

Discussion Paper On Asthma And Diving published in *Thoracic Society News*, Vol 14 Issue 4 A Response By Dr Graham Simpson

The discussion document by Anderson et al makes some interesting points about changing opinions regarding asthma and scuba diving over the last eleven years. One point it fails to address is whether this is actually a real problem. Scuba diving is a remarkably safe sport - safer, for example, than rock fishing on the New South Wales coast (see www.safewaters.nsw.gov.au). Anderson et al quote an estimate of one death for every 50,000 dives. It is known from many sources that the vast majority of diving accidents relate to stupidity, poor training, equipment malfunction or usually some combination of these factors. A very careful analysis of Australian diving deaths implicated medical conditions in a very small fraction of fatal diving accidents. Of these the majority involved cardiac events in middle aged or elderly men.¹⁻³ There is no good evidence that the proportion of asthmatics in the scuba diving population is any different from that in the general population and at least some evidence that many clinical asthmatics continue to dive without difficulties. A recent study from New Zealand of over 20 years of diving deaths found only four cases in whom asthma was even suggested as a contributing cause without any evidence for this assertion being available in any case.⁴

Despite considerable effort no study has demonstrated that asthmatics are at a statistically significant increased risk of death or barotrauma when scuba diving. If there is an increased risk, then it is relatively small and in absolute terms minute.⁵

Why then are we so concerned? Unfortunately a lot of responsibility for this must be placed on the TSANZ 1993 position paper. This elegantly and lucidly describes the theoretical reasons why asthmatic bronchospasm may create localised air trapping and thus pulmonary barotrauma and it is largely as a consequence of this paper that the Australian diving medical standard, which is enshrined in law in Queensland, puts such stress on asthma and bronchial provocation testing.

The history of medicine is sadly littered with examples of detailed theoretical argument which, when belatedly put to the test, are shown to produce exactly the opposite result of that expected. Fluid loading for acute tubular necrosis, HRT to prevent ischaemic heart disease and routine post-operative radiotherapy for lung cancer are only a few examples. In fact the only pulmonary function abnormalities convincingly demonstrated to predict pulmonary barotrauma are a low vital capacity and decreased pulmonary compliance - in fact the opposite of those seen in obstructive lung disease.

Bronchial provocation testing

Australia has put a unique emphasis on the role of bronchial provocation testing in the exclusion of prospective scuba

diving candidates. There has been an almost emotional attachment to the use of hypertonic saline, presumably because the sea is salty. Both the 1993 and current paper refer to aspiration of fine aerosols of hypertonic sea water through faulty regulators. It must be remembered that to perform a hypertonic saline challenge one needs an ultrasonic nebuliser as no jet nebuliser yet devised has a sufficiently high output. The idea that a regulator could become faulty underwater such that it produces an output of respirable particles of saline at about double that of the best purpose designed nebuliser one can buy is akin to suggesting that a dive torch could develop a short circuit and transform itself into a DVD player. Aspiration of sea water into the upper airway is also invoked but it seems unlikely that enough water could be aspirated deeply enough into the lungs to cause widespread bronchospasm by altering airway surface osmolality. In any event this sort of aspiration occurs far more commonly when swimming, snorkelling or surfing and as yet these activities are free from medical regulation. Anderson quotes a study of hypertonic saline challenge in intending divers with a past history of asthma where 17% were advised against diving because of a positive result.⁶ In the same issue of the SPUMS Journal we reported a study in a group 50 experienced scuba divers with over 70,000 logged dives.⁷ Strict application of the criteria for respiratory fitness suggested by the standard Australian diving text books and recently again supported by the current president of the SPUMS⁹ would have resulted in 46% of this group being excluded from scuba diving training. Interestingly the exclusions did not include three of the five divers with currently active clinical asthma. Contrary to Anderson's suggestion, more of the divers failed the hypertonic saline challenge than the histamine challenge.

The problem with bronchial provocation testing is that bronchial smooth muscle is present for a reason and if sufficiently provoked will produce bronchospasm in anyone. The difficulty is in knowing how much provocation to apply. Eucapnic voluntary hyperpnoea (EVH) has become the accepted test for use in elite athletes who wish to use bronchodilators during competition. These individuals, however, do not have asthma in the sense which any respiratory physician would understand it and it is a considerable leap of the imagination to apply results from these super fit athletes to the average recreational scuba diver. Contrary to repeated statements in the discussion paper, scuba diving is essentially a very relaxed pastime and high levels of exertion are rarely required. If they are, it is usually at the surface where scuba divers are joined in their predicament by swimmers, snorkellers and surfers. To put things in perspective, the EVH test suggested by Anderson et al (six minutes of 85% of MVV) is not applicable to a scuba diver at 20 m of sea water depth, because that level of ventilation would empty the average scuba tank in less than six minutes. Even in elite athletes

the levels of ventilation achieved in the EVH are significantly higher than that normally achieved at maximal exercise. The British Thoracic Society guidelines have surely got this right with a suggestion that the exclusion criterion should be significant wheeze precipitated by moderate exercise. It is perhaps unfortunate that the debate on asthma and diving in Australia is being dominated by individuals with particular expertise and interests in bronchial provocation testing. It is of note that the patent for the use of mannitol in bronchial provocation testing, which has been suggested to replace EVH, is held by the Health Authority which employs the principal author of the Discussion Paper.

Accurately calculating the 'Number Needed to Test' by EVH or mannitol to prevent a single SCUBA diving accident is not possible as even active asthma has not been shown to increase risk but the number is likely to be many thousands. The converse of this is that thousands of people would be barred from a voluntary activity for no good reason. The informed consent approach is clearly the right one with regard to medical assessment for scuba diving. A simple explanation of the possible potential problems of a history of asthma and the true magnitude of the risk involved would however seem to make more sense than the mandatory use of expensive and time consuming tests.

Conflict of interest

The author has demonstrable exercise induced bronchospasm and chooses to continue to scuba dive.

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