

SOUTH



AUSTRALIA

FINDING OF INQUEST

An Inquest taken on behalf of our Sovereign Lady the Queen at Adelaide in the State of South Australia, on the 23rd, 24th, 25th and 25th of February 2004 and the 6th day of April 2004, before Wayne Cromwell Chivell, a Coroner for the said State, concerning the death of Robert Anthony Walker.

I, the said Coroner, find that, Robert Anthony Walker aged 55 years, late of 40 Suffolk Road, Hawthorndene, South Australia died at near Second Valley, South Australia on the 21st day of April 2002 as a result of ascent barotrauma.

1. Introduction

- 1.1. On Sunday 21 April 2002 Robert Anthony Walker went diving with his friends Magdalena Rowan, Barry Severne and Graham Riley at a spot approximately 8 nautical miles (Nm) from the South Australian coast at Second Valley. Mr Severne told me that Mr Walker was a very experienced diver (T57).
- 1.2. They were diving in water which was approximately 37 metres deep, in the vicinity of a ship-wreck believed to be that of the 'Ulonga'.
- 1.3. The group reached the dive site in Mr Severne's boat at about 11:30am. They planned to retrieve an anchor which they had left there on a previous occasion. They had left hurriedly to avoid disclosing the location of the wreck (Exhibit C54, p2).
- 1.4. The group had also located a dinghy in the area of the wreck to which they had attached plastic drums. They intended to fill the drums with air from their scuba tanks to assist in righting the dinghy so that they could photograph it with someone sitting in it (T60).

1.5. The four divers entered the water at about the same time. Mr Walker and Mr Riley descended first. When they reached the bottom of the anchor line, they located the lost anchor and tied it to the boat anchor so that it could be raised later.

1.6. After this, Mr Walker and Mr Riley became separated. Mr Riley's statement reads:

'After this we both swam towards the boat's anchor. I had stirred up some sand on the bottom and had lost sight of Bob. Given that we had achieved our task I started to surface. I reached the surface and looked around for the boat, initially I couldn't see the boat but then saw it. I figured that by the time I reached it Bob would have been on the boat or near to it. This was because Bob had told me earlier this morning that he intended to dive for only 7 to 9 minutes due to his heart condition, it was a viral condition and his doctor advised he shouldn't dive.

I reached the boat and I got into the boat. I then re-entered the water at the back to do a decompression, although I probably didn't need it. I made my way down a line on the starboard side of the boat and saw Bob in the water. Bob appeared motionless, I got closer and saw that his eyes were closed. His regulator was still in his mouth. I thought to myself "he is unconscious". I grabbed him and moved him to the surface to get his face out of the water.'

(Exhibit C53, pp1-2)

1.7. In the meantime, Mr Severne and Ms Rowan had descended. Mr Severne estimated that they were about 10 minutes behind Mr Walker and Mr Riley. When they reached the top of the anchor chain, about 1½ metres from the bottom. Mr Walker swam up to Mr Severne and gave him a quick 'out of air' signal. He then removed the regulator from Mr Severne's mouth and began using it himself. Mr Severne then took Ms Rowan's regulator from her mouth and began using it, and she then used her spare.

1.8. The three divers then commenced their ascent to the surface, connected in a 'daisy chain' via their regulators. Mr Severne described how they were facing into the current, with the anchor line angled at 45° above and behind them. Mr Walker was the first of the group above and behind Mr Severne, who was above and behind Ms Rowan. Mr Severne was not able to maintain eye contact with Mr Walker during the ascent. He said:

'We then commenced our ascent up the anchor line. Bob was above me and Magdalena below me. We went up with a quick ascent rate, I don't know how many seconds per metre it was but it was quick. I didn't know what Bob's problem was, but being below thirty metres being prudent we should go up quickly.

I don't recall if I had visual contact with the other two during the ascent, I believe I did with Magdalena as she was below and I had her reg in my mouth. I couldn't see Bob as

he was behind me, I wasn't looking for him, I just assumed he was on my reg. Once we had gone a few metres it felt like we were ascending at the same rate, in control. At about thirty metres, I'm not exactly sure of the depth but I believe we were about ten metres off the bottom, I noticed that my reg, the one that Bob had been on, was unattended by my left side. I believed that Bob mustn't have needed it any more and had let it go. I picked it up to use it myself and noticed that the mouthpiece was missing from the second stage. This was unusual and it made me anxious, I didn't understand it. I indicated to Magdalena to continue the ascent as rapidly as possible. By rapid I mean as fast as I could get up, I wanted to find out what Bob's situation was. We continued to ascend. Magdalena wanted to stop at our usual stop of eight metres or whatever but I didn't want to stop because I was concerned about Bob. We continued up the anchor line until we reached the gear line attached to it a couple of metres below the surface. At this time I let go of Magdalena's reg and continued up the last couple of metres on free ascent because it was quicker and I wanted to look for Bob.

On reaching the surface I could see two pair of legs under the surface at the rear of the boat so I swam over there. I saw that Graham was supporting Bob's head out of the water, on seeing me he asked for help to get out of the water. I immediately dropped all my dive gear and finned over to the side into the boat. We got Bob's dive gear off and eventually got him into the boat with the use of ropes.'

(Exhibit C54, pp5-6)

- 1.9. Mr Walker must have continued his ascent to the surface after he broke free of Mr Severne's regulator, pulling off the mouthpiece in the process. When Mr Riley found him near the surface his own regulator was back in his mouth. Mr Riley said:

'I took his regulator from his mouth and noticed that he was bleeding from the mouth. Barry appeared and we tried to get Bob out of the water. This proved too difficult so we had to place ropes on various parts of his body to get him out of the water. We placed a rope around his chest under his arms, on his wrist and one on his thigh. We eventually got him into the boat by having him face the boat. By this time Magdalena had arrived and assisted us. Whilst in the water I helped Barry to remove Bob's SCUBA gear, the vest was fully inflated. I think Magdalena removed his weight belt. I noticed whilst still in the water there was froth around Bob's mouth and nostrils and it wasn't moving. I don't think he was breathing. I checked for a carotid pulse but it was non existent.'

(Exhibit C53, p2)

- 1.10. Mr Severne drove his boat back to Wirrina, where they were met by police and ambulance personnel. Dr Lyn Gardiner pronounced life extinct at 2:10pm (see Exhibit C2a).

2. **Cause of death**

2.1. A post-mortem examination of the body of Mr Walker was performed by Professor R W Byard, Forensic Pathologist, on 23 April 2002. Also present was Dr C J Acott, Director, Diving Medicine at the Royal Adelaide Hospital.

2.2. Professor Byard diagnosed the cause of death as ascent barotrauma. The significant findings from the post-mortem examination were as follows:

- Mr Walker was 191cm tall and weighed 127kg;
- His wetsuit was tight causing congestion of the face and upper chest;
- Bloody fluid was coming from the mouth in addition to frothy white oedema fluid;
- The heart was markedly enlarged at 652 grams, and contained air which bubbled extensively when opened under water;
- The lungs were mildly oedematous and congested;
- There was interstitial fibrosis in the heart muscle.

2.3. Professor Byard commented:

'Death was due to air embolism from ascent barotrauma. Air was demonstrated within the heart both on X-ray and at post-mortem examination. In discussion with Dr C Acott (RAH Barotrauma Unit) it appears that the deceased ascended rapidly from a considerable depth. It may be that cardiac problems were occurring associated with the marked cardiomegaly. The presence of patchy interstitial fibrosis in the absence of significant atherosclerosis of the coronary arteries would be in keeping with the possibility of viral myocarditis. No other underlying organic diseases were present which could have caused or contributed to death. There was no evidence of significant trauma with the bleeding in the mouth most likely associated with terminal biting of the tongue and the minor abrasions and bruising associated with the lifting of the body at the scene. The results of blood alcohol and toxicology were not available at the time of this report.'

(Exhibit C1a, p1-2)

2.4. Dr Acott gave oral evidence at the inquest. He is a very experienced diver, and is one of Australia's leading experts in diving medicine.

2.5. Dr Acott told me that, having regard to the evidence available, in his opinion Mr Walker's viral myocarditis led to his heart becoming large and inefficient, leading to pulmonary oedema (fluid in the lungs). His very tight wetsuit would have aggravated this condition because it would have squeezed the blood from his peripheries to the

body core, putting even greater load on his already compromised heart. The pressure generated by diving to a depth of 37 metres would have aggravated this condition even further.

- 2.6. The reduction in heart efficiency and pulmonary oedema would have led to shortness of breath, thereby causing Mr Walker to ‘over breathe’ and run out of air more quickly than normal. This breathlessness would also have led to hyperinflation of the lungs which is the condition most likely to lead to an air embolism. In this process, an air bubble is admitted to a pulmonary vein, perhaps through a tear in the vein, and this travels to the heart. The heart then sends the bubble via the cerebral artery to the brain. This is known as a cerebral artery gas embolism (‘CAGE’). This may have led to a convulsion (in which Mr Walker may have bitten his tongue) or a cardiac arrhythmia, either of which would have incapacitated him in the water, and led to aspiration of water (drowning).

3. Medical issues

- 3.1. I heard evidence from Dr John Clapp, Mr Walker’s General Practitioner since 1990 (T85).
- 3.2. Dr Clapp told me that in 1999 Mr Walker consulted him about abdominal discomfort. His blood pressure was elevated, and there was a ‘murmur’ in his heart. Dr Clapp also detected ‘rattles’ in his chest, suggestive of pulmonary oedema, and incipient heart failure. Dr Clapp referred him to Dr J A Whitford, a cardiologist, for treatment.
- 3.3. Dr Whitford diagnosed cardiomyopathy due to hypertension (see Exhibit C55). He saw Mr Walker through 2000 and 2001 until September of that year when he reported Mr Walker’s condition as stable. He said he could find no evidence of heart failure then (see report dated 11 September 2001, Exhibit C55).
- 3.4. Dr Clapp last saw Mr Walker on 3 January 2020 when he reviewed his medication prescription, and encouraged him to get more exercise.
- 3.5. Dr Clapp told me that he had never been told by Mr Walker that he was scuba diver. Having regard to his condition, Dr Clapp was sure that if he had been aware of that, he would have advised Mr Walker not to engage in that activity. Dr Clapp said:

‘I’m positive that I would have told him he shouldn’t scuba dive knowing his cardiac condition which was never technically cured, he was on lots of tablets but it was all a

satisfactory control eventually after – Dr Whitford had quite a difficult time early on, getting the heart into a controlled situation so I'm sure I would have advised him against it.' (T89)

I accept Dr Clapp's evidence about that issue.

- 3.6. In any event, Mr Walker was aware that he should not be diving. He told both Mr Riley (T29) and Mr Severne (T64) that he had been advised by his cardiologist not to dive. He apparently had a theory that diving would be therapeutic to his illness, although it is not clear where he got that idea from.
- 3.7. Dr Acott gave the clear opinion that having regard to Mr Walker's obesity, his cardiomyopathy, and general lack of physical fitness, Mr Walker should not have been diving (T333).

4. Diving issues

4.1. Equipment

Mr Walker's equipment was examined by Senior Constable B P Allen of the Water Operations Unit of South Australia Police. Senior Constable Allen made the following observations:

- The wetsuit jacket was small for Mr Walker's size;
- The buoyancy control device (BCD), which incorporated a spare regulator, had only a slight air leak which would not have interfered with its operation;
- The air cylinder was last tested in February 2002, so it was within the time period. The cylinder was empty of air. When filled with air, the cylinder and valve functioned correctly;
- There were no faults in the first stage regulator and associated fillings;
- The second stage regulator functioned correctly;
- The dive computer indicated that the last dive lasted 22 minutes and the maximum depth achieved was 124 feet;
- The air contents gauge was accurate within acceptable limits.

In summary, there were no faults in Mr Walker's equipment which might have contributed to his death (Exhibit C4a, p13). Mr Walker's weight belt could not be recovered and weighed.

4.2. An examination of Mr Severne's equipment revealed that the mouthpiece to his regulator was missing. Senior Constable Allen observed that it would only require 'moderate force' to remove it (Exhibit C4a, p14).

4.3. I heard evidence from Senior Constable Darryl Wright who is also a member of the Water Operations Unit. Senior Constable Wright sat through the inquest hearing, and offered his expert opinions on the diving issues involved. He made the following comments:

- Having lost Mr Walker in the silt, and having waited for an appropriate time, Mr Riley had no alternative but to head for the surface as he did. Senior Constable Allen had some reservations about that in his report (see Exhibit C4a, p16) but I accept Senior Constable Wright's opinion about that;
- The 22 minutes recorded on Mr Walker's computer represents 'down-time' (ie the period between when he left the surface to immediately before his ascent);
- The 'daisy chain' arrangement by which Mr Walker, Mr Severne and Ms Rowan commenced their ascent was inappropriate and unsafe. Mr Severne should have used his spare regulator rather than Ms Rowan's and he should have maintained eye contact with Mr Walker who would have been understandably anxious about encountering an 'out of air' situation at such a great depth. If they had formed a circle, it would have been easier to control the rate of ascent. In the event, it would appear that Mr Walker tried to ascend too fast and pulled off the mouthpiece;
- The reason why Mr Walker was out of air is not clear. He may have breathed it (as Dr Acott suggested), or he may have gone to the dinghy and put some of his air in the flotation drums before finding Mr Severne. The latter option seems less likely in the circumstances;
- Senior Constable Allen mentioned the phenomenon of nitrogen narcosis when diving at such depths as follows:

'It is known that as diving depth increases nitrogen begins to impact on the nervous system of the body producing an effect known as nitrogen narcosis. Nitrogen narcosis as the name suggests produces a narcotic effect on the diver, with the effects sometimes being likened to those of alcohol. Nitrogen narcosis is generally recognised as being noticeable over 30 metres deep, and of concern at depths approaching 40 metres. It is probable that all divers involved in this incident were

affected to some degree by nitrogen narcosis at the time of the emergency. It is probable that in an emergency nitrogen narcosis would have considerably hampered their efforts to cope with the emergency. The dangers of nitrogen narcosis and decompression requirements are so great that AS2299 prevents commercial divers from diving on scuba at depths of greater than 30 metres, and prohibits the diving on air at greater than 50 metres of water.'

(Exhibit C4a, p16)

5. **Conclusions**

- 5.1. Senior Constable Allen postulated two scenarios for the circumstances of Mr Walker's death. For the reasons I have already expressed, I adopt the second scenario. This is as follows:

'Walker is overweight and lacks physical fitness. He has a pre-existing heart condition. His wetsuit is tight causing constriction to the arms, legs and chest, and reducing blood flow to the extremities of the body. The combination of these factors causes stress on his heart and leads to a build up of fluid in the lungs (pulmonary oedema). Pulmonary Oedema results in a diminished ability of the lungs to transfer oxygen to the blood, resulting in shortness of breath and hypoxia, even though breathing is normal and the lungs are fully inflated.'

Walker and Riley commence their dive, reach the bottom and complete their task of locating and tying off a line to their missing anchor. Riley loses sight of Walker and ascends to the surface. Walker either spends the next few minutes searching the area for Riley or continues swimming to the Ulonga wreck and then across to the dinghy they had intended trying to lift. He waits for the others to meet him there. He is struggling with the dive, finding that even though he breathes hard and deeply on his regulator he is feeling out of breath. Unknown to him his body is suffering Pulmonary Oedema and his lungs are not able to deliver the oxygen required. Walker eventually notices he is low on air and heads back to the anchor chain. His breathing rate by this time is very rapid, resulting in him being out of air by the time he reaches Severne. He indicates that he is out of air, takes Severne's regulator and begins breathing on it. As they begin to ascend he finds even though he is breathing on Severne's regulator he is not getting the blood oxygen he requires. He feels totally out of breath, panics and swims hard for the surface, overtaking Severne and Rowan, and pulling on the regulator causing the mouthpiece to dislodge. In total panic and feeling out of breath, he holds his breath and swims hard for the surface. At some time during the ascent he suffers a barotrauma of ascent and loses consciousness. The positive buoyancy in his vest carries him to the surface where is located unconscious by Riley.'

(Exhibit C4a, pp23-24)

- 5.2. I find that Mr Walker suffered a CAGE at some stage of his ascent leading to a convulsion, unconsciousness and drowning.

6. **General considerations**

6.1. I have heard evidence in the inquests into the deaths of Robert Anthony Walker, Neville Arthur Kinnear, Rex Alexander John Humberstone, Deborah Christine Campbell and Jennifer Lee Barrington at the same time. These deaths occurred between 24 February 2001 and 21 April 2002. A startling number of similarities exist in these five cases:

- In three cases a CAGE (cerebral arterial gas embolism) was involved - Walker, Kinnear and Barrington;
- In four cases a lack of cardio-vascular fitness was evident - Walker, Kinnear, Humberstone and Campbell;
- Four of the deceased were obese - Walker, Kinnear, Humberstone and Campbell;
- All of the deceased had medical conditions relevant to the cause of death which could have been detected in a properly conducted medical examination:
 - enlarged heart (cardiomegaly) - Walker, Kinnear, Humberstone;
 - other heart disease (myocarditis) - Walker;
 - lung disease - Kinnear, Humberstone, Barrington;
 - back problems - Campbell, Barrington;
 - oesophageal reflux - Campbell;
 - ear problems - Barrington.
- In four cases, the deceased wore a wet suit that was too tight, interfering with breathing and possibly causing reflux - Walker, Kinnear, Humberstone and Campbell;
- In two cases, the deceased wore a weight belt that was too heavy causing excessive fatigue – Campbell and Humberstone; and in one case, the weight belt could not be quickly released - Humberstone;
- In one case the BCD was faulty, also causing excessive fatigue - Humberstone;
- In only one case did the ‘buddy’ system break down - Barrington;
- In two cases, poor diving technique may have contributed to the death - Walker, Campbell;

- Two of the deceased had recent diving training but were inexperienced - Campbell, Barrington, and the other three were experienced but had not had recent training - Walker, Kinnear, Humberstone;
- Three of the deceased had recently seen a doctor - Walker had been told by his cardiologist not to dive but ignored the advice; Humberstone had recently seen his General Practitioner but not in relation to diving; and Barrington had ignored her General Practitioner's advice to consult her surgeon, and had earlier misled the medical practitioner conducting the diving medical examination;

6.2. Dr Acott said that in his opinion all of these deaths were preventable. He said:

'A diving medical is required before a candidate commences scuba diving. This medical, in SA, does not have to be performed by a medical practitioner knowledgeable in diving medicine. (If the physics and unique physiology involved with diving and hence the problems are unknown the risks can't be discussed). Once the candidate is 'passed fit' he/she is fit for the rest of their lives. This is 'nonsense'. Commercial and professional divers are required to have an annual medical by a medical practitioner suitably qualified in diving medicine. However, annual diving medicals for 'recreational divers' are controversial. There needs to be some recommendation that states that if a diver suffers an illness or their medical or general fitness changes they should seek guidance from a suitably qualified medical practitioner regarding the risks that may be associated with continuing to dive. Perhaps annual self assessment forms should be introduced that will highlight problems which will then lead to a discussion with a suitably qualified medical practitioner.'

(Exhibit C66, p4)

6.3. Dr Acott suggested that:

- Recreational diving medical examinations should be conducted by medical practitioners who are trained in diving medicine;
- The medical practitioner conducting the recreational diving medical examination (if he/she is not the subject's regular medical practitioner) should require the subject to produce a referral letter detailing the subject's medical history as far as it is known;
- Candidates should be made aware by the medical practitioner that health factors are a concern and are potentially lethal not only to the patient but to their 'buddies' in the water, so they are under a duty to disclose them.

6.4. Senior Constable Allen suggested that a public awareness campaign should be conducted to remind divers of the dangers associated with hookah equipment (Exhibit

C21a, p13). Mr Humberstone's hookah equipment (as distinct from the BCD and weight belt) was not faulty and did not cause Mr Humberstone's death, so I am prevented by Section 25(2) of the Coroner's Act from making such a recommendation.

6.5. Senior Constable Allen also recommended that all recreational divers should undergo a regular medical examination (Exhibit C4a, p25).

6.6. Senior Constable Wright suggested that there are three options available to address these issues:

1. Do nothing;
2. Conduct an educational or public awareness campaign about the dangers of diving with a medical condition and recommending regular checkups;
3. Make periodic medical examinations compulsory.

6.7. Senior Constable Wright also pointed to the fact that occupational divers are required to undergo an annual medical examination by a medical practitioner trained in hyperbaric medicine.

6.8. The difficulties with option 3 are:

- Resentment from recreational divers;
- Expense;
- The lack of sufficiently trained medical practitioners;
- Unenforceability.

6.9. Senior Constable Wright commented:

'As recreational SCUBA diving is just that, a recreation, it is my opinion that it should remain as free from legislation and regulation as is safely possible. My preferred option would be Option 2, for the recreational diving industry to take steps to promote safe diving practices by the development of an education programme specifically aimed at the need for divers to maintain a good level of fitness.'

(Exhibit C65a, p16)

6.10. Senior Constable Allen made a similar recommendation (Exhibit C4a, p25). I agree.

7. **Recommendations**

7.1. Section 25(2) of the Coroner's Act 1975 empowers me to make recommendations in certain circumstances following an inquest. The section reads:

'A coroner may add to his or her finding any recommendation that might, in his or her opinion, prevent, or reduce the likelihood of, a recurrence of an event similar to the event that was the subject of the inquest.'

7.2. Pursuant to that Section, I make the following recommendations:

1. All persons engaged in recreational underwater diving should undergo an examination by a registered general medical practitioner trained in hyperbaric medicine on a regular basis, preferably annually but not less frequently than every two years.
2. Medical practitioners should decline to conduct such examinations unless they are appropriately qualified to do so.
3. Medical practitioners conducting such examinations should, if they are not the subject's regular medical practitioner, require the subject to produce a referral letter detailing the subject's medical history as far as it is known.
4. Medical practitioners conducting such examinations should warn the subject that diving is a potentially lethal activity if undertaken by a person with certain medical conditions, and that absolute honesty in providing background medical history is called for.
5. If there is any doubt about the subject's health, the medical practitioner should arrange such follow-up tests as chest X-rays, hypertonic saline tests, or whatever else may be indicated, before passing the subject as fit to dive. Any doubt should be resolved against passing the subject as fit, until such follow-up tests demonstrate fitness to dive.
6. The recreational diving industry should conduct an awareness campaign among its member organisations and the diving public about the dangers of diving with certain medical conditions, the need for regular medical examinations at least every two years, the need for absolute honesty during such examinations, and the

responsibility a diver has both personally and to his or her diving colleagues to ensure that he or she is fit to dive.

Key Words: Drowning; CAGE; Underwater Diving; Hyperbaric Medicine

In witness whereof the said Coroner has hereunto set and subscribed his hand and

Seal the 6th day of April, 2004.

Coroner

Inquest Number 5/2004 (1022/2002)