

Pneumothorax and Its Consequences

DAN Offers Advice on Penetration of the Lungs

Q: After sustaining a fractured rib and pneumothorax during a sports injury, a diver has asked why he could never dive again. What is the risk of a spontaneous pneumothorax? Could scarring of the pleura cause any problems?

A: The lungs are contained in the chest cavity within the pleural membrane. The pleura lines the exterior of the lungs and the interior of the chest cavity with a potential space between the two layers. If air enters the area between the pleural tissues, the potential space becomes an actual space. If the space expands, the lung expansion is reduced, and respiration is compromised.

If the air comes from an interior wound, it is called a closed pneumothorax, and if the wound is external, it is called an open pneumothorax. The opening may result from a lung defect or an injury (trauma). The larger the hole, the more rapid the progression of the pneumothorax.

If the hole is small, the pneumothorax may self-seal, and the body will gradually reabsorb the air. If the interior wound does not close and air continues to enter the space, the condition is called tension pneumothorax. In tension

pneumothorax the expanding gas volume in the pleural space compresses the lung and heart. This condition is considered very serious and requires emergency treatment. If it were to occur in a diver underwater, the increase in pressure within the pleural space would be compounded by gas expansion as the diver heads for the surface.

This young man who has asked about diving after this type of injury sustained a fractured rib and a pneumothorax from a sports injury. We assume this was blunt trauma, which fractured the rib and the pneumothorax, but that the broken rib did not penetrate the pleura and lung. A pneumothorax can result from blunt trauma to the chest, causing the pleura to tear, much like popping an inflated paper bag.

What is the chance of this area rupturing again, producing a spontaneous pneumothorax? If the mechanism of the injury was as just described, the injured area should heal adequately within a few months, with very little risk of a spontaneous pneumothorax as a result of this injury. The lung itself probably suffered little if any damage from this injury.

However, if a chest injury results in penetration of the lung by a broken rib, a gunshot, a knife or other sharp object, then it is often

assumed that the underlying lung tissue is damaged, and scarring of the lung and pleura may increase the risk that pulmonary barotrauma will occur during diving.

A person with this type of injury would require an evaluation prior to scuba diving. The presence of any abnormal shadows within the lung on a chest X-ray or CT scan suggests an increased risk of air-trapping and reduction in elasticity. Thus, he might be advised that the risk of barotrauma is too great to consider diving.

A spontaneous pneumothorax can occur with no warning to an apparently healthy person. This is due to a lung defect, which may be congenital or may appear later in life. The recurrence rate of this type pneumothorax is high, and, for that reason, these individuals are usually advised not to dive. The risk is that a spontaneous pneumothorax might occur while diving, resulting in a closed air space, which could not be equalized as the diver ascends. The resulting expansion of this air space with decreasing ambient pressure would interfere with the function of the heart and the other lung, with possible disastrous consequences.

If you have questions about pneumothorax, see your diving doctor or contact DAN.

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