Should computed tomography of the chest be recommended in the medical certification of professional divers?

I L Millar

Chest CT should not be used in the assessment of fitness to dive

Toklu et al have raised the question of whether routine high resolution computed tomographic (CT) scanning of the chest should form part of the initial diving medical examination for occupational divers. The authors make this proposition in discussing their series of three divers in which pulmonary abnormalities were discovered on high resolution CT scan after occupational diving incidents. One case involved a bulla, the second multiple air cysts, and the last a subpleural bleb. The authors assume that the initial mechanism of injury in each case was pulmonary barotrauma associated with the lesions revealed.

One could argue whether the second and third cases may have involved arterialisation of venous bubbles rather than pulmonary barotrauma, but any uncertainty does not invalidate consideration of the authors’ contentions. It is widely agreed that lung cysts, bullae, and blebs may all predispose to pulmonary barotrauma, and most authorities recommend disqualification from diving if such lesions are found. This report adds to others in which CT scans were abnormal, but was not previously argued that pulmonary barotrauma on the basis that ventilated gas embolism, pneumothorax, or pneumomediastinum is less likely to be a predisposing factor for such lesions. The authors assume that the initial mechanism of injury in each case was pulmonary barotrauma associated with the lesions revealed.

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Current expert opinion seems to be that a major underlying predisposing factor for lung barotrauma is likely to be scarring, fibrosis, or decreased tissue compliance, especially where this is non-homogeneous. This is thought to predispose to development of shear forces as the lung expands, risking tears occurring in the bronchiolar lining. It is also reasonable to hypothesise that there may be variability in the tensile strength of lung tissue across the population, and within any one lung this factor may be relatively homogeneous or variable. The variability of these characteristics of compliance homogeneity and tensile strength together could result in a wide range of susceptibility or resistance to pulmonary barotrauma, even in apparently healthy people. This proposal would also be consistent with findings in cases of primary spontaneous pneumothorax where half of otherwise healthy sufferers have no identified blebs or other structural predisposing factors. In divers having CT scans, Denison has reported on cases of pneumomediastinum developing during the deep breathing involved in the scan. It can even be speculated that microrupture of the lung is a relatively common and perhaps even “normal” event, which usually has no clinical consequences if the result is at worst a small air leak into the local interstitial tissues, which self seals and heals asymptomatically. If decompression were to occur during such a time, however, the expansion of air in the lungs might very easily produce a significant temporary air leak even with a relatively controlled ascent rate. If these theories are correct, functional compliance testing and imaging for fibrosis rather than for abnormal air spaces may prove more predictive of barotrauma risk.

Tokuil A et al accept that CT scanning at all examinations would be impractical and suggest restriction to the initial medical examination only, especially in those with a history of smoking or lung infection. It seems apparent that even this cannot be supported in the current environment. Given the relative rarity of pulmonary barotrauma and the frequency with which we could expect to find abnormality, screening CT would not only be unjustifiably costly in financial terms but also in terms of potential divers unnecessarily excluded from an occupation or recreation to which they might be well suited.

Questions about the true association of cysts, blebs, and blebs with risk for divers will not go away, however. Rather, they will present an increasingly common dilemma for medical assessors of both occupational and recreational divers, given trends towards individualised risk assessment and continuing improvements in technology. More divers treatment facilities need to build on the reports of Tetzlaff et al comparing thoracic CT scans from pulmonary barotrauma cases with those from divers presenting for other reasons. Centralised registries of diving accident data would enable compilation of sufficiently large case numbers to gain a better idea of any associations. It is hoped that important denominator information will also become available if sufficient medical examiners respond to Watt’s call for submission of medical examination reports to his pulmonary risk evaluation audit. Relatively rare conditions such as pulmonary barotrauma require very large data sets to indicate any significant associations, and the greatest potential probably lies in the hope that more countries adopt a system of occupational diver medical examination assessment and data management such as that established in New Zealand. Until more information is available, it will be important for those interpreting high resolution imaging findings not to jump to the conclusion that any lesion detected should automatically indicate unfitness to dive.

**REFERENCES**

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