subsequent testing determined that the "J" valve was malfunctioning and provided resistance to airflow when in the "on" position. In the other the tank valves of both the deceased diver and his buddy were only partially open reducing the flow of available air.

We acknowledge that issues relating to training, in and utilization of, buddy breathing and octopus breathing arise in these deaths. As do other issues including equipment care and maintenance. We accept that there is a need for close examination of these aspects by instructors. We wonder whether there is anything which can be learned from these two incidents about stress and its effect on divers especially whilst participating in deeper dives.

It seems that when trouble began each diver was at a depth equivalent to at least 4 atmospheres. It is likely that nitrogen narcosis played no small part in the way in which each diver coped (or failed to cope) with the problems with which he was confronted.

Is enough known about the effects of stress on divers

who may be suffering from nitrogen narcosis and their ability to carry out what should be fundamental and vital skills when so affected?

Is this a matter which can, or should, be the subject of medical evaluation and assessment when a diver presents for an initial "diving medical" or again for periodic review?

Whilst a trainee or novice diver may be expected to react adversely to an unexpected change in circumstances, in each of these two cases the deceased diver had the capacity to adapt to his altered situation. Yet in both cases sadly that did not happen, and each of the buddies was also placed at risk.

### Stress caused death?

An other diving death investigated by the Coroner was that of a 51 year old male who died in a maximum depth of 12 m in Port Phillip. He had undergone an entry level training course in warm northern waters. This was his first dive in temperate southern waters as well as being his first experience of diving in a full 7 mm wet suit. He was using this newly acquired diving equipment for the first time.

This diver had a history which, in retrospect, may have been significant. In the past he had served in the RANR where he had applied, unsuccessfully, to undergo diving training. In 1979 he had developed a malignant tumour which had been treated by surgical excision and extensive radiotherapy after which he developed tremors. A neurologist had prescribed, and the diver took, propranolol (Inderal) for his tremors.

About four months before his fatal dive and whilst undertaking his entry level training, the deceased had six open water dives in tropical conditions. He was observed to be physically tired, even exhausted, and very cold with shaking hands after each of these dives. Before participating in the entry level course a medical examination had been conducted and he had been found fit to dive.

There was no evidence before the Coroner concerning the qualifications of the examining doctor nor of the nature and extent of the examination. There is nothing to indicate whether the doctor had undergone any training in or had any knowledge of hyperbaric or diving medicine.

This case raises what should be the requirement for medical examination of prospective divers. That such assessments should be undertaken by members of the medical profession skilled in diving and hyperbaric medicine ought not to be in dispute and ought to be accepted without question by all instructor agencies and charter operators.

The more difficult task is to determine the parameters

of such a medical assessment acknowledging the realities of time and cost and the reliance by doctors in obtaining an accurate and thorough history from each prospective diver.

With the benefit of hindsight one may consider that it might have been useful to know why the deceased diver was refused permission to undergo diving training whilst a member of the RANR; whether the fact that he was taking propranolol was known to and considered by the examining doctor; whether the effects of propranolol on divers is understood; whether, in the light of the age of the diver and the post mortem findings of the presence of moderate atheroma and occlusion of between 30% and 60% of the coronary arteries, appropriate investigation of the cardiovascular system of the diver was undertaken.

In this case, once again the Coroner considered the stress to have been an implicating factor together with anxiety induced by combined effects of this being the first dive in such waters, wearing a full wet suit for the first time and the use of all new equipment.

Again, the relationship between stress and diving accidents has been emphasised as a causative factor.

With stress likely to have been such a prominent precipitating element in each of these three incidents does that mean, that more should be done to assess the capacity of a diver to cope with stress? Or does it mean that more training of divers is required to improve their ability to manage emergencies likely to provoke or involve stress and anxiety.

### **Hyperventilation death**

The fourth death involved an experienced diver who was snorkelling at the time of the fatal incident. The Coroner emphasised three aspects of this incident. The first was the likelihood that the diver had engaged in hyperventilation prior to the snorkel dive from which he failed to surface. The second was the likelihood that he was overweighted whilst the third was that the buddy system was not in use at the time.

The dangers of hyperventilation would seem to be well known. The deceased was an assistant diving instructor and diver of considerable experience and ability. He was also known to be an asthmatic although there is nothing to indicate that his death was in any way related to that condition.

There were no witnesses to the events which immediately preceded the commencement of the fatal dive, so whether or not hyperventilation was a factor must remain a matter of speculation albeit that there is little reason to doubt that this was a causative factor.

Is the incidence of hyperventilation amongst experi-

enced snorkelers sufficiently frequent to warrant further study of the subject of post-hyperventilation blackout or is it simply a matter of all snorkelers better understanding what is meant by hyperventilation?

### **Is drowning the correct finding?**

The Coroner found that three of the deaths were due to drowning and one to an air embolism. This raises the question as to whether the post mortem investigation of diving fatalities determine the appropriate cause (or multiple causes) of death.

In one of the diving deaths the post mortem findings included moderate atheroma and some coronary artery occlusion. In this case the Coroner found that combination of anxiety, increased carbon dioxide retention and probable precipitation of ventricular fibrillation led to unconsciousness and ultimate drowning. The Coroner found too that the use of propranolol may have also been a contributing factor.

The point here is that on its face, the cause of death was said to be "drowning". There were other ingredients involved but the causative role of each of these other factors may not have been appropriately investigated in order to determine whether there is anything which needs to be understood and applied to the pursuit of safer diving.

Although the cause of death in diving incidents is often attributed to drowning, there are often other contributing elements involved. The role played by these other factors may be such that without their occurrence the ultimate fate of the diver might have been averted.

### **Conclusion**

Is enough understood about the medical relevance of the sequence of events which may lead to death by drowning? In addition we wonder whether the need to establish a cause of death leads to the Coroner to concentrate on the final cause of death rather than what led to the drowning. We hope that this paper will stimulate discussion.

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